Malaysian Communications and Multimedia Commission

Review of Access List

Public Inquiry Paper

20 August 2021

This Public Inquiry Paper was prepared in fulfilment of sections 55(2), 55(4) and 61 of the Communications and Multimedia Act 1998

PREFACE

The MCMC invites submissions from industry participants, other interested parties and members of the public on the questions and issues raised in this PI Paper concerning the **Review of the Access List**. In this PI Paper the MCMC sets out an array of preliminary views. Submissions are welcome on the preliminary views where comment is specifically sought. Submissions are also welcome on the rationale and analysis comprising this PI Paper where no specific questions have been raised. All submissions should be substantiated with reasons and, where appropriate, evidence or source references. Written submissions, in both hard copy and electronic form, should be provided to the MCMC in full by **12 noon, 18 October 2021**.

Submissions should be addressed to:

> The Chairman
> Malaysian Communications and Multimedia Commission (MCMC)
> MCMC HQ Tower 1
> Jalan Impact, Cyber 6
> 63000 Cyberjaya
> Selangor

> Attention   : Ms. Janakky Raju / Ms. Karen Woo / Ms. Nabilah Rafiene
> Email   : accesslist@mcmc.gov.my

> Telephone: +603 8688 8000
> Facsimile: +603 8688 1000

In the interest of fostering an informed and robust consultative process, the MCMC proposes to make submissions received available to interested parties upon request. The MCMC also reserves the right to publish extracts or entire submissions received. Any commercially sensitive information should be provided under a separate cover clearly marked '**CONFIDENTIAL**'. However, for any party who wishes to make a confidential submission, a "public" version of the submission should also be provided.

Contents

ABBREVIATIONS AND GLOSSARY

A2P	Application-to-Person
AaaS	Antenna-as-a-Service
ACCC	Australian Competition and Consumer Commission
ADEX	Advertising Expenditure
ADSL	Asymmetric Digital Subscriber Line
ANO	Alternate Network Operator
API	Application Programming Interface
ARCEP	Autorité de Régulation des Communications Électroniques et des Postes
ASEAN	The Association of Southeast Asian Nations
ASP	Applications Service Provider
ARPF	Authentication Credential Repository and Processing Function
ATM	Asynchronous Transfer Mode
AUSF	Authentication Server Function
B2B	Business-to-Business
BRT	Bus Rapid Transit
BSS	Business Support Systems
BTS	Base Transceiver Station
BTU	Basic Transmission Unit
CAPEX	Capital Expenditure
CAS	Common Antenna System
CASP	Content Applications Service Provider
CAT-M1	Category M1
CEM	Customer Experience Management
CDN	Content Delivery Network
CBD	Central Business District
CMA	Communications and Multimedia Act 1998
CoS	Classes of Service
CPP	Calling Party Pays
CRAN	Centralised Radio Access Network
CRTC	Canadian Radio-Television and Telecommunications Commission
CSFB	Circuit-Switched Call Fallback
DAB+	Digital Audio Broadcasting (plus)
DEL	Direct Exchanged Line
DNB	Digital Nasional Berhad
DRM	Digital Rights Management
DSL	Digital Subscriber Line

DSLAM	Digital Subscriber Line Access Multiplexer
DSS	Dynamic Spectrum Sharing
DTT	Digital Terrestrial Television
DTTB	Digital Terrestrial Television Broadcast
DWDM	Dense Wavelength Division Multiplexing
eMBB	Enhanced Mobile Broadband
eNB	Evolved Node B
eSIM	Electronic Subscriber Identity Module
EPC	Evolved Packet Core
EU	European Union
FeMBMS	Further Enhanced Multimedia Broadcast Multicast Service
FCC	Federal Communications Commission
FNP	Fixed Number Portability
FTA	Free to Air
FTTH	Fibre to the Home
FTTP	Fibre to the Premise
FTTx	Fibre to the x
FWA	Fixed Wireless Access
GGSN	Gateway GPRS Support Node
gNB	Next Generation Node B
GPON	Gigabit Passive Optical Network
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
GSMA	GSM Association
HSBB	High Speed Broadband Network
HSBT	High Speed Broadband Transmission
ILEC	Incumbent Local Exchange Carrier
IMDA	Info-Communications Media Development Authority
IMT	International Mobile Telecommunications
IoT	Internet of Things
IP	Internet Protocol
IPTV	Internet Protocol Television
IPVPN	IP-based Virtual Private Network
IRAT	Inter Radio Access Technology
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
IVR	Interactive Voice Response
IWK	Indah Water Konsortium

IX	Internet Exchange
JBIX	Johor Bahru Internet Exchange
JENDELA	Jalinan Digital Negara
Kbps	Kilo Bit Per Second
LLU	Local Loop Unbundling
LTBE	Long-Term Benefit of the End User
LTE	Long-Term Evolution
LTU	Light Rapid Transit
M2M	Machine to Machine
MAFB	Malaysian Access Forum Berhad
Mbps	Mega Bit Per Second
MBMS	Multimedia Broadcast Multicast Service
MCMC	Malaysian Communications and Multimedia Commission
MDF	Main Distribution Frame
MEC	Multi Edge Computing
MEF	Metro Ethernet Forum
Metro-E	Metro Ethernet
MJM	Memorandum Jemaah Menteri
MMS	Multimedia Messaging Service
MMTC	Massive Machine Type Communications
MNO	Mobile Network Operator
MOCN	Multi-Operator Core Network
MORAN	Multi Operator Radio Access Network
MPFN	Majlis Perancangan Fizikal Negara
MNKT	Majlis Mesyuarat Negara Bagi Kerajaan Tempatan
MSA	Mandatory Standard on Access
MSAP	Mandatory Standard on Access Pricing
MSAP 2017	Commission Determination on the Mandatory Standard on Access Pricing, Determination No.1 of 2017
MRT	Mass Rapid Transit
MVNO	Mobile Virtual Network Operator
MVNSP	Mobile Virtual Network Service Provider
MyIX	Malaysia Internet Exchange
MyNAP	Malaysia Network Access Point
NaaS	Network-as-a-Service
NB-IoT	Narrowband Internet of Things
NEAP	Numbering and Electronic Addressing Plan
NEF	Network Exposure Function

NFCP	National Fiberisation and Connectivity Plan
NFV	Network Function Virtualisation
NGN	Next-Generation Network
NR	New Radio Network Architecture
NRA	National Regulatory Authority
NSA	Non Standalone Architecture
NSSF	Network Slice Selection Function
NTU	Network Termination Unit
Ofcom	Office of Communications (United Kingdom)
OLT	Optical Line Terminal
OSI	Open Systems Interconnection
OSS	Operations Support System
OTT	Over-the-Top
P2P	Person-to-Person
PBX	Private Branch Exchange
PDH	Plesiochronous Digital Hierarchy
PDM	Poles, Ducts and Manholes
PLMN	Public Land Mobile Network
POI	Point of Interconnection
PON	Passive Optical Network
POP	Point of Presence
PSTN	Public Switched Telephone Network
PTN	Packet Transport Network
QoS	Quality of Service
RAN	Radio Access Network
RAO	Reference Access Offer
RCS	Rich Communication Services
RFS	Radio Frequency System
ROW	Right of Way
SA	Standalone Architecture
SAO	Standard Access Obligation
SBC	State-Backed Company
SCORE	Sarawak Corridor of Renewable Energy
SDH	Synchronous Digital Hierarchy
SD WAN	Software-defined wide-area network
SEAF	Security Anchor Function
SEPP	Security Edge Protection Proxy
SIDF	Subscription Identifier De-Concealing Function

SIM	Subscriber Identity Module
SIP	Session Initiation Protocol
SKR1M	Sistem Kabel Rakyat 1Malaysia
SLA	Service Level Agreement
SLG	Service Level Guarantee
SLTE	Submarine Line Terminal Equipment
SMA	Sarawak Multimedia Authority
SMS	Short Messaging Services
SOP	Standard Operating Procedure
SPV	Special Purpose Vehicle
SS7	Signalling System Number 7
TDM	Time Division Multiplexing
TGA	Talian Gerak Alih
TM	Telekom Malaysia
UCaaS	Unified Communications as a Service
UDM	Unified Data Management
UDR	Unified Data Repository
UK	United Kingdom of Great Britain and Northern Ireland
ULL	Unconditioned Local Loop
UPE	User-Facing Provider Edge
URLLC	Ultra-Reliable Low Latency Communications
USP	Universal Service Provider
VDSL	Very High Bit Rate Digital Subscriber Line
VoIP	Voice over Internet Protocol
VoLTE	Voice-over-LTE (Long-Term Evolution)
V2V	Vehicle-to-vehicle
V2X	Vehicle-to-everything
VPN	Virtual Private Network
WiMAX	Worldwide Interoperability for Microwave Access
WLLC	Wholesale Local Leased Circuit
3G	Third Generation
3GPP	Third Generation Partnership Project
4G	Fourth Generation
5G	Fifth Generation
5GC	5G Core Network

Part A Background

1   Overview

Structure of this PI Paper

1.1   This PI Paper comprises three parts:

(a)   **Part A (Background)** — Chapters 1 to 5 are an introduction to this Public Inquiry, providing details about this document, the Public Inquiry process, the legal and historical context, key concepts and the MCMC's methodology to reviewing the Access List.

(b)   **Part B (Review of Access List Services)** — Chapters 6 to 15 review the existing Access List facilities and services in the context of the family of facilities and services to which they belong, consider potential changes to the facilities and services and summarize stakeholder views. In these chapters, the MCMC:

(i)   gives a preliminary view on the continuing regulation of each of those facilities and services, including any proposed changes to the description of the facilities and services;

(ii)   reviews any potential new Access List facilities and services and gives a preliminary view on whether each of those facilities and services should be regulated, including changes to existing Access List service descriptions to accommodate the potential new facilities and services where required; and

(iii)   reviews stakeholder views and the MCMC's assessment of whether any facilities or services should be removed from the Access List.

(c)   **Part C (Other submissions)** – Chapter 16 sets out other submissions received from stakeholders in relation to the access regime more generally. In this chapter, the MCMC discusses and gives a preliminary view on these submissions, to the extent relevant to the scope of this Public Inquiry.

Purpose of this Public Inquiry and PI Paper

1.2   Under section 55(1) of the Communications and Multimedia Act 1998 (**CMA**), the MCMC may, from time to time, make a determination on any matter specified in the CMA. The relevant matter in this case is the question of access under Part VI, Chapter 3 of the CMA.

1.3   Access regulation, or forbearance in respect of access regulation, has long-term consequences: overall economic implications for industry, financial implications for firms, and impacts on consumers and technological innovation. The MCMC has adopted the widest possible consultative approach under the CMA in order to obtain maximum industry and public input. The MCMC's approach is also designed to promote certainty and transparency in the exercise of its powers.

1.4   This PI Paper has been issued by the MCMC to solicit views from industry participants, other interested parties and members of the public to assist the MCMC to determine whether:

Access List

(a)   existing Access List facilities and services should be retained or removed;

(b)   the descriptions of any Access List items that are to be retained in the Access List remain appropriate or should be revised; and

(c)   additional facilities and services should be included in the Access List.

1.5   As discussed below, the MCMC has already undertaken an information gathering exercise which included the circulation of an informal questionnaire and presentations to industry about the proposed Public Inquiry. The MCMC has had regard to feedback provided by industry during this information gathering phase in preparing this PI Paper.

Public Inquiry Process

1.6   The Public Inquiry process is subject to certain requirements under the CMA. Chapter 2 of this PI Paper sets out a more complete description of the CMA provisions which apply to this Public Inquiry. However, in brief:

(a)   section 61(1)(d) of the CMA requires that the Public Inquiry period must be a minimum of 45 days, within which public submissions will be invited;

(b)   section 65(2) of the CMA requires the MCMC to publish a report setting out the findings of an inquiry within 30 days of the conclusion of its Public Inquiry; and

(c)   section 55(5) of the CMA requires the MCMC to make a determination about a matter regarding which a public inquiry is held within 45 days of the conclusion of its Public Inquiry.

1.7   At the end of the Public Inquiry, the MCMC will:

(a)   publish a report setting out its findings in relation to the Public Inquiry during the 30-day period following the close of the Public Inquiry; and

(b)   make any determinations arising out of the Public Inquiry within a further 15 days (during the 45-day period following the close of the Public Inquiry).

1.8   An indicative timeline for this process is set out in Annexure 2 (Proposed timeline for Public Inquiry and Access List revision) of this PI Paper.

IMPORTANT NOTE: *The MCMC has provided a period for submissions of close to 60 days. As a result, the MCMC will not be providing extensions of time for late submissions.*

Scope of Public Inquiry

1.9   In conducting this Public Inquiry, the MCMC will be undertaking the following tasks:

(a)   applying a robust and transparent methodology for determining which new facilities and services will be considered for inclusion in the Access List, and which existing facilities and services should be removed or amended; and

(b)   reviewing the state of competition in the Malaysian communications and multimedia industry under the current Access List and assessing whether there are any potential access issues which arise, and whether any of these issues can be addressed by amending the current Access List;

(c)   an analysis of the likely competition/long-term benefit of end user outcomes arising from access regulation, in particular whether the inclusion of certain facilities and services in the Access List would be consistent with the objects of the CMA; and

(d)   reviewing and/or drafting supporting regulatory documents such as drafting a revised Access List to accommodate any changes in the access regime arising from this Public Inquiry.

1.10   In undertaking these tasks, the MCMC will have regard to feedback from the industry during the information gathering phase described above.

Matters outside scope

1.11   Matters that are outside the scope of this review include:

(a)   determinations on pricing;

(b)   determinations on non-price terms and conditions, which will be the subject of a separate review of the Mandatory Standard on Access; and

(c)   consideration of exemptions from the standard access obligations (**SAOs**), which are subject to grant by the Minister.

Outputs from Public Inquiry

1.12   The first output of the Public Inquiry will be a Public Inquiry Report which will set out the MCMC's findings on the Public Inquiry.

1.13   The regulatory instruments that may potentially be issued following this Public Inquiry are:

(a)   a Determination that varies the existing Determination on the Access List; or

(b)   a new Access List Determination, which would include all retained facilities and services (as amended) and any new facilities and services to be included in the Access List Determination.

1.14   The existing Access List is set out in the Commission Determination on Access List, Determination No 2 of 2015. This Access List would be modified, varied or revoked under sections 56 and 146 of the CMA.

2   Legislative Context

2.1   The CMA governs the communications and multimedia industry in Malaysia and establishes the regulatory and licensing framework applicable to the industry.

2.2   Chapter 3 of Part VI of the CMA is about Access to Services. It contains processes for the MCMC to regulate access to facilities and services which are listed in the Access List.

2.3   The relevant provisions of the CMA for the purposes of this review of the Access List are as follows:

(a)   section 55 – the general processes for the MCMC to follow in making a determination under the CMA, including the requirement for the MCMC to hold an inquiry;

(b)   section 56 – the general processes for the MCMC to follow in modifying, varying or revoking a determination under the CMA (which are the same as the processes that apply to the making of a determination under section 55);

(c)   section 58 – the discretion of the MCMC to hold a public inquiry on any matter which relates to the administration of the CMA, either in response to a written request from a person or on its own initiative if the MCMC is satisfied that the matter is of significant interest to the public or to the industry;

(d)   section 60 – the discretion for the MCMC to exercise any of its investigation and information-gathering powers in Chapters 4 and 5 of the CMA in conducting an inquiry, such as issuing directions to persons to produce any information or documents that are relevant to the performance of the MCMC's powers and functions under the CMA;

(e)   section 61 – the requirement for the inquiry to be public and for the MCMC to invite and consider submissions from members of the public relating to the inquiry;

(f)   sections 62 and 64 – the discretion of the MCMC to conduct an inquiry (or parts of an inquiry) in private in certain cases, to direct that confidential material presented to the inquiry or lodged in submissions not be disclosed or that its disclosure be restricted;

(g)   section 65 – the requirement to publish a report into any inquiry undertaken under the previous sections of the CMA within 30 days of the conclusion of the inquiry;

(h)   section 145 – the categories of facilities and services which the MCMC may determine are to be included in the Access List;

(i)   section 146 – the power of the MCMC to determine that facilities and services be included in or removed from the Access List; and

(j)   section 147 – the ability for an access forum to recommend the inclusion or removal of a facility or service from the Access List.

2.4   The MCMC has determined under section 58(2) that a public inquiry will be held as part of this review, as the review is of significant interest to the public or industry. This process accords with international regulatory best practice.

Objects and national policy objectives

2.5   This Public Inquiry will be conducted in accordance with the objects and national policy objectives of the CMA. The objects of the CMA are set out in section 3(1) as follows:

(a)   to promote national policy objectives for the communications and multimedia industry;

(b)   to establish a licensing and regulatory framework in support of national policy objectives for the communications and multimedia industry;

(c)   to establish the powers and functions for the Malaysian Communications and Multimedia Commission; and

(d)   to establish powers and procedures for the administration of the CMA.

2.6   The national policy objectives are set out in section 3(2) as follows:

(a)   to establish Malaysia as a major global centre and hub for communications and multimedia information and content services;

(b)   to promote a civil society where information-based services will provide the basis of continuing enhancements to quality of work and life;

(c)   to grow and nurture local information resources and cultural representation that facilitate the national identity and global diversity;

(d)   to regulate for the long-term benefit of the end user;

(e)   to promote a high level of consumer confidence in service delivery from the industry;

(f)   to ensure an equitable provision of affordable services over ubiquitous national infrastructure;

(g)   to create a robust applications environment for end users;

(h)   to facilitate the efficient allocation of resources such as skilled labour, capital, knowledge and national assets;

(i)   to promote the development of capabilities and skills within Malaysia's convergence industries; and

(j)   to ensure information security and network reliability and integrity.

3 Key Concepts

Long-Term Benefit of the End User

3.1   In the MCMC's 2015 review of the Access List and in previous reviews, the MCMC adopted the principle of regulation in the long-term benefit of the end user (**LTBE**) as its guiding point of assessment for whether facilities or services should be included in the Access List. The LTBE is one of the national policy objectives for the communications and multimedia industry set out in section 3 of the CMA (discussed below). In its recent regulatory activities, the MCMC has focused on the following elements of the LTBE:

    (a)   the objective of promoting competition in relevant markets;

    (b)   the objective of achieving any-to-any connectivity in relation to communications services; and

    (c)   the objective of encouraging the economically efficient use of and investment in communications infrastructure.

3.2   The MCMC also considered other national policy objectives that were relevant to access regulation, including national development, equitable and non-discriminatory provision of services over ubiquitous national infrastructure, and the promotion of technology-neutral service delivery with an eye to future requirements. These objectives are, to some extent, inherent in the LTBE concept. However, the MCMC found it useful to have separate explicit regard to these objectives when one of them was particularly relevant to the inclusion or exclusion of a particular facility or service in the Access List.

Bottleneck Facilities

3.3   In the MCMC's most recent Access List review, the MCMC also proceeded on the presumption that the inclusion of 'bottleneck' facilities and services in the Access List would be in the LTBE, and the MCMC intends to proceed on the same presumption in this review. The sharing of 'bottlenecks' or 'essential facilities' which cannot feasibly be duplicated is a well-established concept in economic regulation.

3.4   The concept requires the existence of two markets, typically designated as an 'upstream' and a 'downstream' market, and usually the presence of one firm in both markets. Other firms that are (or seek to become) active in the downstream market require access to an input in the upstream market. That input may be supplied by the rival firm operating in both markets.

3.5   The MCMC stresses however that:

    (a)   whether a service is (or is not) a "bottleneck" service will not be determinative of whether it should (or should not) be listed on the Access List; and

(b)   the MCMC will have regard to all relevant factors, including weighing the costs of regulation against the benefits, in determining whether a service should be listed on the Access List.

3.6   Accordingly, as it has been stated previously, the MCMC notes that even if a facility or service is not characterised as a bottleneck, it will still be assessed against the individual components or factors of the LTBE test and considered in light of other relevant factors. For example, some facilities or services may not exhibit bottleneck characteristics, but the MCMC may consider that the markets in which these facilities or services serve as inputs do not exhibit workable levels of competition. The MCMC may accordingly decide to regulate those facilities and services in order to promote competition to a workable level in accordance with the LTBE.

Incentive-Based Regulation

3.7   In the MCMC's 2015 review of the Access List, the MCMC introduced a mechanism to remove regulated access to facilities and services in the Access List in a targeted manner when there is evidence that supply is occurring in respect of a related upstream service and will continue to occur on reasonable terms even if regulation is removed.

3.8   Accordingly, given that some facilities and services in the Access List have not been supplied at all to date in 2015, the MCMC introduced additional regulation of facilities and services in higher layers of the network stack, where those alternative facilities and services are being supplied in the market at present. As such, in 2015, End-to-End Transmission Service was included in the Access List, in addition to Trunk Transmission Service and Wholesale Local Leased Circuit Service; and Layer 3 HSBB Network Service was included in the Access List in addition to Layer 2 HSBB Network Service with Quality of Service. These facilities and services are subject to SAOs, which oblige access providers to make the facilities and services available to all access seekers on an equivalent basis and on equitable and non-discriminatory terms in accordance with section 149(2) of the CMA.

3.9   As mentioned above, the MCMC introduced mechanisms where the additional facilities and services (e.g. Layer 3 HSBB Network Service) could be deregulated once there is evidence of the supply of the original upstream facilities and services (e.g. Layer 2 HSBB Network Service with Quality of Service) as a method of incentivising access providers to offer the original upstream facilities and services.

3.10   Such regulatory design is consistent with the 'ladder of investment' theory which has proven robust in other jurisdictions. That is, effective regulation of services in higher layers of the network stack would be removed as access seekers are given the opportunity to make additional infrastructure investments and need only rely on regulated access to facilities and services in lower layers of the network stack.

3.11   However, this theory relies on access providers actually supplying services in the higher layers of the network stack. In this regard, the MCMC notes that one form of incentive-based regulation is to allow for the de-regulation of higher-level

services in the OSI stack where lower layer services become available. For example, there could be a case for the MCMC to deregulate the Layer 3 HSBB Network Service if supply of the Layer 2 HSBB Network Service with QoS becomes more prevalent. Conversely, the current lack of availability of the Layer 2 HSBB Network Service with QoS may prevent the future de-regulation of the Layer 3 HSBB Network Service.

4 Methodology

Access List

4.1 Part B (Review of Access List Services) of this PI Paper reviews existing facilities and services listed in the Access List in the context of the family of facilities and services to which they belong and sets out the MCMC's preliminary analysis of whether they should be retained in the Access List (with or without amendment), having regard to the above methodology. Where sensible for discussion purposes, one facility or service has been split into multiple sub-topics or the discussion of multiple facilities and services has been combined.

4.2 In deciding to list a particular service in the Access List, the MCMC has previously employed a variety of specific approaches to determine whether the LTBE has been satisfied. These have included:

(a) the "with or without" test, which posed the question of whether it was more desirable (that is, in the LTBE) to impose regulation rather than to exercise regulatory forbearance; and

(b) a qualitative cost-benefit analysis of access regulation, based on the submissions received to the MCMC's public inquiries.

4.3 Based on this methodology, in 2015, the MCMC added certain facilities and services onto the Access List, removed others and varied the descriptions of certain facilities and services which were already in the Access List.

4.4 This methodology reflects international best practice and was generally well received by the industry in the course of the MCMC's previous Access List Review in 2015. Accordingly, the MCMC proposes to apply the same methodology in this Access List Review.

4.5 For each facility or service being considered for addition to, removal from or retention (with or without amendment) in the Access List, the PI Paper sets out:

(a) a short summary of competition in the supply of the facility or service;

(b) any submissions received on the facility or service during the information gathering phase;

(c) a public policy assessment of retaining, amending, removing or adding the facility or service (at which stage the PI Paper considers the tests above for determining whether access regulation is in the LTBE);

(d)   a preliminary finding on whether to retain, amend, remove or add the facility or service to the Access List (as applicable); and

(e)   specific questions on the facility or service.

4.6   Importantly, the MCMC notes that other than in respect of section 9, submissions by operators set out in this PI Paper were made prior to the Government's announcement of the establishment of Digital Nasional Berhad (**DNB**) as Malaysia's single 5G wholesale network operator in February 2021. Accordingly, some submissions may reflect an outdated assumption by operators regarding the context in which 5G deployment will occur. MCMC has not amended the summary of those submissions in this PI Paper, but the summary of submissions other than those provided specifically in respect of 5G services in section 9 should be read in this context.

Other submissions

4.7   Part C (Other submissions) of this PI Paper sets out other submissions received from stakeholders in relation to the access regime more generally. In this chapter, the MCMC discusses and gives a preliminary view on these submissions, to the extent relevant to the scope of this Public Inquiry.

5   Focus areas

5.1   In the course of its previous reviews of the Access List, the MCMC has typically established key themes which have assisted in framing the scope of the Public Inquiry. While these themes do not exhaustively cover the issues raised by stakeholders, the MCMC considers that they have proven useful in guiding the industry and the MCMC itself as to the focus areas of the Public Inquiry, to ensure that regulation (or forbearance) is appropriately targeted at the "pain points" experienced by access seekers and access providers.

5.2   The MCMC has also formulated focus areas for this Public Inquiry, which are set out below. The common theme underlying all areas is the need to continuously refine the Access List and its implementation, in order to reflect the state of competition in the supply of regulated facilities and services.

5.3   The 2015 Access List review reflected the MCMC's key focus areas at the time, especially in relation to transmission services, HSBB services, fostering investment in network infrastructure and on incentive-based regulation. In particular:

(a)   the MVNO Access Service was added to the Access List in order to incentivise supply of that service to access seekers;

(b)   a new End-to-End Transmission Service was added to the Access List to minimise challenges reported by access providers in establishing Point of Interconnections and acquiring Network Co-Location Services as is typically required in respect of other regulated transmission services;

(c) a new Layer 3 HSBB Network Service was listed on the Access List to improve access to next generation services at layer 3 and provide a path to competition at layer 2 over time;

(d) the Duct and Manhole Access Service was added to the Access List to include access to lead-in ducts and manholes, and mainline ducts in certain areas of exclusivity; and

(e) the service descriptions of many services were amended in order to clarify that these services are technology neutral, ensuring ongoing investment in, and availability of, new technologies.

5.4 The period between the 2015 Access List and this review reflects the broader trend observed by the MCMC in the last few years of fewer fundamental technological developments in the lower layers of the network stack that are inputs to other facilities and services. For example, as the supply of HSBB services has widened and matured, so too has the state of wholesale fixed broadband services settled.

5.5 As the lower layers of the network stack are inputs to other facilities and services, they are generally where bottleneck facilities are found. Consequently, access regulation – and the MCMC's ongoing focus in this review – is generally aimed at the lower layers of the network stack, especially passive network infrastructure, and of elements of the JENDELA and MyDigital plans, such as 5G access.

5.6 These themes are reflected in the information provided by operators in the information-gathering phase. The MCMC's review of that information suggests five focus areas for the current review which are shaped by technological development, the state of competition and investment in the industry. The five focus areas are:

(a) **ensuring access to DNB's monopoly 5G single wholesale network:** The establishment of DNB as a Government-owned special purpose vehicle responsible for deploying Malaysia's single 5G wholesale network will have a transformative impact on Malaysia's digital capability, in line with the Government's MyDigital blueprint. The MCMC is concerned to ensure that although DNB will be the only wholesale 5G provider and will accordingly have a monopoly in respect of such services, that access seekers are able to secure access to such services on equitable and non-discriminatory terms. The MCMC also seeks to ensure that regulation is dynamic and forward-looking so as to be responsive to technological innovation over time, even though 5G services have not yet been launched and will be at a nascent stage for some time as DNB commences its rollout;

(b) **enhancement of High Speed Broadband (HSBB) network regulation:** the MCMC has strengthened regulation of Layer 2 HSBB Network Service with QoS and Layer 3 HSBB Network Service to address issues faced by access seekers and to take into account technological developments;

(c) **ensuring and improving access to passive infrastructure:** ensuring that passive infrastructure including ducts, poles, manholes and 5G-related infrastructure such as street poles and street furniture are openly accessible in order to accelerate network rollout and meet the Government's ambitious JENDELA targets;

(d) **continuing development of regulation of transmission services:** as transmission services are the most acquired services in the Access List, regulation of End-to-End Transmission Service, Trunk Transmission Service and Wholesale Local Leased Circuit Service have been strengthened and clarified to ensure that the services can remain available to be acquired on an unbundled basis; and

(e) **fostering investment in access network infrastructure:** enhancing regulation on duct and manhole access to enable operators to access these bottleneck facilities, particularly when wishing to expand their access to high-speed broadband or other fixed transmission infrastructure beyond premises currently served by an HSBB Network.

5.7 These focus areas are particularly relevant to:

(a) the MCMC's proposal to list certain new facilities and services in the Access List (discussed in Part B of this Public Inquiry Paper); and

(b) the MCMC's proposal to introduce regulation of downstream facilities and services in response to a failure by operators to supply access to related upstream facilities and services which are currently regulated (discussed below).

Part B Review of Access List Services

6 Overview of current Access List

6.1 The current Access List includes the following listed facilities and services, organised by families of facilities and services, each of which is considered in this Part B (Review of Access List Services) of the PI Paper:

(a) Fixed line services

  (i) Fixed Network Termination Service

  (ii) Fixed Network Origination Service

  (iii) Wholesale Line Rental Service

(b) Mobile services

  (i) Mobile Network Termination Service

  (ii) Mobile Network Origination Service

  (iii) MVNO Access

(c) Facilities access services

  (i) Infrastructure Sharing

  (ii) Duct and Manhole Access

(d) Interconnection services

  (i) Interconnect Link Service

  (ii) Network Co-location Service

(e) Broadcasting services (except transmission services)

  (i) Digital Terrestrial Broadcasting Multiplexing Service

(f) Transmission services

  (i) End-to-End Transmission Service

  (ii) Wholesale Local Leased Circuit (**WLLC**) Service

  (iii) Trunk Transmission Service

  (iv) Domestic Connectivity to International Service (connectivity only)

(g) HSBB Services

  (i) Layer 2 HSBB Network Service with QoS

(ii)   Layer 3 HSBB Network Service

(h)   Copper-based services (except in relation to HSBB connected premises)

(i)   Full Access Service

(ii)   Line Sharing Service

(iii)   Sub-Loop Service

(iv)   Bitstream Service

(v)   Digital Subscriber Line Resale Service

7   Fixed line services

Introduction

7.1   The following facilities and services comprise the family of fixed line services in the Access List:

(a)   Fixed Network Termination Service;

(b)   Fixed Network Origination Service; and

(c)   Wholesale Line Rental Service.

7.2   In this section, the MCMC will consider each of the above fixed line facilities and services in turn.

Fixed Network Termination Service

Overview: Voice termination services terminating on each operator's network

7.3   Termination of voice calls and messages, together with origination (see paragraphs 7.45 to 7.50), are required to facilitate any-to-any connectivity. When an end-user (A-party) makes a call or sends a message to a person (B-party) connected to a different network, the A-party's service provider must acquire termination services from the B-party in order to allow the call or message to reach the B-party.

7.4   Termination services are not required for on-net services, where the A-party and B-party are both connected to the same network and the operator can therefore originate and terminate the call or message over the same network.

7.5   Termination services are acquired by the A-party's service provider from a Point of Interconnection (**POI**) or "hand-off" point. This is a point where the network of the A-party service provider physically interconnects with the B-party service provider.

7.6   The need for wholesale termination services arises due to the prevalence of the "calling party pays" (**CPP**) model, which is the most common pricing construct for retail voice and messaging services. Under this arrangement, only the A-party pays a retail charge for a voice call (or, for mobile termination services,

SMS/MMS messages), with the B-party not paying any charge. The B-party service provider therefore does not recover the cost of termination from its own end-user, but rather from the A-party's service provider, in the form of wholesale termination charges. These termination charges are then passed on to the A-party via the retail charges paid by the A-party to its service provider.

Competition/LTBE Analysis

7.7   The specific operator to which a B-party number is connected is the only operator who has the ability to provide termination services in respect of that B-party number (because it controls all of the network infrastructure enabling such termination to the B-party number). Accordingly, the relevant terminating operator has a monopoly and is the only viable supplier.

7.8   The MCMC acknowledges the theoretical possibility of the originating party acquiring termination services from a downstream operator (i.e. from a transit provider or reseller, rather than directly from the terminating operator). However, because the terminating network operator is the sole party who has control over the terminating segment of the network leading up to the B-party's number, such transit provider or reseller must also ultimately acquire termination services from that terminating network operator. The MCMC has no evidence that, in practice, transit providers or resellers compete with terminating network operators in providing termination services to originating operators.

7.9   Accordingly, the MCMC's preliminary view is that each network operator has a monopoly in respect of termination services to B-parties connected to their network. Such operator's control over the terminating segment of their network also means that there is no viable possibility of competition or future entry in the relevant markets in which these services are supplied.

7.10   The MCMC does not believe there have been any material changes in the state of competition in the supply of these services since the 2015 Access List review.

Service Description

7.11   The Fixed Network Termination Service is currently described in the Access List as follows:

4(2)   Fixed Network Termination Service

(a)   *A Fixed Network Termination Service is an Interconnection Service provided by means of a Fixed Network for the carriage of Call Communications from a POI to a 'B' party. The Fixed Network Termination Service comprises transmission and switching, whether packet or circuit, for Fixed Network-to-Fixed Network, Mobile Network-to-Fixed Network and incoming international-to-Fixed Network calls and messages which require Any-to-Any Connectivity.*

(b)   *The functionalities of the Fixed Network Termination Service include:*

(i)   *transmission and switching, whether packet or circuit; and*

(ii)   *the signalling required to support the Interconnection Service.*

Examples of technologies used in the provision of the Fixed Network Termination Service include PSTN, Integrated Services Digital Network ("ISDN"), other IP based networks and any other fixed network technology which is currently available or which may be developed in future that involves the carriage of Call Communications.

7.12   As explained in paragraphs 7.51 to 7.53 below, the broad definition of "Call Communications" in the Access List means that the description of the Fixed Network Termination Service comprises voice call termination, SMS and MMS message termination.

7.13   The scope of the Fixed Network Termination Service is illustrated in the diagram below:
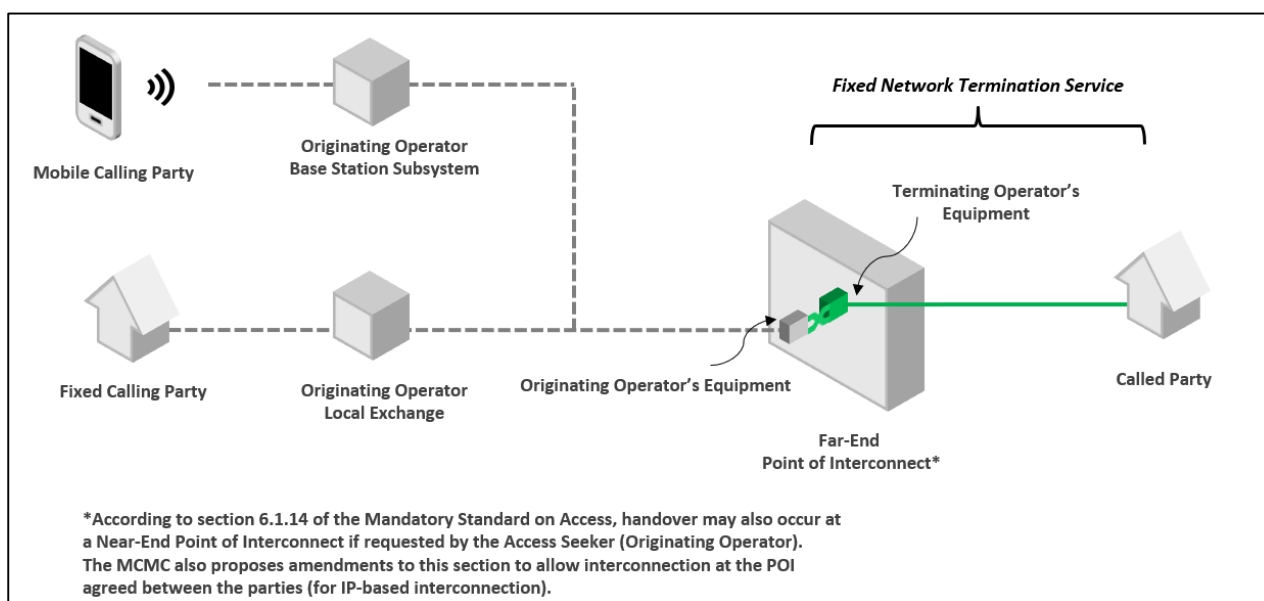
Figure 1 – Scope of Fixed Network Termination Service

Submissions Received

7.14   As operators generally combined their submissions in respect of the Fixed Network Termination Service and the Fixed Network Origination Service, the following paragraphs set out submissions in respect of both of these services.

7.15   Access seekers generally noted that the Fixed Network Origination Service and Fixed Network Termination Service listed in the Access List are useful as an input to the services supplied by access seekers to their customers.

7.16   Celcom submitted that the Fixed Network Termination Service listed in the Access List allow calls made from Celcom's mobile network to terminate on fixed networks, enabling any-to-any connectivity. Celcom noted that it is not experiencing any impediment in acquiring this service.

7.17   Digi, Ohana, Redtone, TIME, TM and Webe each submitted that they acquire these services and find them usable as an input to the services they respectively supply to their customers.

7.18   Digi requested that the MCMC review the status of calls which terminate to a customer's network by means of an IVR voice prompt. Digi cited an increasing trend of traditional voice calls being used to contact end customers, including for scam phone calls. Digi proposed that IVR voice prompts should be subject to their own rules, whether technically or commercially.

7.19   Maxis acquires the Fixed Network Origination Service and Fixed Network Termination Service as an input for the fixed and mobile services it supplies to its customers. Maxis submitted that the listed services provide the required functionality, but that the services need to be improved to cater for fixed number portability.

7.20   Maxis cited examples of mandated fixed number portability in jurisdictions such as the United Kingdom, France, Australia, Singapore and Hong Kong, and noted the following advantages of fixed number portability:

(a)   improves competition by facilitating changes of providers, in turn aiding the introduction of new and innovative services such as IP telephony, hosted PBX, cloud services and unified communications solutions; and

(b)   reducing the key barrier to end users changing fixed numbers, given the cost, resource, time and lost business implications of a number change.

7.21   Maxis also submitted that a growing number of fixed voice services are being provided over IP, including voice over broadband. Maxis proposed that the MCMC should further study these types of calls and provide proper guidance on their service descriptions, call routing, point of interconnect and QoS.

7.22   Myren acquires the Fixed Network Origination Service to bundle with non-telco services for its customers and reported no impediments in acquiring the service.

7.23   Redtone submitted that although the acquired Fixed Network Origination Service provides the required functionality, Redtone has experienced a lengthy access request and negotiation process, which affects implementation and pricing. Redtone wishes to ensure the supply of the Fixed Network Origination Service is not limited based on the technology listed in the Access List.

7.24   TM submitted that public switched telephone network (**PSTN**) technology should be excluded from the Access List service description for each of the Fixed Network Origination Service and Fixed Network Termination Service, on the basis that TM has stopped using PSTN technology for these services.

7.25   TM also proposed that international inbound termination be removed from the definition of domestic interconnection and be established as a separate interconnect offering / service. TM submitted that clarifying the distinction between domestic interconnection and international inbound termination would enable a different termination rate to be established for international inbound traffic termination that reflects its market value (which TM argues should be higher).

7.26   In TM's view, such an approach would align with the approach adopted in other markets, for example in Singapore where TM noted the IMDA distinguishes

between international and domestic fixed voice services and has imposed a different access regime for these services.

7.27   U Mobile acquires the Fixed Network Termination Service. U Mobile submitted that Fixed Network operators should be required to offer IP-based interconnection to carry the Fixed Network Termination Service via SIP-I, given that TDM interconnection will reach end of service in the near future and is unlikely to be replaced.

7.28   Webe noted that the Fixed Network Origination Service and Fixed Network Termination Service enable its customers to enjoy seamless connectivity with end users on various platforms.

7.29   YTL acquires the Fixed Network Origination Service and reports no impediments in acquiring the service. However, YTL requested that the MCMC consider number portability for fixed numbers, which are currently allocated based on geographic areas. YTL considers that number portability for fixed numbers would allow operators to provide fixed services to customers without geographical restrictions.

MCMC Assessment

LTBE overview: Fixed Network Termination Service

7.30   Fixed Network Termination Service remains a bottleneck service. As described in paragraph 3.3 above, the MCMC considers that where a facility or service is characterised as a bottleneck, it is in the LTBE for the facility or service to be regulated.

7.31   The Fixed Network Termination Service can only be provided by the terminating operator in relation to each network. In terms of the LTBE in particular, Fixed Network Termination Services are necessary for achieving any-to-any connectivity and to promote competition in markets for which the Fixed Network Termination Service is an essential input. Therefore, the MCMC's preliminary view is that it is in the LTBE for that facility or service to be regulated.

7.32   Given the above, the MCMC considers that the rationale for regulating access to wholesale fixed network termination services remains valid, and there appears to be general consensus across the industry that this service should continue to be regulated.

Adjustments to service description

7.33   Operators have not raised any concerns regarding the basic definition of the service and the MCMC is not aware of any material changes in the market that would justify fundamental changes to the description of this service.

7.34   Rather, operators have generally observed that they are able to acquire the service as described with no impediments and that the service is usable as an input to the retail services they supply to their customers.

Technologies used in supply

7.35   The MCMC does not agree with TM's proposal that PSTN technology should be removed from the scope of the fixed origination and termination services. The MCMC's data as at first quarter of 2021 indicates that almost 1.7 million subscribers still acquire a direct exchange line (**DEL**) subscription, each of which is connected over PSTN.

7.36   Although the number of DEL subscriptions are reducing amidst the continuing transition to VoIP-based fixed services, the MCMC considers that there is insufficient substitutability between OTT voice and unmanaged VoIP services (on the one hand) and fixed PSTN, ISDN and managed VoIP services (on the other hand). As a result, there is a lack of services-based competition in relation to PSTN services, further diminishing the degree of competitive constraint on TM.

7.37   Given the above, the MCMC does not consider that PSTN technology should be excluded from the scope of the fixed origination and termination services.

7.38   Like U Mobile, a large number of stakeholders have mentioned that IP-based interconnection should be included in the Access List. The MCMC is closely considering whether the description of the Interconnect Link Service should be amended to explicitly include IP-based interconnection. This is discussed in further detail under the analysis of the Interconnect Link Service in paragraphs 11.3 to 11.45 below. The MCMC notes however that the description of the Fixed Network Termination Service is already technology neutral, and therefore also includes fixed voice termination services carried over IP-based networks (rather than only packet-switched or PSTN networks).

Other issues

7.39   With regard to Redtone's experience regarding a lengthy access request and negotiation process in respect of the Fixed Network Origination Service that it acquires, the MCMC reiterates that the Fixed Network Origination Service is already technologically neutral, and notes that minor variations were made to the service description and related definitions during the 2015 Public Inquiry Report on the Review of the Access List (**2015 Access List Review**) to reinforce this characterisation.

7.40   Regarding Digi's requested review of calls terminating to customers through IVR voice prompt messages, the MCMC again notes that the description of these services is technology neutral. The MCMC considers that any specific technical or commercial rules sought by Digi are more appropriately discussed in the context of a later review by the MCMC of the Mandatory Standard on Access.

7.41   If operators are unable to obtain access to a listed service to which the SAOs apply after trying to resolve any impediments directly with the access provider, operators should submit a complaint to the MCMC in accordance with section 69 of the CMA.

7.42   The MCMC notes Maxis and YTL's submissions that fixed number portability is a significant barrier to end users switching services and to market entry by new operators. The MCMC acknowledges that a static number is an important asset

for many end users, and given switching to a different retail provider would require the end user to change its fixed number, this is likely to carry significant costs for that end user. The MCMC also notes that the lack of fixed number portability continues to affect competition in the provision of fixed line services. As operators are likely aware, the MCMC has consulted on the implementation of FNP in Malaysia, and subsequently, the MCMC has provided its final view on the matter.[1]

7.43   In relation to TM's proposal that international inbound termination be regulated as a separate service on the Access List, the MCMC notes that the fixed network termination service is already technology and function-neutral, and therefore includes the termination of international calls to fixed Malaysian numbers. Further:

(a)   local, international and fixed-to-mobile calls involve the same underlying access infrastructure. In particular, (and in contrast to origination), termination of international inbound calls to fixed numbers in Malaysia takes place over the same infrastructure as termination of other calls to fixed numbers;

(b)   these calling services are supplied in the same market and are typically bundled; and

(c)   accordingly, these services are substitutable with each other, and there is no compelling justification for international inbound termination to be regulated as a separate service.

MCMC Preliminary View

7.44   The MCMC's preliminary view is that it would be in the LTBE for the Fixed Network Termination Service to remain in the Access List. The MCMC also considers that the service should be retained on the Access List without modification.

Questions

Question 1:   Do you agree with the MCMC's view to retain Fixed Network Termination Service in the Access List? Please provide details of your views.

Fixed Network Origination Service

Overview: Fixed voice origination services from each fixed operator's network

7.45   Origination is a wholesale service which carries a call from the A-party's premises to a POI, where it is handed over for termination on the network of the B-party (receiving party). Where the pricing construct for voice calls is a CPP model (as outlined in paragraph 7.6), there is no separate wholesale origination service. This is because the originating service provider is able to charge the A-party for the relevant call, meaning that this service provider does not need to recover

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the cost of origination from the terminating operator through a wholesale origination charge.

7.46   However, there are some circumstances where the CPP charging model does not apply. For example, freephone (1800) and toll-free (1300) voice calling services involve the B-party paying retail charges for the service to their service provider. The A-party is able to then call a 1300 number at a local call rate and a 1800 number at zero charge. This arrangement requires the terminating (B-party) service provider to pay an origination charge to the A-party service provider, to cover the origination of the call from the A-party to a POI.

Competition/LTBE Analysis

7.47   In the 2015 Access List Review, the MCMC held the view that the fixed wholesale origination service was a "bottleneck" service. Hence, the MCMC determined that this service should continue to be subject to regulation through inclusion in the Access List, as doing so would be in the long-term benefit of end users.[2]

7.48   Since the previous Access List review, the MCMC does not believe that there have been any material changes in the level of competition with respect to the supply of fixed wholesale origination services which would justify a change in this approach.

7.49   In the MCMC's view, each operator has a monopoly in respect of origination services from A-parties connected to their network. No other operator is able to provide origination services for A-parties connected to that operator's network. This suggests that, in order to promote the efficient use of infrastructure, there continues to be a strong basis for regulating access to wholesale origination services.

Service Description

7.50   The Fixed Network Origination Service is currently described in the Access List as follows:

4(1)   Fixed Network Origination Service

(a)   *A Fixed Network Origination Service is an Interconnection Service provided by means of a Fixed Network for the carriage of Call Communications from an 'A' party to a POI. The Fixed Network Origination Service comprises transmission and switching, whether packet or circuit, for Fixed Network-to-Fixed Network, Fixed Network-to-Mobile Network and Fixed Network-to-international outgoing calls insofar as they relate to freephone 1800 number services, toll free 1300 number services, and other similar services which require Any-to-Any Connectivity.*

(b)   *The functionalities of the Fixed Network Origination Service include:*

(i)   *transmission and switching, whether packet or circuit; and*

(ii)   *the signalling required to support the Interconnection Service.*

Examples of technologies used in the provision of the Fixed Network Origination Service include PSTN, Integrated Services Digital Network ("ISDN"), other IP based

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[2] MCMC, Access List Review Public Inquiry Report, 7 August 2015, pp. 9-12.

networks and any other fixed network technology which is currently available or which may be developed in future that involves the carriage of Call Communications.

7.51   "Call Communications" has the following definition in the Access List:

"Call Communications" means communications in whole or in part involving a number or IP address used in the operation of each Operator's network including Message Communications.

7.52   In turn, "Message Communications" is defined in the following manner:

"Message Communications" means communications that provide only text with or without associated images, audio clips and video clips. Examples of Message Communications include Short Message Service and Multimedia Message Service and any other technology which is currently available or which may be developed in future that involves the carriage of text communications with or without associated images, audio clips and video clips.

7.53   Accordingly, the description of the Fixed Network Origination Service comprises not only voice call origination, but also SMS and MMS message origination.

7.54   The scope of the Fixed Network Origination Service is illustrated in the diagram below:
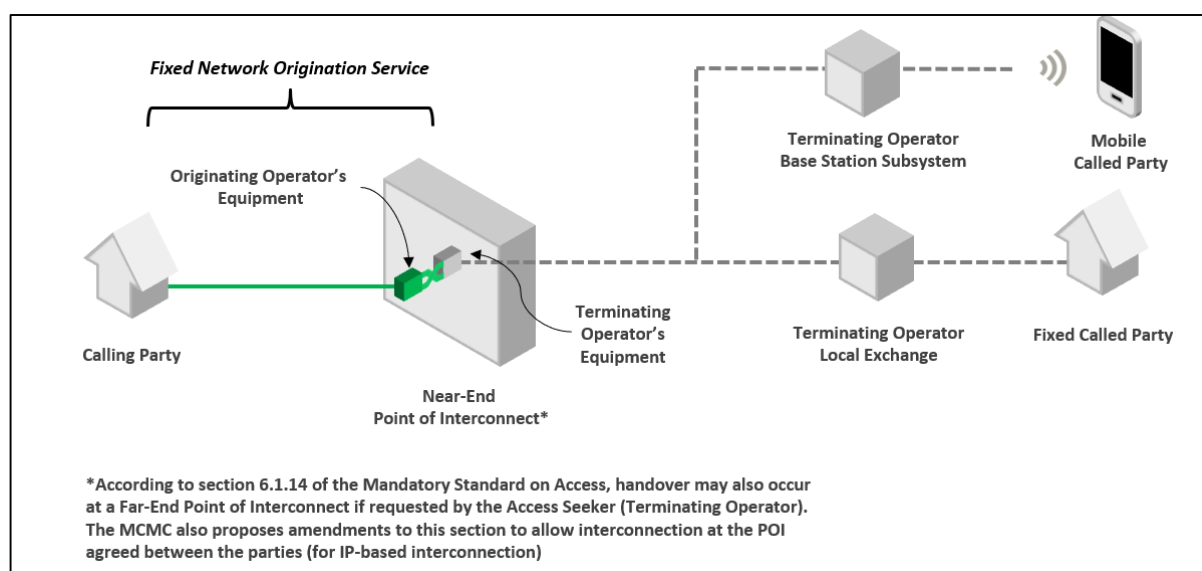

Figure 2 – Scope of Fixed Network Origination Service

Submissions Received

7.55   As noted above, stakeholders generally combined their submissions in respect of the Fixed Network Origination Service and the Fixed Network Termination Service. A summary of the submissions received in relation to these services is provided in paragraphs 7.14 to 7.29 above.

MCMC Assessment

7.56   For the same reasons set out in paragraphs 7.30 to 7.44 above in respect of the Fixed Network Termination Service, the MCMC considers it is in the LTBE for the Fixed Network Origination Service to remain on the Access List without modification. In particular:

(a) the Fixed Network Origination Service is a bottleneck service because only the originating operator can provide the service in respect of each originating network, and therefore regulation of the service is fundamental to achieving any-to-any connectivity; and

(b) there does not appear to be any justification or industry demand for fundamental changes to the description of this service.

7.57 Separately, while SMS/MMS messages are currently included in the service description for the Fixed Network Origination Service. The MCMC understands that SMS messaging typically relies on a CPP billing model, rather than a receiving-party pays model. This means that the A party's operator will originate such messages at its own cost, which it recoups from the A party. The MCMC is accordingly interested to understand whether operators consider that SMS/MMS messages should continue to be included within the service description for the Fixed Network Origination service, or whether the service description should be amended to apply only to calls.

MCMC Preliminary View

7.58 The MCMC's preliminary view is that it would be in the LTBE for the Fixed Network Origination Service to remain on the Access List. The MCMC queries whether the service description should be modified to remove references to SMS and MMS.

Questions

Question 2:	Should the Fixed Network Origination Service remain in the Access List? Please provide details.
Question 3:	Should SMS and MMS messages be removed from the service description for the Fixed Network Origination Service? Please provide details.

Wholesale Line Rental Service

Overview: Fixed voice calling services (including ISDN and managed VOIP services)

7.59 Fixed voice telephony services are services that enable end-users to make or receive voice calls from a telephone handset or other device at a fixed location (e.g. a household or business premises).

7.60 There are three main ways in which fixed voice telephony services are delivered in Malaysia:

(a) DEL services, which are delivered using the PSTN. DEL services are delivered over legacy copper-based networks and transmitted using circuit switching;

(b) ISDN services, which allow voice services to be supplied simultaneously with data services over a single copper line. ISDN voice calls are transmitted over a separate "channel" of the copper line to data services. Unlike VoIP services, ISDN services remain circuit-switched (like DEL

services) and are not themselves supplied over the data layer of the connection; and

(c)   Managed VoIP services, which are IP-based voice services delivered over an underlying data connection (e.g. a broadband service or a managed data service). While managed VoIP services are delivered over an underlying data connection, such services are "managed" in the sense that they use a separate protocol or network layer compared to other forms of data, such as Internet access. The voice layer of the network has certain guaranteed transmission speeds and benefits from traffic management to ensure that VoIP services are delivered reliably and not affected by the simultaneous transmission of other data packets over the same connection.

7.61   In the past, the MCMC has considered that business fixed telephony services should be treated differently from residential fixed telephony services.

7.62   However, the MCMC's preliminary view now is that business and residential services (including wholesale fixed voice calling, ISDN and managed VOIP services) can be treated the same, because:

(a)   business and residential fixed line telephone services largely perform the same functions; and

(b)   in respect of call types, there is a lack of sufficiently different economic characteristics or underlying access infrastructure.

Competition/LTBE Analysis

7.63   In the 2015 Access List Review, the MCMC found that the (then) wholesale fixed telephony services were not competitive. In reaching this view, the MCMC noted that:

(a)   TM had a very high market share in relation to services supplied over the PSTN network (comprising 97.9% of DEL connections);

(b)   barriers to entry were prohibitively high due to the high sunk cost of constructing DELs; and

(c)   innovation, including in the form of VoIP services, had a limited role and impact in the market.

7.64   To the MCMC's knowledge, there is no other supplier of wholesale fixed telephony services in Malaysia, suggesting TM faces no competition in the supply of these services. Further, the MCMC considers that there is limited scope for the emergence of new market entrants in the supply of these services, given three high barriers to entry:

(a)   lack of fixed number portability;

(b)   high cost of infrastructure deployment; and

(c)   the very significant economies of scale from which TM is likely to benefit.

7.65   The MCMC also acknowledges that it has observed some convergence between the fixed and mobile telephony services. However, it has not observed sufficient convergence such that it would regard the two as competitively constraining each other.

7.66   Accordingly, the MCMC's preliminary view is that there has not been a material change in the state of competition in the supply of wholesale fixed voice calling services since the 2015 Access List Review, and it would encourage the economically efficient use of existing communications infrastructure to continue listing these services on the Access List.

Service Description

7.67   The Wholesale Line Rental Service is currently described in the Access List as follows:

4(17) Wholesale Line Rental Service

The Wholesale Line Rental Service is a Service which allows an Access Seeker's Customer to connect to an Access Provider's Public Switched Telephone Network, and provides the Access Seeker's Customer with an ability to make and receive Call Communications.

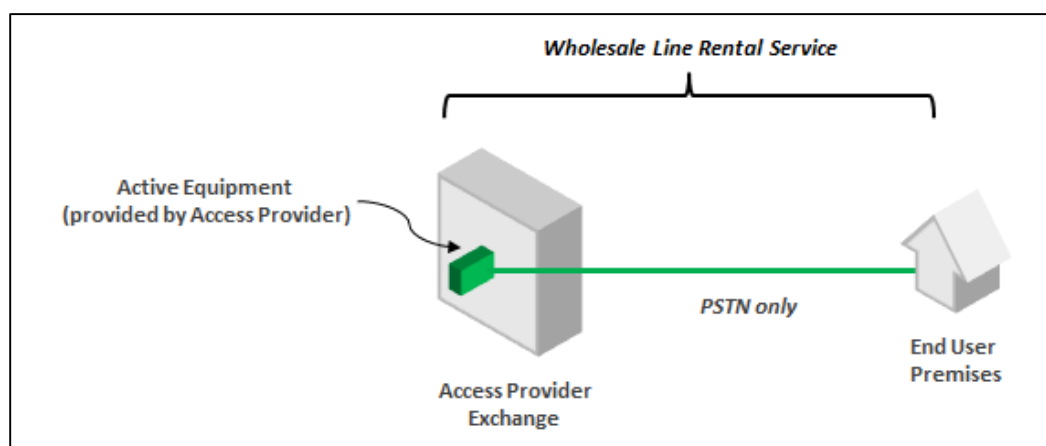7.68   The scope of the Wholesale Line Rental Service is illustrated in the diagram below:

Figure 3 – Scope of Wholesale Line Rental Service

Submissions Received

7.69   Operators did not note any impediments in accessing the Wholesale Line Rental Service.

7.70   edotco considers that the Wholesale Line Rental Service should be removed from the Access List.

7.71   Maxis submitted that there are still more than 4 million subscribers using direct exchange lines who should be given the choice to choose their preferred fixed voice service providers, and that accordingly the Wholesale Line Rental Service should remain on the Access List. However, Maxis noted that the key impediment in using this service to supply retail services is the demand for fixed number

portability, which Maxis considers critical "to enable [the Wholesale Line Rental Service] to succeed".

7.72   Myren submitted that it may require access to the Wholesale Line Rental service in future, but does not anticipate any impediments in gaining access for the time being.

7.73   Ohana submitted that it would like to acquire the Wholesale Line Rental Service in future, but foresees the process of acquiring the service as an impediment. Ohana cites that depending on the quantity, it may not be suitable for small and medium-sized enterprises.

7.74   TM considers there is limited demand for this service from access seekers due to the availability of substitutes such as OTT services, live chat and voice over broadband services, as well as mobile substitution.

MCMC Assessment

LTBE overview: Wholesale Line Rental Service

7.75   The Wholesale Line Rental Service is a bottleneck service. To promote competition and to promote efficient use of existing infrastructure, it is necessary to regulate the service. Wholesale Line Rental is a potentially important input to allow access seekers to offer a bundle of fixed line services where the Access Seeker does not otherwise control ownership of the line itself.

7.76   The MCMC holds some reservations, however, given the Wholesale Line Rental Service is not currently being acquired by any access seekers, and accordingly there is a question as to whether the inclusion of this service on the Access List is likely to promote competition or the efficient use of (or investment in) infrastructure. If the service is not required by access seekers, then the case for regulation is diminished because the potential impact on competition or efficiency is also likely to diminish. Therefore, while there is a prima facie case to regulate the Wholesale Line Rental Service, the MCMC wants to further investigate whether, in practice, regulation of this service will provide the benefits sought depending on the demand for the service.

Adjustments to service description

7.77   The MCMC does not believe that there have been any relevant changes in the market that require a change in the description or continued regulation of the Wholesale Line Rental Service, and once again there seems to be general consensus within the industry that the service description remains appropriate.

Service demand

7.78   Although no access seekers are currently acquiring this service, access seekers such as Myren and Ohana noted that they may require access to the service in future, while Maxis submitted that it should continue to be listed on the Access List. For completeness, while Maxis submitted that more than 4 million subscribers use direct exchange lines, the MCMC's own data indicates that this figure is closer to 2.2 million subscribers.

7.79   In relation to Ohana's concerns regarding the volume of the services available to be acquired, the MCMC invites further views from Ohana and other operators, but notes that while the Wholesale Line Rental service remains listed on the Access List, it is subject to the SAOs and accordingly must be provided to all access seekers on an equivalent basis and on equitable and non-discriminatory terms in accordance with section 149(2) of the CMA. To the extent that an access seeker has difficulty in acquiring the volume of any services it requires, it should submit a complaint to the MCMC in accordance with section 69 of the CMA.

7.80   The MCMC agrees with TM's views regarding the limited demand for this service. However, the MCMC notes that demand is not determinative of whether a service should be included on, or removed from, the Access List.

7.81   As the MCMC noted in the 2015 Access List Review, operators in the communications and multimedia sector require scale to build viable businesses and to compete, which is to the long-term benefit of end users. In this regard, access seekers require wholesale inputs to voice services on all networks (including legacy and HSBB), in order to build scale. For these reasons, the MCMC considers that the Wholesale Line Rental Service should remain on the Access List.

7.82   Finally, stakeholders did not raise any issues regarding the description of Wholesale Line Rental as described in the Access List, according with the MCMC's views that the service remains appropriately described.

MCMC Preliminary View

7.83   The MCMC's preliminary view is that, if the Wholesale Line Rental Service is to remain in the Access List, it should be retained without any modification.

7.84   However, given the Wholesale Line Rental Service is not currently being acquired by any access seekers, the MCMC is exploring, and is interested to understand from operators, whether the ongoing regulation of this service would still be in the LTBE.

Questions

Question 4:	Do you agree with the preliminary view of MCMC to retain Wholesale Line Rental Service in the Access List? Please provide details.
Question 5:	Have there been any relevant changes in the supply of wholesale fixed telephony services that would justify removal of the Wholesale Line Rental Service from the Access List? (Please provide details).

8   Mobile services

Introduction

8.1   The following facilities and services comprise the family of mobile services in the Access List:

(a)　　Mobile Network Origination Service;

(b)　　Mobile Network Termination Service; and

(c)　　MVNO Access.

8.2　　In this section, the MCMC will consider each of the above mobile facilities and services in turn.

Mobile Network Termination Service

Overview: Mobile voice termination services terminating on each MNO's network

8.3　　Wholesale voice termination services are described in paragraphs 7.3 to 7.6 above.

Competition/LTBE Analysis: Mobile Voice Termination Services

8.4　　As observed in paragraphs 7.7 to 7.9 in respect of fixed wholesale termination services, the MCMC considers that wholesale mobile termination services constitute a key bottleneck in telecommunications networks, given they can only be provided by the terminating operator in relation to each network.

8.5　　The MCMC does not believe there has been any material change in the level of competition in the supply of these services which justifies removing regulation of this service.

Overview: P2P SMS/MMS termination services terminating on each MNO's network

8.6　　Person-to-person (**P2P**) messages are SMS/MMS messages sent by one natural person to another, in the context of a two-way communication or conversation.

8.7　　The originating party is required to route a communication according to the wishes of the A-party, who chooses whether to call a B-party connected to a fixed or mobile service or whether to send an SMS/MMS message. Accordingly, from the service provider of A-party's perspective, there is no demand-side substitutability between termination of fixed voice calls, mobile voice calls or SMS/MMS messages.

8.8　　This view is further supported by the fact that:

(a)　　voice and SMS/MMS services typically have different prices; and

(b)　　international regulatory practice indicates that fixed voice calls, mobile voice calls, and SMS/MMS messages are supplied in separate product markets.

8.9　　The MCMC takes the preliminary view that P2P SMS/MMS termination services terminating on each MNO's network should be treated separately from application-to-person (**A2P**) messaging and termination services, which are discussed separately in paragraphs 8.83 to 8.122 below.

Competition/LTBE Analysis: P2P SMS/MMS Termination Services

8.10   In relation to P2P SMS/MMS termination services, the relevant terminating operator is the only viable supplier. The same dynamics set out in paragraphs 7.7 to 7.9 above apply in respect of these services.

Service Description

8.11   The Mobile Network Termination Service is currently described in the Access List as follows:

> ### 4(4)   Mobile Network Termination Service
>
> (a)   *A Mobile Network Termination Service is an Interconnection Service for the carriage of Call Communications from a POI to a 'B' party. The Mobile Network Termination Service supports Mobile Network-to-Mobile Network, Fixed Network-to-Mobile Network, incoming international-to-Mobile Network calls and messages which require Any-to-Any Connectivity.*
>
> (b)   *The functionalities of the Mobile Network Termination Service include:*
>
> > (i)   *transmission and switching, whether packet or circuit; and*
> >
> > (ii)   *the signalling required to support the Interconnection Service.*
>
> (c)   *Examples of technologies used in the Mobile Network Termination Service would be:*
>
> > (i)   *Global System for Mobile Communications ("GSM");*
> >
> > (ii)   *International Mobile Telecommunications 2000 ("IMT-2000" or "3G");*
> >
> > (iii) *Worldwide Interoperability for Microwave Access ("WiMAX");*
> >
> > (iv)   *Long-Term Evolution ("LTE");*
> >
> > (v)   *International Mobile Telecommunications – Advanced ("IMT-Advanced" or "LTE-Advanced"); and*
> >
> > (vi)   *any other mobile technology which is currently available or which may be developed in future that involves the carriage of Call Communications.*

8.12   As explained in paragraphs 7.51 to 7.53 above, the broad definition of "Call Communications" in the Access List means that the description of the Mobile Network Termination Service comprises voice call termination, SMS and MMS message termination.

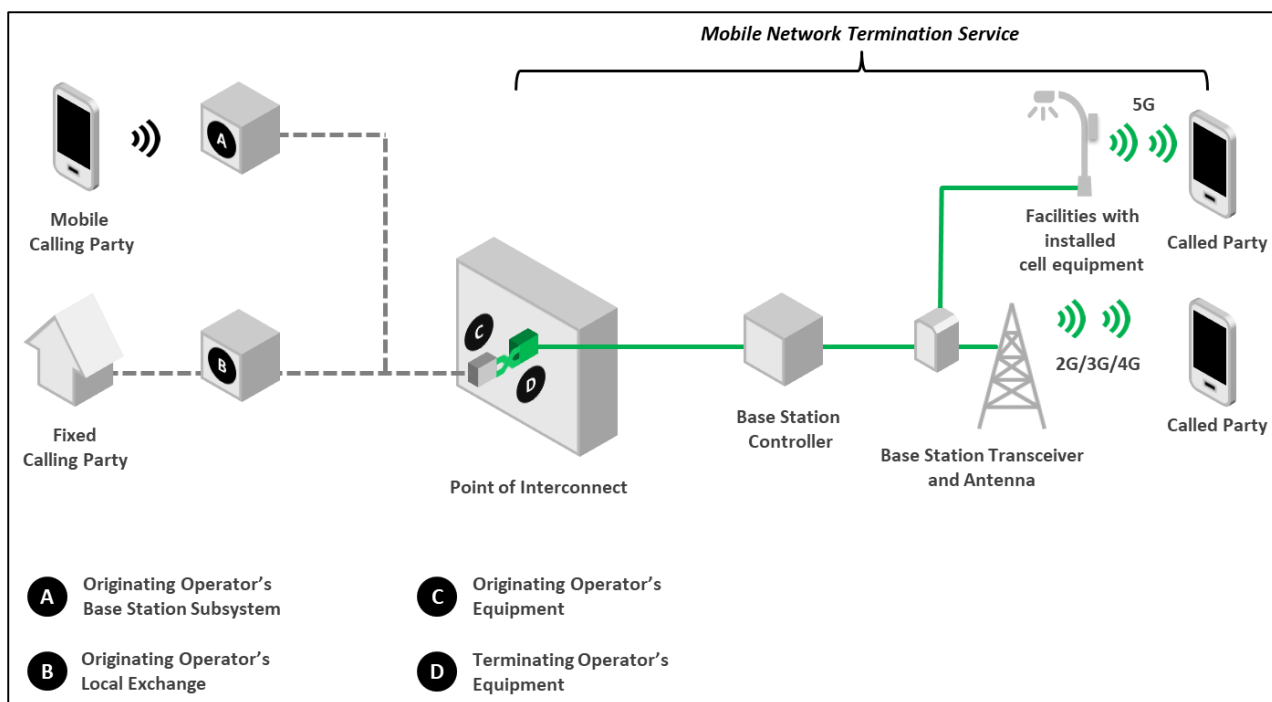8.13   The scope of the Mobile Network Termination Service is illustrated in the diagram below:

Figure 4 – Scope of Mobile Network Termination Service

Submissions Received

8.14   Operators generally combined their submissions in respect of the Mobile Network Origination Service and the Mobile Network Termination Service. Accordingly, the following paragraphs set out submissions received in respect of both of these services.

8.15   Most access seekers noted that these services were a usable input to the respective services supplied by access seekers to their customers. Myren also noted that these services could be useful as a bundled package in future.

8.16   Some operators requested that certain technologies should be expressly referred to within the scope of the services, for example Celcom and YTL (VoLTE), TM (5G), and My Evolution (5G, NB-IoT and CAT-M1), whilst Digi viewed that the description of the services should be technologically neutral to cater to all types of technologies.

8.17   Celcom submitted that some countries have adopted interconnection for cloud-based mobile numbering providers to fully interconnect with mobile network operators, but that the Malaysian Numbering and Electronic Addressing Plan has yet to progress to this stage.

8.18   As noted in paragraph 7.18 above in the context of the Fixed Network Termination Service, Digi requested that the MCMC review the status of calls which terminate to a customer's network by means of an IVR voice prompt.

8.19   Maxis submitted that it does not face any impediments in acquiring or supplying access to these services. Maxis also noted that it was supportive of the MCMC's earlier analysis regarding the increasing substitutability between OTT applications and voice and SMS services. Maxis considers that the existing

description of these services is sufficient and does not require any further changes.

8.20   Webe noted that these services enable its customers to enjoy seamless connectivity with end users on other mobile networks, but proposed that international inbound termination be removed from the definition of domestic interconnection and be established as a separate interconnect offering / service.

8.21   Webe also submitted that the new revision of the Access List should consider including services that are impacted from the shutdown of the 3G network, such as SMS, to ensure the gap is addressed. Webe suggested that, even though SMS is deemed to be conventional to some, it is still a key customer feature, especially for banking and financial services.

MCMC Assessment

LTBE overview: Mobile Network Termination Service

8.22   The MCMC considers that it is in the LTBE for the Mobile Network Termination Service to remain regulated in the Access List, as it remains a key bottleneck service in telecommunications networks that can only be provided by the terminating operator in relation to each network.

8.23   The same LTBE analysis that applies to the Fixed Network Termination Service applies to the Mobile Network Termination Service. In particular, regulation of the Mobile Network Termination Service is necessary to achieve any-to-any connectivity and to promote competition in markets for which the Mobile Network Termination Service is an essential input.

Adjustments to service description

8.24   The MCMC does not consider there to be any justification for fundamental changes to the service description for the Mobile Network Termination Service.

8.25   In relation to comments by operators that certain technologies be included as examples within the service description for the mobile network origination and termination services, the MCMC notes that the description of these services is already technology neutral, and the lack of explicit inclusion of a technology does not mean that such technology is excluded from the service description.

8.26   The MCMC notes in this regard the broad application of sub-paragraph (c)(vi) of each service description as introduced in the 2015 Access List Review, which includes "any other mobile technology which is currently available or which may be developed in future that involves the carriage of Call Communications".

8.27   However, the MCMC recognises the clarity provided by explicit inclusion of a technology in the Access List, and proposes to make minor amendments to these service descriptions to reinforce the inclusion of 5G technology (noting that LTE is already expressly included in these service descriptions).

8.28   The MCMC also proposes to make consequential amendments to the definition of "Interconnection Service" to reflect that, for A2P messaging services, the

carriage of communications may be between an End User and an access seeker Point of Presence (rather than merely to a POI).

Other issues

8.29   The MCMC notes Celcom's comments regarding the Malaysian Numbering and Electronic Addressing Plan (**NEAP**), however the MCMC's current focus is on reviewing the Access List. The MCMC does not consider it appropriate to deal with NEAP-related issues in this Access List review.

8.30   A number of operators also raised comments which the MCMC addressed in relation to the fixed telephony services in section 7. In particular:

(a)   the MCMC again considers that any specific technical or commercial rules sought by Digi in respect of IVR-related termination is more appropriately discussed in the context of a later review of the MSA; and

(b)   there is no compelling justification for international inbound termination to be regulated as a separate service, as set out in paragraph 7.43 above.

8.31   Regarding Webe's submissions that the updated Access List should include services that may be impacted by 3G sunset such as SMS messages, the MCMC confirms that it does not propose to remove SMS and MMS messages from the current description of "Call Communications" (which is, in turn, embedded in the service description for the Mobile Network Termination Service).

8.32   Finally, the MCMC notes that a number of operators made submissions in respect of A2P services. These submissions, and the MCMC's preliminary analysis, are set out in paragraphs 8.83 to 8.122 below.

MCMC Preliminary View

8.33   The MCMC's preliminary view is that it would be in the LTBE for the Mobile Network Termination Service to remain on the Access List. There is also broad industry consensus that the Mobile Network Termination Service should remain on the Access List.

8.34   The MCMC also proposes to make the following modifications to the service:

(a)   including wholesale A2P termination services (in conjunction with defining a new wholesale end-to-end A2P messaging service, as discussed in paragraphs 8.83 to 8.122 below);

(b)   underscoring that 5G technology is included in the scope of this service (with an equivalent change to be made to the Mobile Network Origination Service, as described in paragraph 8.47 below);

(c)   removing 3G technology from the scope of the service due to the 3G sunset at the end of 2021; and

(d)   would like to query whether WiMAX technology should continue to be included in the scope of the service.

8.35   Words that appear in <u>underlined red text</u> below have been added relative to the existing description while words that appear in ~~strikethrough text~~ are proposed to be deleted, and the amended service description for the Mobile Network Termination Service is as follows:

4(4)   Mobile Network Termination Service

(a)   *A Mobile Network Termination Service is an Interconnection Service for the carriage of Call Communications from:*

(i)   <u>in the case of Call Communications other than A2P Message Communications,</u> *a POI to a 'B' party<u>; and</u>*

(ii)   <u>in the case of A2P Message Communications, a POI or Access Seeker POP (for example, an aggregator POP) to a 'B' party</u>.

(b)   *The Mobile Network Termination Service supports Mobile Network-to-Mobile Network, Fixed Network-to-Mobile Network, incoming international-to-Mobile Network calls and messages which require Any-to-Any Connectivity.*

(c)   *The functionalities of the Mobile Network Termination Service include:*

(i)   *transmission and switching, whether packet or circuit; and*

(ii)   *the signalling required to support the Interconnection Service.*

(d)   *Examples of technologies used in the Mobile Network Termination Service would be:*

(i)   *Global System for Mobile Communications ("GSM");*

(ii)   ~~*International Mobile Telecommunications 2000 ("IMT-2000" or "3G");*~~

(ii~~i~~)   *Worldwide Interoperability for Microwave Access ("WiMAX");*

(i~~v~~<u>ii</u>)   *Long-Term Evolution ("LTE");*

(iv)   *International Mobile Telecommunications – Advanced ("IMT-Advanced" or "LTE-Advanced"); ~~and~~*

(v)   <u>*5G New Radio ("5G"); and*</u>

(vi)   *any other mobile technology which is currently available or which may be developed in future that involves the carriage of Call Communications.*

8.36   The MCMC also proposes to amend paragraph 3 of the Access List to amend the definition of Interconnection Service and to insert a new definition for "A2P" as follows:

"A2P" or "Application-to-Person" means, in respect of a Message Communication, a one-way Short Message Service or Multimedia Message Service communication originating from an application and delivered to an End User.

"Interconnection Service" means Facilities or Services including the physical connection between separate networks, to facilitate Any-to-Any Connectivity provided by an Access Provider to an Access Seeker which involves or facilitates the carriage of communications between an End User connected to the network of the Access Provider and<u>:</u>

(a)   a Point of Interconnection; or

(b)   where specified in the description of the relevant Facility or Service, an Access Seeker Point of Presence.

Questions

Question 6:	Do you have any comments on the proposed amendments to the service description for the Mobile Network Termination Service (including the proposed amendments to the definition of "Interconnection Service"?
Question 7:	Should WiMAX continue to be included in the scope of the service description for Mobile Network Termination Service?

Mobile Network Origination Service

Overview: Mobile voice origination services from each MNO's network

8.37   Wholesale origination services are described in paragraphs 7.45 to 7.46 above.

Competition/LTBE Analysis

8.38   As observed in paragraphs 7.47 to 7.49 in respect of fixed wholesale origination services, each network operator has an effective monopoly in providing origination for calls made by its own end users to called parties on the terminating operator's network.

8.39   The MCMC does not believe there has been any material change in the level of competition in the supply of mobile wholesale origination services which justifies removing regulation of this service.

Service Description

8.40   The Mobile Network Origination Service is currently described in the Access List as follows:

4(3)   Mobile Network Origination Service

(a)   A Mobile Network Origination Service is an Interconnection Service for the carriage of Call Communications from an 'A' party to a POI. The Mobile Network Origination Service supports Mobile Network-to-Mobile Network, Mobile Network-to-Fixed Network and Mobile Network-to-international outgoing calls insofar as they relate to freephone 1800 number services, toll free 1300 number services, and other similar services which require Any-to-Any Connectivity.

(b)   The functionalities of the Mobile Network Origination Service include:

(i)   transmission and switching, whether packet or circuit; and

(ii)   the signalling required to support the Interconnection Service.

(c)   Examples of technologies used in the Mobile Network Origination Service would be:

(i)   Global System for Mobile Communications ("GSM");

(ii)   International Mobile Telecommunications 2000 ("IMT-2000" or "3G");

> (iii)   Worldwide Interoperability for Microwave Access ("WiMAX");
>
> (iv)   Long-Term Evolution ("LTE");
>
> (v)   International Mobile Telecommunications – Advanced ("IMT-Advanced" or "LTE-Advanced"); and
>
> (vi)   any other mobile technology which is currently available or which may be developed in future that involves the carriage of Call Communications.

8.41   As explained in paragraphs 7.51 to 7.53 above, the broad definition of "Call Communications" in the Access List means that the description of the Mobile Network Origination Service comprises voice call origination, SMS and MMS message origination.

8.42   The scope of the Mobile Network Origination Service is illustrated in the diagram below:
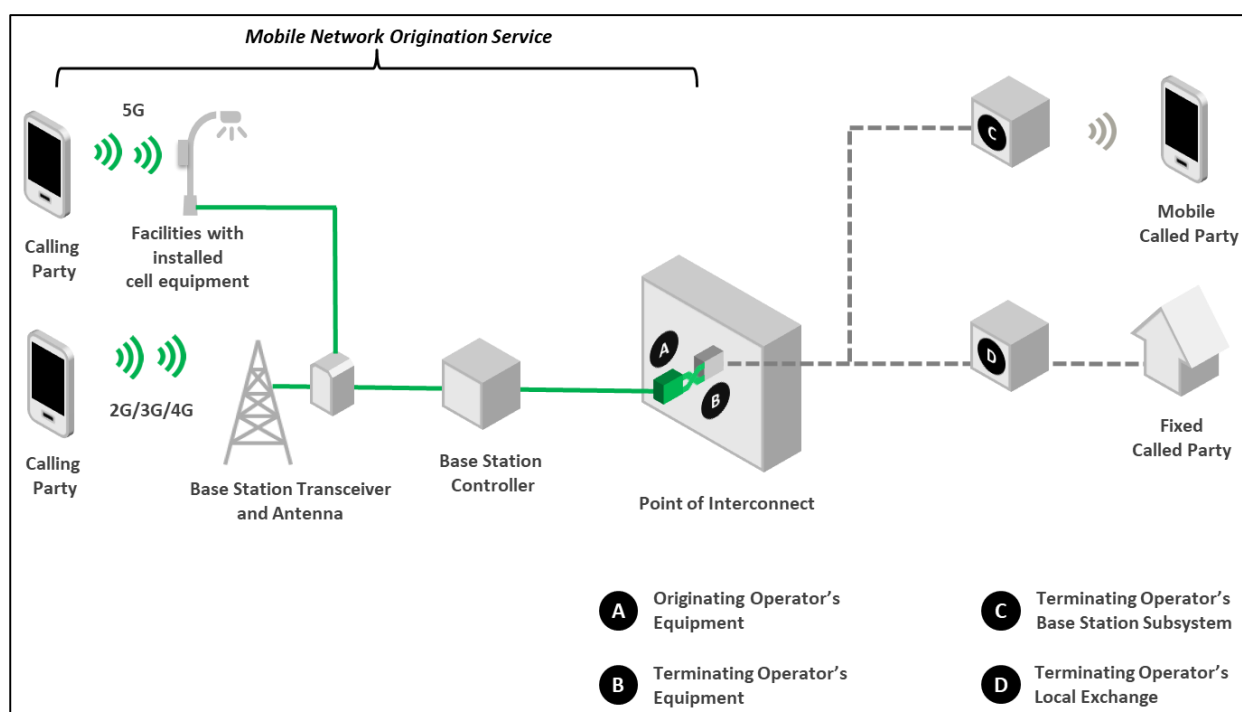
Figure 5 – Scope of Mobile Network Origination Service

Submissions Received

8.43   As noted above, operators generally combined their submissions in respect of the Mobile Network Termination Service and Mobile Network Origination Service. The submissions received in relation to these services are set out in paragraphs 8.14 to 8.21 above.

MCMC Assessment

8.44   The MCMC considers it is in the LTBE for the Mobile Network Origination Service to remain in the Access List, given the Mobile Network Origination Service is a bottleneck service, and is fundamental to achieving any-to-any connectivity. Regulation of this service is also likely to promote competition in markets for which the service is an essential input.

8.45   There is also broad industry consensus that the Mobile Network Origination Service remains on the Access List. There also does not appear to be any justification or industry demand for fundamental changes to the description of this service, other than to clarify that 5G technology is included in the scope of the service and to remove 3G technology from the scope of the service.

MCMC Preliminary View

8.46   The MCMC's preliminary view is that it would be in the LTBE for the Mobile Network Origination Service to remain in the Access List. Moreover, the MCMC considers that only minor amendments are required to be made to the service, to clarify that 5G technology is included within the scope of the service and to remove 3G technology from the scope of the service. Further, the MCMC would also query on whether WiMAX technology should be retained in the scope of the service.

8.47   Words that appear in underlined red text below have been added relative to the existing description while words that appear in strikethrough text are proposed to be deleted, and the amended service description for the Mobile Network Termination Service is as follows:

4(3)   Mobile Network Origination Service

(a)   A Mobile Network Origination Service is an Interconnection Service for the carriage of Call Communications from an 'A' party to a POI. The Mobile Network Origination Service supports Mobile Network-to-Mobile Network, Mobile Network-to-Fixed Network and Mobile Network-to-international outgoing calls insofar as they relate to freephone 1800 number services, toll free 1300 number services, and other similar services which require Any-to-Any Connectivity.

(b)   The functionalities of the Mobile Network Origination Service include:

(i)   transmission and switching, whether packet or circuit; and

(ii)   the signalling required to support the Interconnection Service.

(c)   Examples of technologies used in the Mobile Network Origination Service would be:

(i)   Global System for Mobile Communications ("GSM");

(ii)   International Mobile Telecommunications 2000 ("IMT-2000" or "3G");

(iii)   Worldwide Interoperability for Microwave Access ("WiMAX");

(ivii)   Long-Term Evolution ("LTE");

(iv)   International Mobile Telecommunications – Advanced ("IMT-Advanced" or "LTE-Advanced"); and

(v)   5G New Radio ("5G"); and

(vi)   any other mobile technology which is currently available or which may be developed in future that involves the carriage of Call Communications.

Questions

Question 8: Do you have any comments on the proposed amendments to the service description for the Mobile Network Origination Service?
Question 9: Should WiMAX technology remain in the scope of the service description for the Mobile Network Origination Service?

MVNO Access Service

Overview: Mobile broadband services and network sharing arrangements (including MVNO access, domestic roaming, RAN sharing and MOCN arrangements)

8.48   The wholesale dimension of mobile broadband services consists of mobile virtual network operator (**MVNO**) access and other network sharing arrangements such as domestic roaming, RAN sharing and MOCN arrangements. Other access models may also emerge in the context of 5G wholesale services, which are discussed in section 9.

8.49   MVNO arrangements involve mobile network operators (**MNOs**) providing MVNOs with wholesale access to the MNO's radio access network and potentially other service components, such as backhaul networks, billing systems, etc. MVNOs use such access to supply retail mobile data services, as well as other retail services, such as mobile calling and SMS/MMS messaging.

8.50   There are two distinct types of MVNO arrangements:

(a)   "thick" MVNO access, where the MVNO obtains access to the RAN of the MNO, but uses its own core network (backhaul), billing and customer support systems and engages in its own marketing and distribution; and

(b)   "thin" MVNO access, where the MVNO is responsible for a smaller proportion of the value chain, relying on the MNO not only for RAN access but also for backhaul/core network access, billing and customer support functions. Under a "thin" MVNO arrangement, the MVNO is effectively only responsible for marketing and distribution (using a different brand than the host MNO but otherwise relying on the MNO for most or all technical functions involved in delivering mobile services).

8.51   Unlike fixed broadband services, there is no direct one-to-one correspondence between MVNO access services and retail mobile broadband services. The MCMC understands that MVNOs acquire "MVNO access service" (which captures the entire arrangement between the MNO and MVNO), rather than acquiring a distinct "wholesale mobile broadband service" for each subscriber served by the MVNO.

Competition/LTBE Analysis

8.52   Access seekers acquiring wholesale mobile broadband services (e.g. by becoming an MVNO) face significant barriers, including commercial, technical and regulatory barriers and the complexity of negotiating MVNO access arrangements.

8.53   The MCMC does not consider that fixed access seekers could switch to becoming MVNOs in a sufficiently timely and practicable manner so as to make such any price increases unprofitable for the fixed access provider.

8.54   Similar barriers also appear to arise in the opposite direction: becoming a fixed access seeker requires significant investments, particularly in respect of Layer 2 access. These investments relate not only to the infrastructure level (e.g. the need to install equipment at the access provider's POIs), but also involve changes to billing systems, software development, marketing, etc. Accordingly, it is unlikely that a price increase in relation to MVNO access or other network sharing arrangements would result in access seekers switching to the acquisition of fixed broadband services.

8.55   Since the 2015 Access List Review, the MCMC has seen some signs of improving competition in this market, having received 4 MVNO agreements for registration. However, the MCMC considers that MVNO access services only form a relatively small section of competition in the supply of retail mobile services and that there is less than workable competition in the supply of these services. For example, the MCMC has noted that there are only 8 MVNOs, with the majority of these being hosted by Celcom and a steady decline in the number of MVNOs since 2017.[3]

8.56   The MCMC's preliminary view is that it would be in the LTBE to continue listing the MVNO Access Service on the Access List, as it would encourage the economically efficient use by MNOs of communications infrastructure and promote competition in the supply of retail mobile services.

Service Description

8.57   The MVNO Access Service is currently described in the Access List as follows:

4(23) MVNO Access

(a)   *MVNO Access is a Facility and/or Service for access to the Mobile Network used by the Access Provider to provide public cellular services to the public, for the purpose of the Access Seeker providing public cellular services to the public.*

(b)   *MVNO Access may include access to the Facilities and Services used by the Access Seeker to provide:*

(i)   *one or more of voice, data and application services, as selected by the Access Seeker; and*

(ii)   *services over networks including GSM, IMT-2000 or 3G, WiMAX, LTE, IMT-Advanced or LTE-Advanced, and any other mobile networks which are currently available or which may be developed in future.*

Examples of Facilities and Services to which the Access Seeker may request access to which includes but not limited to the Access Provider's:

[3] See Malaysian Communications and Multimedia Commission,, Industry Performance Report 2019, p. 62, https://www.mcmc.gov.my/skmmgovmy/media/General/pdf/ENG-MCMC_IPR_2019.pdf and MCMC, Industry Performance Report 2017, p. 55, https://www.mcmc.gov.my/skmmgovmy/media/General/pdf/Industry-Performance-Report-2017-291018.pdf.

（i）   *radio network;*

（ii）   *Serving GPRS Support Node and Gateway GPRS Support Node;*

（iii）   *Home Location Register;*

（iv）   *value-added service platforms (such as its Short Message Service Centre, Multimedia Service Centre and Voicemail Server);*

（v）   *SIM provisioning and configuration;*

（vi）   *customer billing; and*

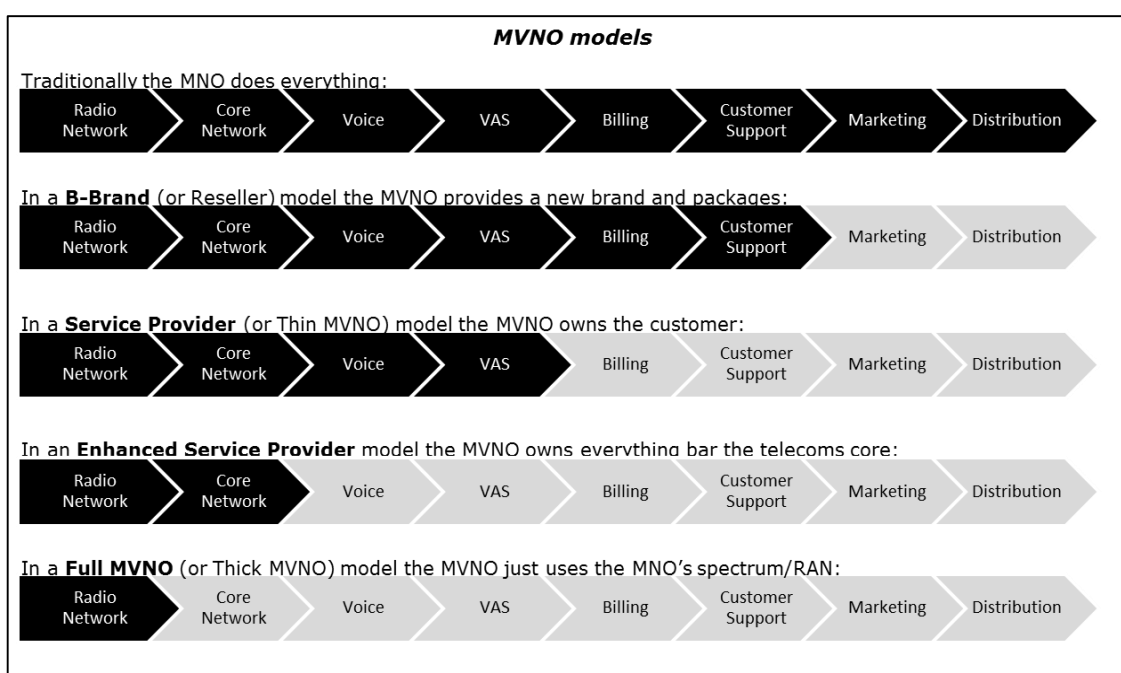（vii） *customer relationship management.*

MVNO models

Traditionally the MNO does everything:
| Radio Network | Core Network | Voice | VAS | Billing | Customer Support | Marketing | Distribution |

In a **B-Brand** (or Reseller) model the MVNO provides a new brand and packages:
| Radio Network | Core Network | Voice | VAS | Billing | Customer Support | Marketing | Distribution |

In a **Service Provider** (or Thin MVNO) model the MVNO owns the customer:
| Radio Network | Core Network | Voice | VAS | Billing | Customer Support | Marketing | Distribution |

In an **Enhanced Service Provider** model the MVNO owns everything bar the telecoms core:
| Radio Network | Core Network | Voice | VAS | Billing | Customer Support | Marketing | Distribution |

In a **Full MVNO** (or Thick MVNO) model the MVNO just uses the MNO's spectrum/RAN:
| Radio Network | Core Network | Voice | VAS | Billing | Customer Support | Marketing | Distribution |

Figure 6 – Models for MVNO arrangements

Submissions Received

8.58   Celcom submitted that barriers to entry for MVNOs are sufficiently low and that MVNO Access should accordingly be removed from the Access List. Celcom states that MVNO arrangements are based on commercial flexibility and involve a variety of commercial arrangements and complex business models, rather than straightforward wholesale provision of mobile minutes and/or data at a margin. Celcom submitted that the best way to ensure that MVNOs succeed is to allow MVNOs and mobile network operators to venture into varied and flexible business models according to the MVNOs' operating models and requirements, which is best achieved under purely commercial negotiations, instead of regulating the service.

8.59   Cubic Telecom holds an ASP(C) licence in a number of categories and delivers M2M and IoT connectivity under an MVNSP Agreement with Digi. Cubic Telecom submitted that its experience with Digi has been positive and that the MCMC was professional in ensuring compliance with all relevant MVNSP Determinations.

8.60   Cubic Telecom noted that Malaysia is an established and relatively sophisticated MVNO market, and considers that two factors relevant to both the JENDELA plan and the MVNO market are eSIMs and the digital economy, including the upcoming transition to 5G and the potential for new MVNO business models. Cubic Telecom submitted that the MCMC should consider 5G access for MVNOs to further the objectives of JENDELA and the potential emergence of IoT-specific MVNOs. Cubic Telecom also commented on various potential transformative impacts of 5G-based technology on the evolution of automotive connectivity.

8.61   In Cubic Telecom's experience, the main challenge for any MVNO will be access to 5G networks, given MNOs that have expended significant resources in deploying 5G networks may not be forthcoming in granting MVNO access. In Cubic Telecom's view, this reluctance would likely only extend to "traditional MVNOs" with an individual consumer base, whereas Cubic Telecom expects the deployment of 5G networks to give rise to a greater number of "enterprise" style MVNOs providing B2B connectivity for a range of different applications, including smart health, smart cities and intelligent agriculture. Cubic Telecom submitted that this may lead to MNOs allowing access to 5G networks, given these applications do not threaten the MNO's customer base. Finally, Cubic Telecom commented that other Asia Pacific countries are leading the way in terms of 5G network deployment and the emergence of specialised MVNOs with 5G access.

8.62   Digi complained that it faces challenges when an MVNO fails to comply with payment obligations to Digi or otherwise ceases to carry on business without managing the associated end user impacts. Digi submitted that a safety or guarantee mechanism should be in place to safeguard the access providers' interest as well as managing the acquired end user customer base in these circumstances, so that an access provider is not required to provide ongoing access while receiving no payment.

8.63   Maxis submitted that the MVNO Access Service should be removed from the Access List. In support of this proposal, Maxis noted that:

(a)   the Malaysian retail cellular market is "highly competitive", given the existence of four nationwide MNOs and 23 MVNOs. In Maxis's experience, most access seekers for MVNO access prefer to negotiate on a commercial basis in order to meet requirements in terms of services, quality of service, volume and network integration level, and access seekers have a greater degree of bargaining power given the multiple competitive offers in the market from the MNOs;

(b)   the wholesale cellular market is also competitive, given the movement of operators between different providers of wholesale services. Maxis considers that infrastructure-based competition promotes diversity and enables price and quality differentiation;

(c)   it supports the MCMC's plans to improve the MVNO Guidelines, which it considers preferable to formal regulation given the added benefit of flexibility to update the framework as and when required to accommodate different types of arrangements; and

(d)   MVNOs have been able to grow a larger share of the cellular retail market in Malaysia compared to regional peers, evidencing a wholesale cellular environment that facilitates competition:

Chart 1: MVNO Market Share by connections in Emerging Asia-Pacific (2018) (Source Analysys Mason)
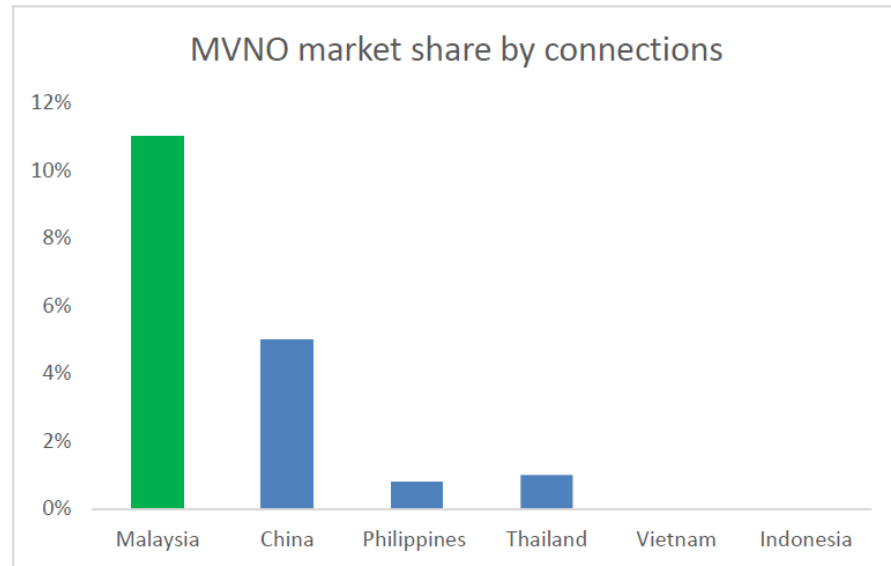
8.64   In Maxis's view, mobile access does not have the same competition concerns as fixed access, given that the nature of wireless access avoids the formation of local monopolies. Maxis's submission is explained further in the paragraphs below:

(a)   Mobile or wireless access creates 'limited' shared bandwidth for a large area, where additional spectrum or new radio sites are required to support higher capacity. Spectrum is typically provided for a much shorter period (e.g. 15 years), as compared to civil infrastructure for fibre, which has a very long life and typically depreciates over 30-40 years. The need for ongoing investment in mobile (e.g. 4G to 5G or new 3GPP releases) means it is better to promote competition at the infrastructure layer via the timely release of spectrum.

(b)   Malaysia has 4 national cellular network operators with wide coverage, in addition to a few smaller network operators, such as YTL, TM and Webe. The presence of multiple infrastructures ensures fierce and effective competition, both at the retail and wholesale levels, and ensures continued long-term benefits for end users.

(c)   Given the existing competitive mobile markets, wholesale mobile facilities/services, such as MVNO access, domestic roaming and RAN sharing, can typically be negotiated commercially by access seekers to meet their different requirements in terms of services, quality of service, volume, network integration level, etc. In most cases, mobile access providers compete to provide the best wholesale offer to meet the requirements of access seekers. Access seekers also have bargaining

power to get the best deal from the mobile access provider, due to multiple competitive offers available in the market. This is evident in the case of U Mobile who managed to negotiate for improved competitive offers from Celcom and, subsequently, with Digi and Maxis.[4]

8.65   Net2One acquires the MVNO Access service under an access agreement, but noted that its access agreement is supplemented with a commercial agreement given many elements of the provision of this service are yet to be regulated. Net2One submitted that MVNO Access should remain in the Access List given the current make-up of the Malaysian MVNO market.

8.66   Redtone has a commercial agreement for MVNO access which it entered into before the MVNO Access service was listed on the Access List. Redtone submits that the MVNO Access service should remain in the Access List as it helps open up access and establish clear SOPs and instruments for the provision of the service.

8.67   U Mobile commented that the current mobile landscape features very aggressive and competitive pricing and products, with a high degree of penetration. However, U Mobile noted that there are pockets of opportunities in specific segments or industry verticals, and accordingly U Mobile's preference is for the MVNO Access Service to be retained in the Access List.

8.68   My Evolution submitted that it has had a generally positive experience with its MNO, but noted some areas of focus which may be to the detriment of an access seeker:

(a)   broad termination rights for the MNO, including for mere suspicion of MVNO breach;

(b)   delays in provision of access to LTE services, and the MNO using technical arguments to justify not enabling this service with API provisioning. Although My Evolution acknowledges that the MNO is working to improve this situation, My Evolution is concerned regarding similar tactics for new access technologies; and

(c)   delays in negotiating access to newer technologies such as NB-IoT and 5G. My Evolution is concerned that these delays could enable an MNO to sell services over those technologies a few years before the MVNO can do so. My Evolution suggests these technologies be expressly listed on the Access List and that the MVNO Access service state that any access technology currently used by the MNO should also be made available to access seekers.

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[4] Digi, Bursa Announcement, 10 December 2009, 'Domestic Roaming Agreement Between Digi Telecommunications Sdn Bhd and U Mobile Sdn Bhd, https://digi.listedcompany.com/news.html/id/427992.

MCMC Assessment

LTBE overview: MVNO Access Service

8.69   The MCMC's preliminary view is that the barriers to entry in the supply of wholesale mobile broadband services are very high, due to high investment costs and regulatory barriers (including the need to acquire spectrum).

8.70   The MCMC also does not consider that there is a workable level of competition in the supply of these services. In fact, competition is relatively limited, with MNOs having less incentive to supply wholesale MVNO services competing with the retail products of those MNOs. This is evident in the supply of P2P messaging services, in which the only suppliers are the four MNOs, with neither MVNOs nor OTT players active at this functional level.

8.71   Further, as noted above, the MCMC has noted the existence of only 8 MVNOs, with the majority of these being hosted by Celcom.[5] Importantly, the number of MVNOs has been steadily declining since 2017.[6] While this is not clearly attributable to the behaviour of MNOs, the MCMC considers this to be indicative of a limited level of competition in respect of the supply of these services.

8.72   Finally, even if MVNO services are acquired commercially, there is evidence that retaining the MVNO Access Service on the Access List establishes clear standard operating processes for access to the service, due to the non-price terms and conditions that are set out in the MSA in respect of this service.

8.73   Taking into account the above, MCMC considers that it would be in the LTBE to continue regulating access to the MVNO Access Service, because:

(a)   so long as competition in this market is less than workable, the MCMC considers that listing the MVNO Access Service following the 2015 Access List Review has promoted competition and will likely continue to promote competition in the future; and

(b)   it will also encourage efficient investment in, and use of, infrastructure, particularly by thick MVNOs who, with the certainty of continued regulation of MVNO access, are likely to invest in infrastructure relating to billing and support systems and other infrastructure, as has already been observed by the MCMC.

Adjustments to service description

8.74   Operators did not raise any issues with the description of the MVNO Access service or any impediments in accessing the service as described. Most operators submitted that MVNO Access should be retained in the Access List without modification, indicating that MVNO Access is appropriately described, with industry support.

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[5]   Malaysian Communications and Multimedia Commission, Industry Performance Report 2019, p. 62, https://www.mcmc.gov.my/skmmgovmy/media/General/pdf/ENG-MCMC_IPR_2019.pdf.
[6]   In 2017, there were 17 MVNOs: MCMC, Industry Performance Report 2017, p. 55, https://www.mcmc.gov.my/skmmgovmy/media/General/pdf/Industry-Performance-Report-2017-291018.pdf. This declined to 8 MVNOs in 2019: MCMC, Industry Performance Report 2019, p. 62, https://www.mcmc.gov.my/skmmgovmy/media/General/pdf/ENG-MCMC_IPR_2019.pdf.

Technologies used in supply

8.75   Some access seekers submitted that 5G technology should be expressly included within the scope of the MVNO Access service.

8.76   As noted in paragraph 7.40 above in relation to the wholesale mobile origination and termination services, the description of the MVNO services is already technology neutral, and the lack of explicit inclusion of a technology does not mean that such technology is excluded from the service description. However, for consistency, the MCMC proposes to make minor amendments to the MVNO Access service description to reinforce the inclusion of 5G technology, the removal of 3G technology, and to make the similar amendment to WiMAX technology.

Other issues

8.77   A number of access seekers raised commercial issues relating to the supply of the MVNO Access service, including:

   (a)   delays experienced by (particularly thin) MVNOs in launching strategic retail product and pricing initiatives due to delays in the MNO approval process and the general dependency of these MVNOs on MNO systems;

   (b)   equivalence of input regarding the access technologies made available by MNOs to their own retail arms, and the access technologies made available to the MVNO; and

   (c)   other terms of MVNO access agreements, including MNO termination rights.

8.78   Similarly, access providers including Digi raised concerns regarding payment default by MVNOs and the corresponding commercial and reputational risk for MNOs.

8.79   The MCMC considers that the issues described in paragraphs 8.77 and 8.78 above are more appropriately dealt with under the subsequent inquiry that the MCMC will conduct in respect of the MSA and the MCMC will accordingly address comments on these issues in that subsequent inquiry.

MCMC Preliminary View

8.80   The MCMC's preliminary view is that it would be in the LTBE for the MVNO Access service to be retained in the Access List, as it will promote competition and encourage efficient use of, and investment in, infrastructure, including by access seekers who acquire "thick" MVNO access.

8.81   The MCMC proposes to make minor modifications to the service description to underscore that 5G technology is included in the scope of this service, to remove 3G technology from the scope and to correct typographical errors in the existing description.

8.82   Words that appear in <u>underlined red text</u> below have been added relative to the existing description while words that appear in ~~strikethrough text~~ are proposed

to be deleted, and the amended service description for the MVNO Access service is as follows:

4(23) MVNO Access

(a)   *MVNO Access is a Facility and/or Service for access to the Mobile Network used by the Access Provider to provide public cellular services to the public, for the purpose of the Access Seeker providing public cellular services to the public.*

(b)   *MVNO Access may include access to the Facilities and Services used by the Access Seeker to provide:*

   (i)   *one or more of voice, data and application services, as selected by the Access Seeker; and*

   (ii)   *services over networks including GSM, ~~IMT-2000 or 3G,~~ WiMAX, LTE, IMT-Advanced or LTE-Advanced, 5G New Radio or 5G and any other mobile networks which are currently available or which may be developed in future.*

Examples of Facilities and Services to which the Access Seeker may request access ~~to which~~ includes but is not limited to the Access Provider's:

   (i)   *radio network;*

   (ii)   *Serving GPRS Support Node and Gateway GPRS Support Node;*

   (iii)   *Home Location Register;*

   (iv)   *value-added service platforms (such as its Short Message Service Centre, Multimedia Service Centre and Voicemail Server);*

   (v)   *SIM provisioning and configuration;*

   (vi)   *customer billing; and*

   (vii)   *customer relationship management.*

Questions

> Question 10: Are any further amendments required to the MVNO Access Service beyond the amendments for 5G technology and 3G technology set out above?

Other services: A2P messaging

8.83   There are two distinct types of SMS/MMS messages: P2P messages and A2P messages.

8.84   As discussed in paragraphs 8.6 to 8.10 above, P2P messages are sent by one natural person to another, in the context of a two-way communication or conversation. Conversely, A2P messages are sent by an application to a natural person, as a form of one-way communication. A2P messages are typically used by organisations, such as financial institutions, government agencies, social media and transport providers, to communicate with their customers.

8.85   Specific use-cases of A2P messages include the transmission of one-time passwords (as a way of achieving two-factor authentication), service updates

(e.g. timing updates for ride-sharing transport services), service notifications and, in some cases, advertising (including unsolicited advertising).
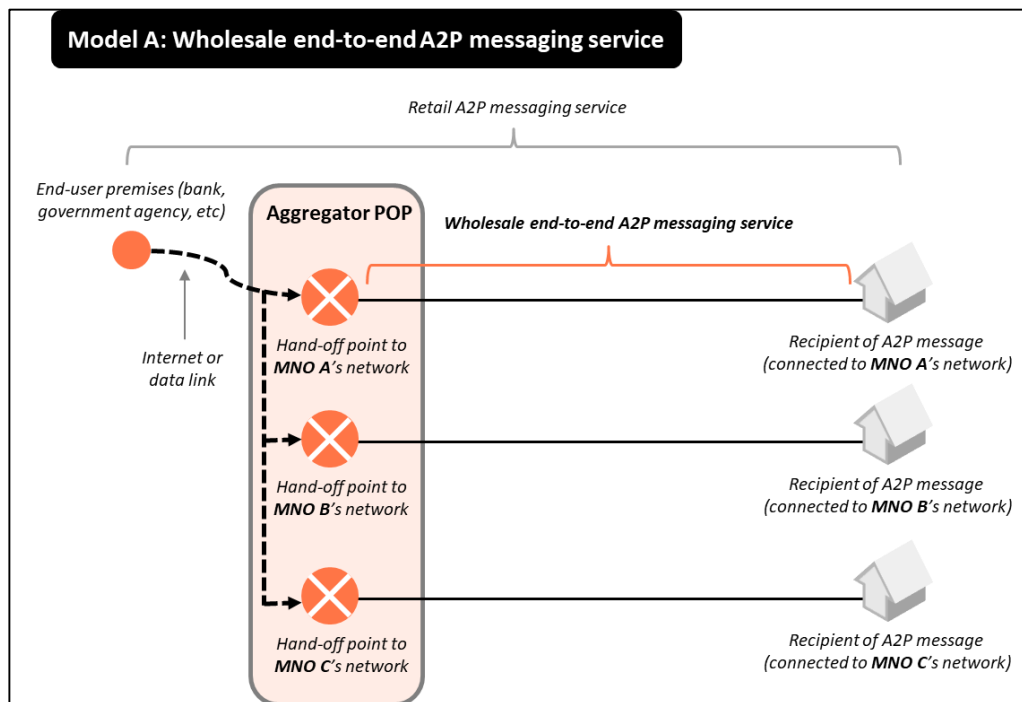
8.86   A2P messages can also be sent over OTT applications. However, because such applications do not have technical any-to-any connectivity (and require the recipient to download a specific application to their device), the bulk of A2P messages are sent using SMS and MMS protocols and carried by MNOs and MVNOs.

8.87   Theoretically, the P2P/A2P distinction also exists in respect of voice calls, but the MCMC's focus on A2P services in this Access List review is primarily focused on A2P messaging.

Overview: Supply of A2P messaging services

8.88   The MCMC considers that there are two models under which A2P messaging services are supplied:

(a)   wholesale end-to-end A2P SMS messaging services, from a A2P aggregator/retail provider location to the B-party (**Model A**); and

(b)   A2P SMS messaging termination services, from an MNO's A2P messaging gateway to the B-party (**Model B**).

8.89   The MCMC considers these two models as different because, to access termination services (Model B), the retail A2P messaging provider must either have its own network infrastructure up to the MNO's A2P gateway or must acquire access to such infrastructure from a third party (e.g. through a transmission service). Each of these models is depicted in the diagrams below:

Model B: A2P messaging termination service

Retail A2P messaging service

End-user premises (bank, government agency, etc)

Aggregator/ retailer POP

A2P messaging termination service

MNO A's A2P SMS gateway

Hand-off point to MNO A's network

Recipient of A2P message (connected to MNO A's network)

Internet or data link

Retailer's own network or separately-acquired transmission link

A2P messaging termination service

MNO B's A2P SMS gateway

Hand-off point to MNO A's network

Recipient of A2P message (connected to MNO B's network)

A2P messaging termination service

MNO C's A2P SMS gateway

Hand-off point to MNO A's network

Recipient of A2P message (connected to MNO C's network)

Figure 7 – Models for A2P messaging

8.90   Each wholesale A2P SMS messaging service functions like a termination service, supplied within the boundaries of each MNO's network.

8.91   The lack of interconnection between MNOs with regard to A2P messaging means that, when an A2P aggregator or other retailer wishes to obtain an end-to-end A2P messaging carriage service from that retailer's Point of Presence (**POP**) to a B-party location, their only viable option is to obtain such service from the MNO to which such B-party is connected.

8.92   Accordingly, each MNO has a monopoly in respect of wholesale end-to-end A2P messaging services and A2P messaging termination services terminating on its network.

Submissions received

8.93   Celcom submitted that A2P messaging should be regulated under a separate platform, rather than through interconnection (under which only P2P messages are currently allowed to pass).

8.94   Digi submitted that the supply of new services such as A2P and Unified Communications as a Service (**UCaaS**) should be commercially driven and therefore sit outside the scope of the Access List. In Digi's opinion, it would be premature for the MCMC to include these services in the Access List today, and the MCMC should intervene only when these services have grown and matured and there are impediments to accessing these services.

8.95　　　Maxis submitted that A2P messaging should not be included on the Access List.

8.96　　　Maxis uses wholesale end-to-end A2P carriage services acquired through an aggregator in order to transmit A2P messages to end users of other operators. Maxis notes that A2P messages do not involve one-way termination from the aggregator to the MNO, but also involve reliance on the aggregator indirectly terminating SMS messages to third party MNOs. Maxis characterises this as a "dual-sided" market that presents challenges for regulation from a termination perspective, as both parties are access seekers and the aggregators also facilitates (and seeks access to) third party networks.

8.97　　　In Maxis's view, in order to control the incoming bulk SMS to their networks and avoid fraudulent SMS messages, spam, gambling and advertisements from reaching their end users, operators do not use mobile network termination services for A2P SMS. Maxis submitted that bulk SMS platforms also provide MNOs with added functionalities such as tracking responses and keyword messaging.

8.98　　　Maxis also noted that current retail mobile plans, under which MNOs provide unlimited SMS messages to end users, can be abused through the use of marketing messaging over the interconnect gateway. Maxis considers that end user complaints in respect of spamming and gambling SMS messages will increase significantly if A2P messages are terminated via conventional SMS interconnect.

8.99　　　Even under the current arrangements, where only P2P SMS messages are allowed via the interconnection/POI, Maxis has experienced a significant increase in complaints from its customers regarding unwanted SMS messages. Maxis submitted that for these reasons, A2P messaging should not be regulated on the Access List.

8.100　　In the informal operator feedback session, the Malaysia Mobile Technology Association (**MMTA**) submitted that Malaysia has a very successful market for A2P services. Content aggregators with ASP(C) licences can compete with MNOs to provide these services, however there are some operators that do not follow the short code model. MMTA noted that while only companies who have an ASP licence can perform certain activities, financial institutions such as banks, approach MNOs directly to seek access to A2P termination services.

8.101　　MMTA's further feedback can be summarised as follows:

(a)　　　Typically, MMTA members enter into separate agreements with MNOs to carry bulk SMS messages to B-parties, depending on the preference of the customer and the aggregator member.

(b)　　　There are broad services provided by companies in delivering messages to a B-party, including end-to-end A2P services through a web-based interface. Larger enterprise users typically implement their own APIs, which are then sent to aggregators to be routed to various MNOs. Aggregators, who acquire a database service from Talian Gerak Alih Sdn. Bhd (**TGA**), then route the messages to MNOs.

(c) Aggregators route messages manually, following which operators respond with a delivery notification, confirming whether the messages were sent or not. MNOs handle all routing on-net - once it is determined that a number belongs to an MNO to whom the messages are being routed, the message does not cross anyone else's network.

(d) In terms of barriers in acquiring services from MNOs, MMTA noted that three major MNOs have entered into partnerships with foreign firms who don't have ASP licenses, unlike most aggregators in Malaysia. This is often in the form of a "premium branded service", which attracts a premium price for local players compared to large multinational enterprises.

(e) The MMTA considers that as OTT services, such as WhatsApp and Viber, are being deployed to replace traditional messaging (either partly or fully) but with no licensing requirements and no regulation, there are concerns about the misuse of OTT messaging and potential for regulation to address these concerns.

(f) MMTA also enquired about the MCMC's view on Rich Communication Services **(RCS)** messaging.

8.102 TM acquires mobile network termination and origination services to deliver A2P messages to end users. This is achieved through terminating the SMS service over a separate A2P interconnection platform to establish separate connectivity over IP (as requested by Celcom, Maxis, U Mobile, XoX, YTL, Tune Talk, Webe) and via VPN connectivity (as requested by Digi).

8.103 TM submitted that mobile operators generally differentiate between A2P and P2P messaging. A2P messaging is considered by mobile operators as an unregulated enterprise/commercial service, while the Mobile Network Origination Service and Mobile Network Termination Service are deemed to include only P2P messaging. TM has accordingly faced challenges in commercially negotiating access to A2P messaging services, including one-sided terms of supply that may not be fit for an access seeker's purposes.

8.104 In TM's view, this is against the spirit of any-to-any connectivity sought to be achieved under the Access List. TM proposes that the service descriptions of the Mobile Network Origination Service and Mobile Network Termination Service are updated to clearly include both A2P and P2P messaging. TM also proposes that A2P messaging rates must also be regulated, potentially using the current regulated rates for the Mobile Network Origination Service and Mobile Network Termination Service.

8.105 Webe submitted that while it does not currently face any major challenges in gaining access to A2P messaging services, an access provider could face obstacles in providing these services once 3G technology sunsets under the JENDELA plan. Webe noted that this could result in:

(a) potential traffic congestion affecting A2P message delivery to subscribers; and

(b)   degradation in the performance of the service provided by access providers to access seekers (in this case, content providers).

8.106   Webe requested that the descriptions of each of the Mobile Network Origination Service and Mobile Network Termination Service should include both A2P and P2P SMS.

8.107   YTL submitted that all content providers in Malaysia who hold ASP licences and short codes should be mandated to connect with all Malaysian operators, in order to ensure that A2P messages can be delivered to all Malaysian subscribers. YTL also proposed that Malaysian numbers registered by end users located outside Malaysia should be permitted given the service is provided over the cloud and should be flexible enough for customers to access the service regardless of their location.

MCMC Assessment

LTBE overview: A2P messaging services

8.108   Given the MCMC's view that each MNO has a monopoly in respect of wholesale end-to-end A2P messaging services and A2P messaging termination services terminating on its network, there is little or no competitive constraint on operators who currently supply these services on a commercial basis and therefore it is likely to promote competition in accordance with the LTBE to include these services in the Access List. This is evidenced by the submissions from stakeholders that they are facing difficulties in acquiring these services on fair terms of supply, and that potential difficulties (including service degradation) could be faced in future once 3G technology sunsets.

8.109   Although some operators view that A2P services should be given the opportunity to grow and mature prior to any regulatory intervention, the MCMC notes that in regulating telecommunications services and facilities, the MCMC has regard not only to the current state of technology and competition, but also the future state, as is inherently required in any consideration of the LTBE. This is consistent, for example, with the forward-looking approach adopted by the MCMC and other leading regulators in comparable jurisdictions in relation to the regulation of HSBB and 5G services.

8.110   A2P messaging services are an increasingly important sector. In this context, and in light of the above, the MCMC considers that it would be in the LTBE to regulate these services to:

(a)   promote competition in the supply of these services at a retail level;

(b)   help achieve any-to-any connectivity; and

(c)   encourage efficient investment that is required to support the ongoing emergence and growth of these services.

Form of Access List regulation for A2P messaging services

8.111   A number of stakeholders commented on A2P services, and there were a number of differing opinions regarding whether and how these services should be listed on the Access List.

8.112   Maxis and Digi each opposed any proposal for these services to be listed on the Access List.

8.113   On the other hand, Webe and TM each submitted that A2P messages should be included within the definition of the Mobile Network Origination Service and Mobile Network Termination Service, and Celcom considered that these services should be regulated through a separate platform rather than interconnection. YTL also submitted that all content providers with ASP licences and short codes should connect with all Malaysian operators.

8.114   Regarding submissions by operators that A2P services should be listed on the Access List, either within the scope of the existing mobile network origination and termination services or otherwise, the MCMC considers that given the different models under which A2P services are currently supplied (i.e. from an A2P aggregator/retail provider location to a B-party or from an MNO's A2P messaging gateway to a B-party), it is appropriate to reflect each model by both listing a new A2P messaging service, and amending the description of the existing Mobile Network Termination Service, as outlined below.

8.115   Similarly, in response to the MMTA's feedback, the MCMC notes its expectation that listing A2P termination and end-to-end A2P messaging services in the Access List will address many of the issues being faced by aggregators and MNOs alike. In combination with the reporting obligations under the MSA (that will be covered in the subsequent review), such amendments will provide the MCMC with greater visibility over how these services are supplied and the challenges faced by operators and aggregators in this sector.

8.116   The diagram below depicts the scope of the proposed A2P messaging services:
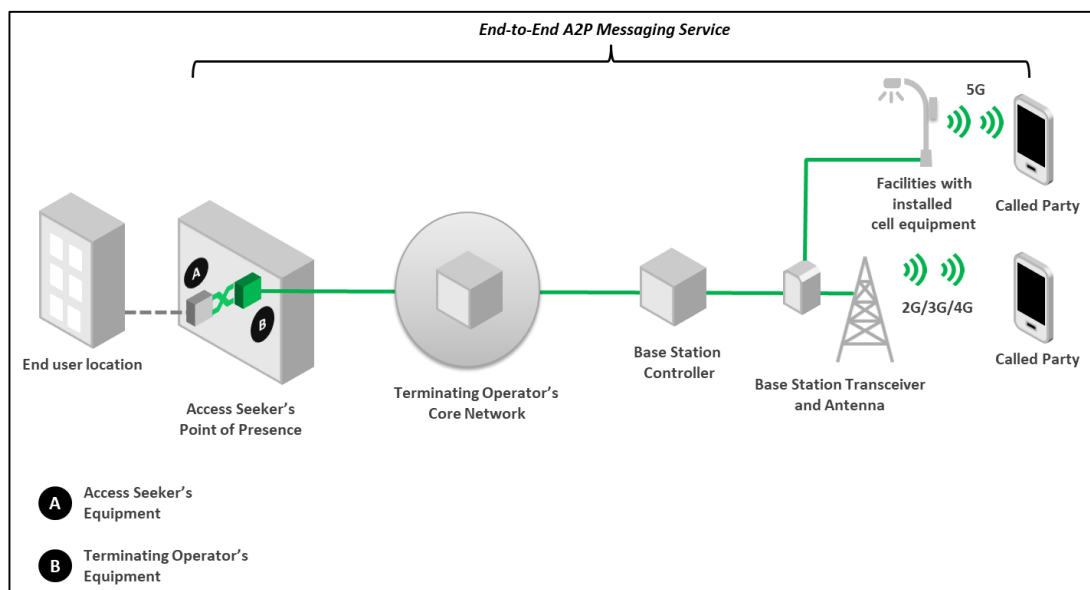
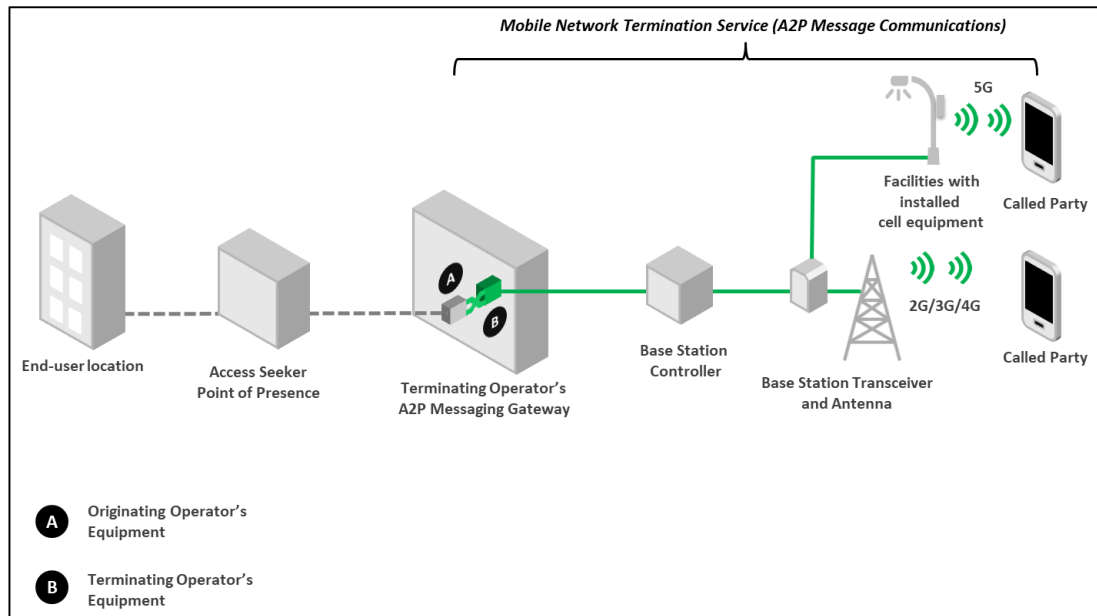**Figure 8 – Scope of proposed End-to-End A2P Messaging Service**

Figure 9 – Scope of proposed Mobile Network Termination Service (A2P Messaging)

Other issues

8.117   Regarding Maxis's comments that including A2P services within the scope of the Mobile Network Origination Service and Mobile Network Termination Service would lead to an increase in spam content being transmitted over these services, the MCMC notes that these are technical considerations that could be addressed by operators through other means, such as spam filters.

8.118   The MCMC invites further information from operators as to why these concerns cannot be addressed from a technical perspective, but the MCMC does not consider these concerns relevant to the LTBE analysis that underpins this Access List Review. Rather, as set out above, the MCMC's focus is on promoting the LTBE through promoting competition, achieving any-to-any connectivity and encouraging efficient use of, and investment, in communications infrastructure.

8.119   In relation to the feedback provided by the MMTA regarding OTT services, the MCMC notes that it will consider the options available in respect of these services, including from the perspective of consumer protection. Nevertheless, this aspect is beyond the purview of the current inquiry.

8.120   In response to the MMTA's query regarding RCS messaging, the MCMC considers that RCS messaging is still in its infancy and the MCMC does not have sufficient information to determine at this stage whether these services should be expressly included in the Access List. The MCMC welcomes further submissions from operators on this type of messaging.

8.121   Finally, in response to the MMTA's comments on the premium prices aggregators are required to pay for premium branded service, the MCMC repeats its earlier comments that matters relating to pricing are outside the scope of this inquiry.

MCMC Preliminary View

8.122   The MCMC's preliminary view is that it would be in the LTBE for A2P messaging services to be included on the Access List, given the likely benefits to competition, any-to-any connectivity and investment in infrastructure that regulation would likely bring.

8.123   With regard to how the service should be regulated, the MCMC considers that:

(a)   A2P messaging services supplied under "Model A" described in paragraph 8.89 above should be listed as a new service on the Access List, as set out below;

(b)   A2P messaging services supplied under "Model B" described in paragraph 8.89 above should be included within the service description of the Mobile Network Termination Service. The MCMC's proposed amendments to the Mobile Network Termination Service are set out in paragraph 8.35 above; and

(c)   for clarity, any proposed amendments to the Access List to cover Model A and Model B are not intended to be substitutable; the MCMC intends that both models of supply should be covered in the Access List.

End-to-End A2P Messaging Service

(a)   An End-to-End A2P Messaging Service is an Interconnection Service for the carriage of A2P Message Communications from any Access Seeker Point of Presence (for example, an aggregator POP) to a 'B' party. The End-to-End A2P Messaging Service supports Mobile Network-to-Mobile Network Message Communications which both originate and terminate on the Access Provider's Mobile Network.

(b)   The functionalities of the End-to-End A2P Messaging Service include:

(i)   transmission and switching, whether packet or circuit; and

(ii)   the signalling required to support the Interconnection Service.

(c)   Examples of technologies used in the End-to-End A2P Messaging Service would be:

(i)   Global System for Mobile Communications ("GSM");

(ii)   Worldwide Interoperability for Microwave Access ("WiMAX");

(iii)   Long-Term Evolution ("LTE");

(iv)   International Mobile Telecommunications – Advanced ("IMT-Advanced" or "LTE-Advanced");

(v)   5G New Radio ("5G"); and

(vi)   any other mobile technology which is currently available or which may be developed in future that involves the carriage of Message Communications.

8.124   As described in paragraph 8.123(a), the MCMC also proposes to insert a new definition for "A2P" in paragraph 3 of the Access List, repeated here for ease of reference.

"A2P" or "Application-to-Person" means, in respect of a Message Communication, a one-way Short Message Service or Multimedia Message Service communication originating from an application and delivered to an End User.

Questions

Question 11: Do you have any comments on the proposal to include a new End-to-End A2P Messaging Service in the Access List or to its service description?
Question 12: Are any further amendments required to either the Mobile Network Termination Service or the new End-to-End A2P Messaging Service?

Other services: Domestic roaming / RAN sharing

Description

8.125   Domestic roaming, also known as "national roaming", refers to an MNO or MVNO using the RAN of another MNO or MVNO to supply retail mobile telephony services (or services of a particular type) in locations where the first MNO or MVNO does not have its own coverage (or coverage of a particular type of service). Such a service addresses economic barriers to rolling out mobile networks in regions that are sparsely populated or where an operator only has a small subscriber base.

8.126   The MCMC considers that network sharing arrangements such as domestic roaming, RAN sharing, MOCN arrangements and MVNO access can be treated holistically when assessing the supply of wholesale mobile broadband services generally. These arrangements are also discussed in section 9 below in the context of 5G access models.

8.127   The MCMC acknowledges that each of these services is used for a different purpose and is often acquired by different types of operators. For example, MVNO access is generally acquired by operators without any RAN infrastructure, whereas RAN sharing and MOCN arrangements are entered into by operators who may operate a RAN but wish to optimise their network or gain a footprint in new areas. This results in a low level of demand-side substitutability between such services or arrangements.

8.128   However, each of these services or arrangements is capable of being provided by MNOs, meaning the conditions of competition under which each of domestic roaming, RAN sharing, MOCN arrangements and MVNO access are supplied are relatively similar.

8.129   The supply of wholesale mobile broadband services is discussed in paragraphs 8.48 to 8.55 above.

Submissions Received

8.130   The MCMC thanks operators for their submissions on these services, and acknowledges the difference of operators' views on domestic roaming and other network sharing arrangements, generally based on whether the operator is an

access seeker or an access provider of such services. Many operators also noted the importance of these services in the achievement of JENDELA aspirations.

8.131   Importantly, and as noted above in paragraph 4.6, the MCMC notes that the submissions in this section were made by operators prior to the Government's announcement of the establishment of DNB as Malaysia's single 5G wholesale network operator. The MCMC notes that operator submissions in respect of MOCN and other network arrangements as they relate specifically to 5G are addressed in section 9 of this PI Paper.

8.132   However, the MCMC considers that submissions by operators regarding network sharing arrangements more generally remain relevant for the MCMC to consider, given legacy 4G/LTE networks are likely to co-exist with 5G networks for some time. Further, as noted below, the MCMC's preliminary view is that it is appropriate to consider 5G services separately to other technologies, given the different competition and economic conditions that apply to 5G services as a result of the single wholesale network operator model under which DNB will operate.

8.133   Celcom is an access provider to Webe for 4G domestic roaming and MOCN services including complete 2G, 3G and 4G wholesale services. Additionally, Celcom:

(a)   has in place MOCN arrangements with Digi and Maxis under the Universal Service Provision in Time 3 selected areas for 2G and 3G multi-operator RAN (**MORAN**); and

(b)   is in ongoing discussions on a 2G domestic roaming arrangement with a potential access seeker.

Celcom submitted that the MCMC should have a role in mandating and providing funding for migration from 3G MORAN to 4G MOCN, in anticipation of 3G sunset by December 2021.

8.134   Celcom submitted further that all forms of domestic roaming should not be included on the Access List. In Celcom's view, there is no indication of market failure; rather, there is clear empirical evidence that commercial negotiations have been successful and resulted in mutually beneficial outcomes for access seekers and access providers alike.

8.135   Celcom also cited that Infrastructure Sharing arrangements amongst the MNOs have worked very well to date to reduce the need and economic justification for regulation of domestic roaming. In Celcom's view, imposing ex-ante regulation on these services would be onerous, disproportionate and cost ineffective for market players and the regulator.

8.136   Celcom supported the MCMC's views in the 2015 Access List Review that RAN sharing requires a high degree of joint co-ordination, planning and investment by participating MNOs, and considers that the asymmetric relationship between access seeker and access provider is not suitable to achieve this.

8.137   Finally, Celcom cited that it faces a number of challenges in relation to these services as 5G networks are deployed. In particular, with regard to 5G sharing, Celcom noted challenges on joint co-ordination and planning, such as:

(a)   spectrum allocation between sharers as 5G MOCN will require contiguous spectrum positioning;

(b)   agreeing and aligning on network design and architecture; and

(c)   agreeing and aligning on commercial arrangements between sharing parties.

8.138   Cubic Telecom submitted that the rollout of 5G networks will have an influence on the state of mobile competition and commented that some regulators have retained the power to regulate domestic roaming in the era of 5G spectrum allocation and network rollout. In this context, Cubic Telecom submitted that a regulatory backstop of mobile roaming could be necessary to prevent the commercial hold-up of 5G deployment.

8.139   Digi currently has RAN sharing arrangements at Time 3 sites. While Digi submits that there are no impediments in gaining access to, or (as an access provider) in supplying, any domestic roaming or RAN sharing services, Digi suggests that access seekers need to provide traffic and subscriber requirements, Service Level Availability expectations, and details on capacity availability and technical capability.

8.140   Maxis has entered into 2G domestic roaming arrangements with Digi and Celcom under the Time 3 Domestic Roaming for USP Sites. Maxis is the access provider when there is inbound domestic roaming at Maxis sites, and is the access seeker for outbound roaming at either Celcom or Digi's sites.

8.141   Maxis is also an access provider and access seeker for the provision of 2G and 3G services under MORAN sharing arrangements with Celcom, Digi, Redtone, OCK and Felda Prodata at more than 1300 sites funded by the USP under the Time 3 and Time 3 Extension programs. Additionally, by the end of 2021, Maxis expects to commence providing 2G, 3G and 4G services to U Mobile via MOCN arrangements at 152 sites, again funded by the USP, under the NFCP1 tender program.

8.142   Maxis made extensive submissions that it does not see any impediments in gaining access to or supplying domestic roaming or RAN sharing services. Maxis cites the above arrangements as examples of successful implementation of sharing on a commercial basis.

8.143   Maxis submitted that, currently, the cellular operators are also working on developing common arrangements for active RAN sharing via MOCN to improve the (non-USP funded) service coverage and speed in urban and sub-urban areas, such as Putrajaya and Cyberjaya, and "coverage improvement sites", such as Laban Ulu in Sarawak, Bukit Tangga and Bukit Selambau in Kedah. In supplying 2G/3G/4G services at these sites, as guided by the MCMC, Maxis says that the cellular operators have already commenced discussions on commercial terms for active RAN sharing and have agreed that such sharing is an effective means to

provide services based on optimal technical design and at minimal cost for the benefit of end users.

8.144   Maxis additionally submitted that, under the JENDELA Phase 1 target of 4,589 2G/3G sites to be upgraded to 4G in 2021 through utilisation of USP major contributions, a significant number of these sites would be upgraded based on MOCN RAN sharing collaboration between Celcom, Digi and Maxis, which involves sharing or understanding the operational costs incurred on a commercial basis amongst the operators. Maxis understands that the MCMC has asked the cellular operators to discuss and find workable commercial solutions to achieve the JENDELA Phase 1 aspirations. Maxis proposed that, where negotiations work, the MCMC should allow a market-driven approach.

8.145   Maxis strongly viewed the existing Malaysian wholesale cellular markets as sufficiently competitive based on the movement of operators between different providers of wholesale services.

8.146   Maxis does not support the formation of a single RAN sharing company in the country. It is concerned that this could create a monopoly, raise barriers to entry for the cellular operators and will not secure the long-term benefit of end users in terms of access, commercial terms, technical terms, service delivery and so on.

8.147   Maxis is also concerned about the complexity for the MCMC to regulate domestic roaming and RAN sharing services among the cellular operators due to different sets of requirements at each site such as the number of operators engaged in RAN sharing, technology (2G/3G/4G), type of sharing (MORAN/MOCN), network configurations (POI, spectrum sharing/pooling) and so on. Maxis submitted that there are various types of topology and USP provisions and it is difficult to have a standard set of provisions across all sites.

8.148   Maxis submitted its view that most regulators do not regulate any form of domestic/national roaming or RAN sharing services, and this view is supported by international regulatory best practice in the Asia Pacific region and in Europe. Maxis noted that RAN sharing and national roaming are not regulated in several jurisdictions, including Australia, Singapore, South Korea, Japan, China, UK, Portugal, Netherlands and Germany.

8.149   In relation to 5G deployment, Maxis does not foresee any particular challenges in acquiring or in supplying domestic roaming or RAN sharing services commercially between the cellular operators. In line with the points raised by Maxis above, Maxis submitted that cellular operators would continue to adopt the current approach for 5G network deployment without any significant challenges. Maxis commented that this approach is well supported, and referred to examples of global operators with existing 4G MORAN/MOCN agreements which were subsequently extended to include 5G, such as Vodafone/O2 in the UK, Vodafone/Orange in Spain and Orange/T-Mobile in Poland. Maxis also referred to a recent greenfield network-sharing agreement in Belgium between

Proximus and Orange which covers technology-neutral MORAN sharing, including 5G.[7]

8.150   Maxis additionally submitted that it is important to take into consideration that the mobile retail market remains highly competitive in Malaysia. Maxis suggested that with effective competition in the mobile retail market, it is unnecessary to over-regulate the mobile wholesale market by including domestic roaming and RAN sharing services in the Access List.

8.151   Maxis submitted that, in many cases, voluntary sharing in the form of commercial arrangements (even in 5G deployment) is the most prevalent form of RAN sharing, rather than it being mandated through ex-ante regulation. Maxis provided the following examples:

(a)   in China, an agreement between China Unicorn and China Telecom to co-build 5G networks in 15 cities (with plans to extend nationwide), and sharing 5G frequency bands;

(b)   in Spain, Vodafone and Orange extending their active 2G/3G/4G sharing arrangements to include 5G sharing, with the number of sites expected to grow from 5,600 sites to 14,800 sites; and

(c)   in the United Kingdom, Vodafone and O2 extending their network sharing arrangement to include 5G active sharing in suburban and rural areas.

8.152   Maxis stated that another critical point is that, at present, the MCMC has not allocated new spectrum for 5G, there is no published policy on the size of blocks and the relevant Ministerial directions related to 700MHz and 3.5GHz have been revoked. Based on existing spectrum allocations, Maxis considers that operators are free to deploy their own networks using their own existing spectrum, and the level of competitiveness remains unchanged. Maxis submitted that any challenges to securing 5G access cannot be substantiated by formal policy as there has not been much clarity on this matter.

8.153   Based on the above, Maxis proposed that domestic roaming and RAN sharing services should remain subject to the commercial arrangements among the cellular operators and not be included in the Access List (even for the purpose of 5G network deployment), both to facilitate ongoing efforts towards developing and establishing an efficient commercial framework and for the long term benefit of end users.

8.154   Redtone submitted that it was a supplier for the MCMC's USP project, i.e. Time Extension Phase 1 and Time 3 Extension Phase 3 RAN Sharing. It found that for USP sites within the contract period, the access to such services were highly dependent on the MCMC's approval. Redtone foresaw cost as a major challenge, as network equipment will need to be upgraded to support new requirements. Redtone suggested that 5G will require huge capital investment.

8.155   TIME submitted that the MCMC should consider including domestic roaming and RAN sharing in the Access List to promote competition of mobile services at the

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[7] Karim Taga, Glen Peres and Ventsislav Dimitrov, 'Network sharing in the 5G era', November 2020, Arthur D Little, https://www.adlittle.com/sites/default/files/reports/adl_network_sharing_5g_era.pdf.

retail level. In TIME's view, there should be more MVNOs who deploy innovative services to support future 5G applications and use cases such as M2M and ultra-reliable and low-latency services.

8.156   TM acquires domestic roaming via Webe and will supply RAN sharing via a MOCN arrangement to other MNOs. TM submitted that it faced impediments in gaining, and supplying, access to domestic roaming and RAN sharing services. It proposed that such impediments can be resolved by listing domestic roaming and RAN sharing services in the Access List to avoid duplication of network infrastructure in remote and rural regions of Malaysia, where it may only be economically feasible for one infrastructure provider to be present. In TM's view, regulated domestic roaming:

(a)   is likely to have a positive effect on investment for many new 4G/LTE entrants, with the savings gained by avoiding duplicate investment capable of being used by MNOs to expand coverage to underserved areas or to address congestion in high-demand areas, driving better QoS for end users;

(b)   would allow 4G/LTE operators to provide circuit-switched voice connectivity and nation-wide services, given the delay observed by TM in VoLTE deployment in Malaysia and the benefits of circuit-switched call fallback (**CSFB**) in overcoming that delay; and

(c)   would be critical in the provision of 5G services, given the limited availability of 5G spectrum and the need for MNOs to negotiate domestic roaming arrangements for the provision of 5G services. TM cited as an example the award of 5G spectrum in Singapore, in which the IMDA mandated the two licensees of nationwide 5G spectrum to provide 5G wholesale access to all access seekers.

8.157   TM cited the following specific circumstances in which a domestic roaming arrangement would promote the LTBE:

(a)   low-traffic (and high-cost) areas, where existing coverage is available via alternative MNO(s);

(b)   complimentary/CSFB coverage for new 4G/LTE entrants to ensure service continuity and voice services;

(c)   private coverage areas where operators have exclusive control of market access; and

(d)   areas of particular states where SBCs have exclusive or other rights but are unable or unwilling to provide tower access, for example.

8.158   In TM's view, commercial domestic roaming arrangements require access seekers to agree to unfair terms. Without access to existing mobile networks, TM asserts that a new mobile entrant would have to invest and roll out its network infrastructure in existing coverage areas, impeding progress towards achieving JENDELA's mobile objectives. TM submitted that the MCMC should increase the level of regulated wholesale mobile access to allow existing mobile

networks to monetise spare capacity and allow future investments to be targeted at new coverage areas. Additionally, TM argued that access providers imposed restrictions on RAN Sharing arrangement, such as on the location or area, and limited spectrum choice, such as limiting the access seeker to the spectrum band with the smallest amount of bandwidth and/or the least coverage and lowest site count. TM stated that this results in the access seekers' service offering being of lower quality, with service quality issues and limited coverage and capacity for its customers, compared to the access providers' service offering.

8.159   In commenting on the impediments TM faces on the technological front in respect of such services, TM referred to the:

(a)   **scale of activation:** domestic roaming activation is on a large-scale Tracking Area Code level for LTE and Location Area Code for 3G/2G. TM comments that this is a vast area of activation and such subscription is only beneficial for baseline coverage for operators that do not deploy the same frequency technology; and

(b)   **effective control of traffic movement:** RAN Sharing MOCN can be activated locally at the cell level, however, based on a proof of concept, there is limited ability to control traffic leaking/spillage where both operators have similar overlapping signal strength. TM submitted that, in this case, policy-based control mechanisms (being a Service Profile Identifier and a Fair Usage Policy) are used but these are not effective in returning users to the home operator (e.g. where users get stuck in MOCN mode in a heavy-technology overlapping area).

8.160   Webe also raised the service quality-associated impediments outlined by TM above in Webe's capacity as an access seeker.

8.161   With regard to RAN sharing, TM requested that a regulated MOCN and MORAN sharing model be adopted. In TM's view:

(a)   MOCN allows operators to pool their respective spectrum allocations and share operations and planning costs, which results in improved efficiency; and

(b)   MORAN benefits operators in terms of cost sharing on radio equipment and reduced antenna footprints.

8.162   In addition, TM argued mandated RAN sharing would alleviate spectrum fragmentation issues and facilitate 5G deployment, by allowing MNOs to consolidate and share spectrum to support increasing data demand in Malaysia and reduce the cost of 5G deployment to achieve JENDELA targets. TM cited, as an example, spectrum sharing arrangements introduced by Ofcom in the United Kingdom, including in the 1800MHz, 2300MHz and 3800MHz – 4200MHz ranges. TM also argued that access seekers subscribing to the access providers' domestic roaming or MOCN services will, in turn, boost access providers' CAPEX and, accordingly, assist access providers in, and accelerate, 5G deployment.

8.163   These comments were echoed by Webe in its submission. Webe is currently acquiring the following services:

(a)   Domestic roaming services, which it considers necessary given VoLTE adoption in Malaysia is still in its infancy and to address coverage gaps in areas where LTE is yet to be available. In the absence of 3G spectrum to support basic voice and SMS services, and in order for Webe to provide a full-fledged mobile service to its customers, Webe submitted that domestic roaming is the best option available. It currently acquires nationwide domestic roaming services from its access provider for seamless coverage services; and

(b)   RAN sharing services at selected areas to widen Webe's service coverage and for better customer experience.

8.164   Webe requested that domestic roaming and RAN / spectrum sharing services be added to the Access List to facilitate a simpler and faster negotiation process and ensure economic efficiencies and network monetisation. Webe foresees an imbalance of spectrum allocation that will determine user experience, as well as the investment required for the service rollout. Webe considers that the onus is on the spectrum holder to decide whether to share the spectrum or not, and the holder is at liberty to determine the commercial model.

8.165   Webe submitted that listing these services in the Access List will expedite the process of negotiation and ensure fair and equitable treatment by access providers, given the challenges experienced by Webe in dealing with commercial terms imposed by access providers, such as high prices, difficulties in resolving disputes and a lack of service level availability commitments.

8.166   Webe additionally believes that all aspects of mobile network access should be defined so as to ensure an open market with competitive pricing. In Webe's view, spectrum sharing would allow competition to be driven by product offerings and service innovation instead of infrastructure, benefitting end users and enabling the digital economy, and ultimately helping to achieve JENDELA aspirations.

8.167   Webe also stated that it foresees 5G requiring a significant volume of spectrum bandwidth to support data rich applications and use cases, and thus considers spectrum as a bottleneck for 5G. Webe considers that RAN sharing is the way forward to support 5G and in Webe's view, this can only effectively be achieved by including the service in the Access List.

8.168   U Mobile currently acquires 2G domestic roaming for voice and data services nationwide and faces no impediments in gaining access to these services on a commercial basis. However, U Mobile submitted that wholesale 5G services must be mandated if its rollout is geographically split due to allocation of spectrum to specific licensees. U Mobile also does not foresee any difficulties in acquiring 5G RAN sharing or domestic roaming services currently, on the assumption that the MCMC will mandate the provision of such wholesale services by spectrum assignment holders.

8.169   U Mobile also submitted that domestic roaming and RAN sharing, more generally, will contribute to the achievement of the JENDELA targets, and that prices should be regulated in order to allow the take-up of such services. U Mobile considers that these services have been typically used to allow new entrants to compete during their early stages with established operators.

However, in U Mobile's opinion, network rollout is typically focused in key market centres and less in rural and remote areas, resulting in investments being targeted in areas of high demand.

8.170   Further, U Mobile considers that existing Government programs do not provide sufficient funding to allow late entrants to catch up on coverage targets, forcing newer operators to seek access to domestic roaming and RAN sharing from incumbents at often unprofitable commercial rates. Accordingly, U Mobile submits that these services should be mandated at the wholesale level and priced at cost-based pricing principles in order to ensure competition.

8.171   YTL does not currently acquire or supply these services, but wishes to enter into agreements for such services in the areas where it faces challenges to build or share sites, e.g. remote rural area, in buildings, KLCC, LRT, airport, smart tunnel and protest areas.

8.172   YTL requested that domestic roaming be included on the Access List. In YTL's view, domestic roaming can optimise the use of resources not only in sparsely populated areas where the cost of rollout of all operators is high, but also in in-building circumstances where due to space limitations, building design and cost factors, it is not feasible for an operator to install a separate system.

8.173   YTL submitted that all operating bands in Malaysia should be allowed to perform RAN sharing as, technically, it is not feasible to perform RAN sharing (MOCN) if access seekers and access providers do not share a common frequency band. YTL submitted that regulatory intervention may be required to achieve this. YTL appreciated USP projects that involved RAN sharing as they encompassed all the National Bands (both Time Division Duplex and Frequency Division Duplexing), and suggested that this will provide a good model for RAN sharing. YTL further submitted that there should be no challenges in acquiring or supplying these services as 5G networks are deployed if 5G equipment is readily supportive of RAN sharing.

MCMC Assessment

LTBE overview: Domestic Roaming services

8.174   From an Access List perspective, regulation of domestic roaming services is not a novel approach. By way of background:

(a)   in the 2008 Access List Review, the MCMC explained its intention to sunset the previously listed 3G-2G Domestic Inter-Operator Roaming Service, given its concerns with ensuring that 3G spectrum holders retain an incentive to invest in their own infrastructure rather than relying on 2G roaming;

(b)   consequently, since 1 January 2011, the Access List has not included access to any domestic roaming service; and

(c)   for the same reasons, in the 2015 Access List Review, the MCMC declined to re-list the 3G-2G Domestic Inter-Operator Roaming Service, or to include a broader domestic roaming service, in the Access List. In

particular, as MNOs are already obliged to roll out national networks by virtue of their apparatus / spectrum assignments, it was not clear to the MCMC what the competitive benefit of a regulated domestic roaming service would be. By contrast, reducing incentives for infrastructure investment by MNOs could negatively impact on the potential for facilities-based competition in the supply of mobile telephony services.

8.175   In the MCMC's view, the arguments for and against including domestic roaming in the Access List at this time weigh in favour of regulation.

8.176   As noted in paragraph 8.126 above, the MCMC's preliminary view is that domestic roaming arrangements can be treated the same as MVNO access services, as they both fall within the scope of mobile broadband services and network sharing arrangements.

8.177   Given domestic roaming and MVNO access services (which are already listed on the Access List) can be treated as similar inputs into the competitive process for mobile services, the incremental benefits in regulating domestic roaming services to promote competition in furtherance of the LTBE are potentially narrower, but nevertheless the benefits to competition might emerge through regulation of the service.

8.178   The MCMC notes the submissions of some operators, including Maxis, that international regulatory practice has typically leaned towards regulatory forbearance in relation to domestic roaming arrangements, rather than regulation.

8.179   While it would be an uncommon approach to regulate domestic roaming, it would not be unprecedented. For example:

(a)   operators in France are required to provide domestic roaming in areas with limited mobile coverage;[8] and

(b)   a number of OECD countries regulate domestic roaming, such as Canada and the United States.

8.180   In France, roaming is mandated only on a temporary basis, with the French telecommunications regulator (**ARCEP**) having issued guidance that current roaming arrangements be progressively phased out by the end of 2022 at the latest. Such arrangements were specifically designed to facilitate and assist the market entry of a fourth mobile operator (Free Mobile), rather than constituting a more general access regime to apply on an enduring basis. Indeed, ARCEP considered that the regulation of domestic roaming "cannot be justified over the long term". [9]

8.181   In Canada, while the Canadian Radio-Television and Telecommunications Commission (**CRTC**) found evidence of discrimination against smaller wireless players in commercial roaming arrangements, the CRTC decided on 1 March

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[8] Marc Bourreau, Steffen Hoernig and Winston Maxwell, 'Implementing Co-Investment and Network Sharing', May 2020, https://cerre.eu/wp-content/uploads/2020/05/cerre_implementing_co-investment_and_network_sharing-26.05.2020_1.pdf.
[9] ARCEP, Press Release, 12 January 2016, 'ARCEP publishes guidelines on roaming and mobile network sharing for consultation', https://en.arcep.fr/news/press-releases/view/n/arcep-publishes-guidelines-on-roaming-and-mobile-network-sharing-for-consultation.html.

2017 that mandated wholesale roaming should provide only "incidental" and not "permanent" access to incumbents' networks. Again, the fundamental factors taken into account by the CRTC in arriving at this decision were:

(a)   the need for continued innovation and investment in telecommunications facilities; and

(b)   sustainable competition that provides benefits to Canadians, such as reasonable prices and innovative services.[10]

8.182   In the United States meanwhile, domestic roaming has been mandated since 2007, with domestic voice roaming required to be provided on a "just, reasonable and non-discriminatory basis".[11] Since 2011, parties have also had the right to file a petition for a declaratory ruling by the FCC, or to file a complaint with the FCC, if they are unable to reach "commercially reasonable" terms and conditions via negotiation.[12] The FCC adopted this negotiate-arbitrate model on the basis of evidence that operators encountered significant difficulties obtaining data roaming arrangements, particularly from the major nationwide providers, under pure commercial negotiation. In fact, the FCC identified that AT&T, one of the largest MNOs in the United States, "largely refused to negotiate 3G roaming arrangements" until at least 6 years after it launched its 3G service.[13]

8.183   Although some access seekers have requested domestic roaming should be included in the Access List to facilitate ease of negotiation and ultimately allow price regulation, unlike those jurisdictions, the MCMC acknowledges that while there does not appear to be strong evidence in Malaysia of:

(a)   discrimination in domestic roaming arrangements on a commercial basis; or

(b)   any refusal by the Malaysian MNOs to enter into such arrangements,

the absence of these elements is not determinative of whether regulation would provide benefits to competition, and the MCMC would be interested to learn more about these factors from operators.

8.184   Even if there is limited evidence in Malaysia of impediments of the type described in the preceding paragraph, regulating access to domestic roaming could provide other benefits to competition that would be in the LTBE. For example, domestic roaming could be used as a stepping stone to create a new competitive environment or to facilitate investment in new technologies such as 5G, as noted by some operators in their submissions. As alluded to by U Mobile in its submission, regulation may also allow access seekers to utilise excess capacity on access providers' existing infrastructure to expand coverage in regional areas

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[10] Canadian Radio-Television and Telecommunications Commission, 'Regulatory Framework for Wholesale Mobile Wireless Services', 5 May 2015, https://crtc.gc.ca/eng/archive/2015/2015-177.htm.
[11] Federal Communications Commission 'Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers', Report and Order and Further Notice of Proposed Rulemaking, 22 FCC Rcd 15817 (2007), [37]-[40], https://www.fcc.gov/document/reexamination-roaming-obligations-commercial-mobile-radio-service-2
[12] Federal Communications Commission, 'Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers & Other Providers of Mobile Data Services', Second Report and Order, 7 April 2011, 26 FCC Rcd 5411, [75].
[13] Ibid, [25].

of Malaysia. The creation of these types of efficient investment incentives would be in the LTBE.

8.185   In addition to encouraging the efficient use of existing infrastructure, domestic roaming would also create investment incentives in respect of new and upgraded infrastructure for both incumbent and roaming MNOs. In particular, roaming MNOs would, in the short term, be able to acquire end user customers, build revenue and use that revenue to fund their own infrastructure, promoting infrastructure-based competition in those areas. This means that both roaming and incumbent MNOs would then seek to efficiently invest in their infrastructure and differentiate their services, to respond to the emergence of this infrastructure-based competition, which would also be in the LTBE.

LTBE overview: RAN sharing services

8.186   The MCMC considers that there are several reasons it would not be in the LTBE for RAN sharing and Multi-Operator Core Network (**MOCN**) arrangements to be regulated through the Access List, other than to the extent relevant to 5G wholesale services, as discussed in section 9. This is because 5G wholesale services will be supplied under a single wholesale network model, under which the competition and economic conditions will be distinct from services supplied over other mobile technologies, which are subject to competitive market constraints.

8.187   In particular:

   (a)   as raised by some operators, these arrangements are often technically complex, which would likely drive complexity in terms of any associated regulated pricing and general regulatory oversight;

   (b)   these arrangements do not involve interconnection or access in the traditional sense as is the focus of the Access List, but rather involve the sharing of core or radio networks – in other words, RAN sharing and MOCN arrangements are typically bilateral or multilateral commercial arrangements that involve two or more operators using each other's network infrastructure or establishing a joint venture in respect of shared network infrastructure. Such arrangements therefore do not typically involve one operator merely supplying another operator with access to a service or facility, which is the focus of the Access List; and

   (c)   taking into account the above complexities, the benefits to competition and investment of including these arrangements in the Access List are unlikely to outweigh the costs of doing so.

8.188   The MCMC also notes that ARCEP in France has found that RAN sharing arrangements are not desirable in dense areas in France, where infrastructure-based competition is likely to develop. Even in less-dense areas, ARCEP's guidance is that RAN sharing should be assessed only a case-by-case basis. This reflects the key point that investment incentives and competitive dynamics must be closely assessed before imposing any regulation, so as not to inadvertently harm the potential emergence of facilities-based competition, which would undermine the LTBE.

8.189   Given the above, the MCMC does not propose to include RAN sharing and MOCN arrangements on the Access List other than in respect of 5G wholesale services, as discussed in section 9 below.

MCMC Preliminary View

8.190   The MCMC's preliminary view is that it would not be in the LTBE for RAN sharing and MOCN arrangements other than wholesale 5G arrangements to be listed in the Access List.

8.191   However, there are stronger arguments for regulating domestic roaming services in order to promote the LTBE. Accordingly, the MCMC proposes to include a new domestic roaming service in the Access List. The MCMC has proposed a draft service description for such a service below:

Domestic Inter-Operator Roaming Service

(a)   The Domestic Inter-Operator Roaming Service is a Service that enables an End User of an Operator or a Mobile Virtual Network Operator to initiate, receive or otherwise utilise applications on the Mobile Network of another Operator, where:

> *(i)   the Access Seeker is the first Operator or the Mobile Virtual Network Operator; and*

> *(ii)   the Access Provider is the second Operator.*

(b)   The functionalities of the Domestic Inter-Operator Roaming Service include but are not limited to the ability of the Customer to initiate and receive voice calls and transmit data, but are otherwise limited to the applications that the Access Provider provides to its own Customers on its Mobile Network which supports Any-to-Any Connectivity.

Questions

Question 13: Should the Domestic Roaming Service described above be listed on the Access List?
Question 14: Have you experienced any discrimination or refusals to supply Domestic Roaming Services from existing MNOs?
Question 15: If a Domestic Roaming Service were listed on the Access List on a temporary basis, for what period should the service remain listed?
Question 16: Should the scope of any regulated Domestic Roaming Service be limited to specific regions, rather than on a national basis?
Question 17: Should any RAN sharing or MOCN arrangements be listed on the Access List?

Other services: Mobile fronthaul

8.192   YTL submitted that fronthaul services be included on the Access List. YTL currently uses mobile fronthaul in its BTS hotel design, served by fibre core / wavelength-division multiplexing to establish links between a Baseband Unit and Remote Radio Heads. YTL considers that mobile fronthaul will be common in 5G deployment alongside mid-haul and backhaul transmission.

MCMC Assessment

8.193   The MCMC thanks YTL for its submission on mobile fronthaul.

8.194   The MCMC notes that it does not have sufficient data regarding the extent to which these services are currently supplied, and the underpinning competitive dynamics.

8.195   Further, the MCMC considers that, to the extent mobile fronthaul services:

(a)   involve a wired connection between a baseband unit and remote radio head, mobile fronthaul services may be covered by the scope of the existing family of transmission services in the Access List; and

(b)   are similar to RAN sharing and MOCN arrangements (e.g. sharing of centralised baseband controllers and standalone radio heads),

the MCMC is not inclined to regulate such arrangements for the reasons set out in paragraph 8.186 above.

8.196   In particular:

(a)   such arrangements are technically complex, which may drive complexity in terms of pricing and regulatory oversight;

(b)   these arrangements do not involve interconnection or access in the traditional sense, as is the focus of the Access List; and

(c)   taking into account the above, the benefits to competition and investment of including these arrangements in the Access List are unlikely to outweigh the costs of doing so.

MCMC Preliminary View

8.197   The MCMC's preliminary view is that it would not be in the LTBE for mobile fronthaul services to be included in the Access List.

Questions

Question 18: Do you currently acquire or supply a Mobile Fronthaul Service?
Question 19: Should a Mobile Fronthaul Service be listed on the Access List?
Question 20: Can Mobile Fronthaul Services be acquired under the existing transmission services in the Access List? If not, what amendments should be made to the transmission services to include Mobile Fronthaul Services?

9   5G New Radio services

Introduction

9.1   5G technology is designed to support a diverse range of services with different data traffic profiles (e.g. high throughput, low latency and massive connection

numbers) and models (e.g. IP and non-IP traffic, short data bursts and high throughput data transmission).

9.2   The main characteristic of 5G is the introduction of a new radio network interface (**NR**), which offers the flexibility required to support these diverse services, including through network virtualisation and the use of APIs. Some key uses and applications for 5G networks include:

(a)   enhanced mobile broadband (**eMBB**), enabling high data rates, high user density and mobility, and greater coverage, including in connection with telehealth services, virtual/augmented reality content and tele-learning platforms and systems;

(b)   fixed wireless access (**FWA**), allowing rapid deployment of ultra-high speed and low-latency connections with reduced infrastructure, civil works and capital expenditure investment;

(c)   ultra-reliable low latency communications (**URLLC**), with potential applications in transportation safety, autonomous vehicles and remote medical surgery; and

(d)   massive machine type communications (**mMTC**), allowing large numbers of connected devices to transmit a relatively low volume of non-delay-sensitive data, such as in connected energy, control of large-scale manufacturing or production processes, smart city, retail and other industry verticals.

9.3   5G technology also enables a wide range of new characteristics at the core network level, including the following critical elements:

(a)   **network slicing**, allowing the creation of logical networks over a single shared physical infrastructure, facilitating service flexibility and the efficient use of infrastructure;

(b)   **mobile edge computing**, reducing backhaul and core network traffic as well as latency, by enabling the placement of content servers closer to end user devices; and

(c)   **network capability exposure**, facilitating secure access to exposed network services and capabilities to enable the development of new differentiated services for the benefit of end users.

9.4   There are many variants to 5G network architecture, reflecting the fact that deployment of 5G networks will typically – at least in the early stages – rely in part on 4G/LTE core networks.

9.5   Broadly, 5G access networks can be connected to either:

(a)   5G core networks (**5GC**), resulting in a configuration known as Standalone architecture (**SA**); or

(b)   4G/LTE core networks (Evolved Packet Core or **EPC**), resulting in a configuration known as Non-Standalone architecture (**NSA**).

9.6   Further, even under each of the above architectures, there are multiple deployment options, primarily depending on the flow of user plane and control plane data.[14]

9.7   The configuration with which a 5G network is deployed is critical for a number of reasons. In particular:

(a)   5G network architecture will determine whether a particular 5G service is capable of being supplied. For instance, in an NSA architecture, URLLC and mMTC applications may not always be possible;

(b)   the timing and cost implications of NSA and SA network architectures are vastly different. For example, NSA architecture is generally perceived as more favourable in the short term as it allows the efficient use of existing 4G/LTE infrastructure elements while allowing some 5G applications to be deployed. On the other hand, SA architecture is likely more favourable in the long-term as it enables the full potential of 5G technology (but requires greater investment); and

(c)   whether a SA or NSA architecture is used will dictate the model under which wholesale access to that network can be shared with access seekers who supply retail 5G services, such as MNOs and MVNOs.

9.8   The models under which wholesale access to 5G networks can be shared are discussed below.

Overview: Supply of 5G services in the Malaysian context

Formation of DNB and Malaysian policy context

9.9   On 22 February 2021, the Prime Minister announced that a Government-owned special purpose vehicle established under the Ministry of Finance would be responsible for the deployment of a single wholesale 5G network in Malaysia. This announcement followed the launch of Malaysia's new MyDigital economy blueprint, which seeks to build infrastructure, facilitate innovation and create an ecosystem to transform Malaysia's digital economy and contribute to higher standards of living for all Malaysians.

9.10   The special purpose vehicle, now established as DNB, will be a wholesale-only operator, meaning that it will not supply retail services directly to businesses or consumers. Rather, DNB will supply services only to access seekers, such as MNOs. Further, government policy dictates that DNB will be the only entity in control of 5G spectrum, with no other operators permitted to use any spectrum in connection with the supply of 5G services. It follows that MNOs who wish to supply 5G services to their customers will need to acquire the relevant wholesale inputs, such as 5G RAN and 5GC elements, from DNB, meaning DNB will be the sole provider in respect of such wholesale services.

9.11   From a spectrum perspective, DNB has been allocated 5G spectrum in the following bands:

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[14] 3GPP, Release 15.

(a)   700MHz (703 – 743MHz paired with 758 – 798MHz);

(b)   3.5GHz (3.4 - 3.6GHz); and

(c)   28GHz (26.5 – 28.1GHz).

9.12   The MCMC acknowledges that MNOs hold existing spectrum in relevant IMT bands, including 800MHz, 850MHz, 900MHz, 1800MHz, 2100MHz, 2300MHz and 2600MHz. However, given the Government's decision to appoint DNB as a single wholesale network operator, MNOs are not permitted to use their existing spectrum to provide 5G services.

9.13   DNB's use of spectrum is subject to the terms of DNB's NFP(I) and NSP(I) licences, which require DNB to, amongst other obligations, comply with requirements stipulated in the CMA and the Communications and Multimedia (Spectrum) Regulations 2000, the Spectrum Plan issued under section 172 of the CMA, Standard Radio System Plans and guidelines issued by the MCMC. These plans and guidelines are beyond the scope of access regulation under the Access List, and are instead overseen by the MCMC as part of its spectrum management function under Chapter 1 of Part VII of the CMA.

9.14   Even though DNB will be the only wholesale 5G service provider, there are a number of different access models that can be accommodated within this industry structure. In particular, from a technical perspective, 5G wholesale services can be supplied under either a SA architecture or through the integration of access seekers' 4G EPCs with DNB's 5G RAN, the deployment of which architecture may vary between a short-term and long-term horizon. In relation to the latter model, the MCMC understands that technical limitations of this architecture (i.e. the absence of a 5GC) mean that some 5G capabilities may not be possible, and accordingly this service is more appropriately conceptualised as 5G RAN access with 4G EPC integration.

9.15   Additionally, even the actual wholesale service supplied by DNB may vary depending on the scope of the wholesale service that an access seeker may require, such as MOCN-based sharing that integrates DNB's network with the access seeker's core network, or end-to-end access similar to an MVNO service, as described further below.

9.16   The Government is targeting a launch date for 5G services to be provided in Malaysia by the end of 2021. It is the MCMC's intention that the relevant Access List service for 5G wholesale services will be set out in the Access List prior to this time.

GSMA models of 5G access

9.17   When considering the appropriate access models for Malaysia, the MCMC has found it useful to consider the following technical classification of infrastructure sharing by the GSMA (noting that some network elements considered by the GSMA to be "passive", e.g. fibre backhaul, are considered "active" network elements in Malaysia):
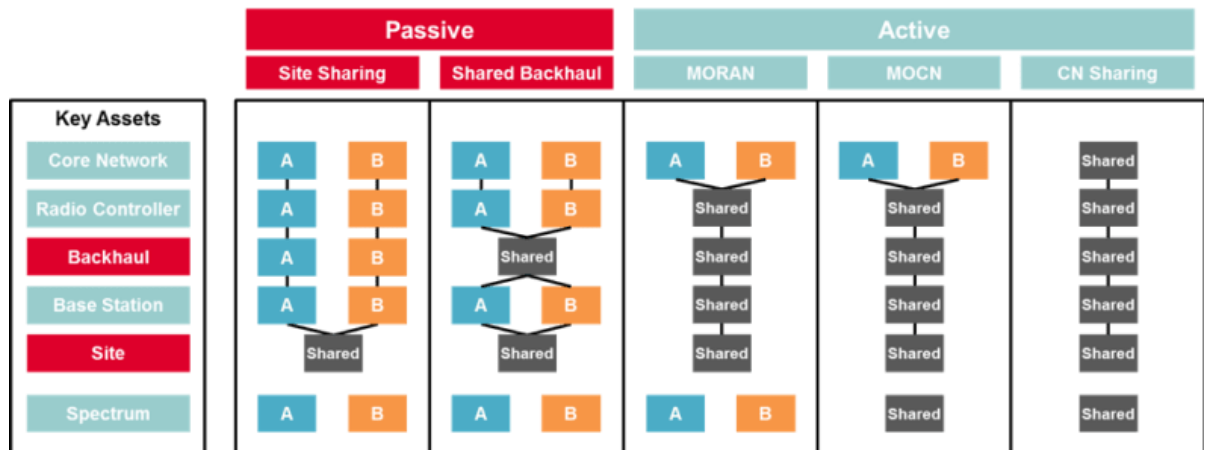
Figure 10 – GSMA models of network sharing[15]

9.18   The above diagram highlights that there is a range of network elements that can be shared between operators. In Malaysia, the MCMC understands that DNB will deploy a combination of NSA and SA network architectures, meaning the scope of network elements that will be shared between DNB as an access provider and other MNOs as access seekers will depend largely on DNB's chosen architecture in a given area.

9.19   Broadly, the diagram sets out four models of network sharing:

(a)   site sharing and shared backhaul, which can be considered together as "passive" forms of infrastructure sharing (noting that in Malaysia, fibre backhaul is considered an active network element);

(b)   Multi-Operator Radio Access Network (**MORAN**), under which operators share RAN elements but use their own 5GC and spectrum, although this model will not be available in Malaysia due to the spectrum holdings of DNB and the constraints on MNOs using their spectrum for 5G purposes;

(c)   MOCN, which involves both spectrum and RAN being shared but with each operator using its own 5GC; and

(d)   core network sharing, being the less commonly-used model where RAN, core network elements and spectrum are shared across MNOs.

9.20   The MCMC acknowledges that the above diagram presents some limitations which must be accounted for in the Malaysian context, where:

(a)   5G networks will be rolled out solely by DNB, a Government SPV. This is different and potentially unique in comparison with other jurisdictions, in which the typical models involve:

(i)   existing MNOs each deploying their own 5GC and RAN networks, meaning sharing is limited to elements that are commonly shared

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[15] GSMA, 'Infrastructure Sharing: An Overview', 18 June 2019, https://www.gsma.com/futurenetworks/wiki/infrastructure-sharing-an-overview/.

in Malaysia such as towers and tower sites and fibre backhaul;[16] or

    (ii)   two or more existing MNOs forming a joint venture for the purposes of 5G network rollout;[17]

(b)   in areas where DNB deploys a SA network architecture, the role played by access seekers in network management will be more limited, and network sharing will be less prevalent, than a scenario in which one or more MNOs are responsible for 5G network deployment (whether through a joint venture or individually). This is because in those areas, access seekers will have no option but to acquire an end-to-end MVNO-type service from DNB (or through an MNO); and

(c)   5G spectrum will be allocated solely to, and controlled solely by, DNB, meaning MNOs in Malaysia will not be able to control their own spectrum in the manner contemplated under a MORAN model.

9.21   RAN and other network sharing arrangements are also discussed more generally in paragraphs 8.125 to 8.191 above.

International approaches to 5G

9.22   Turning to an international perspective, there is a variety of approaches to 5G being adopted by industry and governments across different jurisdictions, a reflection of the breadth of ways in which 5G services themselves can be supplied. While 5G deployment is a product of many factors including MNO and device readiness, the key threshold question in most jurisdictions has typically been the availability of 5G spectrum for allocation to operators.

9.23   Spectrum is a scarce resource in its own right. However, in ASEAN countries, the allocation of spectrum in the key 3.5GHz 5G band has been particularly complicated due to the heavy use of this spectrum by incumbent users, particularly fixed satellite services, in certain parts of the band.[18] This has been complicated further by the impacts of COVID-19, which in some cases has affected the near-term 5G deployment plans of operators and governments.

9.24   Having considered examples of 5G deployments in relevant foreign jurisdictions, it is clear to the MCMC that the rollout model in Malaysia exhibits unique characteristics.

9.25   For example, in Singapore, the IMDA is facilitating two national 5G networks, with two spectrum packages awarded via a call for proposal, designed to deliver "full-fledged" 5G capabilities, i.e. under a 5G SA architecture.[19] In doing so, the IMDA resolved to limit 5G supply to existing MNOs, to avoid "fragmenting" the market.[20]

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[16] For example, in Australia, Telstra, Optus and TPG/Vodafone are each deploying their own 5G networks. Similarly, in the United Kingdom, each of EE (BT), Vodafone, Three UK and O2 are deploying 5G networks.
[17] For example, M1 and StarHub (Singapore), Proximus and Orange Belgium (Belgium), China Telecom and China Unicorn (China, but with separate core networks), SoftBank Corp and KDDI (Japan, in rural areas).
[18] GSMA, 'Roadmap for C-band spectrum in ASEAN', August 2019.
[19] Info-communications Media Development Authority, 'Second Consultation on 5G Mobile Services and Networks', 7 May 2019.
[20] Ibid, p. 22.

9.26   Ultimately, the IMDA awarded 100MHz of 5G spectrum in the 3.5GHz band to each of Singtel and Antina, a joint venture between StarHub and M1, the second- and third-largest MNOs. The spectrum was awarded subject to conditions requiring the licensees to deploy 5G networks under an SA architecture and to achieve certain coverage targets. mmWave spectrum in the 26GHz/28GHz bands was also allocated to Singtel, Antina and TPG, such spectrum focused on rolling out 5G networks on a localised basis. The IMDA has elected to extend to 5G services the existing "Negotiation Principles" which guide and encourage commercial wholesale arrangements for 3G/4G mobile services, rather than regulate access to 5G services.

9.27   Further abroad, in jurisdictions such as Australia and in countries in the EU, other commercial models of access are also being developed, with more limited regulatory intervention. However, in many of those countries, there is sufficient spectrum available for facilities-based competition to emerge even with limited or no regulatory remedies, exhibiting another key distinction from Malaysia and other ASEAN countries.

9.28   In Australia, for instance, 1750MHz of spectrum in the 3575 – 3700MHz band has already been allocated to operators (on a city-by-city basis), for approximately ten-year licence periods commencing in 2020. Three MNOs – Telstra, Optus and TPG Telecom – will deploy 5G networks in Australia, with each expecting to deploy 5G SA networks (with Telstra having already enabled 5G standalone). MNOs and other service providers also acquired significant amounts of 26GHz spectrum in a spectrum auction concluded by the ACMA earlier this year.[21] Relevantly, the 2020 completion of the merger between TPG and Vodafone Australia is also expected to result in a more competitive mobile services market in Australia, with TPG Telecom now exercising a greater competitive constraint on Telstra and Optus, the largest and (previously) second largest MNOs respectively.

9.29   Similarly, in EU countries, there is also evidence of facilities-based competition due to the availability of sufficient spectrum for MNOs:

        (a)   in the United Kingdom, all four major mobile network operators have launched 5G services to varying degrees, with each operator holding a relatively healthy amount of 5G spectrum and planning to roll out its own 5G network.[22] There is also some evidence of network sharing, such as arrangements between O2 and Vodafone to share RAN equipment at certain joint RAN sites;

        (b)   in Germany, a 2019 spectrum auction resulted in frequency blocks from 2GHz and 3.6GHz bands allocated to four MNOs, including a new MNO, 1&1 Drillisch.[23] MNOs offering 5G services in Germany are required to negotiate amongst themselves about the shared use of existing nationwide networks; and

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[21] ACMA, 'Auction summary – 26GHz band (2021)', 23 April 2021.
[22] Spectrum in the 2.3GHz and 3.4/3.6GHz bands is allocated as follows: EE (80MHz), Vodafone (90MHz), O2 (80MHz), Three (140MHz). See also https://5g.co.uk/guides/5g-uk-auction/.
[23] Bundesnetzagentur, 'Mobile Broadband – Project 2018', August 2019.

(c)   in France, spectrum in the 3.4 – 3.8GHz band was awarded to four operators, each of whom has deployment milestones relating to downstream rates available at sites between 2022 and 2030.[24] Operators in France will initially adopt an NSA model, and although no sharing arrangements are in place, there are existing roaming agreements and network sharing arrangements for legacy mobile technologies which may be extended to 5G.[25]

9.30   Having regard to the above, the MCMC's preliminary view is that it can draw on some of these models to ensure that the basic tools of regulation are available in Malaysia, such as with respect to the sharing of infrastructure. However, in Malaysia, the MCMC must go further to consider access to the 5G mobile service itself (rather than merely passive elements such as towers and other infrastructure) because of the unique position occupied by DNB as the only 5G wholesale access provider.

Regulatory approach and principles

9.31   5G is a critical and transformative step in the continuing evolution of mobile technologies. The deployment of 5G networks will drive higher speeds and reliability for both individual and enterprise users, facilitate the delivery of new and innovative retail services and applications across a range of industry verticals, and more generally, uplift the digital capability of Malaysia in accordance with JENDELA targets.

9.32   Given the unique circumstances under which 5G services will be supplied in Malaysia, the MCMC considers it would be beneficial to set out some regulatory principles which will inform its approach to regulating 5G access and determining the scope of regulation and any service description for 5G access.

9.33   The starting point will be that the MCMC's approach to 5G access must promote the LTBE. In particular, the MCMC's approach must promote competition in the supply of downstream services, but also encourage investment by DNB in its single wholesale 5G network and by existing MNOs in their own networks and systems infrastructure to the extent consistent with the Malaysian model for 5G access.

9.34   More specifically however, the MCMC considers that there are **five principles** which might assist the industry to further understand the MCMC's regulatory approach to 5G services:

(a)   **Regulation of 5G wholesale services promotes the LTBE**

(i)   The MCMC considers that it would be in the LTBE to regulate access to 5G wholesale services, because access regulation would:

(A)   promote competition, noting DNB will be the sole provider of 5G wholesale services and accordingly will have a monopoly in respect of the supply of such services;

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[24] CMS, 'CMS Expert Guide to 5G Regulation and Law', accessed July 2021.
[25] ARCEP, 'Sharing of mobile infrastructure', 13 April 2021.

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(B) enable the achievement of any-to-any connectivity between a greater number of connected devices, including IoT devices; and
(C) encourage the economically efficient use of, and investment in, network infrastructure by DNB and ensuring all access seekers have access to the DNB network to enable the deployment of retail services.

(ii) If access were not regulated, the MCMC is concerned that there would not be sufficient commercial incentives for DNB to supply access to 5G wholesale services on fair commercial terms on a non-discriminatory basis across the access seekers. As the monopoly 5G wholesale provider, DNB would face no competitive constraints and could accordingly increase prices or change terms of access largely at will.

(iii) Such an approach would inhibit competition in downstream markets, as access seekers would have less ability to invest in product innovation, which would be detrimental to the LTBE. The MCMC considers that allowing MNOs to deploy their own 5GCs and integrate with DNB's RAN would inefficiently duplicate infrastructure that can be shared on an open basis, given the expectation that DNB will over time roll out 5GC coverage across Malaysia on a national basis. Finally, allowing DNB to simply supply 5G wholesale services on a commercial basis would also increase the already significant barriers to entry to the supply of mobile broadband services for those operators who are unable to agree on the commercial terms with DNB.

(iv) The MCMC acknowledges that, given DNB's wholesale-only mandate and the fact that it will not be vertically integrated, there is a lower risk that DNB could favour itself in the supply of wholesale services to, say, a retail arm. However, the MCMC is nevertheless concerned to ensure that the SAOs and non-discriminatory principles apply to the supply of such services to ensure that all access seekers are provided a level playing field in the absence of any market-driven competition, even if DNB will itself not be competing with access seekers.

(b) **Open access approach to selecting 5G access**

(i) Competition may emerge in many different forms and it is not the MCMC's role or intention to choose which is the preferred form of competition. For example, in Malaysia's retail mobile sector today, there are many industry participants such as MNOs, MVNOs, resellers, etc. The MCMC does not propose to pick "winners" by choosing a particular form of 5G access that DNB should provide and the access seekers should acquire.

(ii) Accordingly, the MCMC will not be limiting its consideration of the relevant 5G access service to one single service, but will consider

many different forms of access and cater for as many different forms of access type that might be reasonably accommodated by DNB as the access provider, to promote competition and thereby the LTBE.

(iii) A similar approach is taken in other parts of the Malaysian access regime. For example, the Access List sets out both Layer 2 and Layer 3 HSBB Network Service types, each of which are required to be provided by access providers (and each of which access seekers may acquire at their election). Similarly, in relation to the regulation of copper-based services, the MCMC has chosen to list a "family" of services, including Full Access Service, Sub-Loop Service, Line Sharing Service, Bitstream Services and DSL Line Resale Service. It is up to access seekers to select which of these copper-based services they elect to acquire.

(iv) Accordingly, the MCMC has noted two forms of access to 5G services to be considered for inclusion on the Access List – 5G SA access and 4G EPC with 5G RAN. With each form of access, there may be some elements that access seekers require and some elements that they may not. For example, 5G SA access accommodates the access seeker also acquiring value-added services or customer billing and relationship services from DNB, in addition to typical 5G service features.

(v) Through this principle, the MCMC believes, consistent with its regulatory approach in relation to access to other services, that the full range of potential competition, within the scope of the regulatory context in Malaysia, will, in most circumstances, be generally promoted and hence the LTBE.

(c) **Access to any licensees**

(i) In accordance with the access regime in Part VI of the CMA, the SAOs under section 149 do not distinguish between an access provider's obligation to supply to one type of access seeker versus another type of access seeker. Rather, the SAOs require that access providers must supply access on request to <u>any</u> access seeker.

(ii) Consistent with the approach in the CMA, the MCMC considers that access to 5G services, as is the case for each existing facility and service on the Access List, should be open to any access seeker that may wish to acquire those services. The MCMC acknowledges that some forms of access will attract a limited number of access seekers because of the functional nature of the service. For example, for some forms of 5G access, an access seeker will need certain infrastructure to interconnect with the DNB network (e.g. a core network where DNB deploys an NSA architecture), and this will somewhat define – albeit in a purely technological way that does not relate to any regulatory principle adopted by the MCMC

– the type of access seekers that might be interested in that form of 5G access.

(iii) However, the MCMC does not believe that it would be appropriate to artificially limit access to particular types of access seekers by specifying that only a specific type of access seeker can acquire 5G access. The MCMC has not taken this approach anywhere else in the Access List and does not believe it should do so here, notwithstanding the unique nature of the Malaysian 5G access arrangement. Therefore, the MCMC will not, for example, be limiting 5G access to MNOs or in any other form.

(d) **Functional service description**

(i) Consistent with the MCMC's approach to describing other services on the Access List, the MCMC will take a functional approach to describing the 5G access services to be included. Describing the 5G access service in this way will provide certainty to DNB and to access seekers about the type of service that is to be regulated, without being overly prescriptive of exactly how the service is to be delivered (or acquired).

(ii) This functional approach also allows for DNB to supply 5G access in the form that is technically feasible for it to do so, while also providing that access seekers have the optionality of choosing the exact form of access suitable for them. That is, the 5G access service takes a "menu" approach. The menu is selected by DNB based on what is technically feasible and access seekers then choose which items they need off the menu to form a service. Some access seekers may choose many items from the menu, whereas other access seekers may choose relatively few and only the basic elements needed from DNB to construct a service (e.g. only the radio elements).

(iii) Finally, the service description must always be read together with the obligations in the MSA. The MSA also informs the basis on which the 5G access service is to be supplied. For example, the service descriptions set out below do not refer to a POI. However, paragraph 5.8.6(b) of the MSA requires that an access provider (in this case, DNB) must provide interconnection at any technically feasible point. Which points are technically feasible to DNB is initially a matter for DNB to decide and include in its RAO, which will then be reviewed by the MCMC to ensure compliance with the MSA. The service description, when read together with the MSA, will inform DNB and access seekers of the scope of access regulation relevant to each of them.

(iv) As noted earlier in this PI Paper, the MCMC is planning to review the MSA, including in respect of 5G services, in a later inquiry in 2022. Accordingly, any potential access issues raised by operators that are more relevant to the MSA will be considered by the MCMC

(e) **Future proofing**

(i) Again consistent with the MCMC's approach to describing other access services on the Access List, the MCMC believes that services should be described in a manner that is forward-looking and future proofed. As operators are aware, the MCMC typically only conducts a review of the Access List every 3 to 5 years. Therefore, at a minimum, the 5G access service should be appropriate for the services that might emerge over the next 3 to 5 years.

(ii) In the 5G context, future proofing the service description is a considerable challenge given that the service has not been launched yet. Nevertheless, the MCMC has sought to take a forward-looking approach when describing the 5G access service. Further, where the version of the 3GPP standard is referred to or particular technical capabilities are described in the service description, the MCMC has taken the approach of allowing for further versions of the standard to be supported by the service description and for advances in capability of the DNB network and 5G access service to also be captured by the scope of the service description.

(iii) For example, for the Mobile Broadband network slice, the MCMC has specified a minimum technical capability of support for peak data rates of 20Gbps (downlink) and 10Gbps (uplink). However, as superior speeds and other capabilities become available over time, these must also be offered by DNB and are automatically taken to be incorporated into the service description.

9.35 With these regulatory principles in mind, the MCMC has developed draft service descriptions set out in paragraph 9.252 below. Before turning to these service descriptions, the MCMC summarises the submissions received from operators. These consultations occurred at an introductory level and the MCMC thanks the operators for their extensive submissions in response to an informal questionnaire issued in respect of 5G services. These submissions are summarised below and the MCMC welcomes further submissions on 5G access in particular.

Submissions Received

Supply of 5G services and potential impediments to supply

9.36 Operators provided several submissions regarding their plans for 5G services, whether wholesale (in the case of DNB) or MVNO or retail (in the case of all other operators). Respondents all agreed that 5G technology will be transformative and enable the supply of services which are not possible using 4G/LTE

architecture. Common services noted by operators as being dependent on 5G include:

(a)   eMBB services, for larger-scale deployments including enterprises and educational facilities;

(b)   uRLLC services, including in respect of remote healthcare and autonomous vehicles; and

(c)   mMTC services, particularly in manufacturing and transport and logistics verticals.

9.37   ALTEL is currently exploring the provision of 5G connectivity solutions to enterprise customers. ALTEL anticipates that 5G will become the natural upgrade to the provision of connectivity services such as IoT, private network and automation for customers which will require higher bandwidth and lower latency. These services will be supplied nationwide, depending on the requirement of ALTEL's customers, and the timeframes for deployment depend on the deployment of 5G by DNB and the requirements of ALTELs customers.

9.38   ALTEL plans to supply retail 5G-dependent services as an extension to its current data plans, with 5G speeds. Furthermore, ALTEL plans to expand its offerings to provide 5G for IoT use cases such as asset-based tracking and M2M based on its customers' requirements, with services to be supplied on a nationwide basis given ALTEL's retail and enterprise customers are spread out around Malaysia.

9.39   ALTEL proposes to differentiate its retail 5G services based on promised minimum bandwidth and competitive rates per GB of data. ALTEL anticipates that product differentiation will be most flexible under a MORAN model since each operator will be able to utilise its own dedicated spectrum. With this, and a dedicated core, ALTEL will be able to avoid congestion within the network as well as provide differentiation via speed.

9.40   Celcom will be an access seeker to wholesale 5G networks to be deployed by DNB and will be seeking access as soon as it is launched by DNB. Celcom's services will include mobile broadband, wireless broadband, IoT-based connectivity, etc. These retail services will be dependent on 5G networks which will support smart city applications and new vertical industries such as transportation, agriculture, education, security, surveillance and many more. Celcom's services will be supplied on a nationwide basis, with anticipated commercial launch by Q1 2022.

9.41   Celcom considers that product differentiation would be more viable under the 5G MOCN model, as that would enable Celcom to steer customer traffic between its 4G network and the access provider's 5G networks based on application usage.

9.42   Celcom considers that the biggest potential impediments to access to 5G wholesale services are:

(a)   high cost of access to 5G network;

(b)   limitations in coverage;

(c)   low service quality/performance;

(d)   delays in roll out; and

(e)   limited ability to test new services ahead of launch.

9.43   Celcom proposes that the above issues can be tackled via ex-ante regulation, through identifying issues beforehand and shaping the stakeholders' behaviour and responses through regulatory intervention. Celcom considers that the existing access regulatory framework and consumer protection rules (to cover quality of service) can be used for this purpose.

9.44   Celcom Timur Sabah plans to supply bandwidth for backhaul and fronthaul services in Sabah and the Federal Territory of Labuan as soon as possible. Celcom Timur Sabah does not have any plans to supply retail services dependent on 5G networks, but anticipates the following impediments:

(a)   tariff issues;

(b)   high cost of penetration and deployment in greenfield areas; and

(c)   the impact of MSAP regulation on current and future business.

9.45   Cubic Telecom operates in the M2M and IoT space, providing connectivity for connected car services via its MVNSP agreement with Digi. Cubic Telecom provides the underlying connectivity for these services, which are offered by car manufacturers free of charge to drivers.

9.46   Cubic Telecom considers that the transition to 5G will be transformative in the connected car space given the possibilities, including the improvement of speed and lower latency which will enable a plethora of new business models and service offerings involving M2M and IoT vehicle connections, such as intelligent transport, V2V (vehicle to vehicle) and V2X (vehicle to everything) and driverless cars. Cubic Telecom sees itself as a key connectivity provider in this regard and the current services for which Cubic Telecom provides connectivity are only a stepping-stone on the journey to a connected vehicle revolution which only 5G can unlock. As a 5G access seeker, this will be Cubic Telecom's key service differentiation from other access seekers, though many of these future connected car services may be both non-retail and retail.

9.47   Cubic Telecom invites the MCMC to consider the idea of an IoT-specific MVNO. In Cubic Telecom's view, two issues are key for 5G access seekers:

(a)   the ability to access 5G at existing wholesale rates; and

(b)   a reliable timeline of 5G availability.

9.48   Given the distinct space in which Cubic Telecom operates, it does not anticipate the same hurdles as access seekers with similar service offerings to access providers. Cubic Telecom has had a relatively positive experience as an access seeker with Digi, and as long as regulation ensures all existing and new players in the 5G sphere have fair access to the 5G network and its capacity to generate

both innovation and competition, Cubic Telecom does not take a strong position on the contours of such regulation.

9.49 Digi plans to continue to provide mobile services, including 5G in the retail market based on market demand, its business case and the technical capabilities of 5G. This may include enhanced mobile broadband services to individuals as well as additional services to business or industrial uses depending on their mobile connectivity needs.

9.50 When providing 5G services using the same underlying network (either from a wholesaler or as part of a network sharing entity), there is very limited scope to differentiate the services along the dimensions of network quality or coverage (or cost). However, in such a situation, Digi plans to use other aspects of its retail service offering (e.g. tariff structures, superior customer experience, tailored bundled services) in order to differentiate its retail products. If Digi were not reliant on a wholesale network, additional aspects of network differentiation would be possible.

9.51 In Digi's view, it will be important to be able to innovate to cater to different 5G use cases and flexibly meeting customers' demands (e.g. mass, enterprise customers). Digi anticipates the following impediments in the supply of 5G services:

(a) access to 5G compatible spectrum;

(b) difficulties in access to additional sites and/or suitable high-speed backhaul, such as fibre;

(c) ability to innovate 5G use cases, which are driven by the network, customers, and industry verticals that require technical capabilities beyond speed (e.g. latency, slicing, etc);

(d) inter-operability with existing 4G networks;

(e) national security and resiliency risks in a single wholesale network scenario;

(f) the importance of enabling innovation that is responsive to customer demands and ensures positive outcomes for consumers.

9.52 Digi proposes the following measures to mitigate these impediments:

(a) safeguards to ensure technical model and governance, including:

(i) a transparent and robust implementation roadmap and timeline (e.g. network coverage, design, rollout, new/updated technology capabilities, etc);

(ii) interoperability between access providers and access seekers networks;

(iii) SLA and QoS delivery to access seekers to ensure end user experience;

(iv)   technical standards supported by international best practices for 5G use cases;

(v)   allowing innovation to prosper;

(vi)   resiliency measures to avoid a single point of failure; and

(vii)   secured 5G network services to avoid threats to national security;

(b)   safeguards to ensure a commercial model and governance practices that avoids cost inflation (i.e. excessively priced services, inflexible pricing model, lack of transparency on how pricing is derived and fair terms), and deliver fair and reasonable price for the 5G services provided; and

(c)   safeguards to ensure good governance, including transparency as to performance, reporting, financial disclosures etc and disputes handling processes.

9.53   DNB will be the access provider for wholesale 5G services. DNB plans to provide wholesale 5G network services to licensed MNOs to enable them to serve their retail and enterprise customers. DNB intends to adopt a phased deployment spanning over 10 years from December 2021, as follows:

(a)   phase 1A in December 2021 will cover Kuala Lumpur, Putrajaya and Cyberjaya;

(b)   phase 1B in 2022 will cover the state capitals of Johor, Penang, Sabah, Sarawak and Selangor;

(c)   in phase 2 (2023 to 2024) and phase 3 (2025 to 2030), DNB will focus on expanding geographic coverage nationwide based on population density, including addressing demand from commercial users/enterprises.

9.54   DNB aims to achieve approximately 36% coverage in populated areas in the immediate term (first two years), approximately 77% coverage in populated areas in the medium term (by the fourth year) and 90% coverage in populated areas in the long term (by the seventh year onwards).

9.55   DNB foresees the following potential challenges in the supply of these services, and suggests the following mitigations in respect of those challenges:

(a)   site acquisition will represent new challenges for timely deployment of 5G due to the increased number of sites required for full 5G coverage. In urban areas, where 5G requires denser network architecture than 4G to deliver its best performance, more 5G antennas will be mounted on existing urban sites, including existing and new street furniture which is incidentally also being utilised for CCTV, security cameras, WiFi hotspots, digital advertising and a variety of sensors. In this regard, DNB:

(i)   considers that the MCMC should work with public utility companies, state governments and local councils to ensure that existing and

new sites (including street furniture) are made available to DNB for efficient 5G deployment;

(ii) the necessary specifications such as size, height, etc. need to be developed for the use of this furniture; and

(iii) understands some street furniture may require enhancements and thus DNB would need to work together with providers, equipment vendors and local councils to customise solutions;

(b) building additional infrastructure and ensuring that planning and approval requirements will not be a barrier to the deployment of 5G sites, including having standard and affordable rates for tower and fibre access, as well as standardising right-of-way requirements across states. To mitigate these challenges, DNB proposes:

(i) the introduction of a streamlined policy concerning infrastructure planning and approval mechanism with coherent adoption by all government agencies, to allow timely deployment of 5G infrastructure; and

(ii) that the MCMC should consider extending the application of the access to passive infrastructure on the Access List to public utilities (and other authorities as deemed appropriate). DNB is of the view that the extension of such obligations to non-licensees can be facilitated under section 145 of the CMA; and

(c) finally, DNB also emphasises the importance of ensuring fair wholesale prices and foresees challenges in securing access to dark fibre.

9.56 edotco will be an access provider for services utilised in 5G networks. edotco will supply the following services on a nationwide basis depending on customer demand and in accordance with DNB's timeline:

(a) infrastructure sharing services, provided that edotco considers that no barter trade arrangements should be permitted, with all services or value exchanged between parties to be monetised so that appropriate taxes due to the Government can be imposed and to improve the transparency of commercial arrangements between licensees;

(b) transmission services; and

(c) Antenna-as-a-Service (**AaaS**) and Network-as-a-Service (**NaaS**), in respect of which edotco expects demand from either MNOs or enterprise clients. edotco also expects that its NaaS offering will likely be concentrated in specific local areas such as airports, higher learning institutes, medical centres or specialised economic zones.

9.57 edotco seeks that DNB promptly roll out 5G services to achieve government targets and objectives, such as a commitment to rollout 5G within specific urban and metro areas in every capital city by the end of 2022.

9.58   edotco does not currently plan to supply 5G retail services, but will further explore opportunities such as 5G private networks. edotco's NaaS offering can be deployed directly to certain enterprise customers in specific industry verticals, such as private networks in transportation/logistics, where there may be requirements for higher wireless security, network reliability and scalability that cannot be offered using current technology.

9.59   edotco also identifies a gap for business-critical networks and larger networks, such as in warehouses, factories, airports, hospitals, schools, smart buildings and other venues that require the reliability and coverage of a public cellular service with the simplicity and affordability of WiFi. These use cases are built based on eMBB and IoT-based connectivity and will vary across enterprise customers. However, edotco considers that they may only be viable in specific geographical locations and specific economic corridors, no specific timeline has been prescribed since the business model is subject to various externalities such as technology innovation, progress on open RAN as well as the need to have better clarity and visibility of services and offerings by DNB.

9.60   In edotco's view, access seekers will differentiate their offerings by combining solutions with higher reliability, network integrity and cybersecurity, scalability and superior analytics capabilities with privacy. In some cases, the ability to bundle with existing retail offers may also be an advantage.

9.61   edotco highlights the following potential impediments in the supply of 5G services:

    (a)   exclusivity by State-backed Companies;

    (b)   onerous and stringent policy and guidelines by Local Authorities for each state;

    (c)   local authorities' requirements such as lengthy permit and approval processes;

    (d)   acquisition process for land owned by corporates and individuals;

    (e)   protests by members of the public and residents;

    (f)   in Putrajaya, issues relating to the deployment of fibre; and

    (g)   lack of clarity regarding the DNB business model, network availability, network capability, key wholesale terms and conditions resulting in most access seekers taking a cautious approach.

9.62   Fiberail has no plans to supply or acquire wholesale or retail services dependent on 5G networks.

9.63   Fibrecomm will be an access provider for services utilised in 5G networks, including End-to-End Transmission Service and Network Co-location Service. Fibrecomm will supply the services in areas including on-net areas and nearest to POP, with timeframes for supply being subject to the demands and requirements of access seekers.

9.64   Fibrecomm is of the view that the main impediment in supplying 5G services or acquiring access to facilities/services in order to deploy 5G networks and provide 5G services in the future is the requirement for the construction of new infrastructure involving third parties such as local authorities and landowners, which will result in higher construction costs and longer delivery times.

9.65   Maxis will be an access seeker for 5G services, and plans to acquire supply in all areas where Maxis provides 5G retail services to its retail customers and any areas where its wholesale customers seek to provide their 5G retail services (in combination with 2G/4G services). Some of these retail services include:

(a)   post-paid and pre-paid enhanced high-speed mobile internet;

(b)   5G new experiences for consumer and enterprises e.g. gaming, augmented reality, virtual reality, etc;

(c)   fixed wireless access;

(d)   managed IoT connectivity and solutions, e.g. eMBB, URLLC, mmTC, etc;

(e)   5G bespoke and private networks; and

(f)   global inbound and outbound roaming.

9.66   Maxis has been ready to launch 5G since early 2020, and is only waiting for spectrum. Maxis is ready to commence integration testing with DNB on 4 weeks' notice and would aim for friendly-customer launch within 4 weeks and full commercial launch within 8 weeks of commencing integration testing, which it would like to commence as soon as possible. Maxis seeks that DNB publish its RAO on equitable and non-discriminatory basis as soon as possible.

9.67   Maxis submits that the 5G wholesale service provided by DNB should focus on the key city areas, primary towns and then move towards the secondary and tertiary areas. Maxis's customer-driven 5G requirements are:

(a)   provide required capacity for consumer and enterprise mobility;

(b)   support education, work-from-home and entertainment using fixed wireless access both outside existing Fibre to the Premise (**FTTP**) coverage and as a complement to FTTP for nomadic customers;

(c)   enable advanced 5G in commercial and industrial areas to allow re-invention of Malaysian businesses. This will require bespoke coverage from DNB; and

(d)   for the most leading edge and transformative applications, private networks will be required which must be designed and built by retail operators specifically to meet business needs.

9.68   Maxis believes that 5G rollout is best guided by consumer demand to ensure affordable network cost and to promote consumer take-up. Supply-driven considerations should be minimal as costs are high and many applications can be delivered using 4G given the 96.9% 4G coverage target under JENDELA.

9.69   Maxis foresees the following potential impediments to the supply of 5G services:

(a)   any inability by DNB to deploy and operate a sufficiently capable and high-performance network;

(b)   any policy choices by DNB to not provide the capabilities needed to properly support retail customers of the retail operators; or

(c)   pricing policies by DNB which have the effect of making these capabilities unavailable due to commercial factors.

9.70   Maxis also notes the following potential consequences of DNB being the sole 5G wholesale access provider:

(a)   MNOs will lose the ability to differentiate and manage the coverage and quality of experience of the 5G RAN, especially during congestion;

(b)   with many MNOs sharing the same resources, overall user experience will be lower;

(c)   greater risk of a single point of failure, with only a single radio network;

(d)   security risk for having one single 5G critical infrastructure to serve all of Malaysia's consumers and businesses; and

(e)   with many MNOs sharing a single network, it will be complex and challenging to manage the different requirements regarding QoS/network slicing.

9.71   Maxis submits that DNB should:

(a)   ensure absolute seamless active voice/data service handover between 4G and 5G networks under MNOs' control, with close coordination between 5G RAN and MNOs' 4G network to determine the best mobility strategy and optimise customer experience;

(b)   facilitate seamless transition to 5G from a customer perspective, such as allowing customers to use the same SIM, no new contracts, and digitisation of the entire process to encourage take up;

(c)   consolidate and prioritise multiple requirements from MNOs for coverage, given 5G coverage areas may differ between MNOs and between 5G areas built by DNB;

(d)   own the 5G site and transport layer up to the POI so that MNOs can interconnect with DNB's POI to bring the respective traffic back to their own networks. If DNB only builds 5G sites without the transport layer, MNOs will all need to re-design the transport network and obtain right-of-ways which will be inefficient and cause long rollout delays;

(e)   support MNO placement of Multi-Access Edge (**MEC**) into the DNB 5G RAN network. Maxis notes there are various requirements and use cases which may require far edge deployment of MECs in DNB's network, and DNB should have both regional and distributed POIs to meet the latency

requirements for 5G MEC use cases. As the MEC can be located on the site of the radio equipment, Maxis considers that the Infrastructure Sharing service description for ancillary services should be fine-tuned to permit co-location of equipment for these purposes;

(f)   allow MNOs to build and deliver private network solutions which involve stringent requirements on isolation, security and QoS as well as complex end-to-end solutions which require customization, given MNOs will need to utilise part of DNB's 5G spectrum for private network deployment to cater to these customized requirements;

(g)   support adding bespoke coverage where MNOs wish to provide services to their customers based on business/enterprise demand e.g. in-building coverage in selected office buildings or areas;

(h)   support a wide variety of network slice options in order to meet diverse requirements from different market segments, such as high priority access for enterprise applications, low latency slices for smart robotic control, etc. Even within the same industry, requirements may differ and require customisation and it is important to ensure DNB support for such customisation;

(i)   grant MNOs exclusivity for a specified timeframe to encourage enterprise/corporate adoption in specific targeted areas; and

(j)   provide appropriate performance guarantees for both private networks and network slicing, across customers of all MNOs.

9.72   My Evolution will be an access seeker for 5G services for M2M and IoT deployments in corporate B2B private networks. My Evolution's preferred geographic areas will initially be urban areas such as Kuala Lumpur, Selangor, Penang and Johor, with planned launch at the end of 2022.

9.73   My Evolution's primary concerns in respect of access to 5G services relate to barriers to entry by MNOs, including:

(a)   unreasonable setup fees;

(b)   technical feasibility and timeframe slowness; and

(c)   increased contractual obligations.

9.74   Sacofa will be an access provider for transmission services used in 5G networks. It has no plans to supply any retail services dependent on 5G networks.

9.75   TIME does not currently have any plans to supply (as an access provider) or acquire (as an access seeker) any wholesale services dependent on 5G networks, and does not have any plans to supply any retail services dependent on 5G networks.

9.76   However, TIME notes that its current network infrastructure (fibre, outdoor and indoor infrastructure) is capable of supporting 5G services on a nationwide basis

(except Putrajaya). TIME's network is ready to support 5G with MEF 3.0 compliance, but timeframes will depend on DNB's roll-out plans.

9.77   TM will be an access seeker for wholesale 5G services, including:

(a)   RAN share MOCN service for licensed operator segments;

(b)   network slicing as a service solution;

(c)   5G core (standalone) as a service solution; and

(d)   private 5G offering.

9.78   TM's priority areas for 5G services will focus on seamless urban and key business areas:

(a)   Phase 1 (2021 – 2022): key major cities, including Kuala Lumpur, Selangor, Putrajaya, Cyberjaya, Johor Bahru, Penang, Kota Kinabalu, Kuching and key industry areas;

(b)   Phase 2 (2023 – 2025): remaining state capitals, key cities and major highways; and

(c)   Phase 3 (2025 – 2028) remaining nationwide (suburban / rural).

9.79   TM has a target launch date of Q4 2021 for go to market with basic 5G services, being 5G mobile broadband, 5G fixed wireless broadband (fixed wireless access) and 5G ready IoT for some business segments, aligning with the nation's COVID-19 recovery and vaccination plan.

9.80   TM plans to supply the following retail services dependent on 5G networks, subject to DNB's commercial value proposition:

(a)   consumer and small medium enterprise:

(i)   5G Unifi services – immediate phase, being high speed 5G mobile broadband and high speed fixed wireless access (5G backhaul);

(b)   enterprise and Government:

(i)   M2M and IoT applications; and

(ii)   high speed primary and backup access for data services, connectivity services, IPVPN and SD-WAN.

9.81   TM anticipates the following potential impediments to acquiring 5G services:

(a)   "pooled" 5G spectrum service QoS that is not being allocated and managed well may impact service level agreements for mission critical applications in the enterprise sector. Fair service orchestration and network slicing commissioning, management and expansion will need to be monitored;

(b) spectrum management may cause poor service performance causing fines, for example, increased drop call rates and lower throughput not meeting the operator's benchmark. Congestion upgrade/mitigation, site optimisation and new congestion site build will need to be monitored;

(c) limited spectrum availability to cover the population (mobile broadband and fixed wireless broadband) and enterprise 5G service applications;

(d) spectrum interference (3.5Ghz) issues with satellite frequency band causes service degradation. Unresolved 5G vs VSAT interference issues will limit the amount of usable 5G spectrum at 3.5GHz;

(e) ability for operators to use private 5G networks for enterprise solution;

(f) challenges related to the integration of 5G core with existing legacy infrastructure; and

(g) distance limitations and susceptibility to rain attenuation of millimetre wave spectrum.

9.82 TM also anticipates these regulatory impediments:

(a) high rates, including premium right-of-way, local council charges and SBC rental and access charges for fibre infrastructure, which costs are passed through to access seekers; and

(b) uncompetitive 5G wholesale MOCN rates and the impact of a single wholesale network operator on speed of delivery of services to industry verticals.

9.83 U Mobile will be an access seeker for wholesale 5G services, but will be an access provider where it provides 5G services to other licensees under an MVNO or private network arrangement.

9.84 U Mobile will provide 5G retail services as follows, commencing in Q4 2021:

(a) 2021/2022: eMBB services, fixed wireless access and IoT services; and

(b) 2022/2023 and beyond: in addition to eMBB, mMTC, URLLC and private network services to support various industry verticals.

9.85 In terms of geographic areas, U Mobile will focus on areas where there is demand for wireless private networks, with dedicated and reliable coverage to support 5G verticals such as large scale manufacturing, freight and logistics, oil and gas, healthcare, etc. These verticals are expected to have connection requirements of more than 500Mbps and <5ms per private enterprise network.

9.86 U Mobile expects that take-up will depend on the development of the 5G ecosystem as well as the maturity of use cases in these industries worldwide and in Malaysia.

9.87 U Mobile cites the following potential impediments in the supply of 5G services:

(a) the fact that there is a sole access network provider that has been assigned to provide wholesale services to existing MNOs, making it vital that DNB is mandated to provide non-discriminatory access to the access seekers;

(b) the need to ensure that DNB rolls out to desired locations within the timeframe stipulated by MCMC and access seekers so that access seekers (being MNOs) are able to secure the necessary wholesale service for the provision of 5G retail services to their customers; and

(c) DNB ensuring that the services it provides to access seekers are of high and consistent quality to allow the MNOs to meet MSQoS obligations.

9.88 YTL will supply retail services dependent on 5G services, subject to DNB's services, coverage, capacity and pricing, and the architecture of the network and associated investment required for YTL to integrate, e.g. SA or NSA deployment.

9.89 YTL will pursue opportunities nationwide for the supply of consumer services (eMBB) as well as Industry 4.0 services (uRLLC and mMTC). Additionally, YTL will require MEC to support edge compute use cases. YTL will endeavour to launch services in alignment with DNB's own launch, and intends to play an active role to help provide input to shape DNB's expansion plan to better serve the Rakyat.

9.90 YTL's product differentiation will depend on network characteristics and resource allocation, network slicing and the availability of spectrum across the 700MHz, 3.5GHz and 26GHz and 28GHz bands. YTL notes that 700MHz can be used for 5G in carrier aggregation with 3.5GHz in SA mode, and that mmWave should be used as soon as possible to enable higher capacity services, including enterprise solutions for private 5G networks, uRLLC and mMTC.

9.91 YTL notes the following requirements for 5G access:

(a) the provision by DNB of equal and open access to all 5G facilities and services;

(b) full transparency and equal sharing of information by DNB with MNOs on DNB's coverage and commercial plans to ensure equal opportunity for all;

(c) codification of band support for 5G as well as core national 4G bands for all 5G devices brought into Malaysia through SIRIM certification process;

(d) government investment incentives and/or subsidies to encourage industrial use of 5G;

(e) DNB working with commercial building owners to improve in-building coverage;

(f) change management and integration of 5G infrastructure with 4G EPC and 5GC, with MNOs to be given sufficient time to undertake this integration; and

(g)   transparent and attractive wholesale model and pricing to encourage adoption.

5G SA and NSA network architectures

9.92   Operators also generally concurred that both 5G SA and NSA architectures will be required, but that only SA architecture will allow the full benefits of 5G to be realised, in line with the MCMC's discussion in paragraphs 9.4 to 9.7 above.

9.93   Celcom proposes that the definition of "standalone" and "non-standalone" 5G deployment, be standardised as follows to ensure that all parties have common understanding in future discussion:

(a)   5G NSA

(i)   NSA anchors the control signalling of 5G radio networks to the 4G core.

(ii)   NSA is a 5G service that does not "stand alone" but is built over an existing 4G network.

(b)   5G SA

(i)   Control signalling does not depend on the 4G network at all.

(ii)   SA connects the 5G radio directly to the 5G core network.

(iii)   SA allows completely independent operation of a 5G service without any interaction with an existing 4G core.

9.94   Celcom also refers to the below diagram from the GSMA:
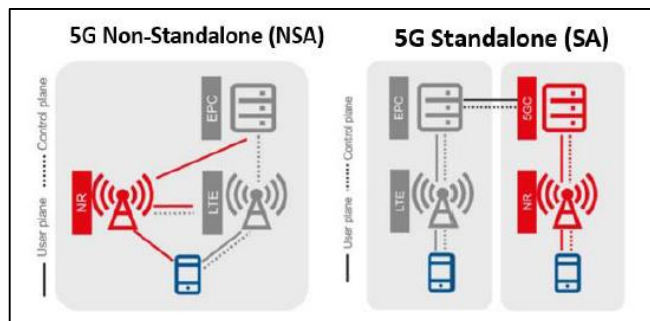
Figure 11 – GSMA NSA and SA models

9.95   Celcom envisions at this stage that as an access seeker, it will require nationwide access to DNB's 5G RAN to be connected to Celcom's 4G/5G dedicated core network, from day 1 of commercial launch in December 2021. This will also include smaller localised areas where enterprise-grade services will be supplied. Celcom does not require core network sharing from DNB at this stage.

9.96   Celcom submits that as a wholesale network provider and access provider, DNB should focus only on provision of 5G RAN and provide regional POIs to the access seeker's network with sufficient capacity. This model will allow the access seeker

to steer customer traffic between the access seeker's 4G and DNB's 5G network based on services and applications.

9.97 Celcom is not aware of how MOCN or MORAN can be offered to access seekers in a SA deployment, or how MVNO can be offered in an NSA deployment. At this stage, Celcom submits that the 5G device ecosystem and readiness of access seekers' core networks are the main drivers for the adoption of 5G NSA. The availability of 5G NSA from day 1 will increase the 5G take-up rate for commercial launch in Q4 2021 compared to if 5G SA is deployed.

9.98 Digi notes that worldwide, 5G deployments have used NSA architecture. By allowing 5G users to utilise both 4G and 5G frequencies in NSA, this allows operators to use spectrum more efficiently and provide better performance than SA. As more users upgrade to 5G, and 5G standards become more complete (including new features reliant on a 5G core), Digi expects a shift from 5G NSA to 5G SA.

9.99 In the short-term, Digi anticipates that pilot 5G SA networks will in most cases be deployed in smaller localised areas (e.g. enterprise customer premises) where enterprise-grade services will be supplied, and complemented by 5G NSA networks. In both SA and NSA contexts, an MNO's core network will be crucial to its ability to innovate and differentiate its 5G services.

9.100 To fully capture the benefits of 5G for society and the economy, Digi considers it likely that many different types of 5G network models will end up being used and it is crucial that operators have the flexibility to choose the most efficient model for their purposes. The different options include:

(a) access to a 5G network run by a wholesale-only company, but as an existing network provider;

(b) 5G access as an MVNO, in a manner similar to existing 4G MVNOs;

(c) commercially-arranged network sharing between two 4G access providers via MOCN, in order to reduce up-front deployment costs whilst still having individual control over the core to enable innovation and differentiation;

(d) deployment of 5G by a single existing access provider as an evolution from its existing nationwide 4G network, using its own 5G network as a means of product differentiation in the market;

(e) supplementary 5G access via roaming (with interlinked core networks) to acquire 5G services where it would be uneconomical to build duplicate infrastructure; and

(f) localised 5G networks for specific industrial applications.

9.101 Digi notes the following factors relevant to which 5G model is chosen in a particular case:

(a) existing infrastructure owned by the venture (e.g. existing operators vs pure retailer);

(b)   scale of desired network (e.g. local vs nationwide);

(c)   level of integration with existing technologies;

(d)   types of services to be provided (e.g. IoT, FWA, eMBB).

9.102   DNB notes that it will supply services under both SA and NSA models.

9.103   Maxis proposes that 5G access should be provided using MOCN and MORAN models, which will enable Maxis to differentiate its retail 5G services from those supplied by other access seekers. In Maxis's view, both models are possible, and each will maximise the ability for MNOs to innovate and differentiate their 5G services by allowing them to deploy their own core network and facilitate faster time to market. To enable further differentiation capability, Maxis submits that DNB must support the flexibility to:

(a)   allow seamless 4G-5G mobility for voice and data services between MNO 2G/4G networks and DNB's 5G network, under the control of the MNO. DNB should support each individual MNO's neighbour cell definition, IRAT thresholds and other PLMN specific radio parameters;

(b)   allow an MNO's customers to switch back to their respective 4G networks (multi carrier) when out of C-Band coverage in order to avoid poor end user experience on the 700MHz layer;

(c)   allow MNOs to utilise existing spectrum for 5G for user experience differentiation e.g. carrier aggregation and traffic load balance;

(d)   allow MNOs to configure network slices/QoS to support diverse services, including dedicated/resource reservation when needed;

(e)   allow MNOs to integrate various systems e.g. service orchestrator, CEM, OSS, etc with DNB's network for end-to-end QoS visibility and control on diverse products offered;

(f)   provide real time feedback on DNB's network for network configuration and alarms, KPI performance and user experience matrix for SLA assurance and monitoring;

(g)   allow multiple transmission POI placement e.g. regional, state locations;

(h)   allow MNOs to deploy MEC in various points in the network e.g. customer premises, depending on use case requirements, with DNB to prepare respective POI locations for MEC integration;

(i)   allow MNOs to deploy private networks based on dedicated 5G spectrum from DNB at specific customer locations, e.g. offshore platforms, manufacturing factories; and

(j)   incorporate planning of bespoke coverage to meet MNOs' business/enterprise demand e.g. in-building coverage in selected office buildings or areas.

9.104   Maxis contends that 5G sites should support both NSA and SA architectures, depending on the factors set out in the following paragraph. Maxis expects that SA users will be able to use both SA and, where out of coverage, NSA networks, while NSA users can use only NSA. Accordingly, Maxis submits that DNB's RAN should allow both SA and NSA to be accessed in all areas, whether on a nationwide or localised basis, to allow all types of users to access the network, promoting service innovation.

9.105   Maxis noted the following factors in determining whether an SA or NSA architecture is preferred:

(a)   **Ecosystem**. Currently, NSA has the largest device ecosystem compared to SA devices. Also, to improve 5G coverage, C-Band needs to be paired with a lower frequency band via dual-connectivity/carrier aggregation where the support for SA devices is very small. Currently ~70% of 5G devices support SA and less than 5% support SA carrier aggregation involving the 700MHz and 3500MHz bands that DNB plans to use.

(b)   **Use cases**. Most 5G applications in the first deployment phase will be eMBB and FWA, which can be supported by both SA and NSA. SA will support advanced use cases such as URLLC or mMTC, which are currently at early phases of ecosystem maturity, and the requirements for these capabilities will depend on consumer and enterprise. Accordingly, the target areas/locations for SA will depend on the demand for these solutions.

(c)   **SIM cards**. Rapid adoption by customers of 5G services is possible in an NSA architecture which allows the re-use of existing 4G SIM cards. In an SA architecture, new 5G SIM cards will be required due to security requirements, leading to complications for consumers.

(d)   **New core network**. SA will require the development of a new core network and complex integration with existing BSS system e.g. new interfaces, MVIV operability testing. Furthermore, certification of devices is also required for SA which can take approximately 3 months. The NSA ecosystem is more mature than SA and Maxis expects that SA and NSA will coexist for some time.

9.106   For IoT applications, My Evolution prefers an SA model to best utilise the designed features. This is preferred to enable smart cities, virtualised environments and generally for future proofing. While an earlier NSA model is possible, it will not enable all features required for smart cities and other IoT deployments.

9.107   TM believes the full potential of 5G services, such as uRLLC and mMTC can only be unleased with a 5G SA deployment, which should target heavy industry areas such as Klang, Pengerang, SCORE industrial area, etc, and depending on industry verticals.

9.108   TM notes that this is why major telcos around the world have started to focus on 5G SA deployment. Accordingly, DNB should not be investing in NSA architecture, as this will incur double investment for 5G deployment while only

enabling basic features of 5G such as eMBB and FWA. TM also considers that the market penetration for SA and NSA devices (i.e. user equipment) is almost equal and is accordingly focusing on 5G SA for commercial launch by December 2021.

9.109   U Mobile anticipates that early launch of 5G services will require an NSA architecture. The introduction of SA implementation will eventually maximise 5G service reach when 5G devices become prevalent. It is paramount that both categories of devices are supported – hence the deployment of the 5G services must be an NSA+SA combo. For both SA or NSA deployment, a MOCN model is preferred due to cost and operational efficiencies.

9.110   U Mobile recommends that 5G traffic should connect to access seekers via the nearest regional POI, which must be availed on an open basis (i.e. not monopolised) to allow connectivity to other services providers such as fibre providers as well as with other services. No restrictions and/or charges (e.g. for right-of-way) should be imposed.

9.111   At launch, U Mobile considers that a 5G SA architecture will be limited to areas where there is a dedicated wireless private network, with dedicated and reliable coverage such as large-scale manufacturing, freight and logistics, oil and gas, healthcare facilities, etc.

9.112   In this scenario, the access seeker may need to install MEC or edge DC at the edge of the 5G private network radio access layer in order to deliver customer-specific 5G SA services e.g. uRLLC. U Mobile provided the following diagram to illustrate this 5G SA model:
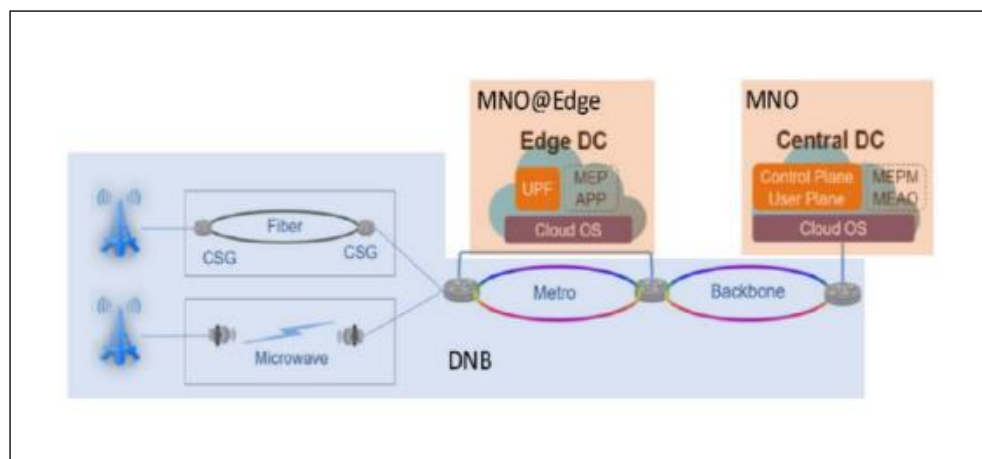
Figure 12 – U Mobile 5G SA model

9.113   YTL prefers to focus on 5G SA deployment. YTL believes that the areas where 5G would make a difference are in manufacturing industries and enterprises and considers that SA can be introduced by December 2021 citing GSMA reports reflecting that more than 50% of devices support SA.

9.114   YTL submits that DNB should provide 5G SA with an open RAN architecture to ensure no vendor lock-in and to ensure Malaysia will enjoy a continuous flow of world-class technology innovation going forward. This includes providing full

access to extended C-band along with mmWave at the earliest opportunity, to ensure high quality services for consumers, enterprises and governments.

5G wholesale access models

9.115   Most operators consider that a MOCN model should be deployed in NSA areas, with several operators noting that it provides advantages over the other models of access, particularly from a service differentiation perspective. Similar comments were made in respect of MVNO-type access in 5G SA areas, where DNB provides all core and RAN elements; operators consider such access should be provided on a "thick" MVNO basis.

9.116   As one operator noted, service differentiation is vital because certain access seekers may wish to develop 5G retail services for fixed wireless access/home broadband services to complement the availability of fibre-to-the-home infrastructure, while other access seekers may wish to provide premium/enterprise-grade 5G connectivity solutions for large corporates.

9.117   Similarly, some access seekers may wish to rely on DNB for all elements other than OSS and BSS systems, which will allow access seekers to differentiate their services from a billing, marketing, and operational support perspective. These scenarios all involve MNOs having the greatest degree of possible flexibility in tailoring their own 5G offerings, depending on the given 5G architecture.

9.118   Operator submissions in respect of the MOCN and MVNO-type models follow below.

9.119   ALTEL prefers a 'thick' MVNO model, as product differentiation would be considerably simpler with full autonomy on product creation, although potentially speed as a differentiator will depend on differentiation via network slicing.

9.120   Celcom considers that MOCN will allow the efficient pooling of large 5G spectrum bandwidth optimally among 3 to 4 access seekers. Celcom has also tested and validated the 5G MOCN NSA sharing method in January 2020 in Langkawi. Celcom's sample network diagram for 5G MOCN model (NSA) is depicted in the diagram below.
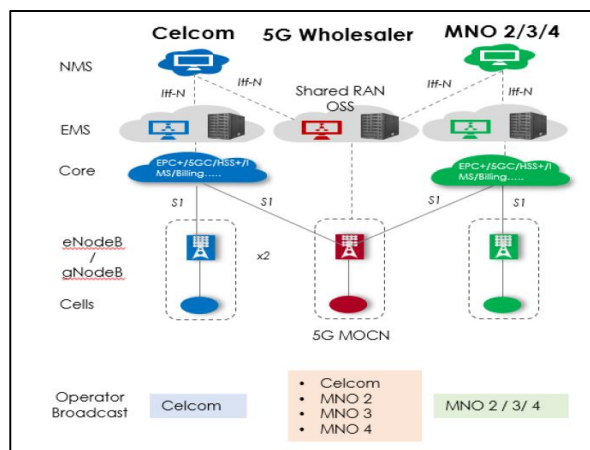
Figure 13 – Celcom 5G NSA MOCN model

9.121   Celcom notes that the effectiveness of spectrum use under MOCN depends on two factors, being the total amount of 5G spectrum bandwidth per cell and the number of access seekers accessing the 5G cells. Even where there is equal access to 5G resources, it may lead to lower quality of service levels as more access seekers are admitted, and/or when 5G spectrum is limited. This creates challenges from a service fulfilment and product differentiation perspective, due to the lack of 5G resources. Regardless of the sharing model, Celcom considers it crucial to have guaranteed QoS and SLA imposed on the access provider, and to limit the number of access seekers due to limitation of 5G resources. The table below illustrates the relationship between 5G spectrum bandwidth and number of access seekers.

5G Spectrum Bandwidth (MHz) per Cell	Average Spectrum Bandwidth Per Access Seeker (MHz)			
	No. of Access Seeker			
	3	4	5	6
40	13.3	10.0	8.0	6.7
60	20.0	15.0	12.0	10.0
80	26.7	20.0	16.0	13.3
100	33.3	25.0	20.0	16.7

Figure 14 – 5G spectrum bandwidth allocation calculations (Celcom)

9.122   Digi notes that there is still a lot of uncertainty regarding deployment models and how infrastructure can be shared in the 5G context. Consequently, Digi considers it is likely premature to determine regulation of 5G wholesale services, although Digi has a number of comments regarding the potential sharing models:

(a)   Active network sharing

(i)   active network sharing models such as MOCN and MORAN are most commonly agreed commercially between two existing access providers leveraging on existing network assets to collaborate on future network deployments. In the simplest sense, this collaboration reduces the cost of future network deployments and upgrades.

(ii)   This type of network sharing is termed "active" as there is common electronic/radio equipment that is used to broadcast the networks of both operators. In both cases, the operators maintain separate core networks.

(iii)   Critically, network sharing only involves the access providers who will be providing services on the shared network. The commercial structures are generally such that there are minimal cash payments between parties and that assets are owned 50/50 by the access providers. This is achieved through either a jointly-owned 'NetCo' or by matching-investment guidelines.

(iv)   In MOCN network sharing, spectrum is pooled so both parties may use it, ensuring the most optimal use of the pooled spectrum. In

MORAN, individual networks only broadcast on spectrum owned by the individual access provider.

(v) In general, MOCN results in a higher-quality network (due to the larger pooled bandwidths). MORAN is often seen as the "next best" option for network sharing, as it can capture a significant proportion of possible cost savings.

(b) Wholesale network access

(i) A regulated wholesaler approach is sometimes the result of the emergence of a natural monopoly for a product where downstream competition is nonetheless desired. Globally, this has most commonly been seen in fixed-line telecoms, electricity and water distribution networks, being situations where infrastructure competition/duplication is undesirable and/or uneconomic.

(ii) In addition to regulated wholesalers, companies may also voluntarily choose to sell their products/services on a wholesale basis, often as a complement to their retail offerings – for example, a mobile network operator selling access to an MVNO.

(iii) However, MVNO offerings traditionally reflect the technological disparity between the two parties. Network operators have the network expertise and infrastructure, while an MVNO generally is more focused on retail reach and branding. Therefore, at the technical level, an MVNO model is generally very simplistic, with all network control and configuration still managed by the host network.

(c) 5G network access – Malaysian context

(i) With the possible creation of a new 5G network in Malaysia, a rather unique value chain may be created where there is a distinction between the provider of 5G spectrum/radio assets, and the primary providers of connectivity (i.e. existing access providers).

(ii) Due to this unique situation – and the inter-connected relationship of mobile networks across multiple technologies – a new form of wholesale relationship is likely needed that is different from either network sharing or MVNO models.

(iii) There are strong requirements for the 5G network to be integrated into the 4G networks controlled by existing access providers for network handover and anchoring. This would be achieved through a level of core integration that is more similar to that found in a MOCN arrangement than an MVNO. These individual core networks will allow for a degree of differentiation, as well as being the foundation of more advanced 5G services.

(iv) However, unlike MOCN, the existing network providers will not have ownership or control in the governance and operation of the 5G network. It is important that the 5G network offers existing network providers fair and equal technical access and pricing. Were this not to occur, there might be a case for regulatory intervention.

9.123 edotco submits that DNB should be tasked to undertake investment into 5G end-to-end networks, with investments in 5G SA being made from day 1 of commercial launch. edotco is of the view that MOCN and MVNO will likely be the mainstream wholesale models for network sharing moving forward.

9.124 edotco also notes that the 5G user experience especially in the enterprise segment will go beyond speed and vary from one industry vertical to another, with each having unique requirements as far as speed, latency and reliability attributes are concerned. Consequently, "pooled spectrum" could play a lesser role compared with the ability to address "network slicing" requirements in combination with superior client support and analytics capabilities.

9.125 Finally, edotco finds it too early to speculate on the preferred MVNO model given lack of clarity over what DNB can provide to access seekers. However, the general rule-of-thumb is that access seekers may be interested to own or control most 5G network elements.

9.126 Maxis prefers MOCN, as it will maximise the ability for MNOs to innovate and differentiate by allowing MNOs to deploy their own core networks and enable a faster time to market. Further, MOCN facilitates seamless user experience between DNB's 5G RAN network and the 4G networks of MNOs, with MNOs still able to have full control over product offerings and use cases and also allows shorter lead time and lower complexity for RAN-core integration.

9.127 In becoming access seekers to DNB's network, existing MNOs would already lose significant differentiation opportunities by losing control over spectrum, radio access and transmission networks. Accordingly, Maxis submitted that taking control of the core network is critical for MNOs to inject remaining controls so that some service differentiation is possible.

9.128 In Maxis's opinion, how infrastructure should be shared depends on the desired outcomes. Maxis understands that the MCMC would like to see services-based competition in 5G, and therefore this should be taken into account when considering different wholesale models. At present, Malaysia (and many other countries) have highly competitive mobile ecosystems based on a small number of competing networks, and Maxis would like to see a wholesale model that looks to retain the benefits of such an ecosystem, while potentially delivering greater network roll-out efficiency. In particular, Maxis highlights the benefits of incentivising innovative products, perhaps through allocations of network capacity to individual MNOs, encouraging product differentiation between retail providers.

9.129 Maxis included in its response the below diagram, based on 5G MOCN sharing. Maxis noted that the location of POIs will depend on the use cases, and could be situated at the edge of the network, or in metro or regional areas. At a minimum,

Maxis proposes that at least one POI should be available per region, with further expansions over time as driven by MNO requirements. From each POI, each MNO's respective 5G traffic will be brought back to the MNO's core network.
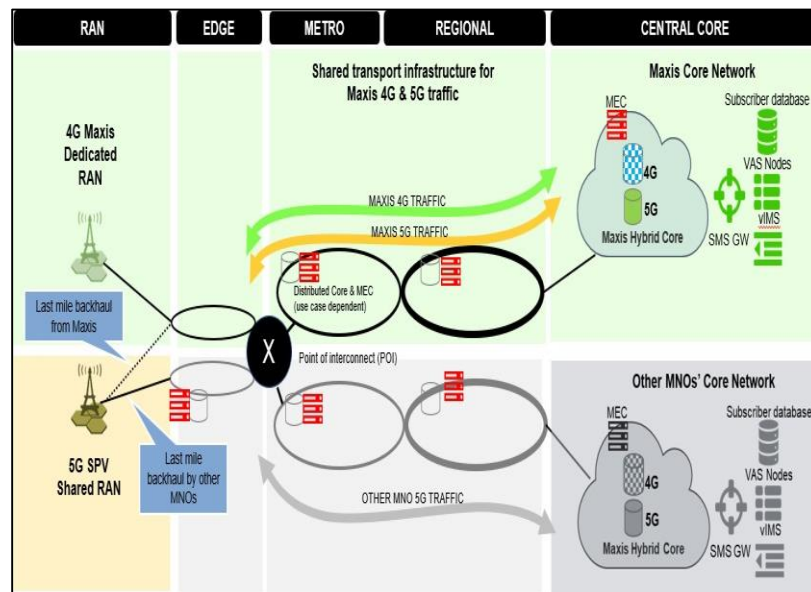

Figure 15 – Maxis 5G MOCN model

9.130   My Evolution prefers MVNO-style access with charging capacity and IP traffic management (not fully handled by the MNO) and considers that the MCMC should regulate 5G access to enable competition.

9.131   My Evolution provided in its response the following network diagram inspired from 3G/4G, in which the MVNO only has BSS systems and is able to provision 5G core through an API, as well as retrieve CDRs from the core. A link to channel IP traffic from the core (same as GGSN) to the MVNO IP routers. MVNOs will control certain elements of services through their BSS, such as mediation, provisioning, rating and billing, customer support, IP routing. However, MVNOs will not own or control the core network and signalling elements.
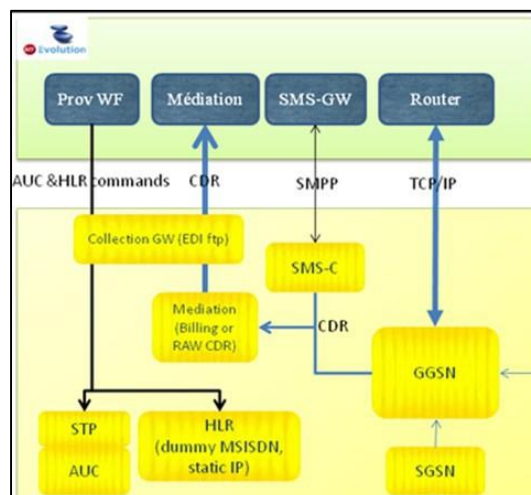
Figure 16 – My Evolution 5G MVNO model

9.132 TM considers that MOCN should be the base 5G service offered for 5G wholesale as it provides flexibility to the customer. TM notes that DNB will need to allocate specific 5G resources to enable product differentiation based on application of SLA of premium and non-premium services, feature activation and customisation of commercial products. TM provides the following diagram depicting its views on MOCN arrangements, with network slicing:
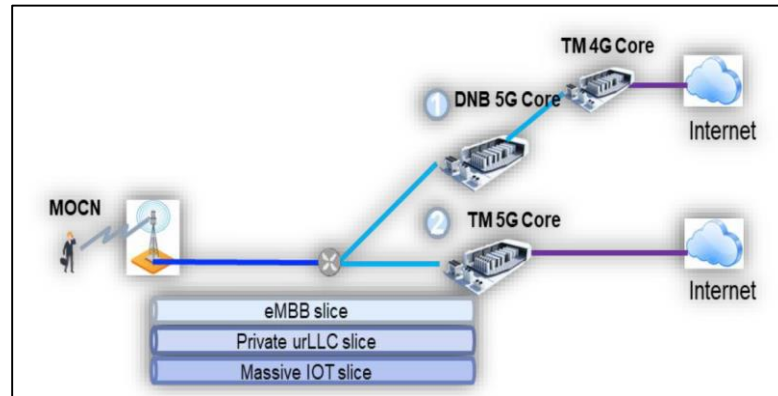
Figure 17 – TM 5G MOCN model with network slicing

9.133 TM submits that spectrum allocated to DNB may not be sufficient to support all access seekers and all types of 5G services, and in order to manage fair and equal access to all access seekers, network slicing will play an integral role in realising the "pooled" spectrum in the MOCN model. The implementation of network slicing will need to be facilitated immediately to ensure all emerging 5G features including for public and private 5G offering, can be served. Further, in order to unlock the full 5G throughput capability, the harmonisation of "pooled" spectrum and device adaptability will need to be overseen for the inter-band and intra-band spectrum aggregation.

9.134 TM considers that product differentiation will be based on QoS definition for commercial and mission critical services across all access seekers, to ensure high service level guarantees to the customer in respect of the relevant service application.

9.135 TM also notes that any 5G MVNO-type access should be offered under a "thick" MVNO model, as the access seeker will have control over the OSS and BSS, including services, applications and content layer, customer fulfilment (e.g. SIM and device management), billing system, policy control, customer relationship management, customer care, sales, distribution and marketing and other supplementary systems, as shown in the diagram shown below.
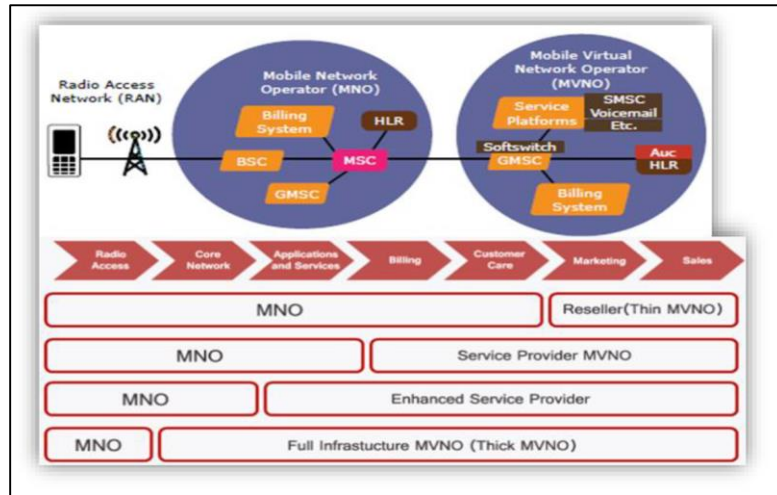
Figure 18 – TM 5G MVNO-type access model

9.136 U Mobile expects that the likely 5G wholesale model will be MOCN, with 5G core residing within each access seeker to enable flexible product and service innovation / differentiation, per the below figure:
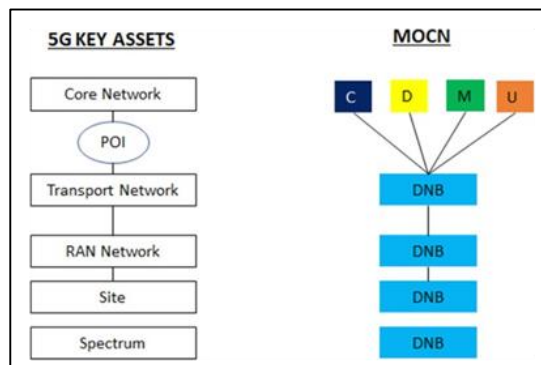

Figure 19 – U Mobile 5G MOCN model

9.137 MOCN is U Mobile's preferred model because it offers the best cost saving potential with pooling of spectrum, RAN sites and backhaul resources. It also enables 5G service differentiation, with each MNO owning its respective core network elements.

9.138 If the MOCN model involves DNB "pooling" its own assigned spectrum (in the 700MHz, 3.5GHz and 28GHz bands) to provide 5G services to MNOs, then U Mobile submits that DNB should ensure that it is able to differentiate service quality links from its spectrum resources as well as shared backhaul, taking into account end-to-end quality parameters such as bandwidth, jitter, delay, packet loss and availability.

9.139 U Mobile also submits that access seekers should have the option to perform network slicing to serve the needs of various customers across industry verticals. Alternatively, U Mobile submits that access seekers should be permitted to procure wholesale services from DNB on a white label basis.

9.140 U Mobile considers that only MNOs who are access seekers of DNB may provide relevant 5G services to other licensees under an MVNO arrangement.

9.141 YTL also supports the MOCN model, depending on DNB's architecture, because it will not only reduce DNB's overall costs of deployment, but also reduce access seekers' costs of integrating and interoperating with DNB's 5G network. Ultimately, all end users will benefit from these cost savings.

9.142 However, some operators expressed contrasting views regarding the MOCN and MVNO-type models. In particular:

(a) ALTEL submits that under a MOCN model, the potential network congestion and capacity limitations from shared antennae will significantly impact customer experience. From a product differentiation perspective, service differentiation cannot be guaranteed in terms of availability and network quality.

(b) Celcom considers that MORAN can be viable if QoS cannot be sufficiently guaranteed, or 5G resources cannot be fairly allocated amongst access seekers, under a MOCN model. If there is sufficient 5G spectrum bandwidth allocated to the 5G access provider, for example, 200-300 MHz, MORAN can be considered. Celcom's sample network diagram for 5G MORAN (NSA) is depicted below.
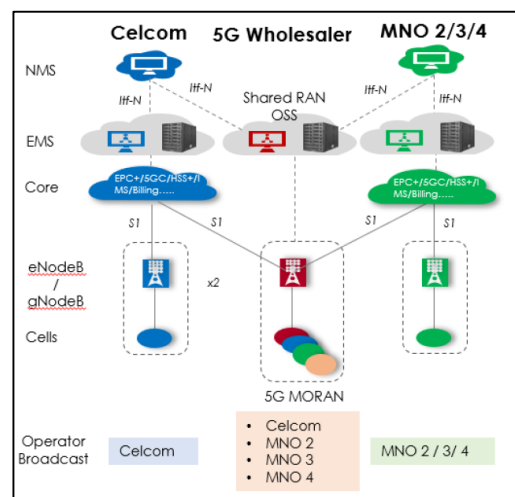
Figure 20 – Celcom 5G MORAN model

(c) Celcom also considers that MVNO-type access is not preferred, as it creates difficulties in service differentiation based on Celcom's requirements, with no ability to ensure service continuity and seamless customer experience for Celcom's existing subscribers without a complex and expensive integration of two separate networks.

(d) Maxis submitted that DNB must also avail MORAN, and allow MNOs to elect whether to utilise MORAN or MOCN based on their requirements. MORAN will work similarly to MOCN, but with dedicated resources assigned to each MNO, allowing slightly better ability for MNOs to control radio policies and resources. At the same time, Maxis acknowledges that MORAN will involve ineffective use of total spectrum resources, with higher requirements for hardware and software in the RAN, leading to a higher deployment cost.

(e)   Maxis also rejects the MVNO-type model of access, which it considers would confuse DNB's role as a wholesale RAN provider, would not be a good use of existing network infrastructure and expertise. Ultimately, Maxis considers that such a model would lead to Malaysia ultimately losing out on the diverse mobile network architecture that has been built over recent decades, being reduced to a series of resellers alongside a government-run network, with all the economic inefficiency that entails. This would be highlighted by the stranded assets of the MNOs, which will reduce the ability and incentives for MNOs to invest in future.

(f)   Under the MVNO model, Maxis submits that MNOs will also lose control on product and service differentiation, as the MNOs will be highly dependent on DNB's network. This could also potentially lead to non-seamless user experience between DNB's 5G network and MNOs' 4G networks.

(g)   Finally, Maxis notes that MVNO access can involve long lead times, greater complexity, and high costs to implement 5G multi-tenancy cores and to integrate with MNOs' BSS. This is because rather than using existing MNO cores, DNB will have to source, implement and test a new core for many MVNO operators, in addition to catering to their individual and different specifications.

9.143   As the 5G access provider, DNB notes that the MORAN model is not applicable in Malaysia, as 5G spectrum will be allocate solely to DNB. DNB will accordingly deploy a shared 5G wholesale network based on the MOCN model.

9.144   Under the MOCN model, spectrum will be allocated to DNB and RAN shared across multiple MNOs as illustrated below:
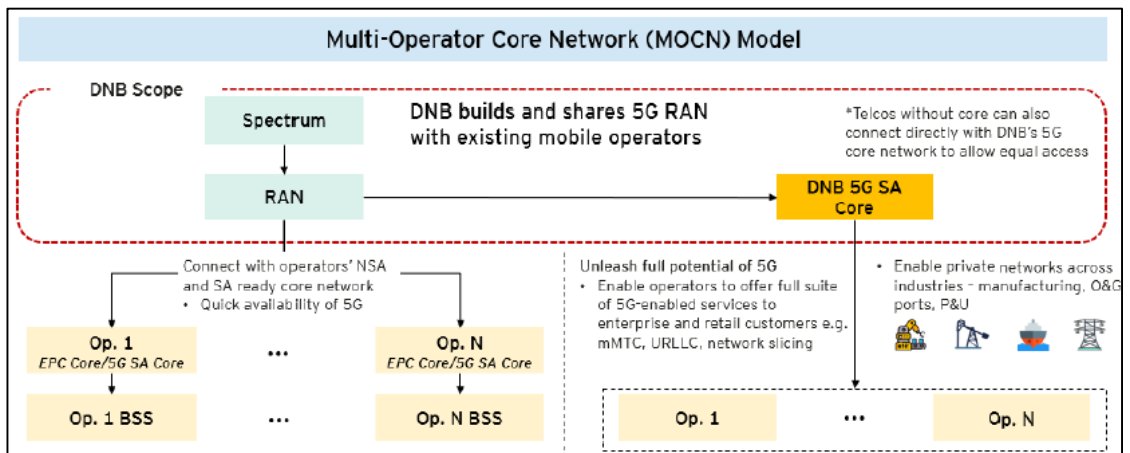

Figure 21 – DNB MOCN models

9.145   The MOCN model will enable MNOs to access DNB's RAN and spectrum and to integrate their core networks with DNB's RAN. This will enable MNOs to have control over their customers, as well as to be able to offer differentiated services to their enterprise and retail customers.

9.146   DNB's own core will also be used to unlock network functionalities and allow licensed operators who do not have their own core networks to integrate with DNB's core network.

9.147   In principle, DNB will follow commercial needs as MNO requirements vary according to their target customers (retail and enterprise) as well as their network requirements for NSA and/or SA 5G services. As each MNO has different 5G strategies and technology readiness, DNB will build a network that will be able to cater to the diverse requirements of the MNOs, building both NSA and SA ready networks.

9.148   DNB highlighted the following three deployment models:

(a)   MOCN NSA with shared LTE and 5G:
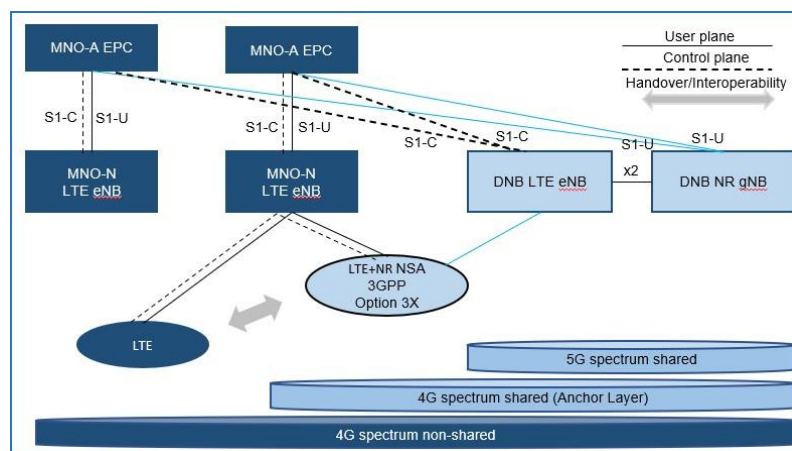
Figure 22 – DNB MOCN 5G NSA model

(i)   This model will involve MNOs working with a shared 5G spectrum layer and using 4G spectrum as an anchor layer, connected via MOCN, and will focus on eMBB to provide higher data-bandwidth and reliable connectivity.

(ii)   DNB will deploy the RAN sharing infrastructure and will support 3GPP Option 3X for NSA, given all MNOs are either ready or almost ready to interface with DNB's radio network via MOCN.

(iii)   DNB will interface with MNOs' 4G EPC cores with DNB's gNBs using LTE eNBs as anchor technology. It will use spectrum in the 700MHz band as the LTE anchor layer for connectivity to MNOs, or use Dynamic Spectrum Sharing (DSS) of 700MHz as LTE/NR concurrently.

(iv)   This strategy will be in line with the 3GPP specification which states that early rollouts of 5G networks and devices can be in an NSA architecture.

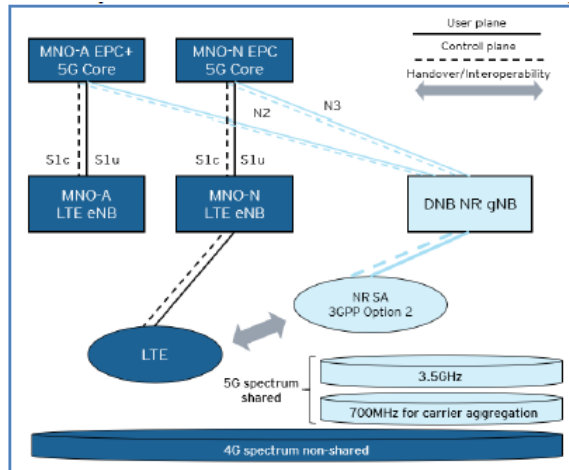(b)   MOCN SA only, using MNOs' 5G cores.

Figure 23 – DNB MOCN 5G SA model

(i)   This model will involve MNOs working with a shared 5G spectrum layer and connected via MOCN.

(ii)   This will unlock 5G use cases such as eMBB services, mMTC for IoT purposes and URLLC for safety-critical and mission critical applications.

(iii) DNB will support 3GPP Option 2 SA architecture, using the MNOs' 5G EPC and DNB's spectrum. The take-up of this model depends on the MNOs' readiness, i.e. their SA maturity and the end-to-end ecosystem including device compatibility.

(c)   5G SA, using DNB's core:
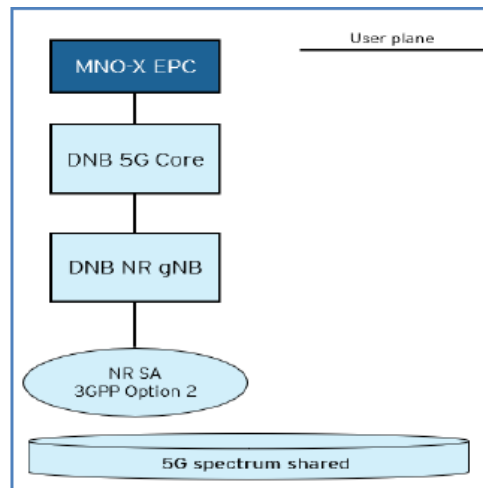
Figure 24 – DNB 5G SA model

(i)   This model will involve DNB's new 5G core supporting any MNOs that may require DNB's SA core for URLLC and mMTC services.

(ii)   This model will support 3GPP Option 2, and supplement the initial build which is largely built for eMBB use cases. DNB's SA core will

be able to support any MNOs that may need to utilise DNB's SA core for URLLC and mMTC services.

(iii) The 5G Core will be deployed via a full cloud native solution to enable DNB to add capacity quickly, set up new services in real time and minimise the complexity of operations and maintenance.

(iv) Subsequently, DNB will be able to dynamically allocate resources in real time according to service needs (via network slicing).

(v) In addition, SA networks may also be rolled out for specific private network needs subject to demand from MNOs and the underlying commercials.

9.149 At this stage, DNB is not considering any other wholesale models besides those described above.

Form of regulation and service description

9.150 Nearly all operators agreed that 5G services should be regulated on the Access List, with support across most respondents for these services to be listed as a new service on the Access List, given the differences in network architecture, technology and product constructs / use cases.

9.151 Celcom considers that listing 5G services as a new service on the Access List will clarify any specific service obligations for DNB's supply of wholesale 5G services. If 5G wholesale services were to be defined under existing Access List services, further details and differentiation would be required. The 5G network is expected to differ from legacy networks implemented today in addition to higher requirement for data services.

9.152 Digi does not consider that 5G presents any new regulatory concerns, and can be treated as a natural evolution of networks. Digi considers that if this situation changes, the MCMC can re-evaluate 5G services on the Access List, but that such evaluation should be in line with international best practice and encourage network investment and innovation.

9.153 DNB acknowledged that 5G services will be listed as a new service on the Access List, but recommended the following principles be considered in regulation:

(a) any proposed regulatory requirements should not be onerous, which could risk impeding the fast and efficient deployment of 5G services in the country. Although DNB is the single wholesale 5G network provider, it is vital to strike the right balance between regulating DNB and ensuring that DNB's commercial interests are sufficiently protected so that DNB is able to deploy an affordable and efficient 5G network in a timely manner; and

(b) as 5G services are in the nascent stage, the MCMC should adopt a light-touch regulatory approach, comprising broad descriptions which will be future-proof to prevent the need to make amendments in short intervals. Listing a service on the Access List which is too prescriptive will restrict DNB's service offerings and could deter innovation.

9.154   edotco notes that there is a need for the industry to define the wholesale services provided by DNB, which will have a monopoly. Timely inclusion of these wholesale services into the Access List and MSA will facilitate more efficient negotiation and conclusion of Access Agreements with DNB.

9.155   Maxis notes that the appointment of DNB creates a monopoly and requires a complete access framework. Maxis submits that prior to the supply of 5G wholesale services by DNB, the Access List, MSA and MSAP must first be completed by the MCMC, for the benefit of Malaysia, the industry and the LTBE. Alternatively, if timing does not permit this, Maxis requests that the MCMC separate out 5G wholesale access and MVNO Access for dedicated Access List, MSA and MSAP inquiries this year.

9.156   Further, Maxis urges that DNB's RAO must fully comply with these regulatory instruments and determinations. In the absence of these instruments, commercial negotiations and long-term arrangements with DNB will present many difficult challenges from a regulatory and governance point of view. DNB must always comply with the non-discrimination principles to ensure effective competition in the supply of 5G wholesale services, with no commercial or pricing arrangements other than as regulated by the MCMC.

9.157   In relation to the Access List specifically, Maxis considers that a comprehensive and complete service description including the scope, model, technical parameters, network demarcation, etc should be deliberated and ultimately regulated in the Access List. In particular, Maxis would like to see the following details covered:

(a)   supply under MOCN and MORAN models;

(b)   clearly defined relevant technical parameters fully available to and configurable by MNOs including:

(i)   network diagrams;

(ii)   network demarcation;

(iii)   POI locations;

(iv)   SLAs;

(v)   network slicing, including associated settings in DNB's RAN to ensure consistent end-to-end QoS homogeneity from MNO cores to DNB's RAN;

(vi)   class of services (e.g. consumer and business);

(vii)   peak speeds of between 100Mbps - 1Gbps;

(viii)   QoS (e.g. latency, jitter, packet loss, etc), including latency from 5ms – 150ms depending on the use case;

(ix)   site/cell level parameters in DNB's RAN to support MNOs' mobility strategies between 4G and 5G networks;

        (x)   others as required; and

    (c)   future-proofing in terms of technology, speeds, products, services, innovations, bandwidth, consumer, business, etc.

9.158   As noted in paragraph 8.63, Maxis considers that MVNO Access should be removed from the Access List, but submits in the case of 5G services that if MVNO Access is to remain regulated, the service description should be amended to exclude 5G wholesale services provided by DNB, amongst other amendments to limit its applicability.

9.159   Maxis also considers that 5G wholesale services provided by DNB should only be offered to existing MNOs, and should not be offered directly to traditional MVNOs, who should access these services only via MNOs. If the MCMC were to enable MVNOs to obtain 5G access directly from DNB, Maxis submits that this would necessitate two separate SIM cards, which would be inconvenient to end users and unnecessarily complex. Limiting the supply of 5G MVNO Access to supply by MNOs would also ensure each MVNO's customers experience the same quality of experience as the relevant MNO's customers, without the technical complexity of two wholesale arrangements.

9.160   Maxis again cites the ambitious JENDELA goals, and considers that if an MVNO could acquire services directly from DNB, this would result in significant coverage gaps compared to other service providers, as it will take several years for DNB to rollout 5G to match the entire 4G footprint. This is another reason Maxis would support a policy decision that an MVNO should procure 2G, 3G (until its sunset), 4G and 5G services from a single MNO supplier.

9.161   Finally, Maxis submitted that DNB should support 3GPP technical standards, particularly 3GPP TS 23.501.

9.162   TIME considers that 5G services can be offered under the existing MVNO Access Service.

9.163   TM submits that 5G services including MOCN sharing and private 5G slicing services should be included in the Access List to ensure guaranteed service for mission-critical services. 5G services requiring uRLLC and mMTC via MOCN needs to be available equally to access seekers. DNB's RAO must also specify a fair and equitable mechanism of managing access seeker requests.

9.164   U Mobile would like 5G services to be listed as new services on the Access List, as they are not like any other services currently on the Access List. In doing so, U Mobile considers that the determination should prohibit DNB from providing 5G services to MVNOs and end users. U Mobile also invites the MCMC to take into account that MNOs are expected to launch 5G services by procuring wholesale services from DNB before the review of the MSAP.

9.165   U Mobile also submitted that the spirit of the Access List is to enable any-to-any connectivity. While this remains a key tenet within the context of the Malaysian access regime, MCMC should note that DNB is intended to operate as a monopoly, and the MCMC must accordingly take all necessary measures to explain the mechanisms and officially recognise the rules of engagement

including the undertakings by DNB. MCMC must ensure that this arrangement does not negatively impact the industry dynamics in any way or cause existing players to lose their long-term viability.

9.166   Finally, YTL referred to a definitive agreement entered into between Celcom, Digi and Maxis on 18 March 2021 for the joint development and sharing of fibre infrastructure, which came after the Prime Minister's 19 February 2021 announcement of the implementation of 5G nationwide to be carried out through DNB.

9.167   YTL is of the view that such an exclusive/private collaboration will result in the collaborative partners engaging in monopolistic and anti-competitive behaviour in breach of Chapter 2 of Part VI of the CMA. Given the importance of this infrastructure to all parties concerned, YTL submits that such an exclusive/private collaboration should not be allowed by MCMC without imposing the relevant undertakings and proper remedies to address such monopolistic and anti-competitive conduct. This will also assist DNB in ensuring that the overall total cost of ownership is reduced so that the final end services can be offered to the Rakyat at affordable prices.

9.168   YTLC accordingly submits that any collaboration on shared fibre should be regulated under the Access List and MSAP, and MCMC should also consider regulating such shared fibre infrastructure under a separate entity (not affiliated to any access provider). This will ensure open, fair and equal access for all MNOs to support healthy industry development.

Price and non-price terms and conditions of access

9.169   Respondents also made several submissions regarding both price and non-price terms and conditions that should apply to access to wholesale 5G services.

9.170   From a pricing perspective, operators expressed mixed views, with the balance of submissions weighing in favour of regulation through the MSAP. Some operators suggested general cost recovery principles and outlined various charging models, as well as recommending more frequent reviews by the MCMC given the nascency of 5G services and the anticipated acceleration of take-up.

9.171   On the other hand, a number of operators commented that it is too premature for the MCMC to determine 5G price regulation at this stage and that operators should be permitted to reach commercial arrangements, with a backstop of regulatory intervention if required. In particular, DNB submitted that it is already incentivised to ensure fair and affordable pricing for the benefit of the Rakyat, and that accordingly price regulation is not required.

9.172   In relation to non-price terms and conditions, operators generally concurred that all MSA provisions should be extended to apply to DNB's supply of 5G wholesale services, with a number of new service-specific obligations suggested including:

(a)   flexibility for MVNOs accessing 5G services through MNOs;

(b)   service levels, including in respect of fault response and rectification;

(c)   compliance with MS QoS, with compensation for non-compliance;

(d)   coverage obligations;

(e)   implementation and migration plans;

(f)   seamless service continuity and mobility between DNB's 5G network and MNOs' 4G networks;

(g)   resiliency and robustness to address single-point-of-failure risks, including information security and monitoring processes;

(h)   simplification of matters such as POI and co-location to allow easy access to DNB infrastructure.

9.173   From the access seeker's perspective, U Mobile submitted that some onerous existing obligations on access seekers should be excluded for 5G services, such as high security sum requirements, resource charges and other ancillary charges. U Mobile considers that access seekers should have more flexibility, for example from a forecasting perspective.

9.174   On the other hand, DNB considers that some new obligations should be imposed on access seekers, including long-term upfront commitments to enable DNB's cost recovery and more granular forecasting obligations to assist DNB to plan its rollout.

Other facilities and services required for 5G services

9.175   The MCMC also invited operators to comment on their requirements for access to other facilities and services used for the supply of 5G wholesale or retail services. Primarily, operators commented that they will require access to data centres for the purposes of integration and interconnection with DNB's network.

9.176   In relation to data centres, operators provided the following comments:

(a)   DNB recommends that access to data centres should be listed on the Access List, as DNB will require access to such services, e.g. hyperscale cloud centres. DNB proposes the following solutions, which it considers would resolve any impediments to acquiring access to these services:

(i)   ensuring fair non-price terms and conditions for access to the physical rack space and power supply;

(ii)   ensuring affordable costs of access, i.e. space rental and connectivity rates, among others; and

(iii)   as some of the data centres are owned by non-licensees, that the MCMC should extend Access List to include non-licensees as stipulated in section 145 of the CMA.

(b)   edotco submitted that it will require access to servers in data centres when providing 5G services, which is a challenge when there are capacity bottlenecks, e.g. physical space, bandwidth and ports.

(c)   Fibrecomm considers that data centre access should be regulated in the Access List, and the high cross connect charges imposed by data centre providers should be reasonable and standardised;

(d)   Maxis considers that DNB needs to make its own commercial arrangements with the relevant owners of each data centre. Maxis already has its own data centre servers and technical operating centre for its wholesale services;

(e)   TM requires access to servers in data centres, and experiences impediments when exorbitant cross connect charges are imposed by some data centre operators. TM considers that a standardised cross connect rate across the industry should be imposed;

(f)   U Mobile commented that MNOs are likely to be 5G access providers to MVNOs, and will be likely to require access to data centres; and

(g)   YTL has its own data centres, however YTL envisions the need for cost-effective access to data centres and POPs throughout the country to attract more data centre workload and to enable mobile edge computing, in line with the MyDigital vision.

9.177   Celcom encouraged the MCMC to take into accounts requirements for 5G outlined by the ITU, including fibre investment incentives, copper migration, access to passive infrastructure, access costs and right-of-way arrangements.[26]

9.178   Maxis submitted that the 5G access model should not create any new 'side effect' monopolies. For example, if DNB provides a POI at a given location, there should be no monopolies or right-of-way charges which in any way limit operator establishment of fibre to that location or selection between competitive transmission providers at that location.

9.179   TM submitted that spectrum sharing should be regulated under the Access List as a new service to cover 4G services.

9.180   Finally, access seekers and DNB also commented on access to other facilities and services, including:

(a)   access to street furniture such as lamps and poles; and

(b)   access to dark fibre for 5G backhaul.

9.181   The MCMC's views in respect of these facilities and services is addressed in other sections of this PI Paper. Those views are not repeated in this section.

MCMC Assessment

9.182   The MCMC's analysis in line with the five key regulatory principles outlined in 9.34, and where relevant the MCMC's responses to the operator submissions summarised above, are set out below.

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[26] International Telecommunication Union, 'Setting the Scene for 5G: Opportunities & Challenges' (2018).

Supply of 5G services and potential impediments to supply

9.183   The MCMC acknowledges the wide range of 5G services being planned for deployment by operators, a vibrancy which reflects the transformational nature of 5G networks. Broadly, the MCMC understands that 5G services will be supplied across three main categories / applications – eMBB, uRLLC and mMTC, as described in paragraph 9.36.

9.184   As discussed above in the context of the MCMC's regulatory principles for 5G access regulation, the MCMC's preliminary view is that any regulated 5G service must be sufficiently broad so as to permit the supply of at least these types of services to enterprise and retail customers by MNOs and MVNOs. Further, the MCMC expects that further services will be developed and offered by access seekers over time, as 5G technology evolves and as DNB's network and the networks of access seekers expand. As has been the MCMC's practice in previous reviews of the Access List, the MCMC will accordingly also consider how best to describe 5G wholesale services so that they are capable of supporting these future applications to the extent possible, particularly for 5G services which have not yet been launched.

9.185   Further, the MCMC will adopt an open access approach to selecting 5G access. It is not the MCMC's mandate to pick which of these services is likely to be the most prevalent or subject to the greatest market demand. Rather, the MCMC is concerned to ensure that the service description(s) for 5G wholesale services do not preclude the supply of one or more of these downstream services, whether at launch or in future.

9.186   Regardless of the breadth of any 5G service description, given the nascency of 5G services and the ambitious rollout plan, there may be a need to incrementally adjust any Access List service description over time. While the MCMC is open to a more frequent or out-of-cycle review of 5G services if required to address any competition or access issues observed in the market, the MCMC remains reliant on information received from industry participants in order to respond to these issues, whether through regulatory instruments or other intervention. Accordingly, the MCMC encourages operators to notify the MCMC of any issues experienced in accessing 5G services as DNB rolls out its network.

9.187   The above open access approach to 5G access was generally supported by access seekers and DNB, who each requested that the 5G service be sufficiently broad to permit this wide variety of use cases.

9.188   Access seekers also commented on several potential issues relating to the acquisition of 5G wholesale services, which may create impediments in accessing these services. The key issues emerging from these submissions are:

(a)   performance / QoS issues; and

(b)   inter-operability with existing 4G infrastructure.

9.189   The MCMC acknowledges that guaranteeing the performance and QoS of 5G services will be critical in unlocking the potential benefits of 5G services, which primarily relate to greater bandwidth, lower latency and higher reliability. It

follows that access regulation should seek to ensure that services are supplied with at least minimum key technical capabilities in order to encourage the efficient use of 5G infrastructure and to promote the LTBE. If DNB were to build a 5G network that did not meet key technical capabilities inherent in unlocking 5G capabilities, DNB's enormous investment in its network would be inefficient, be inadequate for access seekers, and ultimately prevent Malaysians from enjoying the benefits of 5G services.

9.190   As operators are aware and as the MCMC notes above, there are three key instruments available to the MCMC to ensure performance standards in respect of facilities and services, being the Access List, MSA and MS QoS.

9.191   The MCMC will separately consider what technical parameters or capabilities should be set out in the MS QoS and MSA in the course of later reviews and inquiries relating to those instruments, as applicable. This will include any technical considerations such as interference and attenuation issues identified by operators. Accordingly, the MCMC's current review is concerned primarily with what technical elements are so inherent to the supply of 5G wholesale services that they should be listed in the functional description of 5G services in the Access List as key **capabilities**, to ensure the applicability of the SAOs to those elements of the service. The MCMC refers to its discussion regarding these capabilities in paragraphs 9.216 to 9.233 below regarding the service description for the 5G wholesale services.

9.192   The MCMC also acknowledges that the inter-operability of DNB's network with MNO network will be a critical component of access to 5G services, particularly in respect of 4G infrastructure (other than in a SA architecture). The MCMC understands that where DNB does not supply a 5GC, integration will be required between DNB's gNodeB and each access seeker's EPC, whether through the use of anchor technology or otherwise. This is also consistent with DNB's submissions regarding the models under which it will supply access to 5G services, although the MCMC notes that access seekers did not provide details regarding their specific requirements for inter-operability.

9.193   As to other inter-operability requirements, the MCMC notes that subsection 5.3.7 of the MSA currently requires access providers to provide to access seekers all technical information requested by the access seeker, including physical and logical interfaces of the access provider's network necessary to allow interconnection and interoperability with the access provider's network. The MCMC will consider this obligation and any additional requirements that should apply to 5G services in the context of its later MSA review in 2022.

9.194   It is also the MCMC's expectation that DNB's RAO (which is subject to the MCMC's approval) will contain further information regarding (and enabling) more seamless integration between MNOs' 4G/LTE networks and DNB's 5G network. However, the MCMC is interested to hear from access seekers regarding any further information and details they require for inter-operability, so that the MCMC can take these into account in its consideration of DNB's RAO and in its future review of the MSA.

5G network architectures: 5G SA and 4G EPC with 5G RAN

9.195 Consistent with the MCMC's key regulatory principle of an open access approach to selecting 5G access, the MCMC's preliminary view is that the Access List should cover both an SA architecture and 4G EPC with 5G RAN, so that over time, as DNB's 5G SA network is rolled out, the SAOs would apply to mandate the supply of access to that network on equitable and non-discriminatory terms, without the MCMC choosing which architecture is best supplied by DNB or most desirable for access seekers and at what time.

9.196 Importantly, the SAOs do not require access providers to build new facilities or services, and it is not within the MCMC's power to require operators to do so by means of the Access List. Rather, the Access List requires access providers to supply access to *existing* facilities and services. Accordingly, the MCMC cannot mandate that DNB build a 5G SA network in order to make 5G SA access available before DNB has built the required infrastructure to enable such access. However, the MCMC considers it beneficial to cover 5G SA access on the Access List at this time for the following reasons:

(a) as per the MCMC's regulatory focus on future-proofing service descriptions, the Access List is intended to take a forward-looking view, to ensure it is sufficiently flexible and capable of responding to industry and technological changes in the near-to medium-term;

(b) DNB may elect from time to time to trial 5G services in certain areas, e.g. enterprise or educational campuses, and in those circumstances, access arrangements should be subject to regulation and the application of the SAOs, to promote downstream competition in the supply of retail and enterprise services in these areas; and

(c) again, the MCMC's open access approach to 5G access means that it is not the MCMC's role to select the deployment model most likely to succeed, whether over any particular time period or at all.

9.197 From an investment perspective, this balanced approach to 5G regulation will allow DNB to earn a reasonable return on its investment by supplying access to its 5G RAN for integration with 4G EPCs, which would in turn give DNB the required capital to invest in its 5G SA architecture. The MCMC refers in this regard to DNB's plan to first deploy its 5G network in major cities being Kuala Lumpur, Putrajaya and Cyberjaya, with a phased approach during the remainder of the rollout,

9.198 This approach is also supported by the relative 5G SA readiness of operators. The MCMC's preliminary understanding is that most access seekers will seek to supply eMBB and FWA services at launch, and to supply over time 5G services which are more reliant on 5G SA architecture, such as uRLLC and mMTC. The prevalence of these services would increase in line with device readiness and development of 5G standards, as noted by Digi in its submission.

9.199 Over time, as DNB's rollout accelerates and its coverage increases, the MCMC expects that so too would demand for access to DNB's 5G SA service increase.

9.200   As DNB's network is built, the MCMC considers that DNB should provide access to both 5G SA services and 5G RAN for integration with 4G EPCs on a national basis, in line with its installation of infrastructure enabling the supply of these services. The MCMC also refers in this regard to DNB's proposal to pair 700MHz with 3.5GHz band spectrum via carrier aggregation to expand its coverage.

9.201   Given the above, the MCMC does not agree with TM's view that, given the limitations of 5G NSA, DNB should invest solely in a 5G SA architecture. It is not for the MCMC to select what model of access should be supplied by DNB, and in any event, the MCMC notes that:

    (a)   deployment under a model where DNB allows MNOs to integrate their 4G EPCs with DNB's 5G RAN would encourage the efficient use of existing 4G/LTE infrastructure, preventing unnecessary duplication of this infrastructure while 4G/LTE networks remain ubiquitous and promoting the LTBE;

    (b)   although an increasing number of end user devices may be 5G-ready as noted by TM and other operators, the MCMC considers that 5G SA and 4G EPC with 5G RAN will co-exist for some time as challenges relating to 5G SA, including standards, devices and SIM requirements are addressed over time. This means that, while the MCMC will take a forward-looking approach to regulation, it would be myopic if the MCMC were to at the same time overlook the immediate to short-term impacts of regulation; and

    (c)   it is unclear at this juncture if there is widespread demand for services reliant on 5G SA, such as uRLLC and mMTC. Absent any such demand, it would be less efficient for DNB to roll out 5G SA from launch, as DNB would experience delays in obtaining a reasonable return on its investment, which could limit its ability to respond to market developments and adversely affect its ambitious rollout targets more generally.

9.202   The MCMC's views regarding the potential models of regulated access under SA and 4G EPC with 5G RAN architectures are discussed below.

5G wholesale access models

9.203   In furtherance of the MCMC's open access approach to 5G access, the MCMC considers that the 5G service description should support as many models of 5G access that are capable of being supplied by DNB, to enable a menu-style approach to access for access seekers, subject to the overarching principle of ensuring regulation is in the LTBE. Accordingly, the MCMC proposes to apply to the service description the same regulatory principle that it has applied in its analysis of 5G SA and 5G RAN-only (with 4G EPC integration) deployments, being that the MCMC is not regulating in order to pick the best service that access providers should supply (or access seekers should acquire).

9.204   The MCMC's preliminary view is that a MOCN model of network sharing is preferable where DNB is supplying access only to its 5G RAN for integration with 4G EPCs, and an MVNO-type service is preferable in an SA architecture. In

addition, the MCMC's preliminary view is that DNB should deploy both 5G RAN and 5GC, rather than MNOs deploying and using their own 5GC even in an SA architecture.

9.205   The MCMC takes note of DNB's plan, under which there will be two models of 5G access available in Malaysia:

(a)   MOCN NSA with MNO EPC; and

(b)   MVNO-type access, in a 5G SA architecture where DNB deploys 5G RAN and 5GC.

9.206   As noted above, the MCMC disagrees with the model of MOCN SA with MNO 5GC and would like to reiterate that DNB should deploy both 5G RAN and 5GC, with MNOs free to acquire from DNB an MVNO-type service under an SA architecture.

9.207   In particular, the MCMC considers that allowing MNOs to vend-in their own 5GCs and integrating with DNB's 5G RAN will lead to an unnecessary duplication of infrastructure, which would be contrary to the LTBE. It may also harm DNB's investment incentives, as existing MNOs would be able to roll out 5GC networks more rapidly than DNB (at least in the short term), meaning DNB would have less incentive to build out 5GC networks in those areas where MNOs have already deployed their own 5GC networks. This would limit DNB's ability to supply an end-to-end MVNO-type 5G SA service to access seekers who do not have their own 5GC, and more generally would also undermine the efficiencies arising from DNB's establishment as a single wholesale network provider.

9.208   In considering access to 5G RAN for integration with 4G EPCs, the MCMC notes that MOCN arrangements have become increasingly prevalent in international network sharing arrangements. In 2018, ITU noted the existence of 14 MOCN joint ventures between MNOs, a figure predicted to increase over time as spectrum resources become increasingly scarce.[27] Although more technically complex than more "passive" forms of infrastructure sharing such as site sharing, MOCN arrangements provide several benefits, including:

(a)   greater cost-saving potential arising from active sharing of RAN elements such as base stations and backhaul;

(b)   homogenous access to pooled spectrum; and

(c)   greater potential for new market entrants who can use any spare capacity (as such capacity will be available to be shared with those new entrants).

9.209   The MCMC acknowledges that it has not previously regulated MOCN arrangements in Malaysia, and has typically allowed MNOs to enter into such arrangements on a commercial basis. However, the conditions under which MOCN arrangements will be entered into in relation to 5G networks are vastly different to MOCN arrangements under legacy networks, given DNB will have a monopoly over 5G wholesale services.

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[27] ITU, 'ICT and Broadcasting Infrastructure Sharing Guidelines' (2018).

9.210   For these reasons, the MCMC rejects submissions that MVNO-type access (in areas where DNB builds its own 5GC) should not be permitted. Over time, as DNB's 5GC network is built out, access seekers may increasingly look to acquire an end-to-end service from DNB, given the required national coverage of DNB's 5G network, and the MCMC should not choose a single model of supply that it considers "best". The MCMC notes that:

(a)   it is not within the MCMC's authority to prefer one particular access arrangement or form of competition over another; and

(b)   given DNB plans to supply services on the basis of such arrangements, that supply should be regulated under the Access List to promote the LTBE and ensure that DNB, a monopoly provider, is subject to appropriate regulatory constraints and obligations, including the SAOs under section 149 of the CMA.

9.211   On the other hand, it must be acknowledged that the open access approach to regulation has some natural limitations if it is to be correctly applied. In particular, the MCMC does not consider that MORAN arrangements should form part of the 5G wholesale service description, because:

(a)   as noted in paragraph 9.20 above, in Malaysia, 5G spectrum will be controlled solely by DNB, meaning a traditional MORAN model – under which MNOs each control their own spectrum – is not possible;

(b)   accordingly, the only way a MORAN model could be deployed in Malaysia is if DNB were required to allocate specific spectrum bands to MNOs for their dedicated use, simulating a traditional MORAN model in which each MNO controls its own spectrum. However:

(i)   this would be inconsistent with government policy regarding the use to which 5G spectrum may be put, i.e. that DNB must solely control the 5G spectrum allocated to it;

(ii)   even if it were not inconsistent with government policy, it would create complexities from a regulatory perspective. First, each MNO's spectrum requirements are likely to differ from other MNOs, which means the initial sub-allocation of spectrum would not be straightforward. Further, and any market changes e.g. any consolidation of MNOs or the emergence of new entrants, would lead to complications in the future management of this spectrum, which could lead to unforeseen consequences; and

(iii)   finally, DNB's business plan contemplates that DNB will allocate resources dynamically, based on real-time usage. Accordingly, the MCMC considers that there are effective controls in place to ensure a positive end user experience and minimal congestion across DNB's 5G network even under a MOCN model in which DNB controls all 5G spectrum.

9.212 The MCMC notes that its open access approach is relevant only to the extent the MCMC adopts this principle to specify the breadth of **technically feasible** services that may be supplied by an access provider such as DNB. Over time, as DNB's 5GC network is built out, access seekers may look to acquire an end-to-end service from DNB, given the required national coverage of DNB's 5GC network – at which point, it will be technically feasible for DNB to supply that service.

9.213 The MCMC's preliminary view is accordingly that MOCN arrangements for 5G RAN access (with 4G EPC integration) should be covered by listing this 5G wholesale service on the Access List. The MCMC is open to considering views from operators regarding whether MOCN arrangements themselves should be defined, noting that the Access List has typically focused on a functional description of services.

9.214 At this stage, the MCMC considers that these arrangements can be described by reference to the function of the service, i.e. access to 5G RAN to enable the access seeker to provide MVNO Access, services to enterprise or government customers, and public cellular services or wireless or mobile broadband services to the public, rather than referring specifically to MOCN technology. This will also ensure that the service description remains as broadly drafted as possible, to cover any future innovative business models under which access may be supplied by DNB (which the MCMC considers should remain subject to regulation), and in alignment with the MCMC's regulatory principle of adopting a functional approach to drafting service descriptions.

9.215 The MCMC's preliminary views regarding how 5G services should be described on the Access List are set out below.

Form of regulation

9.216 As noted above, the MCMC considers it would be in the LTBE to list 5G services on the Access List, with regulation having nearly unanimous support across respondents to the MCMC's informal questionnaire. Further, the MCMC considers that 5G services should be listed as a new service, rather than as an amendment to the existing MVNO Access service.

9.217 In the MCMC's view, there are several reasons 5G services in Malaysia cannot be meaningfully regulated under the scope of the MVNO Access Service:

(a) the MVNO Access Service relates specifically to public cellular services supplied by access providers to the public. Given DNB's wholesale-only mandate, the MVNO Access Service would not apply to DNB;

(b) the MVNO Access Service is an end-to-end service which does not involve any integration between access seeker and access provider networks, other than in respect of OSS and BSS systems, depending on whether the access seeker is a "thick" or "thin" MVNO. In contrast, 5G services will involve at least some integration with access seekers' EPCs (other than in a 5G SA architecture);

(c)   several elements of 5G services are unique to 5G and are not common to other mobile technologies. For example, while 3G and LTE services can be functionally described in a similar way under the existing MVNO Access Service, 5G services include features such as network slicing, and there is a greater dependency on certain technical parameters. These important distinctions merit the inclusion of a new service on the Access List, to ensure that – in line with the MCMC's functional approach to service description – the service description for the 5G service is consistent with what is technically feasible for DNB; and

(d)   finally, 5G services are in their nascency from a technology and product development perspective, both in Malaysia and internationally. Accordingly, the MCMC's view is that any regulation should take a fresh building block approach, rather than attempting to "fit" 5G services into existing models, which may lead to unintended consequences over time and would be inconsistent with the MCMC's forward-looking approach to access regulation.

9.218   Given the above, the MCMC reiterates that 5G services should not be listed under the existing MVNO Access Service, although the MCMC acknowledges that the MVNO Access Service provides a useful starting point for a 5G service description.

9.219   As noted above, the MCMC considers that the 5G service description should be functionally described, allowing a balanced approach that allows access seekers to choose what they would like to acquire from DNB. In particular, the MCMC proposes that:

(a)   from an Access List perspective, a broad and functional service description should be adopted to ensure that regulation does not restrict DNB's service in a manner which inhibits innovation; but

(b)   given the importance of service performance in unlocking the benefits of 5G services, other regulatory instruments such as the MSA and MS QoS should be used to set out any technical parameters which go beyond the basic functional description of these 5G services.

9.220   In taking this approach, the MCMC reiterates that the Access List is not intended to be a technical document. Rather, its purpose is to *functionally* describe regulated services, with other instruments such as the MSA and MS QoS governing elements such as technical standards, POI locations and other similar details. This is consistent with the MSA's approach to access regulation in respect of other services on the Access List. While there may be certain critical technical elements of 5G services which should be listed in the Access List service description – as is the case with HSBB Network Services – the MCMC does not propose to list all such elements in the Access List.

9.221   In any event, DNB has committed to building a network that is compliant with 3GPP standards and the MCMC proposes that this should be used to frame the nature of the 5G services to be supplied by DNB under the Access List, without repeating the 3GPP standards in the Access List itself.

9.222 There are several challenges and considerations which the MCMC must navigate in taking the balanced approach described above. In particular:

(a) the use cases and technical parameters for 5G services are at a very nascent stage. This is distinguished from other services on the Access List such as high-speed broadband services and other mobile services, which are, relatively, at a significantly advanced state of maturity. Accordingly, the MCMC needs to ensure that the service description accounts for any future developments and changes in the supply of 5G services, the nature of which are as yet unknown;

(b) access regulation of 5G services will precede commercial launch, meaning the MCMC will not have sufficient real-world information regarding any access issues experienced by operators in accessing these services. Rather, the MCMC must pre-empt any such issues to the extent they are relevant to the Access List; and

(c) as DNB will be the sole access provider for wholesale 5G services, there will be no other access providers from whom access seekers can acquire these services and hence, there is no competitive constraint on DNB. The MCMC is accordingly concerned to ensure that access regulation does not permit DNB to argue that any of its services are beyond the scope of access regulation due to, say, a technical inconsistency with the service description. This reflects the general principle that, in the absence of access regulation, a monopoly provider like DNB would not have sufficient commercial incentives to supply its services on equitable and non-discriminatory terms and without increasing its prices at will.

9.223 At this stage, the MCMC's preliminary view based on the information available to it is that the 5G service description must, at a minimum, address the following elements of 5G services (based on the relevant network architecture) and, in each case, comply with relevant 3GPP standards:

(a) **SA model of access**

(i) permit access seekers to acquire only those elements of the 5G service selected by the Access Seeker, e.g. an MNO should not be forced to acquire customer billing and customer relationship management functions if it does not require these functions;

(ii) support for private networks for enterprise or government Customers;

(iii) provision of such facilities and services as may be selected by the access seeker, including the following examples:

(A) Network Slice Selection Function (**NSSF**), allowing the selection of at least mobile broadband, massive IoT and mission-critical 5G network slices;

<table>
<tr><td>(B)</td><td>Unified Data Management (**UDM**), providing authentication and user identification functions similar to the Home Location Register for 4G/LTE;</td></tr>
<tr><td>(C)</td><td>Unified Data Repository (**UDR**), providing a distributed and centralised data repository for subscription and policy data across mobile networks;</td></tr>
<tr><td>(D)</td><td>Network Exposure Function (**NEF**);</td></tr>
<tr><td>(E)</td><td>Mobile Edge Computing (**MEC**);</td></tr>
<tr><td>(F)</td><td>Security-related functions such as Security Anchor Function (**SEAF**) and Authentication Server Function (**AUSF**); and</td></tr>
<tr><td>(G)</td><td>other elements common with the existing MVNO Access Service, such as value-added service platforms (including IP-Multimedia Subsystem), customer billing and customer relationship management; and</td></tr>
</table>

(iv)   all technical parameters and capabilities as required to enable the access seeker to supply <u>any</u> 5G services, including eMBB, mMTC and uRLLC; and

(b)   **4G EPC with 5G RAN model of access**

(i)   support for private networks for enterprise or government Customers;

(ii)   integration between DNB 5GC and access seeker EPC; and

(iii)   all technical parameters and capabilities as required to enable the access seeker to supply 5G services focusing on eMBB-type services, including FWA, telehealth and VR/AR content, and tele-learning platforms and systems.

9.224   In formulating a service description based on the above minimum features, the MCMC notes again that its purpose in access regulation is not to exhaustively describe a service. For instance, the MCMC notes that there are many other features with which 5G services may be supplied, such as Security Edge Protection Proxy (**SEPP**), Subscription Identifier De-Concealing Function (**SIDF**) and Authentication Credential Repository and Processing Function (**ARPF**). In omitting these features from the examples to be included in the draft Access List service description for 5G services, the MCMC does not intend that these features will not be subject to access regulation. Rather, as was the MCMC's approach for the MVNO Access Service, the MCMC considers that access seekers should be free to choose such features and services over the 5G network that they elect to acquire.

9.225 Given the distinctions between each model of access, the MCMC's preliminary view is that two services should be listed on the Access List:

(a) a 5G Standalone Access service, allowing access seekers to acquire an end-to-end "thick" MVNO-type access to wholesale 5G services; and

(b) a 4G EPC with 5G RAN Access service based on a MOCN model, involving require integration between DNB's gNodeB and an access seeker's EPC, using upgraded eNodeBs as an anchor technology.

9.226 The services above also align with DNB's submissions regarding the services it will supply, with the exception of MOCN in an SA architecture (which the MCMC considers would not be in the LTBE, as noted in paragraphs 9.206 and 9.207 above):

(a) 5G SA, using DNB's 5GC; and

(b) MOCN NSA, with shared 5G spectrum and using 4G spectrum as an anchor layer.

9.227 There was general industry consensus that 5G access should be regulated. However, the MCMC's proposed approach to the service description as outlined above lies on the balance of a divergence of views between access seekers and DNB as to the appropriate scope and nature of 5G regulation.

9.228 In particular, on one hand, access seekers generally commented that technical parameters should be clearly specified for 5G services, given the importance of QoS in 5G use cases, with nearly unanimous support for access to network slicing functions in particular. Many access seekers did not express firm views regarding whether these technical parameters should be set out in the Access List or in the MSA, although Maxis submitted that there is a need for a "comprehensive and complete service description" that includes technical parameters and other elements such as network demarcation and POI access, including compliance with relevant 3GPP standards.

9.229 On the other hand, DNB requested that the MCMC adopt a "light-touch" regulatory approach with broad service descriptions so as not to restrict DNB's service offerings and deter innovation.

9.230 The MCMC has chosen to adopt a more balanced approach that focuses not only on a functional service description, but on future-proofing the service to account for future developments and technological improvements, including from a standards compliance perspective. In taking this approach, the MCMC has drafted a dynamic service description that does not unduly burden DNB at launch by setting out overly prescriptive technical specifications, while at the same time ensuring the service description is responsive to changes in 5G access and technology over time.

9.231 The other key element of 5G access regulation raised by access seekers is the scope of access seekers who may access 5G wholesale services supplied by DNB. The MCMC refers in this regard to its key regulatory principle of ensuring open

access to Access List services and facilities to all licensees, and notes in particular that:

(a) in the initial stages of DNB's 5G rollout, DNB will primarily be providing 5G RAN elements, primarily involving integration with MNOs' EPCs (via MOCN). These will be the prevalent modes of access to 5G services and accordingly, only MNOs will have the physical infrastructure (i.e. core networks) required to enable access to these services. By extension, it follows that traditional MVNOs will need to access 5G services through MNOs, in line with the approach for 4G/LTE and earlier mobile technologies;

(b) over time, as DNB builds its own 5GC, MVNOs who elect to acquire end-to-end access directly from DNB should be free to do so. The MCMC notes that this would:

(i) ensure efficient use of, and investment in, DNB's infrastructure, given the MCMC's expectation that DNB will build 5GC capability on a national level over time;

(ii) encourage MNOs to design and provide innovative offerings to the MVNO market to differentiate their MVNO services from those offered by DNB, e.g. through use of superior customer billing or customer relationship management platforms, or additional features and elements, which would ultimately promote the LTBE; and

(iii) provide a competitive constraint on MNOs in a potential market consolidation scenario where the number of MNOs in the Malaysian market is reduced; and

(c) in any event, the MCMC does not have the authority under the CMA to limit access to facilities and services listed on the Access List to any particular type of licensee. Rather, section 149 of the CMA requires that facilities and services on the Access List must be provided to any network facilities provider, network service provider, applications service provider or content applications service provider who requests access to such facility or service.

9.232 Accordingly, the MCMC does not intend, and does not consider that it has the authority to, artificially limit access to wholesale 5G services only to MNOs, though as a practical matter, given the greater prevalence of 4G EPC with 5G RAN access in the initial phases of DNB's 5G rollout, it is likely that only MNOs will be capable of accessing such services. The MCMC is also not persuaded that the uniqueness of the DNB supply model merits such an approach, as it would be squarely at odds with the CMA and the key regulatory principle of equal access to all licensees that the MCMC has adopted in respect of all other facilities and services listed on the Access List.

9.233 Finally, the MCMC acknowledges Maxis's view that all access regulation for 5G services (including Access List, MSA and MSAP) should be completed prior to the launch of 5G services. The proposed timeframe for the MCMC's Access List

inquiry, which has been previously communicated to operators, is set out in Annexure 2. The MCMC notes that even though commercial launch of 5G services will precede the determination of the MSA and MSAP (which will be the subject of a later inquiry in 2022), the MCMC will continue to exercise close regulatory oversight over DNB until then, including:

(a)   reviewing and approving DNB's RAO, which the MCMC expects will set out terms substantially in accordance with the MSA;

(b)   engaging proactively with DNB and operators to ensure alignment between DNB, access seekers and the MCMC as to their requirements to facilitate commercial launch by December 2021; and

(c)   resolving as usual any complaints regarding access issues that are unable to be addressed at a commercial level, pursuant to section 69 of the CMA.

Price and non-price terms and conditions of access

9.234   The MCMC thanks operators for their submissions on pricing. As noted in its informal questionnaire, the MCMC was and remains interested to understand industry views regarding pricing, as these may be relevant to the MCMC's consideration of regulatory settings for 5G more generally. The MCMC will invite further and more detailed submissions on pricing at a later stage, in connection with a future review of the MSAP.

9.235   Similarly, in respect of submissions on non-price terms and conditions, the MCMC considers it helpful to have reviewed these submissions at this early stage to guide the MCMC's general approach to access regulation. For example, the MCMC notes that some non-price terms, e.g. QoS, may be set out in the service description for 5G services in the Access List, as has been the MCMC's approach with other services e.g. HSBB Network Services.

9.236   The MCMC will invite industry participants to provide further submissions on the amendments required to the MSA in respect of 5G services ahead of its MSA inquiry in 2022.

Other facilities and services required for 5G services

9.237   Most operators submitted that access to data centres should be listed in the Access List, with several operators submitting that the cross connect charges imposed by some data centre providers is too high.

9.238   Malaysia's data centre market was estimated at RM900 million in 2018, but this is poised to increase as 5G networks are deployed.[28] In particular, significantly greater volumes of data will traverse 5G networks compared to legacy technologies, and the MCMC understands that the capability for mobile edge computing in 5G networks is expected to require the establishment of localised data centres, to bring data closer to end users.

9.239   It is clear that data centres in Malaysia will play a critical role in unlocking the benefits of not only 5G, but the digital economy more generally. This is reflected

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[28] U.S. Department of Commerce, 'Malaysia – Information Technology' (2019).

in the Government's MyDigital Plan, which sets out a key objective to boost the capabilities of domestic data centre companies to provide high-end cloud computing services, with local data centre industry revenue expected to achieve a target of RM3.6 billion by 2025.[29] Further, the Government has set out its own target of achieving 80% usage of cloud storage across government by 2022.

9.240   The MCMC notes the general consensus regarding the preference for access to data centre services to be regulated on the Access List to resolve impediments such as high cross connect charges. The MCMC would like to invite further detailed feedback on this matter.

9.241   Access seekers and DNB each provided submissions in respect of the following facilities and services:

(a)   access to street furniture, particularly infrastructure owned by public utility companies, state governments and local councils;

(b)   navigating planning and approval requirements; and

(c)   access to dark fibre.

9.242   In relation to street furniture, MCMC refers to its discussion in paragraphs 10.42 to 10.54 regarding proposed expansions to the scope of the Infrastructure Sharing Service. In addition, MCMC would like to clarify that a technical code was developed specifically for street furniture.[30] Since 2020, the MCMC and Malaysian Technical Standards Forum Berhad, have also worked on developing Minor Communications Infrastructure Guideline and Technical Code to address minor communication infrastructure such as 5G antenna, street furniture and other structure. Amongst others, the Guideline aims to help improve the approval process as well as to reduce the charges imposed to improve current network capacity, to provide concentration in coverage areas, and to prepare the implementation of future technologies such as 5G. While the MCMC agrees with DNB's comment that section 145(2) of the CMA allows access to council-owned or other public infrastructure to be listed under the Access List, the MCMC notes that the SAOs set out under section 149 apply only to licensees.

9.243   The MCMC has coordinated with various ministries, state governments, local councils and public utility companies to address issues related to approval process for site acquisition, fees etc. through various platforms such as Majlis Perancangan Fizikal Negara (**MPFN**), Memorandum Jemaah Menteri (**MJM**), Majlis Mesyuarat Negara Bagi Kerajaan Tempatan (**MNKT**), State Planning Council at State level and many more. As a result, most of the state governments and local authorities have given their commitment to improve their processes, policies and guidelines. At the same time, the MCMC is currently in the midst of developing a Minor Communications Infrastructure Guideline to classify communications infrastructure that can be categorized as small-scale communications infrastructure (such as 5G antenna) as a source of reference for local authorities to ease the infrastructure rollout in their local authorities'

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[29] Economic Planning Unit, Prime Minister's Department, 'Malaysia Digital Economy Blueprint' (2021).
[30] Please refer to Radiocommunications Network Facilities - Street Furniture (MCMC MTSFB TC G026:2020) for further details.

areas. These are ongoing efforts and initiatives engaged by the MCMC, that is apart from and supplement access regulation.

9.244 In relation to edotco's comments, the MCMC understands that the Ministry of Housing and Local Government has issued a new procedure that will be used by local authorities which include improvement of approval process and a new procedure for public protests.[31]

9.245 In relation to TM's submission regarding regulation of spectrum sharing, the MCMC has addressed these issues in paragraphs 9.11 to 9.13 above regarding the distinction between access regulation and spectrum management.

9.246 Some access seekers also commented on potential issues relating to access to other facilities and services listed on the Access List, such as SBC exclusivity, local authority approval processes and land acquisition issues in the context of the Infrastructure Sharing Service. These issues are known to the MCMC from earlier submissions made by operators specifically relating to those other facilities and services. The MCMC's response to those issues is accordingly dealt with in the relevant sections of this PI Paper which relate to those other facilities and services.

9.247 Finally, the MCMC's views in respect of access to dark fibre are set out in paragraphs 13.2145 to 13.244 and are not repeated in this section.

Matters beyond the scope of this review

9.248 Finally, operators also commented on a number of matters which are not relevant to the Access List. However, where relevant the MCMC will take into account these comments, and invite further submissions on these matters, in a later review of the MSA and MSAP (as applicable). Most commonly, access seekers commented on the following:

(a) **Availability of 5G spectrum**

(i) Some access seekers expressed concern regarding the availability of 5G spectrum and the ability to control and guarantee performance standards given the scarcity of 5G spectrum that will be controlled by DNB.

(ii) The MCMC considers that how DNB chooses to manage the 5G spectrum that has been allocated to it is largely a matter for DNB to manage in accordance with the relevant spectrum regulations or instruments and its own business plans. Provided DNB supplies in accordance with the SAOs any regulated 5G access service that the MCMC's determines to list on the Access List, the MCMC does not consider that any access regulation is required to address the way DNB manages its spectrum in order to enable such supply. For completeness, the MCMC reminds operators that only DNB may use spectrum for 5G services; existing spectrum allocated to MNOs may not be used for 5G services, whether for carrier

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[31] Please refer to Pekeliling KSU KPKT Bil.3-2021 - Prosedur Permohonan Pemajuan Menara atau Struktur Komunikasi dated 18 June 2021 for further details.

aggregation and traffic load balancing (as suggested by Maxis) or otherwise.

(iii)   In any event, as the MCMC has noted in the past, it would be inappropriate to use access regulation as a vehicle to address spectrum planning and scarcity issues, given it would conflict with the MCMC's existing spectrum management regime, and accordingly the MCMC does not propose to include access to spectrum as a regulated facility or service under the Access List.

(iv)   Further, the MCMC notes again that it will consider QoS and performance requirements with which DNB must comply, including minimum technical capabilities for the Access List, MSA and MS QoS as appropriate. Accordingly, it is ultimately a matter for DNB to decide how best to use its allocated spectrum to ensure that it is capable of meeting these mandated technical requirements. It is these requirements which will most greatly affect the quality of the services acquired by access seekers and accordingly their ability to meet market demand for various 5G use cases.

(v)   Nevertheless, the MCMC is interested to understand from access seekers how they consider DNB should manage its spectrum resources, noting that if a MOCN model is used, MNOs will not have any dedicated spectrum for their own use.

(b)   **DNB business model, service coverage and rollout timeline**

(i)   The MCMC notes the current obligation on access providers of HSBB Network Services to provide implementation plans, and takes the preliminary view that 5G network rollout and coverage information in the approved detailed business plan should also be made available by DNB, with the details of such an obligation to be subject to a later public inquiry by the MCMC on the MSA.

(ii)   As to DNB's substantive rollout obligations, the MCMC notes that the terms of DNB's network facilities licence requires DNB to provide and comply with a detailed business plan to be approved by the MCMC. As such, the MCMC would like to emphasise that details of phased deployments and coverage areas provided by DNB in paragraphs 9.53 and 9.54 are indicative only and are subject to change depending on the finalisation of DNB's DBP with the MCMC. The MCMC expects that DNB's detailed business plan will also set out deployment timeframes and commitments, but DNB must also deploy its network at any areas identified by the MCMC within the timelines specified by the MCMC.

(iii)   The MCMC encourages operators to provide any information regarding their anticipated or desired timeframes for 5G rollout in each region, either in connection with this inquiry or generally, to assist the MCMC in its assessment of DNB's detailed business plan or for the purposes of any further directions to DNB.

(c)   **Security and resiliency**. Again, the MSA currently sets out terms relating to these matters, and the MCMC will consider these in the context of 5G services in a later review of the MSA. Further, the MCMC notes that DNB's licence conditions require it to take several measures in respect of data integrity, redundancy and diversity, and network security.

(d)   **Non-discriminatory access**. While section 149(2) of the CMA sets out a requirement for access to be provided on equitable and non-discriminatory terms, the MSA sets out further details regarding compliance with this requirement.

MCMC Preliminary View

9.249   The MCMC's preliminary view is that it would be in the LTBE for 5G New Radio services to be listed on the Access List.

9.250   As noted in paragraph 9.33 above, the MCMC considers that the form of regulation of 5G New Radio services should start with the MCMC's objectives to promote the LTBE, including by promoting competition in the supply of downstream services and encouraging investment by DNB in its 5G network and MNOs in mobile infrastructure, particularly in the context of DNB's monopoly. However, any regulation must also have regard to the other key regulatory principles that the MCMC has adopted for 5G access regulation, as per the MCMC's discussion in paragraph 9.34.

9.251   With those regulatory principles in mind, the MCMC proposes to list the following new services on the Access List:

(a)   5G Standalone Access, for supply under a SA architecture; and

(b)   4G EPC with 5G RAN Access.

9.252   For clarity, any proposed amendments to the Access List to cover architectures are not intended to be substitutable; the MCMC intends that both models of supply should be covered in the Access List.

5G Standalone Access

(a)   5G Standalone Access is a Facility and/or Service for access to a 5G New Radio Mobile Network, for the purpose of the Access Seeker providing:

(i)   MVNO Access;

(ii)   services to enterprise or government Customers;

(iii)   public cellular services to the public; or

(iv)   wireless or mobile broadband services to the public.

(b)   5G Standalone Access may include access to the Facilities and Services used by the Access Seeker to provide one or more of voice, data and application services, as selected by the Access Seeker.

(c)   Examples of Facilities and Services to which the Access Seeker may request access includes but is not limited to:

(i)   radio network, including gNodeB;

(ii)   Network Slice Selection Function ("NSSF") and 5G Network Slices as selected by the Access Seeker;

(iii)   Unified Data Management ("UDM");

(iv)   Unified Data Repository ("UDR");

(v)   Network Exposure Function or ("NEF");

(vi)   Mobile Edge Computing ("MEC");

(vii)   Network Function Virtualisation ("NFV")

(viii) security-related functions, such as Security Anchor Function ("SEAF") and Authentication Server Function ("AUSF");

(ix)   value-added service platforms (such as its IP-Multimedia Subsystem, Short Message Service Centre, Multimedia Service Centre and Voicemail Server);

(x)   customer billing; and

(xi)   customer relationship management.

(d)   The 5G Standalone Service shall be supplied to the Access Seeker in compliance with 3GPP Release 15 and any updates to that standard from time to time, and with all technical capabilities, as may be required to enable the Access Seeker to provide the following types of services, as selected by the Access Seeker:

5G Network slice (as selected by Access Seeker)	Required minimum technical capabilities	Supported service types
Mobile Broadband	User plane latency: 4 ms one-way (downlink and uplink) Control plane latency: 10 ms Peak data rate: 20Gbps (downlink) and 10Gbps (uplink) Support user data rates of 100Mbps (downlink) and 50Mbps (uplink) Such superior or other technical capabilities specified by the Access Provider for Mobile Broadband services from time to time	Enhanced mobile broadband, fixed wireless access, telehealth, VR/AR content, tele-learning platforms and systems and other 5G New Radio services supplied or to be supplied by the Access Seeker
Massive IoT	Connection density: support for 1,000,000 devices per km^2 Such superior or other technical capabilities specified by the Access Provider for Massive IoT services from time to time	Machine-to-machine communications, connected energy, smart cities, manufacturing and retail and other 5G New Radio services supplied or to be supplied by the Access Seeker
Mission-critical	User plane latency: 1 ms one-way (downlink and uplink) Control plane latency: 10 ms Reliability: 99.999% success rate	Ultra-reliable low latency services, remote surgery, autonomous vehicles and other 5G New Radio services supplied or to be supplied by the Access Seeker

5G Network slice (as selected by Access Seeker)	Required minimum technical capabilities	Supported service types
	Such superior or other technical capabilities specified by the Access Provider for Mission-critical services from time to time	

4G EPC with 5G RAN Access

(a)   4G EPC with 5G RAN Access is a Facility and/or Service for access to a 5G New Radio radio network, for the purpose of the Access Seeker providing:

(i)   MVNO Access;

(ii)   services to enterprise or government Customers;

(iii)   public cellular services to the public; or

(iv)   wireless or mobile broadband services to the public.

(b)   4G EPC with 5G RAN Access may include access to the Facilities and Services used by the Access Seeker to provide one or more of voice, data and application services, as selected by the Access Seeker.

(c)   The functionalities of 4G EPC with 5G RAN Access include:

(i)   integration between the Access Provider's gNodeB and the Access Seeker's Evolved Packet Core ("EPC"), whether using anchor technology or otherwise; and

(ii)   support for 3GPP Release 15 Options 3, 3a and 3x, including E-UTRA New Radio Dual Connectivity ("EN-DC") and any updates to that standard from time to time.

(d)   4G EPC with 5G RAN Access shall be supplied to the Access Seeker in compliance with 3GPP Release 15 and any updates to that standard from time to time, and with all technical capabilities as may be required to enable the Access Seeker to provide the following types of services, as selected by the Access Seeker:

Minimum technical capabilities	Supported service types
User plane latency: 4 ms one-way (downlink and uplink) Control plane latency: 20 ms Peak data rate: 20Gbps (downlink) and 10Gbps (uplink) Support user data rates of 100Mbps (downlink) and 50Mbps (uplink) Such superior or other technical capabilities specified by the Access Provider from time to time	Enhanced mobile broadband, fixed wireless access, telehealth, VR/AR content, tele-learning platforms and systems and other services supplied or to be supplied by the Access Seeker

9.253   The MCMC also proposes to insert a new definition for "5G Network Slice" in paragraph 3 of the Access List:

"5G Network Slice" means, in respect of a 5G New Radio core, a virtualised network or network partition used by the Access Provider to support a particular type of service, use case, application, customer or other purpose, and includes the following:

(a)   Mobile broadband;

(b)   Massive IoT; and

(c)   Mission-critical.

Questions

Question 21: Do you agree with the MCMC's regulatory principles for 5G access regulation as outlined in paragraphs 9.33 and 9.34 above? Please provide details, including whether you consider any other factors should be relevant to the MCMC's regulatory analysis.

Question 22: Do you have any comments on the proposed draft service descriptions for the 5G Standalone Access service and 4G EPC with 5G RAN Access service? Please provide details, including any key elements of the service that should be included in, or removed from, either or both service descriptions.

Question 23: Will the 5G Standalone Access service and 4G EPC with 5G RAN Access service allow you to supply 5G retail or enterprise services to your Customers? If not, please provide details, including any suggested amendments to enable such supply.

Question 24: Should the service description for 4G EPC with 5G RAN Access refer specifically to MOCN technology, or do the service descriptions allow MOCN arrangements as currently drafted?

Question 25: If both 5G Standalone Access and 4G EPC with 5G RAN Access services were to be listed on the Access List, which service do you plan to acquire and why? If you plan to acquire both services, please provide details including any anticipated timeframes and forecasts.

Question 26: As an access seeker for 5G services, have you deployed, or do you plan to deploy, a 5GC network? If so, should the 5G Standalone Access service include integration between the access provider's RAN and your 5GC network?

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10 Facilities access services

Introduction

10.1   The following facilities and services comprise the family of facilities access services in the Access List:

(a)   Infrastructure Sharing; and

(b)   Duct and Manhole Access.

10.2   In this section, the MCMC will consider each of the above facilities access services in turn.

Infrastructure Sharing

Overview: Access to towers and rooftop space

10.3   Mobile network operators require towers and rooftop space in order to install active equipment that forms part of their radio access network (i.e. enables wireless transmission of traffic to mobile end user devices).

10.4   Towers and rooftop space are generally substitutable with each other, in that they tend to be usable for installing base station equipment in connection with macrocells, which allow network coverage over a wide area. This means the supply of access to these two types of facilities can be treated as providing the same inputs from a competition perspective, with a price increase in respect of tower assets likely to result in access seekers switching to the acquisition of rooftop space in nearby areas where it is available.

10.5   However, the suitability of towers and rooftop space depends on geography and usage density, with towers typically being the preferred form of infrastructure, especially in non-urbanised areas and along highways and busy thoroughfares.[32]

10.6   Further, the MCMC considers, as it has in the past, that poles and street furniture are not substitutable with access to towers and rooftop space given they are used complementarily to improve capacity, throughput and blind spots over a smaller area of coverage. The MCMC accordingly continues to hold the view that access to poles and street furniture should be distinguished from access to towers and rooftop space, as discussed in paragraphs 10.14 to 10.17 below.

10.7   The primary suppliers of towers in the majority of Malaysian states are state-backed companies (**SBCs**), which are generally granted exclusive ownership of tower assets by state governments. This means that access seekers will need to enter into separate access agreements in respect of each state where an SBC is present (which are now the vast majority of states). The SBCs supply access to towers through a Reference Access Offer which provides uniform pricing across each state. This strongly suggests that the dynamics of competition in the supply of these services take place on a state-based level, rather than a local area level or a national level.

Competition/LTBE Analysis: Access to towers and rooftop space

10.8   In the 2015 Access List Review, the MCMC found that the markets for access to towers, mastheads and rooftop space differ across the states. At the time, several operators noted barriers to building tower infrastructure, emphasising the need for continuing regulation of Infrastructure Sharing. The service description of Infrastructure Sharing was amended to include the provision of space at the Associated Tower Site for the access seekers may place its cabin or outdoor equipment, and the definition of "Associated Tower Site".

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[32] MCMC, 'Market Definition Analysis - Definition of Communications Market in Malaysia', 24 September 2014, pp. 114-115 [4.6], https://www.mcmc.gov.my/skmmgovmy/media/General/pdf/Market-definition-analysis-Final_1.pdf.

10.9   The MCMC considers that the state of competition in the supply of access to towers, mastheads and rooftop space has become more complex since the 2015 Access List Review, given the prevalence of SBCs in the provision of tower access in some states. Further, in some states in which the MCMC has licensed SBCs to install and provide tower infrastructure, the relevant state government has furnished monopolistic powers on the state's SBC via state government rulings (or otherwise) (**SBC-Exclusive States**).

10.10   The MCMC takes the preliminary view that barriers to entry to the market for tower and rooftop space access are high, for several reasons:

(a)   new entrants must incur high capital expenditure and endure long return on investment;

(b)   there are less reasons for MNOs to own telecom towers going forward because there are inherent difficulties with procuring a site, and the costs associated (including operating expenditure) are increasing every year;

(c)   the rarity for operators to be given local council approval to deploy towers due to their substantial footprint; and

(d)   the presence of SBC-Exclusive States limits the potential geographic areas in which new entrants could (easily) enter and compete in.

10.11   Furthermore, while access seekers are still able to install their active equipment on rooftops or other non-tower infrastructure, this does not provide an adequate competitive constraint on the behaviour of the SBCs, given that towers are the preferred form of infrastructure for rolling out a radio access network for geographical and performance reasons.

10.12   In states other than SBC-Exclusive States, tower providers are subject to the countervailing power of buyers (mainly MNOs), meaning they are at least to some extent economically obliged to engage in competitive behaviour to survive in this market.

10.13   For these reasons, the MCMC considers that it would be in the LTBE to continue to regulate access to these facilities, given the importance of these facilities in enabling any-to-any connectivity and facilitating competition in downstream markets.

Overview: Access to poles and street furniture within a radius of 300 to 500 metres

10.14   In high-density areas, where network usage per square kilometre is greater, a larger number of smaller cells (e.g. microcells and picocells) is required, with base station equipment located much closer to end-user devices. In particular, microcell equipment is likely to be installed on smaller, denser facilities such as utility poles, billboards, water tanks or streetlights (lamp poles). The MCMC uses the term "street furniture" to refer collectively to these facilities, which are often (but not always) owned and/or supplied by local councils.

10.15   With the rollout of 5G networks in the near future (which demands the installation of network equipment that is denser and closer to end-user devices), the importance of poles and street furniture is expected to further increase and

accordingly is a critical area of focus for the MCMC in the context of the current Access List Review.

10.16   As noted above, the MCMC's preliminary view is that access to poles and street furniture should be treated distinctly from access to towers and rooftop space, because:

(a)   poles and street furniture are used to support smaller cells than towers and rooftop space (with smaller geographic coverage areas);

(b)   SBCs do not generally supply access to poles and street furniture, meaning that there is no significant supply of access to such facilities on a state-by-state basis; and

(c)   even if there are stakeholders such as edotco who supply access to lamp poles and "special structures" on a national basis, access to poles and street furniture is also capable of being supplied by local authorities on a local basis.

10.17   The MCMC's preliminary view is that each supply of access to street furniture within a 300 to 500 metre radius can be treated as providing the same inputs into downstream access, as this falls within the scope of the MCMC's understanding of the coverage area of microcell equipment.

Competition/LTBE Analysis: Access to poles and street furniture within a radius of 300 to 500 metres

10.18   The MCMC notes that each local area is bound to vary from the next local area, with each exhibiting its own unique characteristics. Accordingly, it is difficult for the MCMC to assess the conditions of competition in the supply of services in each local area.

10.19   A further difficulty is that often, the owners of poles and street furniture are not licensees, and as such the MCMC may face challenges to regulate such owners.

10.20   However, the MCMC considers that it would be in the LTBE for access to pole and street furniture to be listed on the Access List, as these facilities will enable any-to-any connectivity over 5G networks and promote retail competition in the supply of these services.

Overview: Access to common in-building mobile systems in each building

10.21   Common in-building mobile systems refer to dedicated in-building devices which are used to achieve or improve mobile signal coverage for end users within a building. In-building mobile systems, also known as Common Antenna Systems (**CAS**), typically consist of a central equipment room within the building which houses the following active equipment:

(a)   a base transceiver station (**BTS**) provided by each mobile operator, which is typically connected to fixed-line or microwave transmission networks (for backhaul);

(b)   a multi-band combiner, which combines the radio signals from the different BTSs; and

(c)   a multi-band distributed antenna system, which distributes the radio signal throughout the building.[33]

10.22   Access to CAS typically involves the supply of access to the following elements:

(a)   co-location at a central equipment room located inside the building, to allow access seekers (MNOs) to install their base transceiver station (which is connected to a backhaul network on the upstream side);

(b)   access to a multi-band combiner at the central equipment room, which combines the mobile signal from the base transceiver stations of various operators into one signal; and

(c)   access to a multi-band distributed antenna system, which distributes the mobile signal throughout the building.

10.23   Access to the CAS in each building or site served by such systems is distinct to access to towers and rooftop space, for two reasons:

(a)   even though equipment installed on towers can also be used to transmit mobile signal to end users within a building, such equipment is typically limited in the penetration it can achieve within buildings and the level of service that it is able to provide across multiple floors; and

(b)   CAS involves active equipment (i.e. radio base stations), while towers and rooftop space are passive equipment which requires the access seeker to install its own active equipment.

10.24   Accordingly, access to external infrastructure such as towers and mastheads is not a viable substitute for access to CAS for mobile network operators that seek to achieve a high level of in-building mobile coverage.

10.25   A mobile network operator will only be able to satisfactorily serve users within a particular building if it gains access to the in-building mobile systems within that building. Accordingly, the supply of access to these systems comprises a bottleneck service.

Competition/LTBE Analysis: Access to common in-building mobile systems in each building

10.26   In the 2008 Access List Review, the MCMC found that in-building sharing arrangements were not working effectively and that operators of CAS were not subject to a significant degree of competitive constraint so as to suggest that the markets for access to CAS are sufficiently competitive. On this basis, the service description of Infrastructure Sharing was amended to include in-building

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[33]   MCMC, Access List Review Public Inquiry Paper, 15 May 2015, p. 60, https://www.mcmc.gov.my/skmmgovmy/media/General/pdf/MCMC-Access-List-PI-Paper.pdf.

CAS. In the 2015 Access List Review, the MCMC amended the definition of "CAS" to include in-building access provided by third party operators.[34]

10.27 While it is possible for a mobile network operator to gain access to a building by constructing its own in-building mobile systems, this is likely to be significantly costlier than obtaining shared access to the CAS, and may also be limited by space considerations in some buildings as well as potential interference with existing in-building mobile systems. Moreover, building owners often grant exclusive rights of access to buildings to a single operator (including a related party) to roll-out their own in-building mobile systems, which has the effect that, in many cases, it may be impossible for an alternative operator to roll-out its own in-building mobile system.

10.28 The MCMC does not believe that there has been any material change in the state of competition in the supply of access to in-building mobile systems since the 2015 Access List Review. Each licensee that owns or operates a common in-building mobile system within a building or site likely has a monopoly in the supply of in-building mobile systems within that building or site.

Service Description

10.29 The Infrastructure Sharing Service is currently described in the Access List as follows:

> *4(7)* **Infrastructure Sharing**
>
> *(a)* *Infrastructure Sharing is a Facility and/or Service which comprises the following:*
>
>> *(i)* *provision of physical access, which refers to the provision of space at specified network facilities to enable an Access Seeker to install and maintain its own equipment; or*
>>
>> *(ii)* *provision of access to in-building Common Antenna Systems and physical access to central equipment room.*
>
> *(b)* *Specified network facilities include towers and Associated Tower Sites.*
>
> *(c)* *Physical access includes power, environmental services (such as heat, light, ventilation and air-conditioning), security, site maintenance and access for the personnel of the Access Seeker.*
>
> *(d)* *Provision of space at Associated Tower Sites includes space where the Access Seeker may place its cabin or outdoor equipment and space required for cable gantry connecting to the tower and generator set.*

10.30 The scope of the Infrastructure Sharing Service is illustrated in the diagrams below:

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[34] Commission Determination on Access List, Determination No.2 of 2015, paragraph 3.
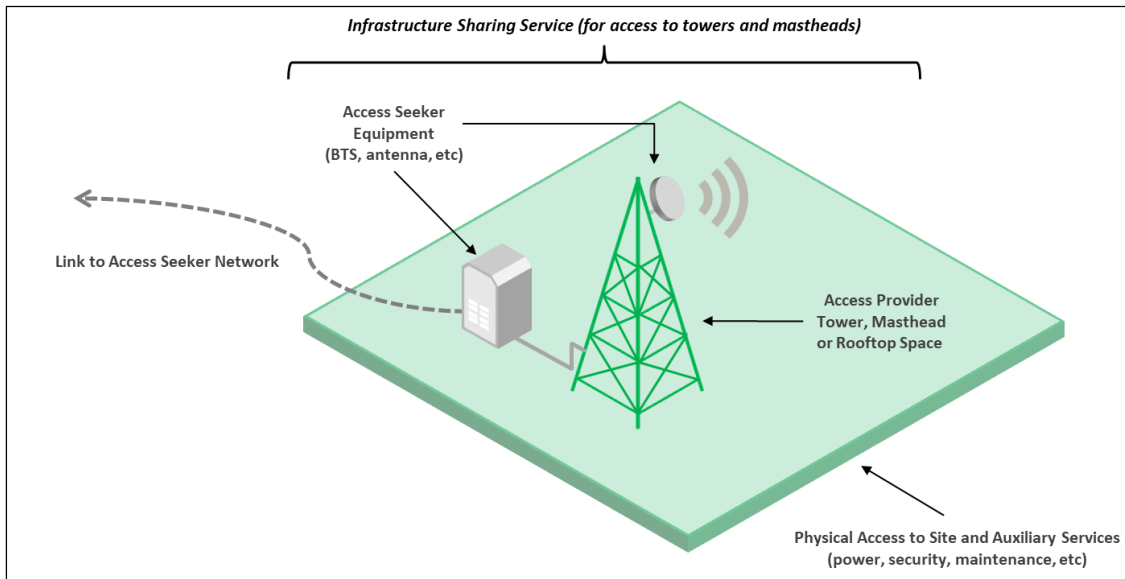
**Figure 25 – Scope of Infrastructure Sharing Service
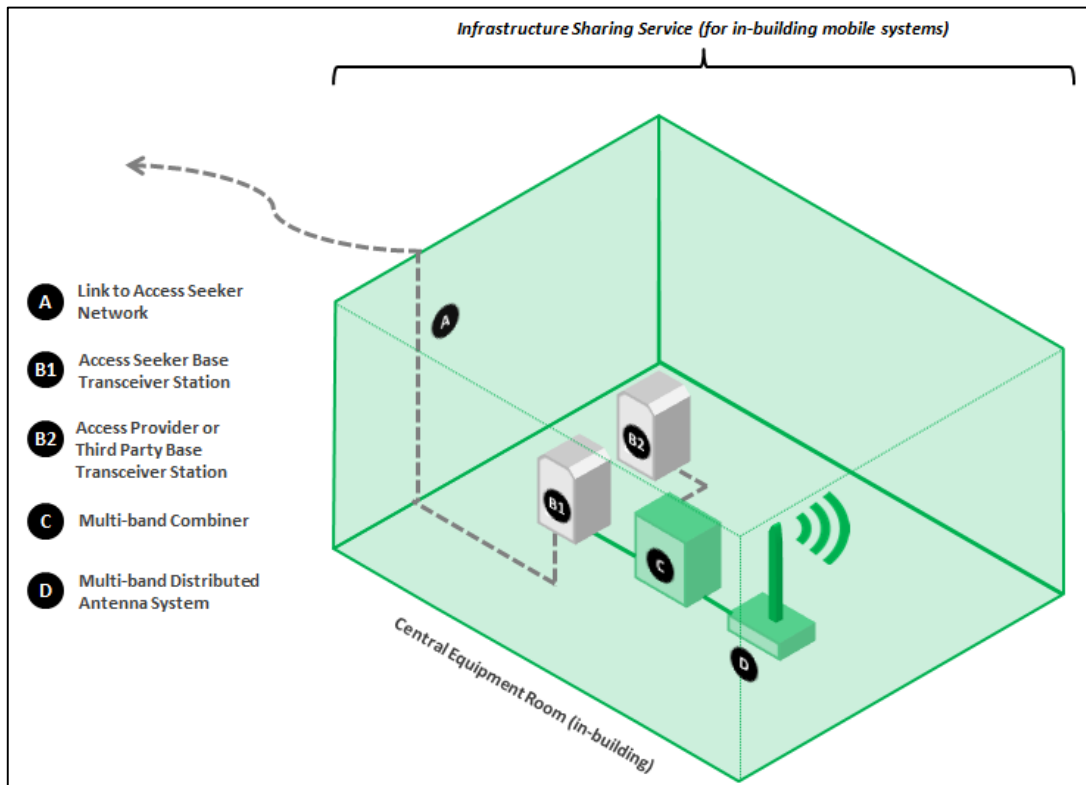(for access to towers and mastheads)**

**Figure 26 – Scope of Infrastructure Sharing Service
(for in-building mobile systems)**

Submissions Received

10.31   Most operators submitted that the Infrastructure Sharing Service is usable as an input to the supply of downstream telecommunications products.

10.32   The vast majority of operators were strongly supportive of the inclusion of utility poles (monopoles) and street furniture in the description of the Infrastructure Sharing Service:

(a)   Celcom requested that special structures such as lamp poles and rapid assembly poles be included in the Access List;

(b)   Digi noted that access to poles and street furniture is crucial in network roll-out, especially in dense areas;

(c)   Fiberail, MyKris and Redtone each acquire the Infrastructure Sharing service as access seekers and consider it should be expanded to include 5G infrastructure;

(d)   Maxis acquires the Infrastructure Sharing service as an access seeker and submitted that the service should be expanded to cover:

(i)   rooftops (which cover macro sites with an average radius of 1km to 2km for coverage and higher capacity purposes); and

(ii)   street furniture facilities (which cover micro sites with a radius of between 100m to 800m to improve capacity, data throughput and reduce blind spots), including street poles, gantries, bridges, billboards, wall facades, road signage, traffic lights and any other road furniture.

Maxis considers that regulated access to these facilities will be particularly important to increase 4G capacity and facilitate 5G rollout;

(e)   MYTV and Net2One plan to acquire Infrastructure Sharing in the near future in preparation for transition to 5G services, and submitted that the description of the service should accordingly be expanded.

(f)   PPIT commented that if the Infrastructure Sharing Service is to be maintained in the Access List, the meaning of the term "tower" will need to be expanded to include all types of facilities, including rooftops, buildings' external facades, poles (both utility and decoration), billboards and street furniture. PPIT submitted that there should be a mechanism to ensure fairness between licensees and non-licensees who own and/or operate such facilities;

(g)   Sacofa supplies the Infrastructure Sharing Service and agrees that the scope of the service should be expanded to include 5G deployment infrastructure;

(h)   TM supplies the Infrastructure Sharing Service and considers that utility poles and street furniture should be included within the scope of the service for the purposes of 5G deployment. This is to ensure that these structures are defined and regulated in a way that prevents failure or permanent distortion occurring on any part of the structures during simultaneous application of the loads in their specified loading configuration. Further, TM notes that access to these structures is dependent on a range of factors, including:

> > (i)   strength of the structures;
>
> > (ii)   availability of physical space and cabin/equipment space;
>
> > (iii)   sufficient power supply; and
>
> > (iv)   relevant laws, regulations and regulatory approvals;
>
> (i)   U Mobile commented that exclusive arrangements and/or indiscriminate use of street furniture could hamper the ability for access seekers to deploy 5G services, and that the mechanism through which 5G infrastructure is regulated must be carefully considered and a regulated pricing mechanism recommended. U Mobile is concerned that exclusive commercial agreements restrict access to 5G infrastructure by major mobile operators;
>
> (j)   Webe noted that including utility poles and street furniture within the scope of the service will enable better reach to densely populated areas and shorten time to market. Webe also submitted that the definition should consider technical capabilities such as weight of loading and wind resistance; and
>
> (k)   YTL would like to see access to monopole trees, monopoles, lamp poles, utility poles and street furniture included within the Infrastructure Sharing Service. YTL also submits that in-Building Common Antenna Systems and common equipment rooms (including sharing of multiplexes) should be included within the scope of the service.

10.33   In contrast, edotco submitted that the Infrastructure Sharing Service should not be expanded to cover access to 5G-related infrastructure, noting instead that access providers and access seekers should be able to freely negotiate the commercial, procedural and technical aspects without being restricted by regulation, which in edotco's view could deter and affect the implementation of 5G deployment.

10.34   Many access seekers submitted that they faced challenges in acquiring the Infrastructure Sharing Service:

> (a)   Digi noted that the current service has some functional limitations:
>
> > (i)   in dense areas where Digi can only deploy smaller structures, which provide only limited coverage capacity; and
>
> > (ii)   in circumstances where there is insufficient space available to accommodate sharing, Digi proposes that all new building layouts or plans should incorporate dedicated space for telecommunications equipment.
>
> (b)   Digi has also experienced some challenges in gaining access to the service where service providers have in place exclusivity arrangements with landlords and building management in certain areas. In certain states of Malaysia, Digi submits that only certain deployment partners

are permitted to build assets, and Digi is required to obtain access only from these exclusively appointed partners;

(c) Celcom submitted that challenges in obtaining approvals from state government and local authorities drive impediments in gaining access to the service;

(d) Maxis submitted that it has growing concerns on the BTS hotel concept introduced by operators such as CRAN in Kota Bharu by Stealth Solution, TM CRAN in Putrajaya and edotco's exclusive arrangements in airport areas. In Maxis' view, this model is not preferred by access seekers and drives higher costs. Further, access seekers would prefer to use their own electronic equipment and perform radiofrequency design freely, rather than being dictated by the BTS hotel provider;

(e) Maxis also submitted that there are also occasions where designs for in-building mobile systems are performed without consulting the access seekers, and thus the systems do not meet the industry quality of service and KPIs for in-building mobile systems, resulting in a negative impact to end users for mobile services;

(f) MyKris and Redtone both raised concerns regarding availability of the service. MyKris noted that at times there is only limited space available for MyKris to install its own equipment at tower sites;

(g) MyKris also submitted that at times it is difficult to identify the relevant access provider, leading to a delay in arranging site surveys. MyKris proposes that infrastructure should be made common and managed by an independent access provider;

(h) Redtone commented that there is limited transparency as to availability of the service. Redtone's main concern is that the service should not be subject to volume-based pricing, thus allowing access seekers to cover markets with a smaller volume without cost impacts;

(i) Webe submitted that the exclusive rights for some SBCs to build new infrastructure, including new towers and rooftops, deters competition and delays network rollout. In some cases, this has also resulted in the interruption of services to Webe's subscribers;

(j) YTL raised several issues with obtaining access to the service, including:

(i) difficulties experienced by new access seekers in obtaining access to in-building coverage from incumbent access providers. YTL submitted that the MCMC should mandate access providers to include in their RAOs all services and facilities used and/or provided by those access providers. Further, YTL submitted that all new buildings should have comprehensive in-building coverage incorporating all frequency bands and technologies approved by MCMC;

(ii) most access providers are charging separately for right-of-way despite the definition of "Associated Tower Sites" including necessary right-of-way. YTL submitted that right-of-way should only be payable by the operator who lays the relevant cabling;

(iii) the imposition of different rental rates for standard and non-standard structures;

(iv) unreasonable and expensive charges imposed by certain access providers for additional antennae; and

(v) "permission to dig" not including power and fibre.

10.35 On the other hand, a number of access providers, including edotco, Sacofa and TM, commented on several challenges they face in supplying the Infrastructure Sharing Service.

10.36 edotco noted that:

(a) several SBCs monopolise the capability to build and own telecommunications infrastructure in certain states in Malaysia;

(b) the appointment of "one stop agencies" imposing mandatory obligations for infrastructure providers to appoint them for the purpose of applying for permits from the relevant local authority;

(c) areas in which members of the public have raised complaints, e.g. in respect of EMF issues, complicating edotco's deployment and installation of infrastructure;

(d) divergent guidelines and requirements imposed by each local authority; and

(e) no standardisation of documents / checklists and process flows among local councils, and long approval timeframes for applications to build towers.

10.37 edotco cites that these impediments increase costs and drive delays in the deployment of tower infrastructure, meaning Malaysian consumers suffer poorer quality of service and slower access to new technologies. In edotco's view, the impact of these impediments will be far greater once the transition to 5G commences, given the proliferation of small cell deployment in that context.

10.38 edotco submitted that facilitating efficient and cost-effective 5G deployment should be a national priority, and suggested the following solutions:

(a) Cabinet-driven directions that States must adhere to Federal laws and regulations, enabling standardisation of Local Council guidelines and minimum requirements and standards; and

(b) mandatory/full access to "utility" type premises, including the imposition of new requirements that housing/building/township projects must allocate a plot of land or rooftop/in-building space for the deployment of infrastructure.

10.39   PPIT also experiences challenges in supplying the Infrastructure Sharing Service. PPIT considers that the service has always been commercially negotiated and can accordingly be removed from the Access List. PPIT noted that:

(a)   access providers have contributed to the reduction of CAPEX required to be incurred by access seekers;

(b)   the provision of the service involves various parties who may not be licensees under the CMA;

(c)   there are often long delays in obtaining relevant permits from local authorities (including land owned by state government or federal entities), and in some cases, at high costs. PPIT also commented on varying and often complex requirements imposed by different local authorities;

(d)   in some cases, various other approvals are also required in order for a site to be approved, such as from neighbours, ADUN and Ahli Majlis. PPIT considers these requirements to be over and above what is necessary;

(e)   rental costs were often too high;

(f)   there are occasionally public complaints that drive delays in deployment;

(g)   there are instances where "certain access providers who are 'related' or 'connected' with certain individuals or parties have bulldozed and ungentlemanly have taken over other access providers' sites"; and

(h)   the current 20m permitted radius for constructing telecommunications structures should be revised to suit 5G deployment, where such structures may need to be constructed closer to buildings (in the same way as other utilities such as electricity and water).

10.40   In Sacofa's view, site acquisition, local authority approvals and availability of power supply (especially in rural areas) are also impediments to supplying the service. Sacofa also submitted that the available tower loading is insufficient.

10.41   TM has entered into commercial agreements to acquire the Infrastructure Sharing Service from Sacofa and edotco, but does not currently maintain any active sites under these arrangements. In relation to in-building coverage, TM submits that it faces challenges in supplying the Infrastructure Sharing Service due to the following factors:

(a)   difficulties in obtaining approvals from the building owner; and

(b)   non-standard and exorbitant room rental charges imposed by the building owner.

MCMC Assessment

LTBE analysis: Infrastructure Sharing Service

10.42   The MCMC considers that the supply of access to towers and rooftop space and for access to common in-building mobile systems remains below a workable level

of competition, at least in certain areas including SBC-Exclusive States, while it is difficult to accurately determine the level of competition in the various local areas in which access to poles and street furniture is provided.

10.43   However, the MCMC is confident there remains a strong LTBE basis for maintaining regulation of Infrastructure Sharing in the Access List. In particular, the Infrastructure Sharing Service promotes downstream competition through facilitating access to bottleneck infrastructure that is required by access seekers for the delivery of retail mobile services, amongst others.

10.44   Further, the MCMC considers that the sharing of infrastructure, particularly bottleneck infrastructure, is likely to promote the efficient use of that infrastructure, which is another key element of the LTBE.

10.45   In addition, only one of the submissions summarised above requested de-regulation of the service. In particular, the MCMC does not agree with edotco's views that mandating access to 5G-related infrastructure could deter and affect the implementation of 5G deployment. These facilities comprise bottleneck facilities, the limited availability of which could restrict competition in downstream markets. The MCMC understands that typically, the local councils who own these facilities have granted exclusive rights to certain designated operators to install microcell infrastructure on these facilities. If these facilities are not included on the Access List, the MCMC considers that access seekers would have no alternatives other than to acquire access from the incumbent operator, who faces limited competition.

10.46   There is otherwise general industry consensus that the regulation of this service remains important to the promotion of competition in the supply of downstream services, in fulfilment of the LTBE.

Adjustments to service description to reflect 5G infrastructure

10.47   Most operators were supportive of expanding the scope of the regulated service to cover access to poles and street furniture.

10.48   Generally, operators suggested the following improvements to the service:

(a)   including 5G-related infrastructure within the scope of the listed Infrastructure Sharing Service, including poles and street furniture; and

(b)   improving transparency of the availability of physical space for the installation of infrastructure.

10.49   With regard to the first suggested improvement, the MCMC agrees with the majority of submissions that access to poles and street furniture will be critical in small cell deployment underpinning 5G network rollout. As many operators submitted, the MCMC considers that mandated access to this street-level infrastructure will drive 5G network coverage in densely populated areas and accelerate network rollout in line with JENDELA objectives.

10.50   At this stage, the MCMC considers it appropriate for access to poles and street furniture to be added to the Infrastructure Sharing service. For this purpose, the MCMC does not intend to adopt a prescriptive definition of "street furniture" but

will be adopting a "facility-neutral" approach, which includes any facility that supports the installation of mobile network equipment, including but not limited to billboards, public transit shelters, traffic light poles, bridges, and road gantries. Since all of these objects have a similar function, the MCMC's preliminary view is that these objects can be treated the same and fall within the scope of access to poles and street furniture.

10.51   The MCMC also considers it appropriate to limit the new facilities to those that are proximate to certain public outdoor areas, including roads, streets, paths, parks, and railway corridors. In this regard, the MCMC is keen to ensure that the service description is not described too broadly so as to impose an undue burden on access providers or lead to unanticipated impacts on competition by mandating access to a wider range of facilities than intended.

10.52   However, again the MCMC does not propose to exhaustively define the types of outdoor areas to which new facilities must be proximally located, or to specify any maximum distance. Rather, the MCMC considers it appropriate to mandate access to those facilities which are alongside, or in close proximity to, outdoor areas which may be accessed by members of the public, with the areas specified in paragraph 10.51 above serving as examples only.

10.53   With regard to the second suggested improvement in paragraph 10.48 above regarding transparency of availability, the MCMC considers that this issue is beyond the scope of the Access List review, but will address issues such as the availability and accuracy of information in a later review of the MSA.

10.54   The diagram below depicts the MCMC's proposed inclusion of 5G-related infrastructure in the scope of the Infrastructure Sharing Service:
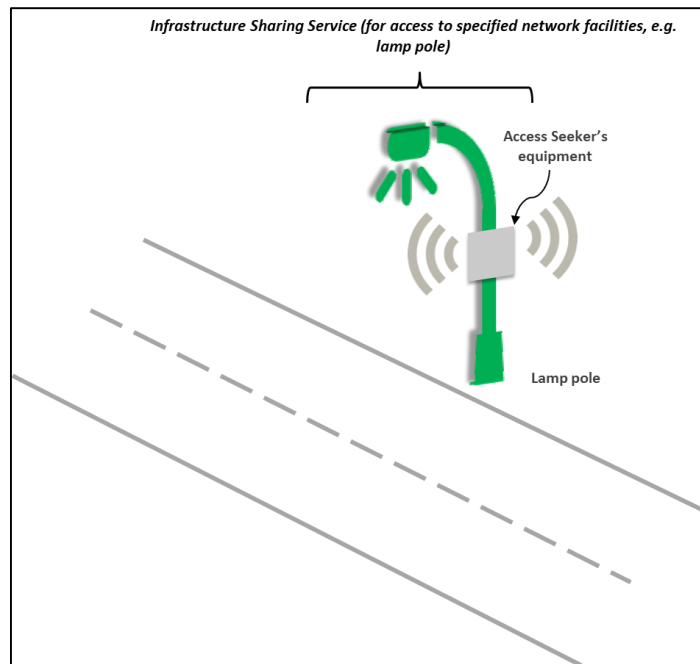

Figure 27 – Scope of Infrastructure Sharing Service
(for proposed access to street furniture)

Other issues

10.55   In relation to the submissions by some operators that the service description of any 5G-related infrastructure should cover technical capabilities and parameters, the MCMC would like to clarify that there are several registered technical codes developed by Malaysian Technical Standards Forum Berhad that addresses issues such as wind resistance and weight of load and interested parties can refer to those technical codes.[35]

10.56   Other issues raised by access seekers include:

(a)   access providers charging separately for right-of-way to towers;

(b)   unreasonable or excessive charges imposed by access providers more generally; and

(c)   areas of exclusivity in relation to the construction or installation of tower infrastructure, particularly for the benefit of SBCs, resulting in diminished or deterred competition.

10.57   Access providers also commented on a number of other challenges faced in providing access to the service:

(a)   excessive rental charges imposed on access providers by building owners;

(b)   complexity and delay in obtaining local authority and other approvals; and

(c)   complaints from the public in relation to the installation of telecommunications infrastructure.

10.58   The MCMC is concerned about these issues faced by access seekers and access providers alike and the MCMC has taken into account these submissions. However, the MCMC notes that none of these issues fall within the scope of the current inquiry as they do not relate to the scope or description of the regulated Infrastructure Sharing service under the Access List. As it has done in the past, the MCMC offers the following guidance to operators who face these problems:

(a)   the MCMC is aware of certain SBCs preventing other licensees from building network facilities in the states in which those SBCs operate, and the MCMC is engaging in direct conversations with the respective Senior State Officials of such states to clarify the actual position / intent of the MCMC on this matter;

(b)   excessive charges by access providers are a matter that stakeholders should raise during a future review of the MSAP, although the MCMC notes that Infrastructure Sharing is not currently subject to price regulation under the MSAP;

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[35] Examples include Radiocommunications Network Infrastructure (External) (MTSFB 001:2009); Radiocommunications Network Facilities – Smart Pole (MCMC MTSFB TC G010:2017); and Radiocommunications Network Facilities - Street Furniture (MCMC MTSFB TC G026:2020).

<ol type="a" start="3">
(c) charges for rights-of-way are outside the scope of this inquiry because they relate to pricing. However, the MCMC notes that:

<ol type="i">
(i) necessary right-of-way is included within the definition of "Associated Tower Sites" under the Access List, and to the extent that access seekers are being forced to pay exhorbitantly for right-of-way, access seekers should submit a complaint to the MCMC under section 69 of the CMA as outlined above; and

(ii) under section 228 of the CMA, a network facilities provider or a public utility provider must provide another network facilities provider with non-discriminatory access to any right-of-way owned by the first network facilities provider (or public utility provider);

(d) the MCMC does not have any jurisdiction in relation to state and local laws and regulations under which approvals must be sought for the construction and installation of tower infrastructure. This includes any public consultation processes under such laws and regulations;

(e) issues relating to the MSA will be considered by the MCMC in a later review; and

(f) more generally, if access seekers are facing barriers to gaining access to Infrastructure Sharing, or believe that they are not gaining access on non-discriminatory terms (including from operators who enjoy exclusive rights over access to infrastructure), they should submit a complaint to the MCMC in accordance with section 69 of the CMA after first trying to resolve any impediments directly with the access provider.

10.59 In response to Sacofa's complaint regarding the unavailability of power supply in rural areas and the unavailability of sufficient tower loading, the MCMC notes that:

<ol type="a">
(a) access providers are required to ensure the provision of all necessary utilities and ancillary services, including power and back-up power; and[36]

(b) the MCMC understands that there may be physical constraints on the provision of certain facilities and services on the Access List, and notes that the obligation for access providers to provide information to the MCMC under the MSA is intended to bring to the MCMC's attention any such issues.

10.60 In relation to YTL's comments regarding difficulties in obtaining access to in-building coverage from incumbent access providers, the MCMC notes that in-building Common Antenna Systems and physical access to central equipment rooms are each included within the scope of the Infrastructure Sharing service. If YTL is experiencing any issues in obtaining access to these facilities, or if YTL has observed that certain access providers are not including these facilities in

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[36] MCMC, Commission Determination on the Mandatory Standard of Access, Determination No. 3 of 2016, s 6.8.12(c), https://www.mcmc.gov.my/skmmgovmy/media/General/pdf/No-3-2016.pdf.

their RAO, YTL should make a complaint to the MCMC under section 69 of the CMA.

10.61   Further, the MCMC notes that imposing any technical telecommunications-related requirements for new buildings is beyond the scope of this review (which relates to whether or not access to certain wholesale telecommunications services should be regulated). The MCMC does not have the power to mandate the requirements proposed by Digi, YTL or edotco in this regard.

10.62   Finally, the MCMC rejects MyKris's submission that access to towers should be managed by an "independent access provider". As the MCMC has noted in previous Access List reviews, the MCMC's jurisdiction under the Access List extends only to mandating access to existing facilities and services, rather than making determinations as to which parties are allowed to roll out facilities or provide services. Nevertheless, to the extent an independent body is involved in the supervision of access to facilities and infrastructure, the MCMC is already available to provide any assistance required by access seekers.

MCMC Preliminary View

10.63   The MCMC's preliminary view is that it would be in the LTBE for the Infrastructure Sharing service to remain listed on the Access List, including because the service promotes downstream competition and encourages and facilitates the efficient use of existing infrastructure.

10.64   The MCMC also considers that the Infrastructure Sharing service should be improved by being expanded to cover access to poles and street furniture. Words that appear in underlined red text below have been added relative to the existing description while words that appear in strikethrough text are proposed to be deleted, and the amended service description for the Infrastructure Sharing service is as follows:

> ### 4(7)   Infrastructure Sharing
>
> (a)   Infrastructure Sharing is a Facility and/or Service which comprises the following:
>
> > (i)   provision of physical access, which refers to the provision of space at specified network facilities to enable an Access Seeker to install and maintain its own equipment; or
> >
> > (ii)   provision of access to in-building Common Antenna Systems and physical access to central equipment room.
>
> (b)   Specified network facilities include:
>
> > (i)   towers and Associated Tower Sites; and
> >
> > (ii)   any other facility that supports, or has the capability to support, the installation of mobile or fixed network equipment along, or in close proximity to:
> >
> > > (A)   a street;
> > >
> > > (B)   a road;

(c)   Physical access includes power, environmental services (such as heat, light, ventilation and air-conditioning), security, site maintenance and access for the personnel of the Access Seeker.

(d)   Provision of space at Associated Tower Sites includes space where the Access Seeker may place its cabin or outdoor equipment and space required for cable gantry connecting to the tower and generator set.

Questions

Question 27: Should the description of the Infrastructure Sharing Service be expanded to cover poles and other street furniture?
Question 28: Do you have any comments on the proposed amendments to the Infrastructure Sharing Service to cover poles and street furniture? Please provide details of any other amendments required, including as to the proximity of such furniture or equipment to public outdoor areas.

Duct and Manhole Access

Overview: Access to local area ducts, inter-exchange ducts and manholes (and separately, access to ducts and manholes in exclusive zones)

10.65   Fixed-line telecommunication links, such as fibre or copper cables, are typically installed in underground ducts and conduits. Ducts are accessed through manholes, which provide a physical interface between the duct and a road or other accessible location and therefore allow personnel to install equipment within a duct.

10.66   Access to ducts and manholes is critical to allowing an operator to deploy its own fixed-line telecommunications network (in the form of cables). In some cases, access to ducts and manholes may also be required for one network operator to interconnect with the network of another operator (which may be situated within a specific duct network).

10.67   There are typically two main elements to a duct network:

(a)   lead-in ducts – these are ducts that connect to a specific premise (or a location close to a premises), allowing operators to install "last mile" network infrastructure connecting into an end-user premises; and

(b)　　inter-exchange and mainline ducts – these are ducts that connect two exchanges or other POIs and are typically used for the installation of backhaul networks or transmission links. Mainline ducts may also run down a street or road, with each lead-in duct connecting to the mainline duct, which may in turn be interconnected to a broader duct network leading to an exchange or POI.

10.68　　The MCMC's preliminary view is that access to ducts and manholes in Malaysia is supplied on the following basis:

(a)　　access to local area ducts, comprising all ducts between an exchange and an end-user premises (except in exclusive zones);

(b)　　access to inter-exchange ducts (except in exclusive zones);

(c)　　access to manholes (except in exclusive zones); and

(d)　　access to ducts and manholes in each exclusive zone (i.e. areas where there is an exclusive owner/operator of ducts and manholes).

10.69　　The MCMC has reached this preliminary view taking into account:

(a)　　its understanding that operators supply unbundled access to these duct and manhole components; and

(b)　　that there is different functionality between the three components listed above, which are not substitutable.

Competition/LTBE Analysis

10.70　　In the 2015 Access List Review, the MCMC considered that access to "Uncompetitive Duct Infrastructure" (comprising lead-in ducts and manholes nationally, and mainline ducts and associated manholes in greenfields and in other areas where operators have been granted exclusive rights to install telecommunications infrastructure) should be regulated through the Access List for the first time.

10.71　　In 2015, the MCMC considered that Mainline Ducts and associated manhole access ought to be regulated only in areas where operators have been granted exclusive rights to install telecommunications infrastructure. This was due to the MCMC's understanding at the time that the national market for the wholesale supply of mainline and inter-exchange ducts was largely competitive outside of exclusive zones.

10.72　　The MCMC is concerned that the strength of competition in the supply of access to these facilities appears to have weakened since the 2015 Access List Review, with many access seekers reporting challenges in acquiring access, with limited or no substitutable services capable of being supplied.

10.73　　Further, the MCMC's preliminary view is that barriers to entry in the national market for wholesale access to ducts and manholes are high, because:

(a)　　although a number of stakeholders own their own ducts and manholes, some do not supply such infrastructure on a wholesale basis, even though

it would be relatively easy for them to do so and accordingly have a dilutionary effect on the availability of these facilities;

(b)   even if these stakeholders did commence supplying access to their own infrastructure, their impact on competition would be relatively low because:

(i)   the duct networks of these operators are limited in scope and do not provide national coverage (compared to TM's nationwide footprint); and

(ii)   since access to ducts and manholes would usually be sought after on a national basis (for commercial simplicity and ensuring a wider / more complete coverage of services), the entity who offers nationwide access would naturally have an advantage and thus be the preferred supplier; and

(c)   the prohibitively high costs of capital involved with constructing duct and manhole infrastructure for operators who do not currently own such infrastructure.

10.74   The MCMC also notes that there are limited substitutes for telecommunications ducts. In particular, other facilities such as aerial access and non-communication ducts have different functional capabilities, are subject to their own regulatory process and regime, are priced differently and are therefore subject to different conditions of competition.

10.75   Moreover, the MCMC's preliminary view is that each licensee who has exclusivity in respect of ducts and manholes within a particular geographic area has a monopoly in respect of that area (an "exclusive zone"), resulting in its ducts and manholes constituting a bottleneck facility.

10.76   The MCMC is aware that some service providers have exclusive arrangements in certain areas.

Service Description

10.77   Duct and Manhole Access is currently described in the Access List as follows:

4(20) Duct and Manhole Access

(a)   Duct and Manhole Access is a Facility and/or Service which comprises provision of physical access to:

(i)   Lead-in Ducts and associated manholes;

(ii)   Mainline Ducts and associated manholes in areas in which a single Operator has exclusive rights to develop or maintain duct and manhole infrastructure, whether or not in combination with other Facilities and Services; and

(iii)   sub-ducts where there is no room for the Access Seeker to install its own sub-ducts.

(b)   Provision of physical access includes the provision of:

> (i)   space at specified network facilities to enable an Access Seeker to install and maintain its own lines, equipment and sub-ducts; and
>
> (ii)   access for the personnel of the Access Seeker.
>
> (c)   Exclusive rights to develop or maintain duct and manhole infrastructure includes exclusive rights in contracts, arrangements or understandings between the Access Provider and any person.

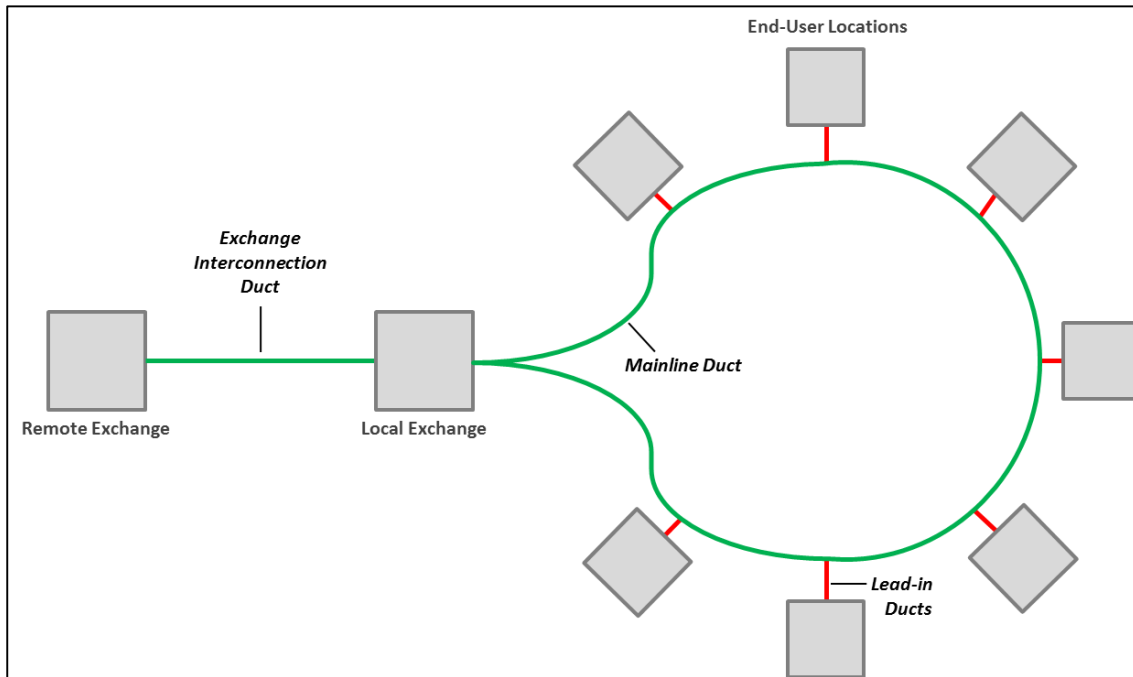10.78   The scope of the current Duct and Manhole Access service is illustrated below:

Figure 28 – PDM segments

Submissions Received

10.79   A number of operators noted that they have experienced challenges in obtaining access to the Duct and Manhole Access service where operators enjoy exclusive arrangements with landowners.

10.80   Celcom submitted that duct and manhole infrastructure should be regulated in brownfields, where infrastructure is uneconomical to duplicate, making access to the incumbent operator's network essential to ensure competition at the retail level. In Celcom's view, this infrastructure is a bottleneck facility and the MCMC must closely examine any claimed impediments in supplying the service.

10.81   Digi has experienced some challenges in obtaining access from landowners, who may have exclusive arrangements in place with other service providers.

10.82   Digi proposed that:

(a)   the scope of Duct and Manhole Access should include access at tower sites, not just residential areas; and

(b)   sub-ducts should be listed independently from mainline ducts. Digi submitted that currently, it can only request access to sub-ducts if a mainline duct is no longer available or has been fully used by other service providers.

10.83   edotco reported some challenges in obtaining physical access to ducts and manholes arising from information asymmetry between the access provider and access seeker.

10.84   edotco also submitted that aerial and overhead lead-in infrastructure could be included in the Duct and Manhole Access service, allowing access seekers to leverage the aerial infrastructure of access providers.

10.85   Maxis supplies and acquires the Duct and Manhole Access Service, and proposed a number of improvements to the service:

(a)   Pole sharing

(i)   Maxis considers that the Duct and Manhole Access Service should be expanded to cover fixed telecommunications fibre poles, to form a complete poles, ducts and manholes access service. Maxis considers that fixed telecommunications fibre poles have a similar functionality to ducts and manholes and should not be separated therefrom. Maxis noted that pole sharing is also easier from a technical perspective, given poles are visible and hence easier from an inventory and productisation perspective, as compared to ducts and manholes where manholes must be opened to check their condition and availability of space, in addition to checking the condition of ducts.

(ii)   In support of this submission, Maxis cited the approach adopted by other countries such as Portugal, Spain and the United Kingdom, where Maxis's research shows that access to poles and fibre cables as well as ducts and manholes beyond the last mile is regulated.

(iii)   Further, Maxis reiterated that sharing physical infrastructure such as poles, ducts and manholes can avoid the duplication of infrastructure and hence reduce deployment costs. Maxis estimates the cost of using poles to deploy fibre as up to 50-60% lower than laying fibre underground, along with time savings and resulting rapidity in network deployment, helping achieve the government's ambitious JENDELA targets.

(b)   Category of PDM access

(i)   In Maxis' view, the current Duct and Manhole Access service, which covers only lead-in ducts from the last manhole to the building or premises, limits the effectiveness of passive fixed infrastructure sharing amongst operators in both brownfield and greenfield areas.

(ii) Maxis submitted instead that the Duct and Manhole Access service include all PDM categories including:

(A) Local PDM, including lead-in PDM and PDMs within residential/business premises areas, usually built and owned by the developer but handed over to the access provider to manage;

(B) Mainline PDM (even where there is no proven exclusivity), also known as D-side and E-side PDMs, usually built and owned by the access provider; and

(C) Trunk/inter-exchange PDM, being PDM between exchanges that are usually built and owned by the access provider.

(c) Areas of exclusivity

(i) Maxis also commented that it is impractical and difficult to validate whether exclusivity is granted to an operator in any written form, with failure to prove that exclusivity exists exempting these areas from Access List regulation.

(ii) Maxis proposed instead that the MCMC adopt "exclusivity test" criteria, including but not limited to:

(A) whether there is any alternative access provider that is independent of the incumbent access provider;

(B) whether there is an alternative direct connectivity for that route (for PDM), at a comparable serving distance;

(C) the level of price competition for the relevant route; and

(D) whether there is evidence of refusal of service for that route (such as rejection notices or a failure by the access provider to respond to access requests).

10.86 As an access provider, Maxis does not face any significant impediments in providing this service, and noted that mobile operators extensively and effectively exchange their fixed infrastructure amongst themselves, speeding up mobile site fiberisation and ultimately benefitting end users.

10.87 However, Maxis has not observed significant sharing of passive infrastructure amongst fixed operators, and considers there is an urgent need for regulatory solutions to enforce more open access to all types and segments of passive fixed infrastructure including poles, ducts and manholes. Due to what Maxis cites as a lack of competition in fixed markets, Maxis considers there is no or very limited access to facilities or services which can enable replication of transmission or HSBB services, including poles, dark fibre, and mainline ducts, which are not currently covered under the Access List. Maxis noted its specific challenges in acquiring pole access from TM.

10.88   TIME also requested that the Duct and Manhole Access service be expanded to cover access to telecommunications poles. Also, in TIME's view, ducts and manholes should be a shared facility managed by an appointed operator imposing only nominal charges for maintenance, rather than being listed on the Access List.

10.89   TM submitted that the current definition of the Duct and Manhole Access service is sufficient. TM considers that Duct and Manhole Access offerings must be at the sub-duct level, (whether lead-in ducts or mainline ducts), giving further opportunity to access seekers to share this infrastructure. However, TM faces barriers in acquiring and negotiating Duct and Manhole Access services as access providers do not include such services in their RAOs. TM stated that access providers did not provide fair terms and conditions to TM under commercial arrangements, such as long agreement lock-in periods, exorbitant charges in excess of the MSAP charge, and Access Agreements TM has in place with access providers do not supersede such commercial arrangements.

10.90   U Mobile submitted that there is no such provider for Duct and Manhole Access, but that actual physical access to these facilities is not required given access seekers typically procure an end-to-end service from access providers. In U Mobile's opinion, the MCMC must consider many legal and operational matters:

(a)   access seekers must obtain permission to enter ducts to perform repairs and maintenance, with some uncertainty regarding who should repair cables residing in the access provider's infrastructure; and

(b)   sharing of these facilities is difficult in circumstances where up to five parties are interested in accessing the ducts. U Mobile suggested that an independent operator should manage duct and manhole infrastructure and the provision of access to access seekers.

10.91   YTL submitted that some access providers interpret the Duct and Manhole Access service as being limited to areas where the access providers have exclusive control, such that access providers have refused to provide access where they do not have exclusivity. YTL considers that ducts and manholes must be looked at end-to-end and should not be limited in this manner.

MCMC Assessment

LTBE overview: Duct and Manhole Access

10.92   As set out in paragraphs 10.712 to 10.76 above, the MCMC considers that the strength of competition in the supply of duct and manhole access services appears to have weakened since 2015, indicating that the bottleneck nature of these facilities has only heightened since then.

10.93   The MCMC notes that there is insufficient evidence that aerial and overhead lead-in infrastructure facilities are widespread enough to allow them to act as a viable alternative (and therefore effective substitute) to telecommunications ducts, further indicating that ducts and manholes are bottleneck facilities.

10.94   An inability to acquire duct and manhole infrastructure can have detrimental effects on downstream competition. For instance, if an access seeker is unable to acquire duct and manhole access into high-rise buildings, it may not be able to lay fibre to, and thereby access, end user customers in those areas. Conversely, it would promote downstream competition and encourage the efficient use of duct and manhole infrastructure if such infrastructure were to be regulated through the Access List, as access providers would be required to supply access to this key bottleneck facility and service.

10.95   Further, the MCMC considers there is a strong case to increase the scope of regulation to include mainline ducts outside exclusive zones (with mainline ducts inside exclusive zones currently included on the Access List). Given that these ducting systems act as bottleneck infrastructure, it is MCMC's preliminary view that access to these ducts will promote downstream competition and encourage efficient investment in new fibre infrastructure which might be accommodated by these ducts.

10.96   Also, the MCMC's preliminary view that manholes should be distinguished from ducts and that access to manholes should be separately considered for inclusion on the Access List will give access seekers the opportunity to, for example, potentially run their own mainline ducting systems and break-into access provider manholes near the connecting premises. The MCMC considers this will allow for the efficient use of existing manhole infrastructure and will likely promote competition in the provision of fibre-based services.

10.97   Accordingly, the MCMC's preliminary view is that it would be in the LTBE to expand the scope of the regulation to regulate ducts and manholes in the manner described above, as well as to retain existing regulation.

Adjustments to service description

10.98   As discussed above and in light of the changes in the competitive dynamics for the supply of Duct and Manhole Access, as referred to in paragraphs 10.70 to 10.76 above, the MCMC proposes to amend the service description for the Duct and Manhole Access service such that, in addition to the existing obligation to supply access to Lead-in Ducts, access providers must also supply access to:

(a)   Mainline Ducts and Inter-exchange Ducts in all areas; and

(b)   manholes in all areas.

10.99   To give effect to the above, the MCMC proposes to include a new definition for "Inter-exchange Duct", which is intended to include each duct or series of ducts that is upstream of an exchange building.

10.100 The MCMC also proposes amending the definition of the listed service to make clearer the access provider's obligation to supply these elements on a separate (unbundled) basis, as also discussed above.

10.101 Regarding Digi's submission that access to sub-ducts should be available regardless of whether the associated Mainline Duct is available or has been fully used by other operators, the MCMC notes that international practice is for an

access seeker to install its own sub-ducts within an access provider's duct infrastructure. Accordingly, the MCMC does not propose to change the basis on which sub-duct access must be provided, other than to clarify that sub-duct access must also be supplied on an unbundled basis along with other duct and manhole elements.

10.102   In response to edotco's submission that aerial and overhead lead-in infrastructure should be included in the Access List, given the MCMC's proposal to list poles within the Infrastructure Sharing Service as described in paragraphs 10.49 to 10.50 above, the MCMC does not consider it necessary at this time to also include aerial facilities within the Duct and Manhole Access service. The MCMC also refers to paragraph 10.95 above, regarding the insufficient evidence that such facilities are an effective substitute for telecommunications ducts.

10.103   Regarding Maxis and TIME's requests that access to telecommunications poles be included within the scope of Duct and Manhole Access, the MCMC refers to the discussion in paragraphs 10.49 to 10.50 above in respect of the Infrastructure Sharing Service, under which the MCMC considers the inclusion of poles and other network infrastructure.

10.104   Finally, given feedback from some operators that they have faced difficulties in accessing ducts and manholes when interconnecting at an access provider location such as a submarine cable landing station or POI, the MCMC proposes to expand the definition of "Lead-in Duct" to clarify that the supply of access to such ducts is not limited to residential End User premises.

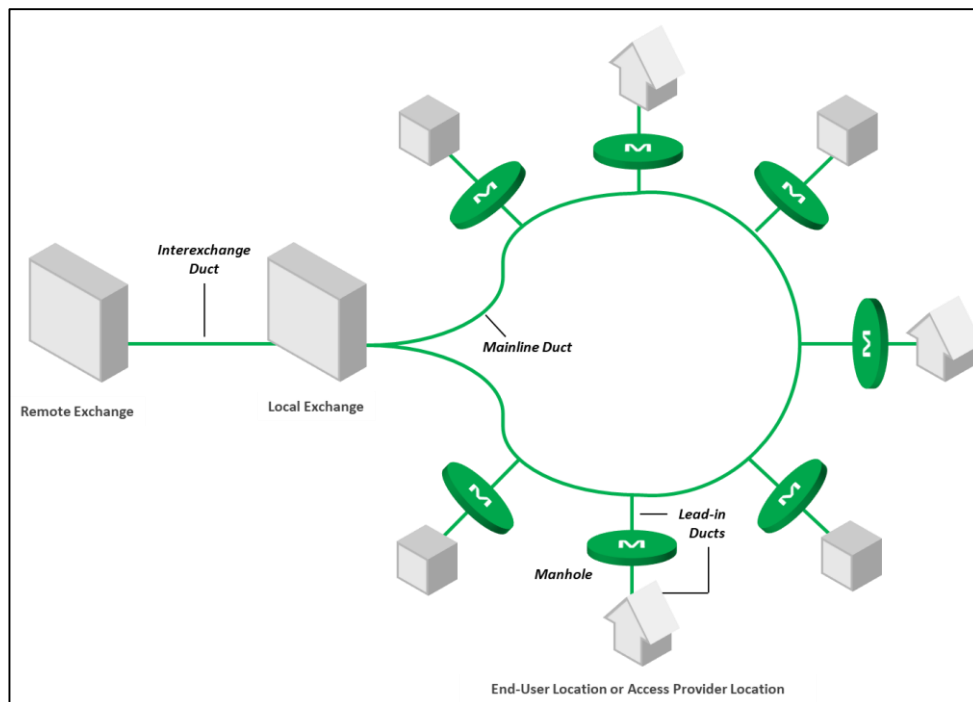10.105   The following diagram depicts the scope of the revised Duct and Manhole Access service proposed by the MCMC:

Figure 29 – Scope of proposed Duct and Manhole Access service

Supply in exclusive zones

10.106   Several operators submitted that they experience difficulties in acquiring this service due to the existence of exclusive arrangements between land owners and incumbent operators, such that land owners deny access to other access seekers.

10.107   The MCMC is of course aware of exclusive zones within Malaysia within which there is only a single owner and operator of duct and manhole infrastructure, each of whom enjoys monopolistic benefits in respect of the relevant exclusive zone.

10.108   The MCMC reminds operators that, regardless of whether an access provider has entered into exclusive arrangements with land owners in relation to duct and manhole infrastructure, the access provider must still comply with its SAOs in respect of the facilities and services listed on the Access List. In so doing, the access provider must comply with the MSA, which provides:

> "**Physical access:** *Where required to fulfil an Order for Duct and Manhole Access or for the Access Seeker to perform operations or maintenance activities, an Access Provider shall allow an Access Seeker, its nominated employees and/or contractors to physically access the Access Provider's network facilities and the Access Seeker's Equipment…"[37]*

10.109   Accordingly, to the extent an access provider has entered into an exclusive arrangement with a land owner such that the access provider is unable or not permitted to provide to other access seekers physical access to its duct and manhole infrastructure, the MCMC's view is that such arrangements are inconsistent with that access provider's SAOs and its obligations under the MSA. The MCMC proposes to amend the Duct and Manhole Access service to clarify that access providers must also, in providing access to the service, provide (or procure) access to the land upon which the relevant duct and manhole facilities are situated.

10.110   For completeness, the MCMC also reminds stakeholders that any person who owns or provides any network facilities or provides any network services must hold a valid individual or class licence under the CMA, and is accordingly subject to, inter alia, the SAOs and the MSA.[38] If access seekers are unable to obtain Duct and Manhole Access after trying to resolve any impediments directly with the access provider, operators should submit a complaint to the MCMC in accordance with section 69 of the CMA.

Transparency

10.111   Access seekers also commented that they faced impediments in acquiring this service due to a general lack of transparency, including as to availability of

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[37] MSA, subsection 6.11.8.
[38] CMA, sections 126 and 149.

physical space and whether an operator does in fact have exclusive arrangements in a particular area.

10.112 The MCMC acknowledges the difficulty faced by operators in obtaining accurate and reliable information regarding the availability of duct infrastructure and will address issues relating to the provision and availability of information relating to services on the Access List, including Duct and Manhole Access, in a later review of the MSA.

Other issues

10.113 The MCMC rejects TIME and U Mobile's submissions that access to duct and manhole infrastructure should be managed by an "independent" or "appointed" operator. The MCMC reiterates its response in paragraph 10.62 above in respect of tower access. Also as noted in that paragraph, the MCMC is already available to provide any assistance required by access seekers, so there is no justification for the involvement of another independent third party.

MCMC Preliminary Views

10.114 The MCMC's preliminary view is that it would be in the LTBE for the Duct and Manhole Access to be retained in the Access List, given the broader bottlenecks observed by the MCMC in these facilities and services since the 2015 Access List Review and the potential impacts on competition if Duct and Manhole Access were to be removed from the Access List.

10.115 Given the changes in competition observed by the MCMC, the MCMC proposes to make changes to the service description of Duct and Manhole Access to broaden the scope of duct infrastructure to apply to lead-in ducts, mainline ducts, inter-exchange ducts and manholes, on an unbundled basis and to clarify the obligation of access providers to provide access to the land upon which such infrastructure is located. The MCMC also wishes to clarify that access to duct and manhole infrastructure must be offered on an unbundled basis.

10.116 Words that appear in underlined red text below have been added relative to the existing description while words that appear in ~~strikethrough text~~ are proposed to be deleted, and the amended service description for Duct and Manhole Access is as follows:

4 (20) Duct and Manhole Access

(a) *Duct and Manhole Access is a Facility and/or Service which comprises provision of physical access to, at the Access Seeker's discretion, one or more of the following elements:*

   (i) *Lead-in Ducts ~~and associated manholes~~;*

   (ii) *Mainline Ducts ~~and associated manholes in areas in which a single operator has exclusive rights to develop or maintain duct and manhole infrastructure, whether or not in combination with other Facilities and Services~~;*

   (iii) *Inter-exchange Ducts;*

> > *(iv)* *manholes, including any manholes associated with Lead-in Ducts, Mainline Ducts or Inter-exchange Ducts;* and
>
> > *(~~iii~~v)* *sub-ducts where there is no room for the Access Seeker to install its own sub-ducts.*
>
> *(b)* *Provision of physical access includes the provision of, or procurement of the provision of:*
>
> > *(i)* *space at specified network facilities to enable an Access Seeker to install and maintain its own lines, equipment and sub-ducts; and*
>
> > *(ii)* *access for the personnel of the Access Seeker, including to the land upon which any Lead-in Ducts, Mainline Ducts, Inter-exchange Ducts, sub-ducts and manholes are situated.*
>
> *(c)* *~~Exclusive rights to develop or maintain duct and manhole infrastructure includes exclusive rights in contracts, arrangements or understandings between the Access Provider and any person.~~*

10.117   Further, the MCMC proposes to amend the definition of "Lead-in Duct" to clarify that Lead-in Duct access is not limited to residential End User locations, but includes any access provider location, as follows:

> *"Lead-in Duct" means a duct which extends from an End User or Access Provider location to the first manhole associated with such a duct.*

10.118   The MCMC also proposes the following new definition associated with the revised Duct and Manhole Access service:

> *"Inter-exchange Duct" means each duct or series of ducts that connects (whether directly or indirectly) between two Access Provider locations, including exchange buildings.*

Questions

Question 29: Do you agree that the MCMC should continue to regulate access to duct and manhole infrastructure? If not, please provide reasons.

Question 30: If you agree, do you agree that the scope of the duct and manhole infrastructure which the MCMC now proposes to regulate (lead-in ducts, mainline ducts, inter-exchange ducts, each on a nationwide basis) is the correct scope for access regulation? If not, please provide your proposed alternative scope for regulation and reasons.

Question 31: Do you have any comments on the proposed new definition for "Inter-exchange Duct"?

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11 Interconnection services

Introduction

11.1   The following facilities and services comprise the family of interconnection services in the Access List:

(a)   Interconnect Link Service; and

(b)   Network Co-Location service.

11.2   In this section, the MCMC will consider each of the above interconnection services in turn.

Interconnect Link Service

Overview: SS7-based interconnection links and IP-based interconnect links

11.3   Interconnect links are critical to ensuring any-to-any connectivity and, more broadly, to facilitating competition in the supply of communications services. This is because interconnect links allow an operator which has limited network infrastructure to provide retail services across a much wider geographic area, by acquiring wholesale services from another operator (e.g. transmission services) and interconnecting its network with the relevant wholesale services via an interconnect link.

11.4   The interconnect link services comprise facilities and services that facilitate a physical or logical connection between two separate networks at a particular point, known as a POI. This may be at an exchange building, POP or other relevant facility.[39] Two key types of interconnect links exist:

(a)   in-span interconnect links, where interconnection between two networks is achieved in an optical fibre in a duct or chamber located between the separate facilities of Operator A and Operator B – under this model, certain network elements facilitating the interconnection, such as switches, are located at the facilities of the respective operators; and

(b)   in-building interconnect links, where interconnection occurs at an optical interface within one operator's premises (or at a third-party facility).

11.5   The specific technical properties of an interconnect link differs depending on which networks it seeks to interconnect. For example, IP-based networks connect with each other through an IP-based interconnection link (at an IP exchange), while PSTN telephony services interconnect through an interconnection link or circuit that typically uses time division multiplexing (**TDM**) technology.

11.6   The conditions of competition to which the supply of an interconnect link is subject depends on the underlying technology:

(a)   for SS7 interconnect links, which involve circuit-switching, interconnection at a specific location is required in order to transmit communications to specific end-users. This means that a specific interconnect link at a given location is not substitutable with an interconnect link owned by the same operator at a different location or by a different operator at the same or different location; and

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[39]

MCMC, 'Market Definition Analysis - Definition of Communications Market in Malaysia', 24 September 2014, p. 60, https://www.mcmc.gov.my/skmmgovmy/media/General/pdf/Market-definition-analysis-Final_1.pdf.

(b)   IP-based interconnect links may be substitutable with each other because, due to the packet-switched nature of IP-based networks and the fact that IP communications can be transmitted over a heterogeneous network, one entity can still send a packet of data to another entity even if they are not directly interconnected at a specific location, through the use of IP addressing and routing.

11.7   Interconnect link services do not include physical access to exchanges, submarine cable landing stations or satellite earth stations (i.e. colocation), which may be required to access the interconnection links located within these facilities. Physical access to these facilities falls within access to exchanges, submarine cable landing stations and satellite earth stations, as discussed in paragraphs 11.46 to 11.50 and 13.182 to 13.192 below in the context of the Network Co-Location Service and Domestic Connectivity to International Service respectively.

Competition/LTBE Analysis

11.8   In the 2015 Access List Review, the MCMC did not explicitly analyse the state of competition in the national wholesale supply of interconnect link services, although it noted that interconnect links are a key bottleneck facility and accordingly decided that the Interconnect Link Service should remain in the Access List.[40]

11.9   One potential substitute for interconnect links would be for an access seeker to acquire capacity or transit on another provider's network, which may have a direct connection between the two points in respect of which the access seeker wishes to transmit data or communications. However, the MCMC considers that this alternative is not likely to be economically viable, and that in many cases there would be no single end-to-end network infrastructure between two points.[41]

11.10   The MCMC's preliminary view is that:

(a)   for SS7-based interconnect links, due to the geographic boundaries within which each interconnect link is supplied, the operator of each interconnect link would by definition have a monopoly in the supply of the relevant interconnect link, and therefore would not face any competitive constraints in providing access to that link; and

(b)   for IP-based interconnect links, due to the any-to-any nature of IP-based interconnection, an access seeker would be able to interconnect with any operator to reach any end-user (not just the operator to which that end-user is directly connected). This means that (unlike SS7-based interconnection), IP-based interconnect links do not appear to act as a bottleneck facility.

[40]MCMC, 2015 Access List Public Inquiry Paper, p. 130.
[41] MCMC, 'Market Definition Analysis - Definition of Communications Market in Malaysia', 24 September 2014, p. 123, https://www.mcmc.gov.my/skmmgovmy/media/General/pdf/Market-definition-analysis-Final_1.pdf.

11.11   In respect of the individual links currently served over the SS7 network, the MCMC does not believe that there has been any material change in the state of competition since the 2015 Access List Review.

Service Description

11.12   The Interconnect Link Service is currently described in the Access List as follows:

> **4(5)   Interconnect Link Service**
>
> *An Interconnect Link Service is a Facility and/or Service which enables:*
>
> *(i)   the physical connection between the network of an Access Provider and the network of an Access Seeker for the purpose of providing an Interconnection Service; and*
>
> *(ii)   the interconnection of the Signalling System Number Seven ("SS7") network of an Access Provider to the SS7 network of an Access Seeker at the signal transfer points.*

11.13   The scope of the Interconnect Link Service is illustrated in the diagrams below, which reflect that the service can be provided in a number of different ways:
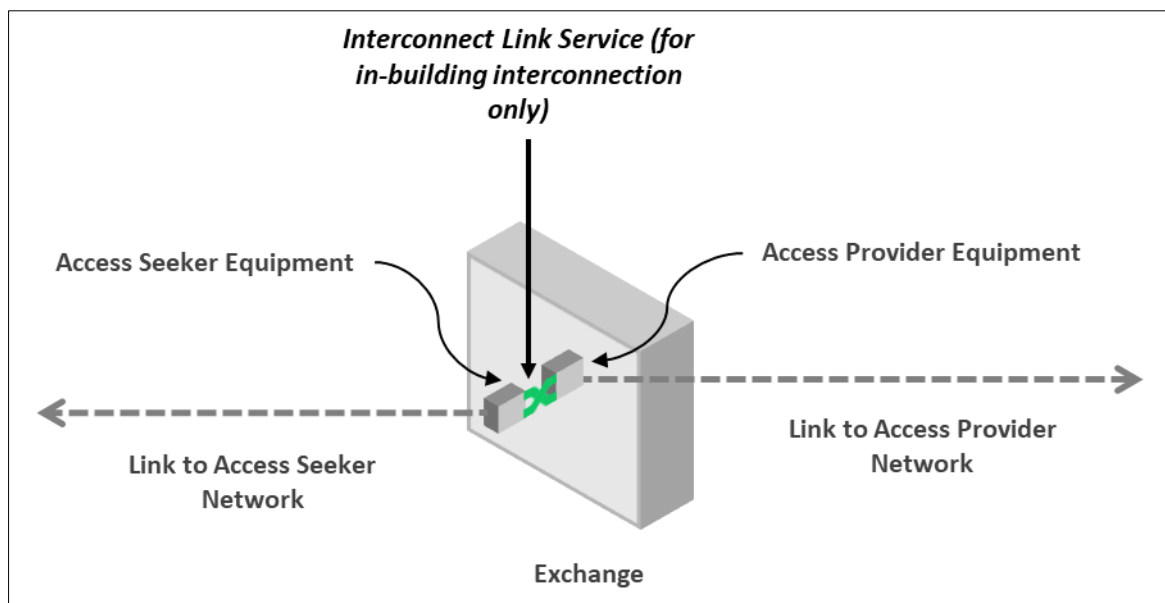
Figure 30 – Scope of Interconnect Link Service (in-building interconnection only)
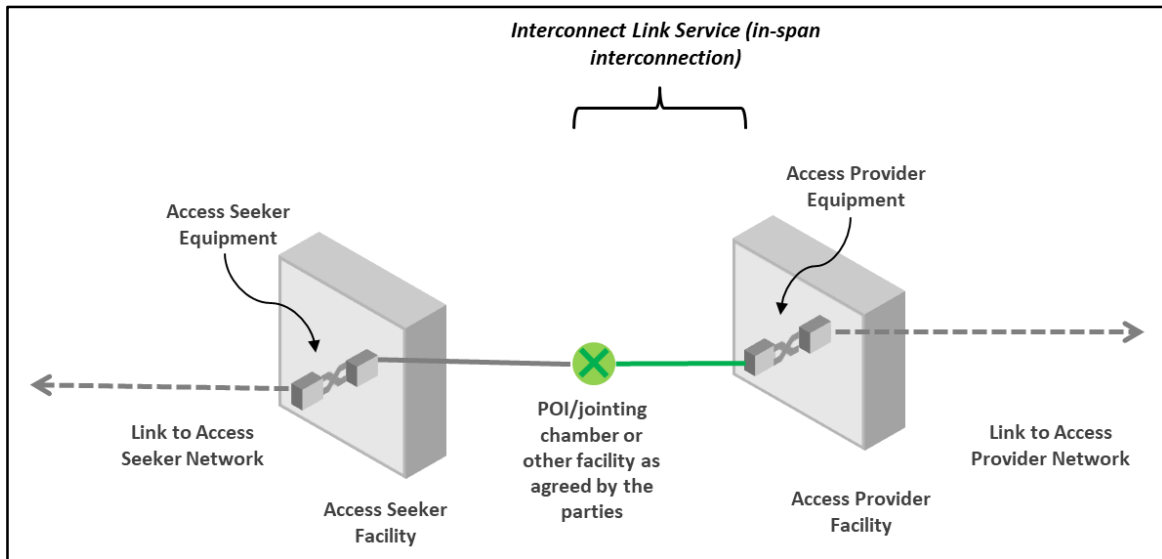
Figure 31 – Scope of Interconnect Link Service (in-span interconnection only)
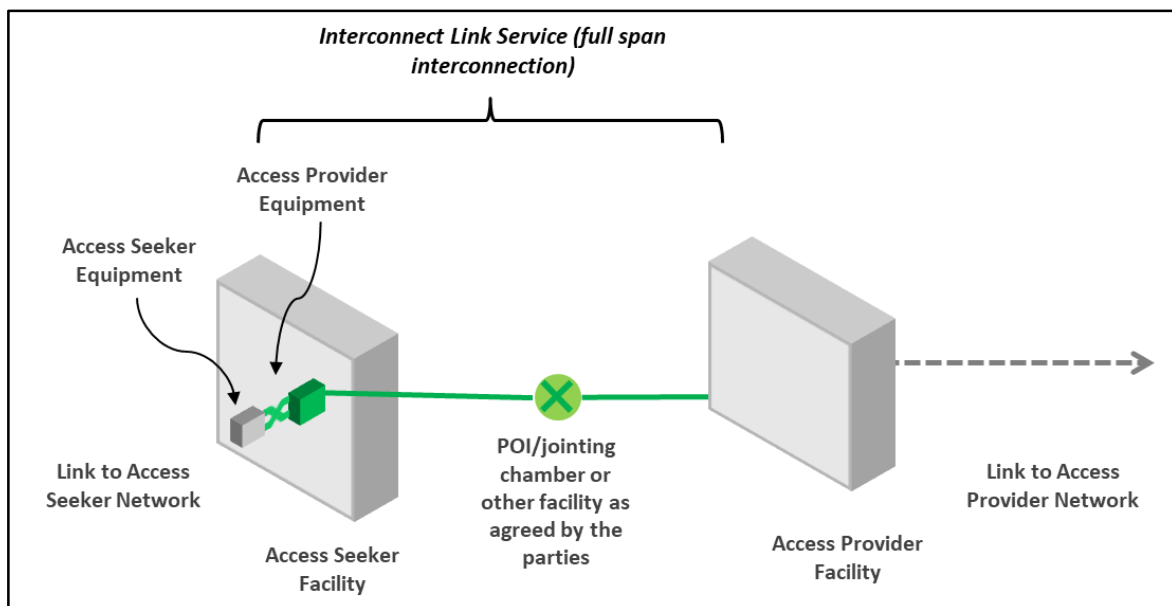
Figure 32 – Scope of Interconnect Link Service (full-span interconnection only)

Submissions Received

11.14   A large number of operators noted that they would like to see the Interconnect Link Service expanded to include bandwidth and IP-based interconnection.

11.15   Astro sought clarification regarding the definition of IP interconnect and how it differs from the existing interconnection services in the Access List.

11.16   Celcom submitted that it acquires the Interconnect Link Service to connect its network with other operators' networks as an input for the voice and SMS services it provides to its customers, enabling any-to-any connectivity. Celcom

noted that all operators are currently migrating to IP-based interconnection (using Ethernet transport technologies and SIP signalling), and that the service description should be updated to reflect this migration. Celcom also submitted that the service description should be updated to include bandwidth allocation, which is delivered using technology such as DWDM, Next Generation of Synchronous Digital Hierarchy and Packet Transport Network (**PTN**).

11.17   Digi also noted that the Interconnect Link Service is typically supplied with bandwidth in practice, based on mutual agreement between the access seeker and access provider. In Digi's experience, each party will typically consume half of the allocated bandwidth for its own outgoing traffic.

11.18   edotco submitted that the Interconnect Link Service should move away from legacy CCS 7 and TDM technologies to IP-based interconnection.

11.19   Maxis acquires the Interconnect Link Service as an access seeker and finds it usable as an input to the off-net voice and SMS/MMS communication services it supplies to its customers. Maxis commonly uses in-span interconnection, but occasionally uses full-span interconnection. Maxis submitted that while the service description provides the required functionality for voice traffic interconnection, it does not cover interconnection for HSBB network services.

11.20   Maxis considers that interconnection for HSBB network services is important where the access seeker is not able to co-locate in the access provider's designated POI or SG location, in which case the preferred method of interconnection is via a meet-me fibre arrangement where the access provider and access seeker meet at an agreed location, e.g. at the manhole, where fibre splicing is performed to connect the respective HSBB networks.

11.21   Maxis recommended that the MCMC propose the standard methodology, QoS, test specification, processes and terms and conditions for IP interconnection for the benefit of the industry. Maxis also submitted that the MCMC take into account the potential use case of IP interconnection whereby access seekers and access providers meet at a third party premises or data centre, e.g. in AIMS or Cyberjaya (i.e. Meet-me fibre for HSBB interconnection).

11.22   In Maxis's view, as the industry moves towards IP-based interconnection, E1 links with 2 Mbps of bandwidth will no longer be applicable. Rather, the GE interface will be used, with bandwidth capped at 100 Mbps, 200 Mbps, 300 Mbps, etc. Accordingly, Maxis does not support expanding the scope of the interconnect link service to include E1 links, and considers that expanding the scope of the service to include IP-based interconnection is sufficient.

11.23   Finally, for HSBB POIs, Maxis considers it critical for the definition of the Interconnect Link Service to specify multiple interconnect links for traffic load balancing and resiliency requirements.

11.24   Myren and Ohana each commented that they may acquire the Interconnect Link Service in future. In Ohana's view, bandwidth availability in the market may not always meet access seeker requirements and the scope of the Interconnect Link Service should be expanded to include bandwidth.

11.25   Redtone acquires full-span interconnection services under a commercial arrangement and is planning to complete the transition to IP-based interconnection within the next year. Redtone proposed that the definition of the Interconnect Link Service should be updated to address the industry's migration to IP-based interconnection.

11.26   TIME also submitted that the Interconnect Link service should be expanded to cover IP-based interconnection. TIME commented that bandwidth should not be limited to only E1 links with 2 Mbps of bandwidth.

11.27   TM acquires the Interconnect Link Service for the purposes of voice and SMS interconnection, and acquires and supplies E1 links with 2 Mbps of bandwidth for interconnection. TM prefers in-span interconnection.

11.28   TM also submitted that the service description should include IP-based interconnection in cases where signalling will be packet-based. However, TM does not consider that bandwidth should be included in the service description. Instead, TM submitted that:

(a)   where bandwidth is provided as part of the current circuit-based full-span arrangement, it should be considered as similar to an End-to-End Transmission Service; and

(b)   where bandwidth is provided as part of a packet-based full-span arrangement once IP-based interconnection is implemented, bandwidth should be subject to a commercial arrangement between the relevant operators, given each party's traffic will use the same bandwidth.

11.29   In U Mobile's view, fixed network operators should offer IP-based interconnection to carry fixed network termination services over SIP-I. However, U Mobile has experienced difficulty in acquiring IP-based interconnection from access providers, and submits that the Access List should be amended to clearly state that IP-based interconnection is included, with no additional charges.

11.30   U Mobile is also supportive of bandwidth being included with the service, e.g. 2 Mbps for E1 links and from 10 Mbps to at least 10 Gbps for IP-based interconnection. Further, U Mobile recommends that the service must be provided with sufficient disaster recovery capacity (at least 50%) to allow for failover to the next IP link in the event of an interface outage.

11.31   Webe is connected to other operators using full span interconnection using CCS 7, under arrangements which require both parties to establish E1 links of 2 Mbps each. Webe submitted that this creates issues where capacity is exceeded (as new E1 links must then be acquired). In Webe's view, these issues do not arise in the IP interconnection environment, where capacity is scalable and accordingly more economical. For this reason, and to facilitate simpler and faster negotiation, Webe considers that IP-based interconnection should be included in the description of the Interconnect Link Service. Webe has already transitioned from SS7 to IP-based interconnection with many other operators.

11.32   Moreover, Webe notes that given bandwidth is typically included with the Interconnect Link Service, it should be included in the service description.

11.33   YTL submitted that Metro-Ethernet, ISDN, IP-based network and Ethernet interfaces and technologies should all be added to the Interconnect Link Service, noting the capacity-related advantages of IP-based interconnection (as also described by other operators above). YTL commented that most operators are transitioning to IP-based interconnection, and the scope of the Interconnect Link Service should be expanded to include SIGTRAN over IP.

MCMC Assessment

LTBE overview: Interconnect Link Service

11.34   The MCMC considers that it would be in the LTBE for the Interconnect Link Service to remain regulated in the Access List. As explained in paragraphs 11.3 to 11.11 above, interconnect links are fundamental to achieving competition and any-to-any connectivity in the communications sector in Malaysia.

Adjustments to service description

11.35   Many stakeholders submitted that they consider the Interconnect Link Service to be an essential input to the wholesale and retail services they supply.

11.36   Broadly, operators suggested two improvements to the Interconnect Link Service, each of which is dealt with separately below:

         (a)   including IP-based interconnection within the scope of the service; and

         (b)   including bandwidth within the scope of the service (given the service is typically supplied with bandwidth in practice).

IP-based interconnect links

11.37   The MCMC understands that IP-based interconnection appears to have developed significantly since the MCMC's 2015 Access List Review, with the majority of (if not all) service providers moving towards an IP-based network architecture, alongside the anticipated decommissioning of SS7 interconnect links.

11.38   Although the MCMC does not consider IP-based interconnect links to act as a bottleneck facility, the MCMC notes that whether a facility or service is characterised as a bottleneck is not the sole determinant of whether that facility or service should be regulated. The MCMC also places a strong emphasis on regulating for the LTBE, of which a key element is the objective of achieving any-to-any connectivity in relation to communications services, as set out in paragraph 3.1.

11.39   In this regard, given the fundamental criticality of interconnect links in achieving any-to-any connectivity and in promoting competition, the MCMC proposes to include IP-based interconnect links in the Access List. In this regard, the MCMC's understanding is that IP-based addressing is the most efficient form of connectivity, because it allows a packet to reach the intended addressee even if the originating party and terminating party are connected only indirectly, through a third-party network. The MCMC considers that direct connectivity through IP-based interconnection (rather than indirect connectivity through

third-party transit) is likely to drive more efficient industry outcomes, particularly for large operators. For example, relying singularly on indirect transit could lead to inefficient use of infrastructure, by forcing all operators to transit across each other operator's network. A lack of direct IP-based connectivity could also result in performance degradation, as indirect connectivity (via transit) requires data packets to pursue a more circuitous route to the intended addressee.

11.40   For these reasons, the MCMC considers that it is in the LTBE to list IP-based interconnect links on the Access List, in addition to retaining SS7-based links. Over time, the MCMC will consider removing SS7 interconnect links as they become fully redundant. The MCMC also notes the widespread support from stakeholders for the inclusion of IP-based interconnection in the Access List.

Inclusion of bandwidth in service description

11.41   The MCMC notes comments from some operators that the existing practice of supplying E1 links with only 2 Mbps of included bandwidth has led to some capacity constraints. The MCMC requires further information to determine whether bandwidth should be included in the service description, but notes that:

(a)   in the SS7 context, bandwidth comprises a critical component of E1 links, in that these links themselves have limited to no functionality without some amount of included capacity;

(b)   access seekers have no viable alternatives for a particular SS7-based interconnect link if the relevant operator for that link fails to offer sufficient bandwidth with the Interconnect Link service to meet access seekers' requirements; and

(c)   as noted above, interconnect links remain a key facility in the achievement of any-to-any connectivity in Malaysia.

11.42   Given the above, the MCMC's initial view is that it would be in the LTBE for bandwidth to be included in the service description for the Interconnect Link Service, however the MCMC requires further information from industry in order to do so.

MCMC Preliminary View

11.43   The MCMC's preliminary view is that it would be in the LTBE for the Interconnect Link Service to remain on the Access List.

11.44   The MCMC also proposes to make modifications to the service to include IP-based interconnection alongside SS7 interconnect links. Words that appear in <u>underlined red text</u> below have been added relative to the existing description while words that appear in ~~strikethrough text~~ are proposed to be deleted, and the amended service description for the Interconnect Link Service is as follows:

4(5)   Interconnect Link Service

An Interconnect Link Service is a Facility and/or Service which enables:~~(i)   the physical~~ connection between the network of an Access Provider and the network of

> *an Access Seeker for the purpose of providing an Interconnection Service, <u>including but not limited to</u>:*
>
> *<u>(i)</u> <u>the interconnection of the IP-based network of an Access Provider to the IP-based network of an Access Seeker</u>; and*
>
> *(ii) the interconnection of the Signalling System Number Seven ("SS7") network of an Access Provider to the SS7 network of an Access Seeker at the signal transfer points.*

11.45 Finally, as noted above, the MCMC also proposes to clarify that bandwidth is included with the Interconnect Link Service. The MCMC looks forward to receiving further submissions regarding this point, but at this stage intends that bandwidth will be included at specified increments in respect of both SS7 and IP-based interconnection, given the criticality of capacity in making this service useful for access seekers.

Questions

Question 32: What related or downstream services do you require IP-based interconnection for?
Question 33: Do you acquire or supply IP-based interconnection on a commercial basis? If yes, do you face any barriers in doing so? (Please provide details).
Question 34: Do you agree with the MCMC's proposed approach to including IP-based interconnection within the Interconnect Link Service?
Question 35: What other features of IP-based interconnection need to be included in the service description if it is amended?
Question 36: Should bandwidth be included within the Interconnect Link Service? If so: (a) should it be included for both SS7 and IP-based interconnection?; and (b) at what increments should such bandwidth be offered?

Network Co-Location Service

Overview: Wholesale supply of co-location at each POI

11.46 In order to facilitate interconnection with another network, an operator generally requires access to the physical facility or building where the POI is located. Facilities access is required to allow the access seeker to terminate its network cables at the POI and also to co-locate active equipment at the POI. To allow this, the access seeker will generally need access to floor space or equipment racks at the POI, as well as ancillary services such as power, cooling and security in respect of the co-located equipment.

11.47 Wholesale supply of co-location services occurs on a POI-by-POI basis.

Competition/LTBE Analysis

11.48 In the 2015 Access List Review, the MCMC held that access to co-location services at a particular exchange building constitutes a natural monopoly, given

only the operator of that exchange building is able to supply the relevant co-location services and there are few external constraints upon the market behaviour of exchange building owners.[42]

11.49   The MCMC's preliminary view is that potential alternatives to physical interconnection at POIs, such as acquiring transit or capacity on another provider's network, are not close enough substitutes:

(a)   due to the significantly higher costs involved in acquiring capacity on an end-to-end basis; and

(b)   because in many cases there will be no single end-to-end network infrastructure between two points, thus nonetheless eventually necessitating physical interconnection with another network at a POI.

11.50   Accordingly, the MCMC takes the preliminary view that the owners of co-location facilities or exchange buildings have natural monopolies over their respective facilities / buildings in relation to co-location services of any given POI, and it would accordingly be in the LTBE for access to these facilities to remain on the Access List in order to promote competition.

Service Description

11.51   The Network Co-location Service is currently described in the Access List as follows:

4(9)   Network Co-Location Service

(a)   *The Network Co-Location Service is a Facility and/or Service which comprises:*

   (i)   *physical co-location, which refers to the provision of space at an Access Provider's premises to enable the Access Seeker to install and maintain equipment necessary for the provision of the Access Seeker's services through the Facilities and/or Services of any Operator. Physical co-location includes physical space, power, environmental services (such as heat, light, ventilation and air-conditioning), security, site maintenance and access for the personnel of the Access Seeker;*

   (ii)   *virtual co-location, which refers to the provision of Facilities or Services at an Access Provider's premises to enable the acquisition by the Access Seeker of Facilities and Services in the Access List, where equipment is owned and maintained by the Access Provider; or*

   (iii)   *in-span interconnection, which is the provision of a POI at an agreed point on a physical cable linking an Access Provider's network facilities to an Access Seeker's network facilities.*

(b)   *Network premises at which co-location is to be provided includes switching sites, submarine cable landing centres, earth stations, exchange buildings, other Customer Access Modules including roadside cabinets and such other network facilities locations associated with the provision of a Facility or Service in the Access List, and includes co-location provided at any location where main distribution frame is housed.*

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[42] MCMC, 2015 Access List Review Public Inquiry Paper, p. 71.

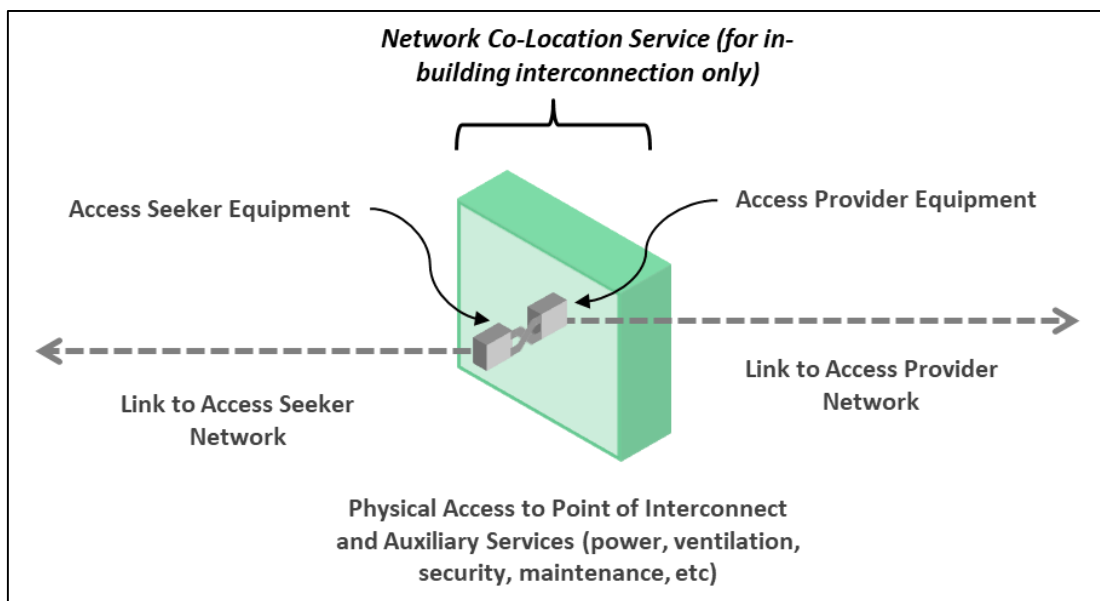11.52   The scope of the Network Co-Location Service is illustrated in the diagram below:

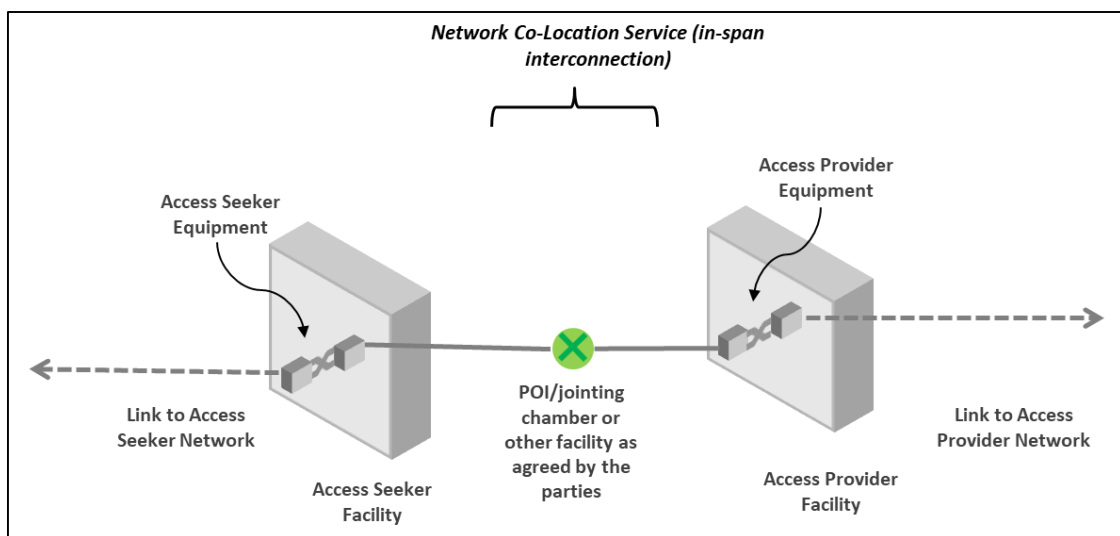***Figure 33 – Scope of Network Co-Location Service (in-building interconnection only)***

Figure 34 – Scope of Network Co-Location Service (in-span interconnection only)

Submissions Received

11.53   Astro plans to acquire physical co-location under the Network Co-Location Service as an input to the services it supplies to its customers.

11.54   Digi acquires the Network Co-Location Service and has not experienced any pronounced impediments in obtaining access.

11.55   Fiberail acquires the Network Co-Location Service for physical co-location and submitted that there are no functional limitations in the service.

11.56   Maxis acquires the Network Co-Location Service in the form of physical network co-location services at the POI for the HSBB network services in the Access List. Maxis also requires physical network co-location at submarine cable landing stations and exchange buildings, in order to access the Domestic Connectivity to International Services, Trunk Transmission Services and Wholesale Local Leased Circuit Services.

11.57   However, Maxis only acquires the service on a "very limited" basis, and cites "many functional limitations" of the service as currently listed:

(a)   the right-of-way to deploy access routes to the building/premises where Maxis has its physical network co-location would need to be acquired from the manhole immediately outside the access provider's premises boundary. In Maxis's experience, there are many occasions where the access seeker is left with no choice but to also acquire transmission services from the access provider in order to connect its equipment in the access provider's premises; and

(b)   similarly, access to ducts and manholes is also important for access seekers to lay their fibre to connect to their equipment co-located in the access provider's building where physical network co-location is being provided.

11.58   In order to avoid these issues, Maxis submitted that the access route to the access provider's premises and the ducts and manholes leading to the premises should be included in the scope of the Network Co-location Service itself. Maxis also recommended that security concerns can be managed by access seekers adhering to standard processes and procedures for accessing the access provider's premises.

11.59   Redtone acquires network co-location under a bundled commercial arrangement together with a metro ethernet service. Redtone has experienced some impediments in accessing this service due to pricing and visibility of sites available for access.

11.60   TM submitted that it does not acquire network co-location as an input to downstream supply, but to enable interconnection with other operators for the purposes of voice and SMS origination and termination services. TM acquires only in-span interconnection and requested that the service description be amended to specify that the provision of physical co-location applies only to the regulated facilities and services of the access provider, rather than all facilities and services (which TM considers inconsistent with the purpose of the Access List).

11.61   TM also submitted that it will provide physical co-location in TM's compound via hosting facilities such as a carrier hut, remote location and BTS hotel, in each case connected to the access provider's premises. Access seekers will be able to obtain physical access to these regulated facilities.

11.62   Webe submitted that it acquires physical co-location, and did not note any impediments in acquiring the service.

11.63   U Mobile acquires physical co-location, and both full span and in-span Network Co-Location, and has experienced no limitation or impediments to accessing this service.

11.64   YTL also requested that the service description fully define in-span and full-span arrangements, as YTL has faced challenges in obtaining MSAP-based pricing from access providers due to this potential ambiguity.

MCMC Assessment

LTBE overview: Network Co-Location Service

11.65   Co-location provides access to a key bottleneck facility, namely interconnecting exchanges. In particular, operators generally require physical access in order to facilitate interconnection with another network, a key component of any-to-any connectivity and ultimately the competitive supply of downstream services reliant on physical co-location.

11.66   Some forms of interconnection do not depend on co-location such as in-span interconnection. In-span interconnection must be made available under the MSA on request of the access seeker where physical co-location cannot be granted. However, access seekers are in the best position to determine the form of interconnection they wish to rely on.

11.67   Given that some of these forms of interconnection rely in an efficient way on access to exchanges which operate as bottlenecks, the MCMC's view is that it would be in the LTBE for the Network Co-Location Service to remain listed on the Access List.

11.68   In relation to YTL's request that the Access List fully define in-span and full-span arrangements, the MCMC refers to paragraph 11.52 above, in which the MCMC sets out diagrams reflecting the scope of the Network Co-Location service within the context of in-span and in-building arrangements.

Adjustments to service description

11.69   Access seekers did not report major issues in acquiring this service, but identified some isolated areas of potential improvement to the service, some of which will be addressed in a later review of the MSA.

11.70   In relation to Maxis's submissions regarding the various challenges it experiences in acquiring this service, the MCMC notes that it proposes to expand the scope of the Duct and Manhole Access service such that access seekers will be more easily able to obtain access to ducts and manholes for the purposes of laying fibre to connect to equipment co-located in the access provider's building, including from the manhole immediately outside the access provider's premises boundary.

11.71   In response to TM's submission that physical co-location be limited to the regulated facilities and services of the access provider, rather than all facilities

and services, the MCMC notes that the premises at which co-location must be supplied are already limited to certain specified facilities, "network facilities locations associated with the provision of a Facility or Service in the Access List" and "any location where main distribution frame is housed". The MCMC does not consider that these reflect "all" of TM's facilities and services, and accordingly the MCMC does not propose to further limit the scope of this description, but proposes to clarify the intention.

MCMC Preliminary View

11.72   The MCMC's preliminary view is that it would be in the LTBE for the Network Co-Location Service to remain in the Access List.

11.73   The MCMC proposes to make modifications to clarify the premises at which co-location must be supplied. Words that appear in <u>underlined red text</u> below have been added relative to the existing description while words that appear in ~~strikethrough text~~ are proposed to be deleted, and the amended service description for the Network Co-Location Service is as follows:

4(9)   Network Co-Location Service

(a)   The Network Co-Location Service is a Facility and/or Service which comprises:

  (i)   physical co-location, which refers to the provision of space at an Access Provider's premises to enable the Access Seeker to install and maintain equipment necessary for the provision of the Access Seeker's services through the Facilities and/or Services of any Operator. Physical co-location includes physical space, power, environmental services (such as heat, light, ventilation and air-conditioning), security, site maintenance and access for the personnel of the Access Seeker;

  (ii)   virtual co-location, which refers to the provision of Facilities or Services at an Access Provider's premises to enable the acquisition by the Access Seeker of Facilities and Services in the Access List, where equipment is owned and maintained by the Access Provider; or

  (iii)   in-span interconnection, which is the provision of a POI at an agreed point on a physical cable linking an Access Provider's network facilities to an Access Seeker's network facilities.

(b)   Network premises at which co-location is to be provided includes switching sites, submarine cable landing centres, earth stations, exchange buildings, other Customer Access Modules including roadside cabinets<u>, any location where a main distribution frame is housed</u> and such other network facilities locations associated with the provision of a Facility or Service in the Access List~~, and includes co-location provided at any location where main distribution frame is housed.~~

Questions

Question 37:   Do you have any comments on the proposed amendments to the Network Co-Location Service as set out above?

Other services: Internet Interconnection Service

Overview: Wholesale internet interconnection services in Peninsular Malaysia and Sabah and Sarawak

11.74 A key aspect of the Internet is any-to-any connectivity (i.e. an end-user of one Internet Service Provider (**ISP**) can access content from a server that is connected to a different ISP's network). To facilitate any-to-any connectivity, an ISP can connect to the network of another ISP in two main ways:

(a) **peering** – this involves the first ISP directly interconnecting with the network of another ISP, typically done at an Internet exchange (**IX**) (or other POI); and

(b) **transit** – this involves acquiring a transit service from a third party (a transit provider), which is usually an ISP with a large global network that is connected to the second ISP through another location at which the first ISP does not have a point of presence.

11.75 Due to the complex structure of the global Internet (with data typically routed over many different networks), a range of different cascading arrangements are often in place between ISPs. For example, an ISP in Malaysia may be connected to an ISP in another part of the world through a complex chain of transit providers with several peering or transit arrangements in between.

11.76 Increasingly, interconnection is also taking place between ISPs and the content delivery networks (**CDNs**) of application providers such as video streaming services. By using their own CDNs that interconnect directly with ISPs, OTT services can obtain greater control over transmission of their services, improving quality.

11.77 Internet Interconnection Service was first listed on the Access List in 2005, but was removed from 1 January 2011 onwards, in recognition of the positive collaboration between Malaysia Internet Exchange (**MyIX**), the industry in general and the MCMC. Since then, given the significant increase in IP-based traffic in Malaysia, other IXs have been launched in the country, including Johor Bahru Internet Exchange (**JBIX**) and Malaysia Network Access Point (**MyNAP**) in Cyberjaya.[43] However, the MCMC has since learned that IP peering is limited in the Sabah/Sarawak region where only MyIX has a POP in Kuching, Sarawak, forcing access seekers to rely more on IP transit services to access upstream networks in that region.

11.78 Meanwhile, the MCMC understands that IP transit services in Malaysia are mostly provided by licensees (including TM and TIME), as well as global transit providers. These are supplied in both Peninsular Malaysia and in Sabah/Sarawak, though the MCMC understands that they are supplied at significantly higher prices in Sabah.

11.79 The MCMC's understanding is that wholesale Internet interconnection services are supplied as follows:

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[43] MYNAP, Website, February 2020, <https://www.mynap.my/>.

(a)   IP peering and IP transit services are supplied in Peninsular Malaysia and Sarawak; and

(b)   only IP transit services are supplied in Sabah.

Competition/LTBE Analysis

11.80   The MCMC's preliminary view is that IP transit and peering services can be treated the same as each other.

11.81   However, the MCMC also understands that the field of rivalry between Peninsular Malaysia and the Sabah/Sarawak region appear to be significantly different given IP peering is not available at all in Sabah. As a result, the MCMC takes the preliminary view that access to wholesale interconnection services should be considered separately in each of these regions.

11.82   The MCMC is aware of potential signals that there may be a sub-optimal field of competition in East Malaysia, including:

(a)   the absence of internet exchanges in Sabah, meaning neutral peering is not present in the market;

(b)   fewer suppliers of IP transit in East Malaysia compared to Peninsular Malaysia; and

(c)   the significantly higher pricing of IP transit services particularly in Sabah (driven largely by the absence of peering), suggesting market forces that could be causing an imbalance in the supply of these services.

11.83   On a related note, the MCMC also understands that most IP transit traffic from East Malaysia must route through the Sistem Kabel Rakyat 1Malaysia (SKR1M) submarine cable. Sacofa also has the East-West Cable that connects between Kuching in Sarawak with Mersing in Peninsular Malaysia. In addition, there is international submarine connectivity that is provided by Common Tower to connect Labuan to Brunei. However, the MCMC is not aware of any factors which suggest that this directly or meaningfully limits the scope of competition in the supply of downstream IP transit services.

Submissions Received

11.84   Most operators submitted that they have not faced any impediments in acquiring the internet interconnection service, however some operators noted during the initial information gathering stage that internet interconnection in Sabah is significantly more expensive than Peninsular Malaysia given MyIX no longer supplies internet interconnection in Sabah.

11.85   Astro acquires internet interconnection services from MyIX for the purposes of Astro's local content and web services. Astro submitted that radio broadcasters face obstacles in acquiring wholesale services, but that these obstacles are typically resolved by negotiation.

11.86   Celcom is a member of MyIX and commented that internet interconnection is essential for end-to-end connectivity to the internet. Celcom experiences "no impediment at all" in acquiring this service.

11.87   Digi is currently transitioning towards IP interconnection with other operators and has experienced no issues in accessing internet interconnection services subject to availability of sufficient capacity. Digi submitted that re-listing the service on the Access List, with capacity requirements, may resolve any impediments.

11.88   Maxis peers at the MyIX exchange with more than 100 internet players, enabling Maxis to effectively exchange IP traffic. For the remainder of the internet globally, Maxis acquires IP Transit services both within and outside Malaysia.

11.89   Maxis submitted that it generally has no problems with both accessing and providing peering service, but sees the future of peering involving more non-telecoms players such as enterprises, and that these will take time to materialise and develop. In Maxis' experience, IP Transit is typically cheaper in Singapore than Malaysia and this may be due to challenges in accessing submarine cable stations in Malaysia, which has a consequential impact on IP Transit prices.

11.90   MyKris, Myren, MYTV, Redtone and Webe all commented that they faced no impediments in accessing internet interconnection services.

11.91   Sacofa submitted that the available capacity of this service is limited and that MyIX should increase its capacity. In Sacofa's view, this impediment would be resolved by re-listing the service.

11.92   TM submitted that it faces no impediment in acquiring this service, as it is already present at the MyIX exchange and practices open peering with all domestic operators.

11.93   U Mobile requires internet interconnection for better reachability to the internet, to attract more OTT content to Malaysia, and to minimise the much higher costs of IP transit (which cannot be replaced entirely with internet interconnection). U Mobile noted that access to IP transit is available at various locations in Kuala Lumpur and Putrajaya and accordingly there are no impediments in accessing the service.

MCMC Assessment

LTBE overview: Internet Interconnection Service

11.94   Internet interconnection services such as peering and IP Transit are key components of any-to-any connectivity. Access to internet interconnection is also essential to the provision of downstream broadband services.

11.95   Although the MCMC's preliminary view is that these services can be treated the same as each other, the unavailability of peering in Sabah has led to significantly higher pricing for IP transit services in that region, particularly in Sabah. The high cost of IP transit is probably impacting investment in broadband infrastructure in Sabah.

11.96   Although there are multiple providers of IP transit services in the region – indicating at least some degree of competition - East Malaysia also exhibits a range of characteristics that indicate that there is no vibrancy in the competitive supply of these services, including more limited entry to the market, limited availability of Internet exchanges and the high cost of IP transit services in Sabah, as noted by several operators.

11.97   The MCMC is considering whether to regulate an IP transit service. On the one hand, the MCMC recognises the success of commercial IP peering arrangements, particularly in Peninsular Malaysia. On the other hand, in order to promote competition, any-to-any connectivity and infrastructure investment, the MCMC considers it would be in the LTBE to regulate the supply of IP transit services where IP peering is not available, particularly in Sabah. In doing so, the MCMC is concerned about the imbalance in the competitive supply of internet interconnection services between East Malaysia, particularly in Sabah and Peninsular Malaysia. In this aspect, the MCMC would also be keen to receive feedback on IP peering arrangements in Sarawak and whether there is a similar issue of high cost of IP transit in Sarawak.

11.98   If the MCMC decides to regulate IP transit, the scope of IP transit would be limited to only those areas where peering is not available. This means that if peering becomes available again in Sabah, then the regulation of IP transit will be reduced accordingly.

11.99   For completeness, if the MCMC decides to regulate IP Transit Service, the service is reflected in the diagram below:
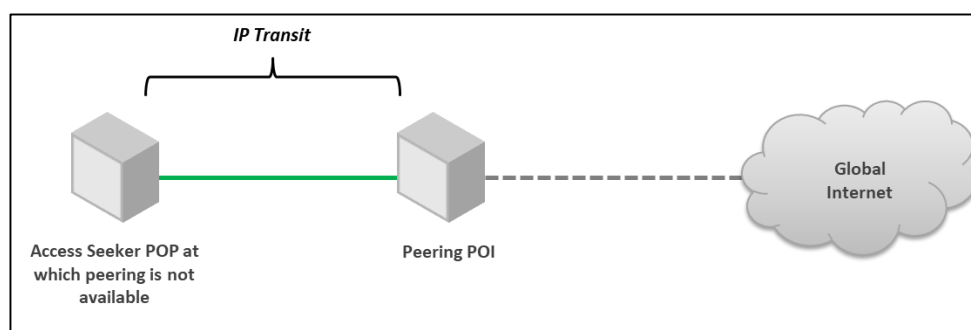

Figure 35 – Scope of proposed IP Transit Service

Other issues

11.100   Generally, stakeholders submitted that access to these services, particularly on Peninsular Malaysia, appears to be readily available and operating without major impediments.

11.101   Regarding Digi and Sacofa's comments that the internet interconnection service should be re-listed with included capacity requirements, the MCMC would like to invite further submissions from stakeholders as to any perceived capacity constraints in the current supply of these services on a commercial basis. In particular, the MCMC is keen to understand the basis for these constraints and whether any other stakeholders have experienced these issues.

MCMC Preliminary View

11.102　The arguments for regulating IP Transit Service are more balanced and the MCMC would like to understand the views of stakeholders on the potential inclusion of IP transit services in the Access List in areas where peering is not available. In addition, the MCMC would also be keen to receive feedback on IP peering arrangements in Sarawak and whether there is a similar issue of high cost of IP transit in Sarawak.

11.103　For completeness, the proposed service description for IP Transit Service below is provided for discussion purposes only, to encourage submissions from operators:

IP Transit Service

The IP Transit Service is a Facility and/or Service for the carriage of data in digital form, based on Border Gateway Protocols, between an Access Seeker Point of Presence at which peering is not available and a POI at which peering is available.

Questions

Question 38: Have you experienced any issues in acquiring sufficient capacity of internet interconnection services?
Question 39: Do you have any comments on the proposal to include an IP transit service in the Access List where peering is not available e.g. in Sabah? Please provide details, including any comments on the proposed service description.
Question 40: Do you have any feedback on IP peering arrangements in Sarawak and on the IP transit prices in Sarawak?

12 Broadcasting services

Introduction

12.1　The Digital Terrestrial Broadcasting Multiplexing Service is the only broadcasting service in the Access List.

Digital Terrestrial Broadcasting Multiplexing Service

Overview – Wholesale digital broadcasting transmission services

12.2　In the time since the 2015 Access List Review, Malaysia has now fully transitioned to digital television broadcasting, with the analogue signal being switched off on 31 October 2019.

12.3　There are two main network elements involved in the process of digital television broadcasting:

(a)　the first element is a fixed-line transmission link which carries the broadcaster's content from the broadcaster's play-out facilities to a

broadcast tower – these transmission services are discussed in section 13; and

(b) the second element is wireless distribution of the broadcaster's content from a broadcast tower to end-user premises, which takes place using multiplexing technology (a process where multiple content streams from multiple broadcasters are compressed and combined into a single stream and distributed wirelessly). It is this second element that is the focus of this section.

12.4 In 2014, MYTV Broadcasting Sdn Bhd (**MYTV**) was appointed to build and operate digital terrestrial television multiplexing infrastructure. Accordingly, MYTV operates a nationwide network of multiplexing equipment (installed at broadcasting towers) as well as a range of transmitters that convey the multiplexed signal up to the end-user premises.

12.5 MYTV provides access to the digital terrestrial television multiplexing infrastructure to FTA broadcasters, as well as any other licensed content applications service provider (**CASP**). MYTV is a monopoly, as it is the only entity permitted to supply digital terrestrial television multiplexing services in Malaysia.

12.6 Given the above, the MCMC considers that these services are supplied on a national basis.

Competition/LTBE Analysis

12.7 Since the analogue switch-off in October 2019, the digital terrestrial television multiplexing service is the only option that broadcasters have if they wish to engage in terrestrial television broadcasting.

12.8 The MCMC is not aware of any evidence of any alternative transmission options that are effective substitutes to digital multiplexing services.

12.9 In particular, despite the increased use of online distribution of content via high-speed broadband services, the MCMC did not consider that online delivery can be treated the same as digital terrestrial broadcasting. This is because there remains a significant group of viewers who do not have adequate access to online delivery channels, either because they do not acquire a high-speed broadband service or do not have the equipment necessary to consume such content (e.g. Smart TVs or "connected" TVs). Similar arguments were upheld by the MCMC in respect of satellite and cable technologies, which require viewers to install specialised equipment.

12.10 Further, the MCMC's preliminary view is that the only way for FTA broadcasters to avoid any price increase imposed by MYTV would be to transition all their content to online-only content, which would either not be economically feasible for FTA broadcasters, or result in the economically inefficient investment in communications infrastructure, at odds with the LTBE.

12.11 The MCMC does not believe that there has been any material change in the state of competition in the supply of these services since the 2015 Access List Review, noting MYTV's appointment was granted before that review commenced.

Service Description

12.12   The Digital Terrestrial Broadcasting Multiplexing Service is currently described in the Access List as follows:

4(16) Digital Terrestrial Broadcasting Multiplexing Service

The Digital Terrestrial Broadcasting Multiplexing Service is a Facility and/or Service for the combining of multiple content applications service Transport Streams into a single Transport Stream with or without the addition of conditional access information.

12.13   The scope of the Digital Terrestrial Broadcasting Multiplexing Service is illustrated in the diagram below:
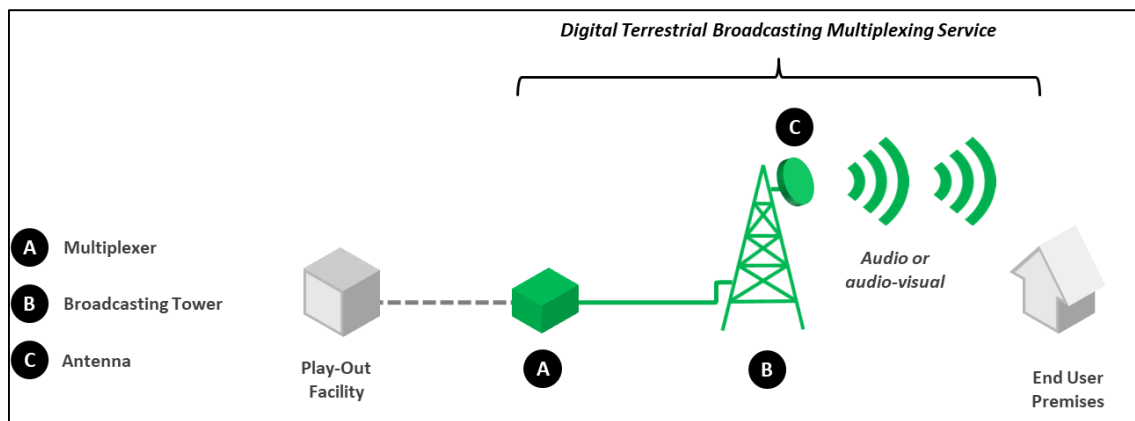
Figure 36 – Scope of Digital Terrestrial Broadcasting Multiplexing Service

Submissions Received

12.14   Astro submitted that the Digital Terrestrial Broadcasting Multiplexing Service is usable as an input to the services Astro supplies to its customers. However, Astro would like to see access providers include more value-added services, such as promotion and marketing of content of channel providers on the access provider's platform.

12.15   Astro submitted that network access is limited to only a small number of access providers who can provide services to MYTV's office in Cyberjaya, which can affect implementation efforts. Astro suggested that more providers would greatly improve implementation turnaround time and provide access seekers with choices. In particular, Astro submitted that there are obstacles faced by radio broadcasters in acquiring wholesale services especially on TM's facilities and services, but that these obstacles are addressed amicably via negotiation between both parties.

12.16   Astro submitted that digital radio broadcasting services should be excluded from the Access List and listed separately. Astro suggested that the Access List should be approached as an end-to-end solution that provides value to broadcasters.

12.17   In respect of impediments faced by radio broadcasters in acquiring any wholesale services, Commercial Radio Malaysia stated that the actual number of DTTV/MYTV users was not disclosed to the operators or publicly available. Commercial Radio Malaysia does not currently acquire any radio broadcasting services.

12.18   Commercial Radio Malaysia submitted that, as a broadcaster, it does not foresee DAB+ or DRM coming into the picture as long as the government does not require every car manufacturer to have the device pre-installed. Commercial Radio Malaysia is, however, agreeable to expanding the scope of the Digital Terrestrial Broadcasting Multiplexing Service in the Access List to include such services.

12.19   Commercial Radio Malaysia also submitted that radio advertising expenditure (**ADEX**) has been declining since the presence of digital platforms, and the fact that advertisers are moving their advertising budget to digital platforms given the greater flexibility. Commercial Radio Malaysia suggested that commercials allowed on digital should also be allowed on traditional radio broadcasting. Commercial Radio Malaysia also suggested that while advertisements can be targeted on digital platforms, this can also be done on traditional platforms by allowing advertisements in Chinese and Tamil radio stations.

12.20   Maxis is not active in this area, but submitted that given this service is provided by only one operator, it should be included in the Access List to ensure access is facilitated on equitable and non-discriminatory terms.

12.21   Media Prima submitted that the Access List should be expanded to cover digital radio broadcasting services.

12.22   My Evolution submitted that the digital radio broadcasting services should be listed in the Access List, although it did not have any comment on whether such services should be listed separately or included within the scope of the Digital Terrestrial Broadcasting Multiplexing Service.

12.23   MYTV submitted that digital radio broadcasting services can be provided over the Digital Terrestrial Broadcasting Multiplexing Service. As such, MYTV is of the view that digital radio broadcasting services should be included in the Access List as part of the Digital Terrestrial Broadcasting Multiplexing Service offering.

12.24   TM submitted that it does not acquire radio broadcasting services but may consider providing such services in the future through arrangements with its partners. Additionally, TM submitted that digital radio broadcasting services can either be listed separately in the Access List or the scope of Digital Terrestrial Broadcasting Multiplexing Services can be expanded in the Access List to cover digital radio broadcasting services, depending on the technology. The technology used may include Digital Terrestrial Multiplexer based on existing transmission link or newly built infrastructure, specifically for broadcasting services or 5G spectrum allocation.

MCMC Assessment

LTBE overview: Digital Terrestrial Broadcasting Multiplexing Service

12.25   The Digital Terrestrial Broadcasting Multiplexing Service has been on the Access List since 2005 [44] Access to the service continues to exhibit bottleneck characteristics, due to the existence of a monopoly provider in MYTV.

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[44] MCMC, Commission Determination on Access List, Determination No. 1 of 2005, paragraph 6(23).

12.26   Given the criticality of this service in promoting competition in downstream markets, particularly in the provision of FTA services where there is unlikely to be any viable alternative for FTA broadcasters, the MCMC considers that it would be in the LTBE for this service to remain on the Access List.

Inclusion of digital radio broadcasting services

12.27   Several stakeholders submitted that digital radio broadcasting services should be listed on the Access List.

12.28   Although Malaysia has not yet made the decision to fully implement digital radio broadcasting (e.g. using the DAB+ standard), the MCMC understands that the industry has been conducting trial and feasibility studies for some time, and the existing Digital Terrestrial Broadcasting Multiplexing Service is used to support 14 digital radio stations.

12.29   The MCMC notes ASTRO's submission that digital radio broadcasting services should be "excluded from the Access List and listed separately". It is not clear to the MCMC whether ASTRO requests that these services be listed separately in the Access List, or whether ASTRO considers that such services should only be acquired on a commercial basis. Regardless, the MCMC considers that the Digital Terrestrial Broadcasting Multiplexing Service as currently listed already contemplates the provision of digital radio services. The MCMC does not consider that the listing of such services separately on the Access List, rather than as a component of the existing Digital Terrestrial Broadcasting Multiplexing Service, would make any substantive difference from an LTBE perspective (or for access providers and access seekers).

12.30   Moreover, although an operator commented in the informal information session that the Digital Terrestrial Broadcasting Service is supplied with different architecture to that required for certain radio services, the MCMC did not receive any submissions from operators regarding any alternative network architecture upon which digital radio broadcasting services can be supplied, other than DTT-based networks and ecosystems.

12.31   Further, most operators submitted that digital radio broadcasting services should be included within the scope of the existing Digital Terrestrial Broadcasting Service rather than listed separately as a new service in the Access List. Accordingly, the MCMC is at this stage not inclined to list a separate digital radio broadcasting service.

12.32   The MCMC refers instead to the current description of the Digital Terrestrial Broadcasting Multiplexing Service, which contemplates the combination of multiple "Transport Streams" into a single Transport Stream. "Transport Stream" is in turn defined to include "digital video and audio streams". The MCMC notes that this description is intended to include not only audio-visual streams (e.g. in the context of television broadcasting) but also audio-only streams. The MCMC proposes to clarify this intention in the definition of "Transport Stream", such that digital radio broadcasting services can be acquired under the scope of the existing Digital Broadcasting Multiplexing Service.

12.33   Regarding Commercial Radio Malaysia's submission that commercials allowed on digital broadcasting should also be allowed on traditional radio broadcasting, the MCMC notes that advertisements and other content dissemination in the communications and multimedia industry in Malaysia should comply with the respective licensee's licence condition or the registered content code. Both these areas are beyond the scope of this review.

MCMC Preliminary View

12.34   The MCMC's preliminary view is that it would be in the LTBE for the Digital Terrestrial Broadcasting Multiplexing Service to remain in the Access List.

12.35   The MCMC also proposes to make modifications to the definition of "Transport Stream" as set out below, to reflect that this service is capable of being supplied as an audio-visual or audio-only service. Words that appear in <u>underlined red text</u> below have been added relative to the existing description while words that appear in ~~strikethrough text~~ are proposed to be deleted:

> *"Transport Stream" means a packet<u>-</u>based method of multiplexing one or more digital ~~video~~ <u>audio-visual</u> ~~and~~ <u>or</u> audio streams having one or more independent time bases into a single stream; and*

Questions

Question 41: Should digital radio broadcasting services be included within the description of the Digital Terrestrial Broadcasting Multiplexing Service or included as a new service on the Access List?
Question 42: Can you suggest any further refinements to the description of the Digital Terrestrial Broadcasting Multiplexing Service (including for the purpose of including digital radio broadcasting services within the service)? If so, please provide details and reasons for such refinements.

Other services: 5G broadcasting services

Overview

12.36   5G broadcasting uses a process called Further Enhanced Multimedia Broadcast Multicast Service (**FeMBMS**). FeMBMS is a 5G standard which allows operators broadcasting capabilities via the telecommunication standard[45] and gives an operator an unprecedented full spectrum of high-power high tower applications in downlink-only mode.

12.37   An important distinguishing feature of FeMBMS compared with 5G mobile broadband (which uses 3GPP specifications based on 5G RAN and 5G core networks) is that 5G broadcasting networks are operated independently of mobile operators. Accordingly, FeMBMS allows operators, such as TV

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[45] Karim Taga, Andreas Rudas, Gabriel Mohr, Dominic Sattler and Stefan Elsken, 'Broadcasters' 5G evolvement within a hybrid environment', November 2020, Arthur D Little, <https://www.adlittle.com/en/BroadcastIn5G>.

broadcasters and content providers, to transmit linear services to all mobile devices regardless of the end user's network.

12.38   Other reported cost-effective benefits of FeMBMS for distribution include how it allows the use of 5G-related edge computing technology to enhance existing content delivery networks.

12.39   The National 5G Task Force (**Task Force**) established in November 2018 noted that, in respect of broadband and media services, suitable business cases for 5G included e-sports, live streaming entertainment, advertisement, and unified communications (video conferencing). [46] However, the Task Force did not consider in any detail the technical elements of 5G broadcasting.

Submissions Received

12.40   All operator submissions in respect of 5G radio broadcasting services were received prior to the government's announcement of the establishment of DNB for the purposes of a single wholesale 5G network. However, no operators commented on 5G broadcasting services during the MCMC's consultation in respect of those services, including during informal operator sessions or in response to the MCMC's informal questionnaire.

12.41   At present, Astro does not acquire any 5G radio broadcasting services as an access seeker but may consider exploring such services in time under analogue or digital platforms.

12.42   Astro is also not exploring 5G broadcasting currently as it does not have any conclusive case study or viable business case to support 5G broadcasting. Astro stated that although broadcasting is a subset of 4G and 5G, none of the broadcasters have expanded their transmission into 4G and 5G in the last 10 years.

12.43   In respect of impediments in gaining access to or in supplying 5G broadcasting services, Commercial Radio Malaysia submitted that smaller broadcasters would look into accessing Multimedia Broadcast Multicast Service (**MBMS**), however, the deciding factor will be costs as transmission costs make up to 40% of the total operating cost.

12.44   Media Prima foresees that the FeMBMS may be an alternative service to the current Digital Terrestrial Broadcasting Multiplexing Service. The FeMBMS should therefore be regulated in a similar manner to other broadcasting services.

12.45   Media Prima also submitted that 5G broadcasting should be included in the scope of the service and treated in a similar fashion to any essential services, as it may also carry government messages and Public Service Broadcast channels. It submits that 5G broadcasting should not therefore be treated 'strictly' as a profit-making service, since the content will still be subject to various government controls and requirements.

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[46] MCMC, 'National 5G Task Force Report: 5G Key Challenges and 5G Nationwide Implementation Plan', December 2019, <https://www.mcmc.gov.my/skmmgovmy/media/General/pdf/The-National-5G-Task-Force-Report.pdf>., p 254.

12.46   My Evolution submitted that it is not currently acquiring 5G broadcasting services, but is examining the opportunity for IoT use-cases such as firmware security updates, broadcast of real-time logistic information, and video camera surveillance.

MCMC Assessment

LTBE overview: 5G broadcasting services

12.47   There is no strong evidence that the regulation of a 5G broadcasting service will result in the promotion of competition. Given the nascent stage of 5G technology, the MCMC has proposed a broader approach to 5G service regulation as discussed in section 9, to allow access seekers to supply key 5G services, including eMBB, FWA, uRLLC and mMTC, and to maintain a flexible, forward-looking approach to regulation.

12.48   The MCMC notes that while there appears to be some demand for 5G broadcasting services, the submissions received indicate that this demand is not immediate and no operators are currently acquiring or supplying such services.

12.49   The MCMC acknowledges that 5G broadcasting services may be a key application of 5G technology over time. However, at this stage, the MCMC does not have enough information regarding the architecture, future demand and potential use cases for 5G broadcasting services to the extent that would allow the MCMC to specifically cater for these services on the Access List.

12.50   In light of the above, the MCMC considers that there is no evidence to suggest that it would be in the LTBE for 5G broadcasting services to be included in the Access List.

MCMC Preliminary View

12.51   The MCMC's preliminary view is that 5G broadcasting services should not be listed on the Access List.

Questions

Question 43: Do you intend to acquire 5G broadcasting services as an access seeker or intend to supply 5G broadcasting services as an access provider?

Question 44: Should 5G broadcasting services be included within the description of the Digital Terrestrial Broadcasting Multiplexing Service or should they be included as an example of a 5G use case that DNB must support under the proposed new 5G services on the Access List, per section 9?

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13 Transmission services

Introduction

13.1   Transmission and managed data services are services that facilitate the dedicated transmission of data between two points, such as two end-user premises, an end-user premises and a POI or POP, or two POIs, POPs or other

premises. Unlike broadband services, transmission and managed data services provide the end-user with a higher level of quality of service and control over the technical characteristics of the service.

13.2   Transmission and managed data services are typically supplied over fibre-based links using a range of different technologies, including:

(a)   synchronous digital hierarchy (**SDH**) and plesiochronous digital hierarchy (**PDH**), often referred to as "traditional interfaces";[47]

(b)   Frame Relay and asynchronous transfer mode (**ATM**);

(c)   Metro Ethernet (or "**Metro-E**") or other Ethernet-based services;

(d)   IP-based virtual private networks (**IPVPN**);

(e)   dense wavelength division multiplexing (**DWDM**), which involves carrying different signals on a single fibre pair (allowing a single fibre pair to provide dedicated services to different users); and

(f)   time division multiplexing (**TDM**), which is a different method for carrying different signals across a single piece of network infrastructure.

13.3   However, transmission services are technology-neutral, and can also be supplied over copper, microwave or satellite infrastructure. Transmission services are also referred to as "leased lines", "private leased lines", "leased circuits" or "digital circuits".

13.4   The following facilities and services comprise the family of transmission services in the Access List:

(a)   End-to-End Transmission Service;

(b)   Wholesale Local Leased Circuit Service;

(c)   Trunk Transmission Service; and

(d)   Domestic Connectivity to International Service.

13.5   In this section, the MCMC will consider each of the above transmission services in turn.

13.6   The MCMC's preliminary view is that competition in the supply of transmission services is dependent on the geographic area in which the services are supplied.

13.7   The MCMC also considers that from an access seeker perspective, tail, trunk and end-to-end transmission services cannot be treated as providing the same inputs into the competitive process. In particular:

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[47] See, for example, BEREC, '*Layer 2 Wholesale Access Products excluding Ethernet-based Leased Lines on Market 4*', BoR (18) 120 (15 June 2018) <https://berec.europa.eu/eng/document_register/subject_matter/berec/download/0/8161-layer-2-wholesale-access-products-exclud_0.pdf>, p. 7.

(a) tail and trunk transmission relate to different network segments, meaning a price increase in respect of trunk services will not result in access seekers switching to tail services (and vice versa); and

(b) the end-to-end service is unlikely to be a viable alternative for tail transmission in the case of a price increase, given the different scope of the end-to-end service;

(c) tail, trunk and end-to-end transmission services are typically subject to different pricing; and

(d) tail, trunk and end-to-end transmission services are subject to different conditions of competition, given the MCMC's understanding that there are different suppliers of each type of service.

13.8 The preliminary views referred to in paragraphs 13.76 and 13.87 above apply equally to the following services, and is accordingly not repeated below in the context of those services:

(a) end-to-end transmission services in Peninsular Malaysia (except exclusive zones);

(b) end-to-end transmission services in Sabah;

(c) end-to-end transmission services in Sarawak;

(d) transmission services between Peninsular Malaysia and East Malaysia; and

(e) transmission services in each exclusive zone.

13.9 Further, where relevant, the MCMC has grouped together in the paragraphs 13.10 to 13.46 below the competition/service overviews in respect of wholesale end-to-end transmission services with the competition/service overviews for wholesale tail and trunk services. Those analyses are not repeated in the context of the wholesale tail and trunk transmission services below.

End-to-End Transmission Service

Overview: Tail, trunk and end-to-end transmission services in Peninsular Malaysia (except exclusive zones)

13.10 The MCMC's preliminary view is that the conditions of competition in Peninsular Malaysia are relatively similar, taking into account the broad competition between TM, TIME, Fiberail and Fibrecomm across the region, and the consistent regulated pricing for wholesale transmission services.

13.11 Accordingly, the MCMC's preliminary view is that there the wholesale supply of transmission services in Peninsular Malaysia (except exclusive zones) can be considered together from a competition/service overview perspective, with distinct analyses for trunk, tail and end-to-end transmission services.

Competition/LTBE Analysis: Tail, trunk and end-to-end transmission services in Peninsular Malaysia (except exclusive zones)

13.12   The MCMC's understanding is that there is an absence of competitors to TM (such as Sacofa and Celcom Timur Sabah) in Peninsular Malaysia, and limited scope for services-based competition in the supply of transmission services in Peninsular Malaysia more generally, particularly given TM's network size and scope.

13.13   In relation to the wholesale supply of end-to-end transmission services in Peninsular Malaysia in particular, the MCMC's preliminary view is that the majority of TM's actual supply of wholesale services appear to be end-to-end transmission services supplied on commercial terms, with no unbundling.

13.14   Although TM does not appear to supply tail and trunk transmission services in practice, the MCMC is aware that TM still has the most significant technical capability to supply these services. In the MCMC's preliminary view:

(a)   TM may be making the commercial decision to not provide wholesale tail/trunk transmission services to independent access seekers and instead use such services only as an input to its own retail services; or

(b)   TM may be engaging in "bundling" behaviour by tying together tail and trunk transmission services and requiring access seekers to acquire both as part of an end-to-end service.

13.15   Both these types of conduct indicate an ability for TM to act independently of the competitive process. If TM faced sufficient competition at the wholesale level, it would likely not be able to refuse supply of unbundled wholesale tail and trunk transmission services. Any such refusal of supply would likely be unprofitable in the face of sufficient wholesale competition.

13.16   The MCMC does not believe that the state of competition in the supply of these services has improved since the 2015 Access List Review (in which the End-to-End Transmission Service was first listed).

13.17   In particular, many operators have indicated that while they are generally able to acquire the End-to-End Transmission Service, many access providers are now treating the supply of any transmission service as an End-to-End Transmission Service, evidencing a potential lack of competitive constraints on access providers for these services.

Overview: Transmission services in exclusive zones

13.18   In areas such as the Genting Highlands, KLIA and KL Sentral, landowners have entered into exclusive arrangements with a telecoms operator (which is typically not a large national operator, but rather an operator that only owns infrastructure in that particular exclusive area).

13.19   In these areas, the only operators that are able to supply wholesale transmission services are the infrastructure owner itself, or other operators who acquire dark fibre from such operator. Based on data it has previously received, the MCMC understands that Digi and Celcom both acquire dark fibre from operators in

exclusive zones, however there is no evidence to indicate that Digi and Celcom are acquiring dark fibre services as an input to the supply of competing wholesale transmission services; rather, they appear to be acquiring dark fibre services for their own internal services e.g. as an input to mobile backhaul.

13.20   This is significantly different to the field of rivalry that exists in the rest of Peninsular Malaysia (analysed above), which strongly suggests that the competition/service considerations underpinning transmission links in exclusive zones are vastly different to the supply of transmission links in other parts of Peninsular Malaysia.

Competition/LTBE Analysis: Transmission services in exclusive zones

13.21   The MCMC's preliminary view is that competition in the supply of wholesale transmission services in exclusive zones is limited by a combination of:

(a)   legal infrastructure exclusivity granted by the landowner (which completely forecloses infrastructure-based competition); and

(b)   lack of legal or regulatory obligations for the infrastructure owner to unbundle its network at the dark fibre level (which practically limits the ability for new entrants to compete with the infrastructure owner in respect of wholesale transmission services).

13.22   The MCMC takes this preliminary view regardless of the potential for operators such as Digi and Celcom to commence supplying wholesale transmission services through the acquisition of dark fibre services.

13.23   Accordingly, the MCMC's preliminary view is that each infrastructure owner that has been granted exclusivity by a landowner in an exclusive zone has an effective monopoly in the supply of wholesale transmission services in that exclusive zone.

Overview: Tail, trunk and end-to-end transmission services in Sabah

13.24   The main provider of wholesale transmission links in Sabah is Celcom Timur Sabah, unlike the rest of Malaysia where different operators own the majority of transmission infrastructure. This suggests that there are different conditions of competition in Sabah to other regions in Malaysia.

13.25   For this reason, the MCMC takes the preliminary view that transmission services in Sabah must be considered separately to as transmission services in other regions of Malaysia.

Competition/LTBE Analysis: Tail, trunk and end-to-end transmission services in Sabah

13.26   The MCMC's understanding is that some operators are heavily reliant on Celcom Timur Sabah's transmission network in Sabah, given the limited coverage of other providers including TM and Borneo Global Connect.

13.27   Based on the information available to the MCMC, it understands that operators face significant challenges in acquiring services from Celcom Timur Sabah on

reasonable terms, suggesting that Celcom Timur Sabah is able to act in a manner independently of the competitive process.

Overview: Tail, trunk and end-to-end transmission services in Sarawak

13.28   In Sarawak, the supply of wholesale transmission services occurs similarly to Sabah, in that a state-based operator (here, Sacofa) competes with national operators such as TM. Sacofa owns a fibre optic network of 10,000 km in Sarawak and provides end-to-end transmission services over this network.

13.29   Sacofa's significant presence in Sarawak suggests that this state is subject to different conditions of competition than other parts of Malaysia, and thus must be considered independently from a competition/service perspective.

Competition/LTBE Analysis: Tail, trunk and end-to-end transmission services in Sarawak

13.30   The MCMC is aware of the potential entry of two new operators in the supply of end-to-end transmission services in Sarawak, as well as the formation of the Sarawak Multimedia Authority (**SMA**), which the MCMC understands may have further lowered barriers to entry in such supply.

13.31   However, the MCMC's preliminary view is that:

(a)   there is no evidence of the two new operators imposing any meaningful or sufficient competitive restraint on Sacofa in the supply of wholesale transmission services in Sarawak; and

(b)   the role of the SMA does not account for the economic (rather than regulatory) barriers to entry given the substantial investments required to roll out competing transmission infrastructure.

13.32   From an LTBE perspective, in states with low population density such as Sarawak, the potential of viable new operator entry is even lower, as there is unlikely to be a strong economic case for duplicating the existing transmission infrastructure of Sacofa and other operators to any meaningful extent. Such duplication would lead to an inefficient use of, and investment in, transmission infrastructure, squarely at odds with the LTBE.

Overview: Transmission services between Peninsular and East Malaysia

13.33   There are two facilities through which access seekers can acquire wholesale transmission services between Peninsular and East Malaysia:

(a)   the SKR1M Cable System, which is jointly owned by TM and TIME,[48] lands at six different locations in Peninsular Malaysia, Sabah and Sarawak and was completed in 2017; and

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[48] Telekom Malaysia, News Release, 2 September 2015, 'TM seals deal for Sistem Kabel Rakyat 1Malaysia', <https://www.tm.com.my/AboutTM/NewsRelease/Pages/TM-SEALS-DEAL-FOR-SISTEM-KABEL-RAKYAT-1MALAYSIA-(SKR1M).aspx>.

(b)   the East-West Cable System, owned by Sacofa, which connects Kuching (Sarawak) with Mersing (Peninsular Malaysia).[49]

13.34   The MCMC's preliminary view is that submarine transmission links between Peninsular Malaysia and East Malaysia cannot be analysed alongside, or acquired as an alternative for, any other transmission link (as they represent the only means of connecting Peninsular and East Malaysia).

13.35   Accordingly, the MCMC's preliminary view is that submarine cables between Peninsular Malaysia and East Malaysia must be considered independently.

Competition/LTBE Analysis: Transmission services between Peninsular and East Malaysia

13.36   The SKR1M Cable System provides connectivity between a greater number of locations than the East-West Cable System, particularly on the East Malaysian side. While the East-West Cable System lands only at Kuching in East Malaysia, the SKR1M Cable System lands at Kuching, Bintulu, Miri and Kota Kinabalu.

13.37   In light of this, the East-West Cable System does not appear to exercise a sufficient competitive constraint on the SKR1M Cable System, particularly given the relative scarcity of transmission infrastructure in East Malaysia (and the higher associated costs). Due to the route configuration and TM's majority control over the capacity of the SKR1M Cable System, the East West Cable System is only able to exercise a partial competitive constraint on TM.

13.38   It would require an enormous degree of investment in infrastructure for new entrants to compete with established operators such as TM in the supply of transmission infrastructure between Peninsular and East Malaysia. This is a significant barrier to entry which the MCMC considers limits the scope and prospect of competition with the established operators, and would in any event comprise potentially inefficient investment in infrastructure, in a manner inconsistent with the LTBE.

Overview: Transmission services to television broadcast towers and analogue radio broadcast towers

13.39   Transmission to the broadcasting towers refers to transmission services between the play-out facilities of television and radio broadcasters and broadcasting towers. These transmission links constitute the backhaul to broadcasting networks and are acquired as a wholesale input into the delivery of retail free-to-air television or radio broadcasting services. Transmission to broadcast towers is not used for subscription television, which is delivered over satellite networks or HSBB networks.

13.40   Transmission to broadcasting towers is generally supplied by TM through its Broadcast Transmitter Service, which is a specialised form of transmission link.[50]

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[49] Sacofa questionnaire response.
[50]   Telekom   Malaysia,   Website,   'Enterprise-Transmitter',   12   August   2021, https://www.tm.com.my/Office/Business/Enterprise/BroadbandInternet/Pages/Business.aspx

13.41 Transmission to television broadcast towers and analogue radio broadcast towers are not alternatives, given the different fields of rivalry between these two types of transmission links and the fact that television broadcasting has, since 2019, used digital multiplexing technology, compared with radio broadcasting which still predominantly uses analogue broadcasting transmission. This results in different towers being used for each type of service.

13.42 As a result, the MCMC's preliminary view is that transmission services to digital terrestrial television broadcast towers and analogue radio broadcast towers must be considered separately from other transmission services from a competition and LTBE perspective.

13.43 Note that digital television broadcasting from the broadcasting tower to *downstream* (to end-user premises) is delivered wirelessly, using multiplexing equipment and repeaters. Access to these services is discussed separately, in section 12. This section 13 deals with, inter alia, fixed-line transmission *upstream* of the tower, between the broadcaster's play-out facilities and the tower, which is typically provided using high-capacity fixed-line transmission links.

Competition/LTBE Analysis: Transmission services to television broadcast towers and analogue radio broadcast towers

13.44 As noted in paragraph 13.41, since 2019, television broadcasting has used digital multiplexing technology. This represents a significant shift since the MCMC's 2015 Access List Review, during which time television broadcasting still used analogue broadcasting transmission.

13.45 TM is the only known national supplier of transmission services to digital terrestrial television broadcast towers. This means the supply of these services by TM exhibits monopolistic characteristics, given:

(a) the significantly high barriers to entry in the supply of these services, which entry would require significant investment in infrastructure and considering the agreement that has been entered into between TM and MYTV (the sole digital terrestrial television provider) for the supply; and

(b) the limited degree of countervailing buyer power to which TM is subject from FTA broadcasters.

13.46 The MCMC considers that the level of competitive constraints on access providers in the supply of these services remain very low.

Service Description

13.47 The End-to-End Transmission Service is currently described in the Access List as follows:

4(22) End-to-End Transmission Service

(a) *The End-to-End Transmission Service is a Facility and/or Service for the carriage of communications between:*

(i) *two End User locations;*

> (ii)   between two Access Seeker Points of Presence; or
>
> (iii)   between one End User location and one Access Seeker Point of Presence,
>
> via such network interfaces at such transmission rates as may be agreed between the Access Provider and the Access Seeker on a permanent or virtual basis.

(b)   Network interfaces may use any technology as may be agreed between the Access Provider and the Access Seeker including, for example, Ethernet interfaces.

(c)   The functionalities of the End-to-End Transmission Service include:

> (i)   transmission and switching, whether packet or circuit;
>
> (ii)   the signalling required to support the technology or to provide a service;
>
> (iii)   termination at either end by a port, router, network termination unit, switch, submarine cable landing centre or earth station; and
>
> (iv)   a digital protocol including Internet Protocols.

(d)   An End User location or Access Seeker Point of Presence in subparagraph (a) may include submarine cable or satellite link between Sabah and Sarawak and Peninsular Malaysia, submarine cable landing centre or an earth station.

(e)   The End-to-End Transmission Service may be for the carriage of communications which comprise a content applications service.

(f)   Technologies used to supply End-to-End Transmission Service, such as Metro-E may be requested by Access Seekers and the Access Provider must supply End-to-End Transmission Service using these technologies on request.

(g)   An Access Seeker for the End-to-End Transmission Service which includes but not limited to a network facilities provider or network service provider which is only authorised to provide limited network facilities or network services such as in the last mile, but wishes to acquire the End-to-End Transmission Service in order to connect its limited network facilities or network services.

(h)   For the avoidance of doubt the End-to-End Transmission Service comprises but is not limited to the Facilities and/or Services specified in the Trunk Transmission Service and the Wholesale Local Leased Circuit Service.

13.48   The scope of the End-to-End Transmission Service is illustrated in the diagram below:
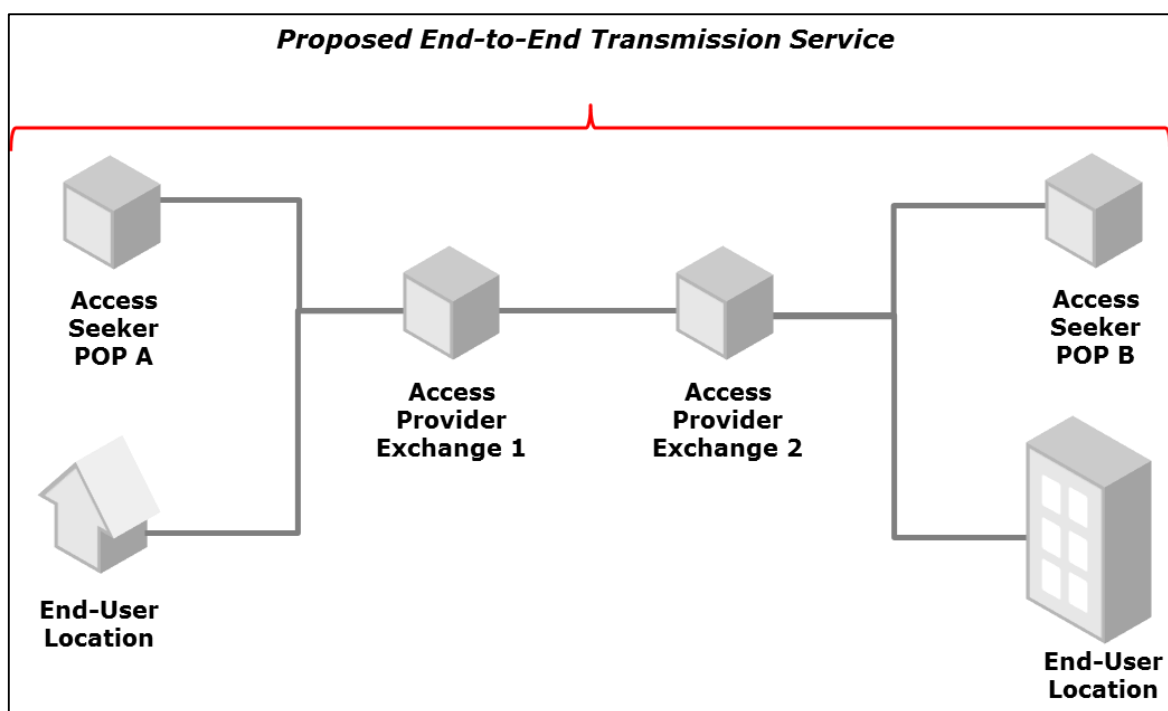
Figure 37 – Scope of End-to-End Transmission Service

Submissions Received

13.49   Astro submits that it has not experienced any problems in acquiring the End-to-End Transmission Service.

13.50   Celcom acquires the End-to-End Transmission Service to facilitate a connection between the access provider's HSBB service gateway to Celcom's service gateway. Celcom submits that any removal of regulation must be carried out with a proper methodology, and must take into account at least the following factors:

(a)   an assessment of market dominance and of any conduct of access providers which has or may have a negative effect on competition in any communications market, e.g. predatory pricing;

(b)   that there must be a minimum of three access providers located at, or within close proximity to the incumbent access provider's exchange, in order for there to be an assessment of competition in the relevant market; and

(c)   if there are three access providers in such proximity, the MCMC should also assess:

(i)   whether the three providers are independent of each other;

(ii)   the presence or close proximity of competing providers to the incumbent exchange;

(iii)   whether the transmission route is being serviced by at least three of the four largest access providers;

<ol type="i" start="4">
(iv) whether there is direct connectivity from the relevant exchange to major transmission hubs in, or close to, the central business districts (CBD) of the major capital cities;

(v) whether there is sufficient demand in that area to indicate likelihood of new investment and the potential for competition to develop the level of price competition in the area; and

(vi) whether there is evidence of transmission services being supplied from the exchange serving areas.

13.51 Celcom believes that specifying technical parameters in detail may lead to some parameters being inadvertently left out. Access providers may then use their discretion to claim that their service is not a regulated service. Celcom also suggests that the parameters of the service provided by the access provider should permit the access seeker or downstream operator to comply with the relevant MCMC's standards on quality of service. Celcom states that this principle has been adopted for HSBB Network Services under subsection 6.6 of the MSA.

13.52 Celcom also submits that if the services access providers offer go beyond the specified parameters, access providers should not use this as a reason to charge more.

13.53 Finally, Celcom submitted that non-competitive access services, such as HSBB Network Services, should remain in the Access List. Celcom stated that there is a need for strong enforcement by MCMC to ensure compliance of the MSA and MSAP by the access provider. For example, an incumbent dominant operator refuses to provide the Layer 2 HSBB Service and, in its provision of the Layer 3 HSBB Network Service, does not comply with the MSA and MSAP. Celcom states that, in this case, the access provider claims that it provides a service level availability of above 99.9% and, as such, the services are subject to commercial negotiation. Celcom accordingly states that the MCMC should not encourage flexibility.

13.54 Celcom Timur Sabah submitted that the End-to-End Transmission Service can be removed from the Access List for the state of Sabah, given Celcom Timur Sabah's view that the industry never experienced any pricing issues prior to the implementation of pricing regulation (at which time all transactions were managed commercially). Celcom Timur Sabah noted further that since Sabah is a developing state, revenues generated from current serviced areas are typically channelled to greenfield areas for the purposes of network improvement.

13.55 Celcom Timur Sabah proposed, if the service is to be retained in the Access List, it should be defined with basic technical parameters, with parties remaining free to negotiate any upgrades or changes to those parameters on a commercial basis. For example, Celcom Timur Sabah suggests that price regulation of the End-to-End Transmission service should be restricted to 2KM fibre node presence, 1Gbps capacity minimum and 5-year non-cancellable contract period, with any parameters beyond this scope to be negotiated commercially, taking into consideration the access provider's costs. In respect of parameter commitments, Celcom Timur Sabah also proposed that:

(a)   the primary path used for the provision of network services should be limited to one, with any redundancy routes to be only upon the access seeker's request (rather than required to be supplied as standard); and

(b)   the Service Level Availability of the service should be 99.9%, with any commitment and fulfilment beyond 99.9% not supplied as standard.

13.56   Digi proposed the following service parameters for the End-to-End Transmission Service:

No	Service parameters	2G/3G/LTE/LTE-A
1	Packet Latency (Round Trip)	<4ms
2	Packet Jitter	<3ms
3	Frame Loss	<10-6
4	Bit error rate	0%
5	Network Synchronization	Freq <50ppb, Phase <1.1us
6	Failover Time	50ms
7	MTU	> 9000 bytes
8	Bandwidth	Dedicated based on subscribed bandwidth
9	QoS	Able to deliver access seeker traffic QoS without changing the traffic priority
10	Broadcast Storm	Ensure the implementation design avoid broadcast storm. Provider shall isolate any broadcast storm happened within provider network from Access Seeker services.
11	Link support	Non-blocking for access seeker native packets including but not limited to CPRI, BPDU, VRPP, Unicast, Multicast, Anycast
12	Network Design	1+1 with protected path 1+0 without protection path
13	Service Level Availability (SLA)	i. 99.9% for 1+1 ii. 99.5% for 1+0

13.57   Fiberail acquires the End-to-End Transmission Service to complement its network, acting as a protection line or helping Fiberail reach areas that its network cannot otherwise reach. Fiberail submitted that it faced no problems in acquiring the service, and proposed that the Penang – Klang Valley – Johor Bahru route should be excluded from the scope of the service. Fiberail also proposed that the End-to-End Transmission Service should be defined simply as a basic connectivity service with 99.9% availability at the core network, with a single access connection to the access seeker. In Fiberail's view, anything beyond these parameters should be commercially negotiated rather than regulated.

13.58   As a provider of the End-to-End Transmission Service, Fiberail requires a longer contract term and commitment from access seekers, rather than the minimum 1-year period under clause 5.14.2 of the MSA. Fiberail especially requires this when it needs to incur capital expenditure to enable the services, and the rate is MSAP.

13.59   Fibrecomm acquires the End-to-End Transmission Service for the purposes of building out its network, diversity, and for resale. Fibrecomm proposed that high capacity transmission routes in Klang Valley, particularly from Cyberjaya to Kuala Lumpur, are serviced by multiple service providers and can be removed from the scope of the listed service. Like Fiberail, Fibrecomm also proposes that the End-to-End Transmission Service is a basic packet-based connectivity service over the Metro-Ethernet Network with 99.9% service availability on the core network segment and a single access connection to the access seeker. Fibrecomm also submitted that anything beyond these parameters should be commercially negotiated.

13.60   Maxis acquires and supplies transmission services, including the End-to-End Transmission Service. Maxis submitted that the End-to-End Transmission Service is used for a different purpose to other transmission services. In particular, Maxis characterises the End-to-End Transmission Service as follows:

(a)   carrying communications between Point A and Point B where both points are at access seeker or end user premises;

(b)   one local access service required in respect of each point (i.e. two services);

(c)   no network co-location or access route required; and

(d)   examples of use include BTS to BSC connectivity, E Node B to a Unified Serving Node or Mobile Management Entity.

13.61   In Maxis's view, acquiring the End-to-End Transmission Service is "much easier" than acquiring other transmission services because it involves simply informing the access provider of Point A and Point B, whereas other transmission services also require network co-location and access route services to be acquired, often resulting in additional charges.

13.62   Maxis strongly agreed that technical parameters such as SLA, traffic prioritisation, class of service and last mile configuration should be included in the service description of the End-to-End Transmission Service, to minimise disputes between access seekers and access providers, particularly as to applicable prices. Maxis also submitted that the available speeds should be amended to include speeds of up to multiples of 100Gbps per interface, noting the growing importance of high-capacity and high-speed transmission services in the 5G context.

13.63   Maxis strongly recommended that the MCMC, for the benefit of the industry, consider two categories of SLA for End-to-End Transmission Services. The first category is for the critical sites that require higher SLA, such as network

aggregator sites, and the second category is for the non-critical sites that do not require higher SLA, such as access sites as per the table below:
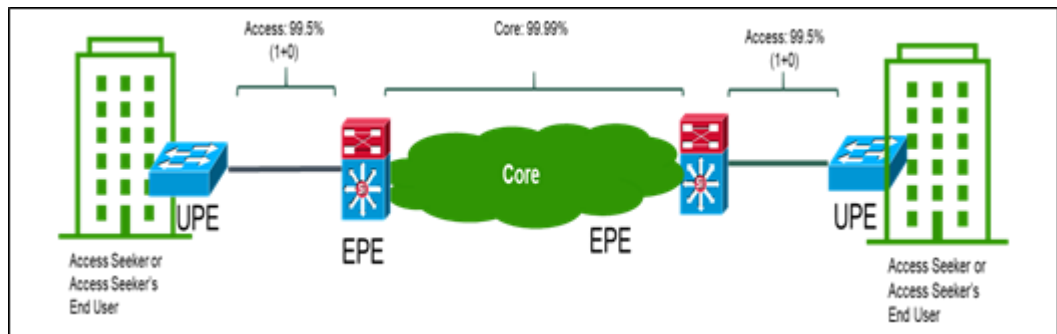
SLA	Sites	Network Element	Network Demarcation	Recommended SLA
Category 1	Aggregator Sites	Core	EPE to EPE	99.99%
		Access	EPE to UPE	99.90%
Category 2	Access Sites	Core	EPE to EPE	99.99%
		Access	EPE to UPE	99.50%

13.64   The network diagrams proposed by Maxis for both categories of SLAs are set out below:

(a)   Category 1:
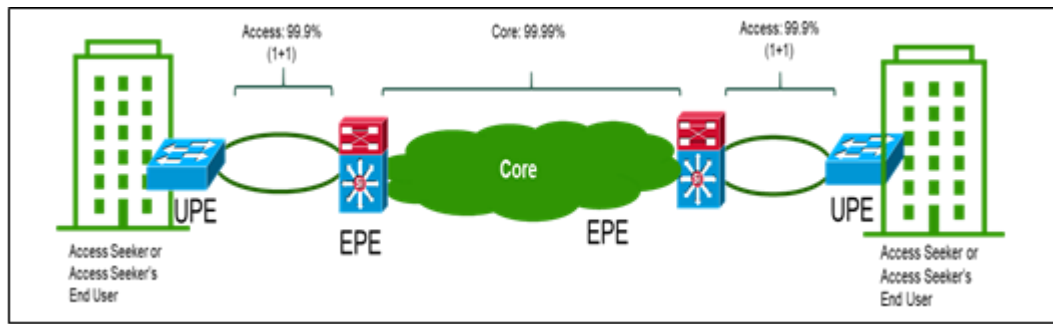
(b)   Category 2:

13.65   Maxis disagreed with any proposal to exclude any high-capacity transmission routes from the scope of the listed service. In Maxis' experience, it is very rare that there would be multiple service providers connecting to the same building or premises, and even where this is the case, access seekers (and end users) will benefit from having these choices.

13.66   Media Prima submitted that the technical parameters for the End-to-End Transmission Service must conform to the "Digital Terrestrial Televison (DTT) - content contribution, encoding and Multiplexing performance"- MTSFB 049:2017 documents. Media Prima further submitted that additional parameters may be referenced to ETSI TR 101 290 (V.1.2.1).

13.67   MyKris and Myren each acquire the End-to-End Transmission Service and neither experience any issues in acquiring the service. Whilst MyKris did not specifically provide a comment on the removal of high-capacity routes, Myren considered that no high-capacity transmission routes should be removed from the scope of the service.

13.68   Myren proposed the following service availabilities: 99.0%, 99.50, 99.70% & 99.90%.

13.69   Net2One submitted that the End-to-End Transmission Service satisfies Net2One's requirements. Net2One urged the MCMC to uphold the technology neutrality principle in all regulatory instruments to ensure any-to-any connectivity, especially with the impending transition to 5G technology. It further stated that an analysis on the question, what should be the "actual" technical parameter of the End-to-End Transmission Service, should be one of the focus areas of the Public Inquiry for the review of the Access List. It acknowledged that there have been significant changes in technology advancement and the transition to Next Generation Networks since the MCMC's 2015 Access List determination. It reiterated the importance to maintain the technology neutrality principle in determining the technical parameters that would be adopted in the revised Access List.

13.70   Ohana acquires the service for its clients who require dedicated internet services. Ohana reported no problems in acquiring the service.

13.71   Redtone acquires the End-to-End Transmission Service to provide services to its customers. In Redtone's experience, access providers interpret the listed service narrowly such that any offerings beyond the service as described in the Access List are provided to Redtone on a commercial basis only. Redtone noted for example that access providers provide only basic SLAs for the End-to-End Transmission Service under the Access List, which don't address Redtone's requirements and do not include any redundancy routes. Redtone has also experienced issues regarding uncertainty of the structure of the access provider's network and a lack of transparency of availability of the service.

13.72   Redtone submitted that including technical parameters in the scope of the service would eliminate many uncertainties and clarify the services offered by access providers. In Redtone's experience, uncertainties today include what SLAs are included, what types of circuit are included and whether the service includes protected circuits and redundancy routes. Redtone proposed the following parameters:

(a)   a Service Level Availability of 99.5% per month;

(b)   packet Loss of < 1%;

(c)   latency of < 20ms (within peninsular) or <40ms (peninsular to east Malaysia);

(d)   delivery of the Services: 4 weeks upon receiving a request from the access seeker; and

(e) restoration for link outage:

    (i) response time: 1 hour;

    (ii) update time: hourly; and

    (iii) restoration time: 4 hours.

13.73 Sacofa acquires the service to serve its end customers and for back-up purposes. Sacofa reported that access providers have quoted expensive rates for this service.

13.74 TIME acquires the End-to-End Transmission Service for full-span interconnection and transmission services between its POIs in areas where TIME has no coverage. TIME has experienced some issues in acquiring the service as it cites that some operators don't follow MSAP prices for the service. TIME submitted that the MCMC should consider de-regulating services where there is adequate competition so as to ensure that market forces decide on the rules of competition and pricing. In TIME's view, where there is only a single access provider for any of the items in the Access List, regulations should be imposed.

13.75 Finally, TIME considers that the current technical parameters, being the Mandatory Standards for Quality of Service (Digital Leased Line Service) Determination No. 3 of 2009 and Quality of Service for Digital Leased Line Services, adequately describe the scope of service, where the parameters include service availability, fulfilment of installation order and service restoration performance.

13.76 TM provides the End-to-End Transmission Service because the service does not refer to a specific location. Rather, the service is described as a bandwidth service that requires an NTU to be placed between the customer equipment and TM's NTU in order to demarcate the service boundary between TM's network and the customer's network equipment.

13.77 TM submitted that multiple service providers can competitively offer routes within major cities in Malaysia, including Klang Valley, Penang and Johor Bahru. TM supports the removal of these routes from the scope of the End-to-End Transmission Service given TM's view that access providers across these routes provide competitive offerings to end users.

13.78 In support of this, TM raised the approaches adopted regarding the Domestic Transmission Capacity Service in Australia and inter-exchange connectivity services in the UK, where TM says areas with sufficient competition were de-regulated. [51] TM also strongly recommended the MCMC to consider the removal of the End-to-End Transmission Service in relation to geographically challenging areas and locations involving high and prohibitive build costs. If the MCMC is to retain the service, TM submitted that the MCMC must consider reviewing the

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[51] Ofcom, 'Promoting competition and investment in fibre networks: review of the physical infrastructure and business connectivity markets', Volume 2, 28 June 2019, <https://www.ofcom.org.uk/__data/assets/pdf_file/0025/154591/volume-2-bcmr-final-statement.pdf>.

price of the service to allow for a realistic margin, or to remove price regulation altogether.

13.79   Like some other access providers, TM regards the End-to-End Transmission Service as a basic connectivity "as-is" service. In TM's view, the definition of the End-to-End Transmission Service should specify the technology to be utilised for the speed to be offered. For lower-speed bandwidth (2Mbps and below) that utilises circuit-switched technology, TM submitted that the End-to-End Transmission Service should be removed from the Access List, as that technology is reaching its sunset stage and will soon be obsolete. TM considers that the End-to-End Transmission Service should be confined to only Metro-E-based technology, a packet-switched network that TM considers is widely adopted by most operators, to ensure standardisation of offerings.

13.80   Finally, TM submitted that any technical parameters for the End-to-End Transmission Service should be defined as follows:

(a)   the technology used to supply the End-to-End Transmission Service must be based on Metro-E technology;

(b)   the access link at both sides of the end-user locations or access seeker POP must be on a single access fibre terminating to a single piece of termination equipment, to enable basic connectivity services from one location to another;

(c)   no traffic prioritisation is applicable to the End-to-End Transmission Service; and

(d)   a core network designed for 99.9% availability is required.

Any level of network design that is inconsistent with the basic technical parameters of the End-to-End Transmission Service should be subject to commercial negotiation.

13.81   U Mobile submitted that no routes should be removed from the scope of the End-to-End Transmission Service, and that QoS should be included in the technical parameters of the service. U Mobile also proposed the following parameters:

(a)   annual per hop Availability (%):

(i)   K Band: 99.995;

(ii)   E Band: 99.95;

(b)   flat Fade margin (db) per hop of >30db; and

(c)   latency per hop (2 way) of <1ms.

13.82   Webe submitted that it has no issues in acquiring the End-to-End Transmission Service for network connectivity purposes. In Webe's view, there should not be any regulation imposed in areas where there is sufficient competition, and incentives should be provided to access providers who have invested their network rollout in areas that are not commercially viable but are required to

serve the nation. Webe also submitted that transmission services should include parameters such as bandwidth.

13.83   YTL requires a fully managed End-to-End Transmission Service with committed SLAs for easy monitoring and management. YTL submitted that most access providers do not comply with the MSAP rates, and some access providers are not opening up nor offering the service providers new network areas. YTL considers that any technical parameters included in the scope of the service should follow QoS Determination No. 3 of 2009 (or any revisions thereto). In YTL's view, technical parameters for the service should be set in such a way that they cannot be used by access providers to exclude the service from any access offer. YTL proposed the following parameters:

(a)   lease bandwidth shall be dedicated (non-shared), transparent to user protocols, no VLAN encapsulation and modification to the access seeker's Layer 2 frame and Layer 3 payload;

(b)   support for Layer 2 MTU size of up to 9000 bytes;

(c)   a Service Availability of 99.9% monthly;

(d)   packet Loss of < 0.1%;

(e)   jitter of < 1ms; and

(f)   one-way latency of < 10ms.

13.84   YTL also submitted that all transmission routes should be regulated, given the exact routes supplied by access providers operators may differ even between the same two locations. In YTL's view, no two networks are interchangeable.

MCMC Assessment

LTBE overview: End-to-End Transmission Service

13.85   The End-to-End Transmission Service is one of the most heavily-acquired services in the Access List. It is essential to the promotion of competition in dependent downstream services, whether transmission services, mobile services, business-grade services or others. It is also essential to the efficient use of, and investment in, infrastructure, given access seekers may otherwise be required to unnecessarily duplicate these networks across cities.

13.86   The End-to-End Transmission Service was introduced by the MCMC in the 2015 Access List Review to align with the provision of end-to-end transmission services being supplied in the market on a commercial basis, with access seekers complaining at the time that certain access providers were not allowing access seekers to purchase trunk and tail transmission services separately.

13.87   Given the ongoing difficulties still being reported by access seekers in acquiring unbundled access to the various transmission services, and the various submissions from access seekers that most transmission services are regarded as an End-to-End Transmission Service, the MCMC considers it would undermine the promotion of competition, and accordingly the LTBE, if the End-to-End

Transmission Service were to be removed from the Access List as suggested by a small number of operators.

13.88   The MCMC also notes submissions received from many stakeholders that typically, access providers treat all transmission services as End-to-End Transmission Services, and accordingly the End-to-End Transmission Service is being supplied on a broader basis than intended, with unbundled access to trunk and tail transmission services difficult to acquire.

13.89   The MCMC is concerned that the same issues are prevalent in the market today due to the way in which some access providers have sought to interpret the description of the listed transmission services, including by adopting a broad interpretation of the End-to-End Transmission Service and a narrow interpretation of tail and trunk transmission services.

13.90   Given the importance of the End-to-End Transmission Service in promoting downstream competition and encouraging the efficient use of, and investment in, the significant infrastructure assets that support the service, the MCMC considers it would be in the LTBE for the End-to-End Transmission Service to remain listed on the Access List.

Technical parameters

13.91   First, most stakeholders commented that the End-to-End Transmission Service should be listed with technical parameters. This appears to be a result of the current market practice through which access providers consider the End-to-End Transmission Service as a "basic" connectivity service, with any technical requirements above this being supplied on commercial terms.

13.92   Relevantly, even many access providers (e.g. Maxis, Fiberail and TM) requested that the service be defined with certain basic technical parameters, which is consistent with Maxis's submission that there is the potential for dispute and confusion between access seekers and providers as to the scope of the listed service as currently described.

13.93   The technical parameters sought by stakeholders naturally varied, but generally, most stakeholders requested that the End-to-End Transmission Service be listed with the following parameters:

(a)   availability or SLAs;

(b)   latency;

(c)   availability of redundancy routes; and

(d)   technology to be used to supply the service (e.g. circuit-switched vs packet-switched).

13.94   In practice, the MCMC understands that access providers typically provide the End-to-End Transmission Service with high availability, but that some access providers treat this as the supply of a commercial service. Fundamentally, however, the End-to-End Transmission Service is intentionally described broadly in the Access List so as to cover all services which fall within that description,

regardless of the parameters with which the service is supplied. The MCMC is concerned to ensure that, as submitted by stakeholders such as Celcom, Redtone and YTL, access providers do not seek to circumnavigate the Access List by supplying regulated services with variant parameters.

13.95   While the MCMC understands that the supply of End-to-End Transmission Service with factors such as redundancy routes, higher availability and lower latency may have significant cost impacts on the access provider, the Access List is not intended to permit the supply of these services on an entirely unregulated basis. In particular, given the wide range of technical parameters with which many Access List services can be supplied, an access provider could argue that any services supplied with technical parameters which are not set out in the Access List (or MSA) are not subject to regulation.

13.96   Clearly, from a policy perspective, allowing such an interpretation would risk entirely undermining the access regime. Accordingly, the MCMC proposes to set out certain technical parameters in the description of the End-to-End Transmission Service, to clarify the scope of the service and ensure the service reflects the commercial offerings of access providers. In this regard, taking into account submissions from many stakeholders regarding the appropriate technical parameters with which the service is supplied, the MCMC considers that the End-to-End Transmission Service includes services supplied with:

(a)   any availability between 99.9% and 99.992% (whether such availability is specified per month or across any other time period);

(b)   any latency of between <1ms and <40ms; and

(c)   zero or more redundancy routes.

13.97   Although some stakeholders proposed the inclusion of other technical parameters, such as jitter, frame loss, class of service, bandwidths and restoration time, the MCMC understands that the key parameters of this service are as set out above, and accordingly the MCMC does not propose to expressly list other parameters.

13.98   Further, the MCMC accepts Celcom's submissions that specifying technical parameters may lead to access providers arguing that any services supplied with different parameters are beyond the scope of the Access List. To prevent access providers pursuing such an approach, the MCMC proposes to clarify within the service description that the End-to-End Transmission Service includes not only services supplied with any of the above parameters, but such other parameters with which the service may be supplied from time to time.

13.99   For clarity, the MCMC will consider at a later stage any amendments required to the MSAP to reflect the access provider's costs associated with the provision of the service with these various listed parameters. The MCMC considers that, taken together, these changes will address the concerns raised by Sacofa, TIME and YTL regarding the non-compliance by access providers with MSAP rates.

13.100   Regarding the technology with which the End-to-End Transmission Service is supplied, the MCMC notes that the service is already defined as technology-

neutral, pursuant to subparagraph 4(22)(f) of the service description. Accordingly, the MCMC does not propose to make any further changes in this regard, and rejects TM's submission that the service should be confined only to Metro-E based technology.

Competitive routes

13.101 Secondly, some stakeholders including Fiberail, Fibrecomm, TM and Webe, made submissions that certain routes should be excluded from the scope of the service, on the basis that those routes are competitive. In particular, stakeholders commented on the existence of multiple service providers within cities such as Klang Valley (particularly from Cyberjaya to Kuala Lumpur), Penang and Johor Bahru.

13.102 As many stakeholders will be aware, in the course of the 2015 Access List Review, the MCMC proposed to include a mechanism through which certain transmission routes could be de-regulated on a route-by-route basis subject to the MCMC's satisfaction that there was sufficient competition (or signs of competition) on those routes.

13.103 However, the MCMC is now of the view that route-by-route de-regulation may not be appropriate. In particular, the MCMC considers that although the two end-points of a certain route may be the same at a city level (e.g. Cyberjaya to Kuala Lumpur):

(a)   the competitive dynamics within each of those cities depends at least to some extent on the number of exchanges in those cities; and

(b)   the routes offered by certain access providers between those two cities may differ in distance and traversed locations.

13.104 A number of stakeholders rejected any proposal to de-regulate certain transmission routes. The MCMC also notes Celcom's submissions that a number of other factors must be taken into account, including the number, size and relationship of access providers in close proximity to the incumbent provider's exchange, and an analysis of demand in the relevant area. The MCMC agrees that these factors could also be relevant to an assessment of whether competition exists on a particular route.

13.105 Given the above, the MCMC's preliminary view is that there remains no compelling need for a mechanism through which transmission services can be de-regulated on a route-by-route basis. However, the MCMC invites submissions from operators setting out any further details of competitive high-capacity transmission routes.

Point of Presence

13.106 Based on discussions during the informal information sessions with operators and taking into account submissions from access seekers, the MCMC notes that there is confusion over the term "POP". In the interest of providing clarity, the MCMC will replace the phrase "Access Seeker POP" with "Access Seeker's premises" in the service description.

13.107 The MCMC also provides further clarity regarding the intended scope of, and interaction between, the various transmission services on the Access List in paragraphs 13.108 and 13.109 below.

MCMC Preliminary View

13.108 The MCMC's preliminary view is that it would be in the LTBE for the End-to-End Transmission Service be retained in the Access List, subject to modifications to include certain technical parameters and to clarify the scope of the service.

13.109 The MCMC proposes to substitute the existing description of the End-to-End Transmission Service with the following description. Words that appear in underlined red text have been added relative to the existing description while words that appear in strikethrough text are proposed to be deleted:

4(22) End-to-End Transmission Service

(a) The End-to-End Transmission Service is a Facility and/or Service for the carriage of communications between:

(i)   two End User locations;

(ii)   between two Access Seekers' premises Points of Presence; or

(iii) between one End User location and one Access Seeker's premises Point of Presence,

via such network interfaces at such transmission rates as may be agreed between the Access Provider and the Access Seeker on a permanent or virtual basis.

(b) Network interfaces may use any technology as may be agreed between the Access Provider and the Access Seeker including, for example, Ethernet interfaces.

(c) The functionalities of the End-to-End Transmission Service include:

(i)   transmission and any type of routing or switching, whether packet, or circuit, multi-layer or otherwise;

(ii)   the signalling required to support the technology or to provide a service;

(iii) termination at either end by a port, router, network termination unit, switch, submarine cable landing centre or earth station; and

(iv)   a digital protocol including Internet Protocols.

(d) An End User location or Access Seeker's Point of Presence premises in subparagraph (a) may include submarine cable or satellite link between Sabah and Sarawak and Peninsular Malaysia, submarine cable landing centre or an earth station.

(e) The End-to-End Transmission Service may be for the carriage of communications which comprise a content applications service.

(f) Technologies used to supply End-to-End Transmission Service, such as Metro-E may be requested by Access Seekers and the Access Provider must supply End-to-End Transmission Service using these technologies on request.

(g) An Access Seeker for the End-to-End Transmission Service which includes but is not limited to a network facilities provider or network service provider which is only

authorised to provide limited network facilities or network services such as in the last mile, but wishes to acquire the End-to-End Transmission Service in order to connect its limited network facilities or network services.

(h)   *For the avoidance of doubt, the End-to-End Transmission Service comprises but is not limited to the Facilities and/or Services specified in the Trunk Transmission Service and the Wholesale Local Leased Circuit Service.*

(i)   *The End-to-End Transmission Service includes any End-to-End Transmission Service supplied to the Access Seeker with:*

    (i)   *any network availability between 99.90% and 99.992%, whether per month or otherwise:*

    (ii)   *any latency of between <1ms and <40ms:*

    (iii)   *zero or more routes of redundancy; and*

    (iv)   *any other technical parameters specified or utilised by the Access Provider from time to time, including parameters of a type referred to in paragraphs (i) to (iii) above.*

Questions

Question 45: What is your view on the amendments proposed to the description of the End-to-End Transmission Service, including the proposed technical parameters? Should any other parameters be listed in the description of the service?
Question 46: As an access provider, are you capable of supplying the End-to-End Transmission Service per the proposed amended service description? If not, please provide details, including amendments you would propose to the service description to facilitate your supply of the regulated service?
Question 47: Should the Access List include a specific definition for "network availability" or "latency"? If so: (a) kindly propose the definition for "network availability"; and (b) please review the current definition for "Latency", and provide your feedback whether it is sufficient for the purposes of End-to-End Transmission Service or should there be any further amendments?

Wholesale Local Leased Circuit Service

Overview: Transmission services (including tail transmission services) based on geographic area

13.110   Wholesale tail transmission services are acquired by service providers to:

(a)   connect their own sites (e.g. mobile operators connecting their mobile base stations to a network location); or

(b)   connect to end user premises (e.g. for the purposes of providing retail services such as managed services or leased lines, typically acquired by large corporate or government customers).

13.111 Tail transmission services do not include, and are not alternatives for, ULL access services or line sharing services, which comprise local access services (see section 15 below for a description of these services). The MCMC's preliminary view is that ULL access services should not be treated the same as tail transmission services, given that the symmetric transmission capabilities of ULL is dependent on the distance between the transmission points to a much greater extent than tail transmission.

13.112 The wholesale supply of for transmission services (including tail transmission services such as the Wholesale Local Leased Circuit Service) in the five distinct geographic zones identified by the MCMC is discussed in paragraphs 13.10 to 13.32 above.

Service Description

13.113 The Wholesale Local Leased Circuit Service is currently described in the Access List as follows:

4(6) Wholesale Local Leased Circuit Service

(a) *A Wholesale Local Leased Circuit Service is a Facility and/or Service for the carriage of communications by way of a private circuit between a POI at the Access Provider's premises and an End User location or an Access Seeker Point of Presence, available only at one end of a private circuit. The Wholesale Local Leased Circuit Service comprises transmission and switching, whether packet or circuit, at such transmission rates as may be agreed between the Access Provider and the Access Seeker on a permanent or virtual basis.*

(b) *The functionalities of the Wholesale Local Leased Circuit Service include:*

(i) *transmission and switching, whether packet or circuit;*

(ii) *the signalling required to support the Interconnect Link Service or onward transmission via a Trunk Transmission Service provided by the same Access Provider; and*

(iii) *a digital protocol including Internet Protocols.*

Examples of technologies used in the Wholesale Local Leased Circuit Service would be Integrated Services Digital Network ("ISDN"), IP based networks and Ethernet interfaces.

13.114   The scope of the Wholesale Local Leased Circuit Service is illustrated in the diagram below:
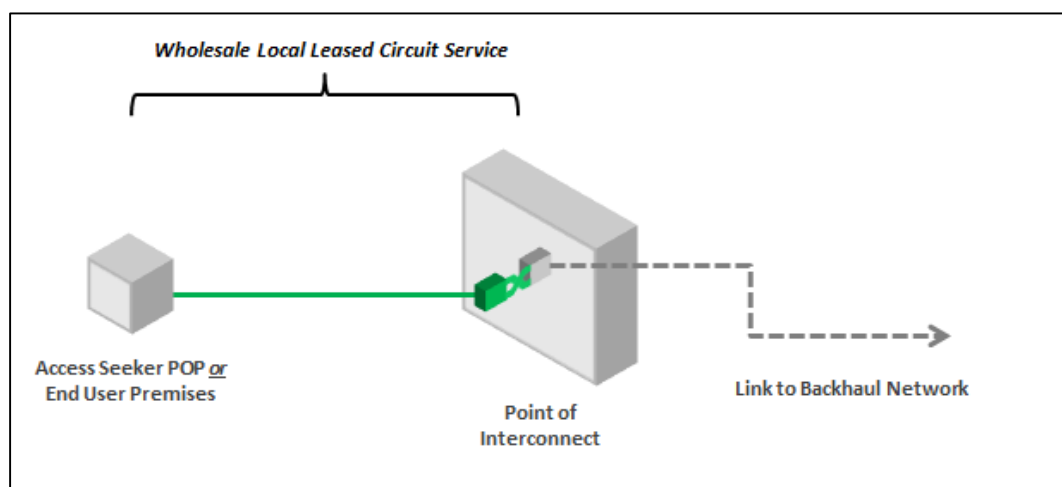

Figure 38 – Scope of Wholesale Local Leased Circuit Service

Submissions Received

13.115   Most operators who responded to the Wholesale Local Leased Circuit Service submitted that the service should be able to be incorporated into a Metro-Ethernet network, including Celcom, MyKris, Myren and U Mobile.

13.116   In Celcom's experience, some operators offer Metro-Ethernet network services as a substitute for leased line transmission services. These services appear to be substitutable for HSBB services and in Celcom's view, are offered in the same market. Celcom submitted that these services should be subject to regulatory intervention because in Celcom's opinion, the operators of these services (who have been exclusively appointed as nominated facilities providers in the relevant area), enjoy significant market power. Celcom submitted that other operators would not be able to duplicate infrastructure in these areas of exclusivity.

13.117   Celcom also submitted that any exclusion of routes should be carried out with a proper methodology (as Celcom noted in respect of the End-to-End Transmission Service in paragraph 13.50 above).

13.118   Fibrecomm does not acquire this service and submitted that it is considered as an End-to-End Transmission Service.

13.119   Maxis acquires and supplies transmission services, including the Wholesale Local Leased Circuit Service. Maxis characterises the Wholesale Local Leased Circuit Service as follows:

(a)   carrying communications between Point A and Point B where one point is at the access seeker or end user's premises and the other point is at the access provider's premises;

(b)   one local access service required;

(c)   network co-location and access route services required at the access provider premises; and

(d)   example of use includes last mile connectivity to the access seeker's end user / corporate customers.

13.120   Maxis finds the Wholesale Local Leased Circuit Service usable as an input to the last mile / local access transmission connection it provides for its business / corporate customers. However, Maxis has experienced some limitations in co-locating its equipment in the access provider's premises, as explained in paragraph 11.57 above in relation to the Network Co-Location Service.

13.121   Further, Maxis submitted that certain operators take the view that Wholesale Local Leased Circuit Service also involves the provision of Trunk Transmission Services for internal connection between the access seeker's equipment and the access provider's equipment, even though these are co-located in the same building. This, together with required network co-location charges, has increased the cost of acquiring the service so that it is similar to prices for End-to-End Transmission.

13.122   Maxis proposed that the service description should be technology neutral and include technical parameters, as per Maxis' comments in respect of the End-to-End Transmission Service in paragraph 13.62 above.

13.123   Finally, Maxis submitted that no locations or areas should be excluded from the scope of the service, given it is typically supplied in a local access area.

13.124   My Evolution commenced acquiring Metro-Ethernet and Layer 2 lease lines in 2020 to link its data centre location in Kuala Lumpur with a new back-up data centre in Cyberjaya, and to some of its customer's facilities. My Evolution did not report any issues in acquiring the service.

13.125   MyKris finds the Wholesale Local Leased Circuit Service usable as an input to the services it supplies to its customers. MyKris requires point to point transmission where one end is either at the customer's premises or at one of MyKris' POIs. MyKris did not report any impediments in accessing the service, but noted that occasionally the access provider does not have available infrastructure coverage.

13.126   Net2One submitted that it has no need to acquire the Wholesale Local Leased Circuit Service at this time.

13.127   Redtone submitted that no routes should be excluded from the scope of the listed Wholesale Local Leased Circuit Service until there is more than one operator serving the same area and location. Redtone also noted that as an access seeker, it does not have visibility over the available areas or locations at which services are available for supply, and must request access on a location-by-location basis to determine availability.

13.128   Sacofa acquires the Wholesale Local Leased Circuit Service and experiences no functional limitations.

13.129   TM submitted that it is not able to offer the Wholesale Local Leased Circuit Service on a standalone basis due to technical reasons. In particular, TM stated that without the trunk segment, the Wholesale Local Leased Circuit Service would not be connected to TM's active network (i.e. it would consist of a UPE

without connection to TM's core network) and such a UPE could not be managed by TM. As a result, TM does not offer the Wholesale Local Leased Circuit Service to third parties or to itself and strongly recommended that the Wholesale Local Leased Circuit Service be removed from the Access List.

13.130   U Mobile submitted that accessing this service in areas such as Putrajaya, Cyberjaya and KLIA is still difficult due to areas of exclusivity. In U Mobile's opinion, exclusivity has resulted in major impediments for access providers to deliver the necessary coverage and by extension, to meet national targets.

13.131   YTL commented that most access providers have refused to provide the Wholesale Local Leased Circuit Service as a standalone service, and considers that there is confusion regarding the description of the Wholesale Local Leased Circuit Service and the Trunk Transmission Service. YTL submitted that most access providers have refused to honour the MSAP rates and that a diagrammatic illustration of these transmission services should be provided to address this confusion.

MCMC Assessment

LTBE overview: Wholesale Local Leased Circuit Service

13.132   The Wholesale Local Leased Circuit Service is supplied in the last mile of the access network, which is commonly regarded as a bottleneck in the supply of telecommunications services, including from an international perspective. The infrastructure in the last mile of the network is difficult to duplicate and is necessary for the promotion of downstream competition.

13.133   Accordingly, the MCMC considers that it would be in the LTBE for the Wholesale Local Leased Circuit Service to remain on the Access List.

Interaction with Trunk Transmission Service

13.134   Access seekers generally commented that they have been unable to acquire this service as a standalone service, as many access providers consider the supply of this service equivalent to the supply of an End-to-End Transmission Service. As noted in paragraph 13.86 above, the MCMC is concerned by this situation, given it was for these reasons that the MCMC chose to include the End-to-End Transmission Service in the 2015 Access List Review.

13.135   In particular, TM commented that it is not able to offer the Wholesale Local Leased Circuit Service (or the Trunk Transmission Service) on a standalone basis without bundling these two together. The MCMC notes that TM did not raise during the course of the 2015 Access List Review any technical issues with the then proposed description of the Wholesale Local Leased Circuit Service. Further, the MCMC notes that there are currently eight access agreements covering take-up of the Wholesale Local Leased Circuit Service. However, the MCMC understands that TM's network architecture is such that the unbundled supply of these services is not possible.

13.136   However, as noted in paragraphs 13.88 to 13.106 above in relation to the End-to-End Transmission Service, the MCMC acknowledges some degree of confusion amongst operators regarding the scope of the family of transmission services in the Access List. In particular, the MCMC understands that where an access seeker requests a Wholesale Local Leased Circuit Service from an end user location (or access seeker premises), some access providers may require the access seeker to also acquire a trunk component, as well.

13.137   The MCMC has reconsidered its earlier views and confirms that it is appropriate in these circumstances for the Wholesale Local Leased Circuit Service to include a trunk component.

13.138   Notwithstanding the fact that it includes a trunk component, such service would still be classified as a Wholesale Local Leased Circuit Service, rather than an End-to-End Transmission Service or a Trunk Transmission Service and a Wholesale Local Leased Circuit Service. For clarity, the MCMC's intends that this "included" trunk component will be limited to a short-distance trunk within the same geographic region, rather than a long-distance trunk supplied between two distinct geographic regions (e.g. between Kuala Lumpur and Johor Bahru). Put another way, if an access seeker were to request connectivity only between a POI and an End User location or access seeker premises, such connectivity would comprise a Trunk Transmission Service.

13.139   The MCMC will also closely review the MSAP at a later time to ensure that the regulated prices for these services are set at an appropriate level and do not create any perverse incentives for access providers. For example, the MCMC will seek to ensure that access providers do not have any commercial incentive to require access seekers to acquire a trunk segment beyond that which is required for the access seeker to efficiently acquire the Wholesale Local Leased Circuit Service.

13.140   For completeness, the MCMC stresses that these arrangements do not comprise an End-to-End Transmission Service. The End-to-End Transmission Service does not include services which have an end point at an access provider POI or premises, as noted in the MCMC's comments in paragraph 13.106 above (and clarified in the proposed updated service description for the End-to-End Transmission Service). Instead, the End-to-End Transmission Service only includes services between two end-user locations, two access seeker POPs or an end-user location and an access seeker premises.

13.141   The intended scope of the revised Wholesale Local Leased Circuit Service is depicted in the diagrams below, which depict two scenarios in which the service may be supplied:
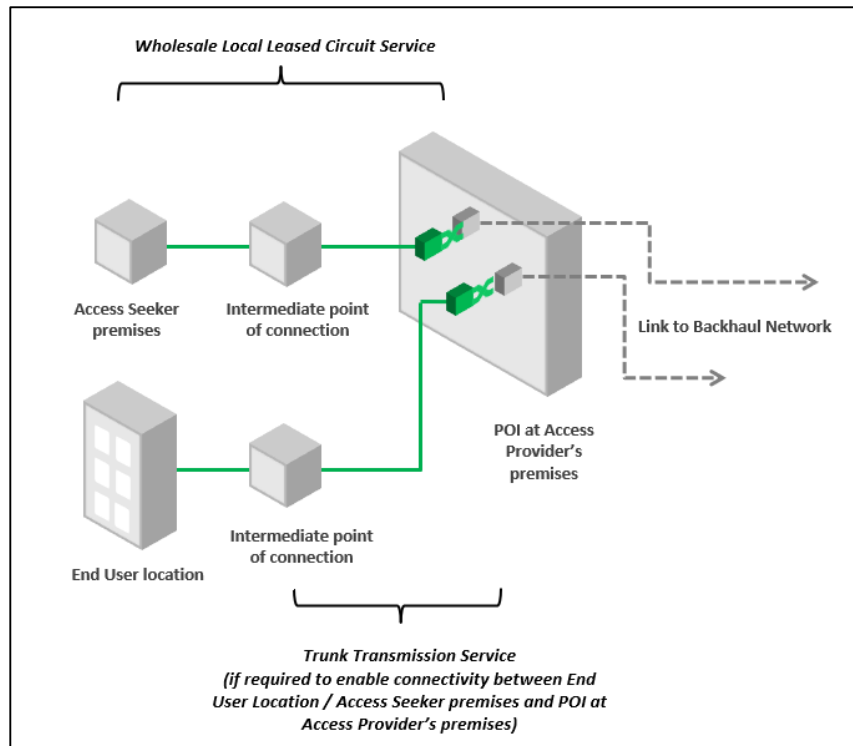
Figure 39 – Scope of proposed revised Wholesale Local Leased Circuit Service (where Trunk Transmission Service is required to enable connectivity)
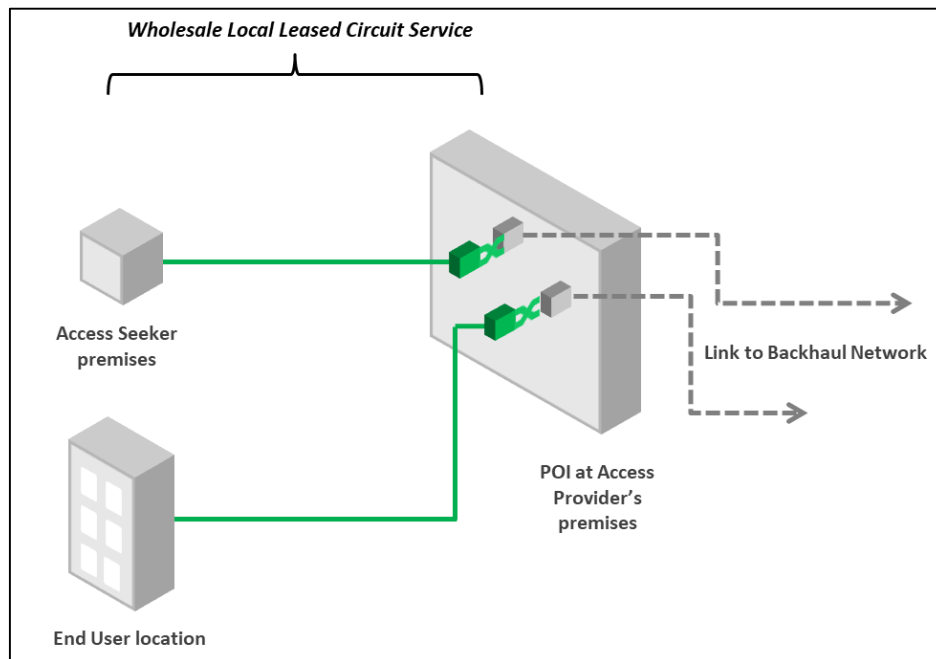

Figure 40 – Scope of proposed revised Wholesale Local Leased Circuit Service (where no Trunk Transmission Service is required to enable connectivity)

Other issues

13.142   In relation to Maxis's submission that the Wholesale Local Leased Circuit Service should be described with technical parameters, the MCMC agrees that including technical parameters may help clarify the scope of the service, however notes that, unlike in respect of the End-to-End Transmission Service no other

submissions were made on this point in respect of this service. At this stage, the MCMC considers that the amendments it is proposing to the description of the service are sufficient in clarifying its scope. However, the MCMC is interested in further views from stakeholders regarding the need for specific technical parameters.

13.143 The MCMC also notes Maxis's comments regarding difficulties experienced by Maxis in acquiring the Network Co-Location Service that is required as part of acquiring the Wholesale Local Leased Circuit Service. The MCMC is aware in this regard that access to certain services and facilities on the Access List is reliant in part on access to the Network Co-Location Service. The MCMC's preliminary views in respect of the Network Co-Location Service are set out in paragraph 11.72 above.

13.144 In relation to Redtone's comments that it does not have visibility over the available areas or locations at which services are available for supply and must request on a location-by-location basis, the MCMC will deal with matters relating to the provision and availability of information in a later review of the MSA.

13.145 Regarding U Mobile's submission that accessing the Wholesale Local Leased Circuit Service remains difficult in certain exclusive zones, the MCMC repeats its comments in paragraph 10.109 above regarding the ongoing application of the SAOs and mandatory compliance with the MSA regardless of whether an access provider has entered into exclusive arrangements.

13.146 Finally, in relation to submissions by operators that the service should be able to be incorporated into a Metro-Ethernet service, the MCMC proposes to amend the service description to clarify that such incorporation is available, to align with paragraph (f) of the End-to-End Transmission Service.

MCMC Preliminary View

13.147 The MCMC's preliminary view is that it would be in the LTBE for the Wholesale Local Leased Circuit Service to be retained in the Access List.

13.148 The MCMC proposes to make modifications to the service description to clarify that the service:

(a) includes the provision of a Trunk Transmission Service where required for the provision of the Wholesale Local Leased Circuit Service; and

(b) may be incorporated into a Metro-Ethernet network.

13.149 The MCMC proposes to substitute the existing description of the Wholesale Local Leased Circuit Service with the following description. Words that appear in underlined red text have been added relative to the existing description while words that appear in ~~strikethrough text~~ are proposed to be deleted:

4(6) *Wholesale Local Leased Circuit Service*

(a) *A Wholesale Local Leased Circuit Service is a Facility and/or Service for the carriage of communications by way of a private circuit between a POI at ~~the~~ an Access Provider's premises and an End User location or an Access Seeker's premises ~~Point~~*

of Presence, available only at one end of a private circuit. The Wholesale Local Leased Circuit Service comprises transmission and switching, whether packet or circuit, at such transmission rates as may be agreed between the Access Provider and the Access Seeker on a permanent or virtual basis.

(b) *The functionalities of the Wholesale Local Leased Circuit Service include:*

(i) *transmission and any type of routing or switching, whether packet, or circuit, multi-layer or otherwise;*

(ii) *the signalling required to support the Interconnect Link Service or onward transmission via a Trunk Transmission Service provided by the same Access Provider; and*

(iii) *a digital protocol including Internet Protocols.*

Examples of technologies used in the Wholesale Local Leased Circuit Service would be Integrated Services Digital Network ("ISDN"), Metro-E, IP based networks and Ethernet interfaces.

(c) *Without limiting subparagraph (a), the Wholesale Local Leased Circuit Service includes the provision of any Trunk Transmission Service by the same Access Provider to the extent required to enable connectivity between the relevant End User location or Access Seeker's premises and a POI at the Access Provider's premises.*

13.150 In referring to the provision of any Trunk Transmission Service by the same access provider "to the extent required to enable connectivity", the MCMC intends that the scope of the Wholesale Local Leased Circuit Service will be expanded beyond solely a "tail" component to include the distance of "trunk" required to facilitate the carriage of traffic from the End User location or access seeker premises to the access provider's premises in the most efficient manner.

Questions

Question 48: What is your view on the changes proposed by the MCMC to include a new subparagraph (c) to the description of the Wholesale Local Leased Circuit Service to include within the Wholesale Local Leased Circuit Service any Trunk Transmission Service required for the provision of the Wholesale Local Leased Circuit Service between a POI at the access provider's premises and the relevant End User location or access seeker premises?

Question 49: As an access provider, are you capable of supplying the Wholesale Local Leased Circuit Service according to the proposed amended service description? If not, please provide details, including amendments you would propose to the service description to facilitate your supply of the regulated service?

Question 50: As an access provider that is required to provide the onward transmission via Trunk Transmission Service to enable connectivity, what is the typical distance, and what is the furthest distance for the trunk component, at which access seeker networks are capable of interconnecting?

Question 51: Do you have any comments on the MCMC's proposal to clarify that the Wholesale Local Leased Circuit Service should include Metro-E technology?

Trunk Transmission Service

Overview: Transmission services (including trunk transmission services) based on geographic area

13.151   Trunk transmission allows access seekers to carry traffic (voice or data) over long distance, in order to connect their access networks to other access networks in different locations (including the access networks of other access providers). Access to transmission capacity is required in order to allow service providers to supply end-to-end voice and data services to end users.

13.152   The wholesale supply of transmission services (including trunk transmission services) in the five distinct geographic zones identified by the MCMC is discussed in paragraphs 13.10 to 13.32 above.

Service Description

13.153   The Trunk Transmission Service is currently described in the Access List as follows:

4(19) Trunk Transmission Service

(a)   The Trunk Transmission Service is a Facility and/or Service for the carriage of communications between any two technically feasible network transmission points, not being End User locations or Access Seeker Points of Presence, on the Access Provider's network, via such network interfaces at such transmission rates as may be agreed between the Access Provider and the Access Seeker on a permanent or virtual basis.

(b)   Network interfaces may use any technology as may be agreed between the Access Provider and the Access Seeker including, for example, Ethernet interfaces.

(c)   The functionalities of the Trunk Transmission Service include:

(i)   transmission and switching, whether packet or circuit;

(ii)   the signalling required to support the technology or to provide a service;

(iii)   termination at either end by a port, router, network termination unit, switch, submarine cable landing centre or earth station; and

(iv)   a digital protocol including Internet Protocols.

(d)   A technically feasible network transmission point in subparagraph (a) may include a submarine cable or satellite link between Sabah and Sarawak and Peninsular Malaysia, submarine cable landing centre or an earth station.

(e)   The Trunk Transmission Service may be for the carriage of communications which comprise a content applications service.

(f)   An Access Seeker for the Trunk Transmission Service which includes but not limited to a network facilities provider or network service provider which is only authorised to provide limited network facilities or network services such as in the last mile, but wishes to acquire the Trunk Transmission Service in order to connect its limited network facilities or network services.

Submissions Received

13.154   Like the Wholesale Local Leased Circuit Service, many operators submitted that the Trunk Transmission Service should be able to be acquired and incorporated into a Metro-Ethernet Network, including Celcom, Digi, Myren, Redtone and YTL.

13.155   Allo submitted that the Trunk Transmission Service should be commercially negotiated.

13.156   Celcom submitted that any exclusion of routes should be carried out with a proper methodology (as Celcom noted in respect of the End-to-End Transmission Service and the Wholesale Local Leased Circuit Service in paragraphs 13.50 and 13.117, respectively above).

13.157   Celcom Timur Sabah submitted that the Trunk Transmission Service should be removed from the Access List for the state of Sabah, citing the same reasons for which it submitted that the End-to-End Transmission Service should be removed, as outlined in paragraph 13.54 above.

13.158   Fiberail submitted that the Trunk Transmission Service can be removed from the Access List, because the End-to-End Transmission Service is sufficient for the provision of transmission services.

13.159   Fibrecomm does not acquire this service and submitted that it is considered as an End-to-End Transmission Service.

13.160   Maxis acquires and supplies transmission services, including the Trunk Transmission Service. Maxis characterises the Trunk Transmission Service as follows:

(a)   carrying communications between Point A and Point B where both points are at a premises of the access provider;

(b)   no local access service required;

(c)   network co-location and access route services required at both of the access provider's premises; and

(d)   example of use includes HSBB trunk transmission from the access provider service gateway located in another state / region to the access provider's designated POI/POP in the central region.

13.161   Maxis finds the Trunk Transmission Service usable as an input to the high-speed broadband services that it supplies to its customers. Maxis notes however that to acquire the Trunk Transmission Service, access seekers need to co-locate equipment in the access provider's premises at both Point A and Point B, and as noted in paragraph 11.57 above, Maxis experiences impediments in acquiring the Network Co-Location Service.

13.162   Maxis submitted that the Trunk Transmission Service should be technology neutral and include technical parameters, as per Maxis' comments in respect of the Wholesale Local Leased Circuit Service in paragraph 13.122 above. In Maxis's view, the service description should cover speed ranges up to multiples of 100Gbps per interface.

13.163   Finally, Maxis submitted that no locations or areas should be excluded from the scope of the service, citing a lack of substitutability for Trunk Transmission Services provided by one access provider and those provided by another access provider (as both Point A and Point B are located at a premises of the same access provider).

13.164   Myren commented that it may require the Trunk Transmission Service to expand its network in future. Myren submitted that some changes may be required to the scope of the service, but did not provide any details of the changes to which it refers.

13.165   MYTV and Net2One each submitted that the description of the Trunk Transmission Service should include redundancy requirements in the provision of the service. MYTV reiterated the importance of technology neutral provision of service and submitted that the network interface of a transmission service should be provided on any available technology that suits the access seeker's requirements.

13.166   Redtone has experienced that the Trunk Transmission Service offered by access providers is different to what is specified in the Access List. Redtone submitted that access providers' interpretation is that the additional parameters/capabilities made available by the access provider exclude the service from the scope of the Access List service. Redtone would like clarity on the service description of the Trunk Transmission Service, including as to network structure, network diagrams and SLAs.

13.167   Sacofa acquires the Trunk Transmission Service and reported no functional limitations.

13.168   TM does not supply the Trunk Transmission Service due to technical challenges and the availability of the End-to-End Transmission Service as an alternative. TM submitted that the Trunk Transmission Service is described so as to include a direct interface into TM's core network, which is not technically feasible. In order for TM to provide the Trunk Transmission Service, TM says it would need to install a dedicated piece of equipment (i.e. a UPE) at both ends of the circuit, resulting in the same configuration as the End-to-End Transmission Service. TM also cites potential network security and integrity issues arising from the provision of the Trunk Transmission Service as described. TM accordingly highly recommends the removal of the Trunk Transmission Service from the Access List.

13.169   Webe does not acquire the Trunk Transmission Service and instead acquires the End-to-End Transmission Service. Webe commented that Metro-Ethernet is used to supply the End-to-End Transmission Service.

13.170 YTL commented that the Trunk Transmission Service should remain as a separate service available to be acquired by access seekers, as it will allow operators to achieve end-to-end connectivity where they build the last mile of infrastructure. In YTL's view, this will further the aims of JENDELA (under which operators are required to fiberise base stations) and also encourage the MCMC's vision of "step-ladder" investment.

13.171 However, YTL also experiences issues in acquiring the Trunk Transmission Service. YTL repeated its comments in paragraph 13.131 above regarding challenges in acquiring the Wholesale Local Leased Circuit Service, which apply equally here.

MCMC Assessment

LTBE overview: Trunk Transmission Service

13.172 Trunk transmission services are supplied over sunk infrastructure assets that are difficult to replicate. Further, each trunk network typically traverses a different route, thereby serving different customers, facilitating essential connectivity between major capital cities in Malaysia and promoting competition in dependent downstream markets.

13.173 The MCMC also echoes its earlier comments in paragraph 13.87 in rejecting submissions by Allo, Celcom Timur Sabah, Fiberail and TM that the Trunk Transmission Service can be removed from the Access List (or purely commercially negotiated).

13.174 Accordingly, the MCMC's preliminary view is that it would be in the LTBE for the Trunk Transmission Service to remain on the Access List.

Adjustments to service description

13.175 Submissions in respect of the Trunk Transmission Service largely aligned with the submissions received in respect of the Wholesale Local Leased Circuit Service. In particular, access seekers reported challenges in acquiring the Trunk Transmission Service, with many operators again commenting that access providers treat the supply of this service as an End-to-End Transmission Service.

13.176 The MCMC refers to its comments in paragraphs 13.106, 13.136 to 13.140 and 13.149 above in respect of the amendment from "Access Seeker POP" to "Access Seeker's premises", the clarifications and proposed amendment to the Wholesale Local Leased Circuit Service , as well as the intended interaction between the Wholesale Local Leased Circuit Service, Trunk Transmission Service and End-to-End Transmission Service, which are equally relevant (but not repeated) here.

13.177 In relation to TM's comments that it is unable to supply this service due to technical challenges, the MCMC refers to its proposed amendments above to:

(a) expand the scope of the regulated End-to-End Transmission Service; and

(b) expand the scope of the Wholesale Local Leased Circuit Service.

13.178   Taken together, these proposed amendments also have the effect of clarifying the scope of the Trunk Transmission Service such that the MCMC considers TM can no longer characterise Trunk Transmission Services as having the same configuration as End-to-End Transmission Services.

13.179   As observed in respect of the Wholesale Local Leased Circuit Service, the MCMC agrees with submissions by many operators who consider that the service should be able to be incorporated into a Metro-Ethernet network, and proposes to amend the service description accordingly.

MCMC Preliminary View

13.180   The MCMC's preliminary view is that it would be in the LTBE for the Trunk Transmission Service to be retained in the Access List.

13.181   The MCMC also proposes to make a minor modification to the service description to clarify that the service may be incorporated into a Metro-Ethernet network, and accordingly intends to substitute the existing description of the Trunk Transmission Service with the following description. Words that appear in <u>underlined red text</u> have been added relative to the existing description while words that appear in ~~strikethrough text~~ are proposed to be deleted:

4(19) Trunk Transmission Service

(a)   *The Trunk Transmission Service is a Facility and/or Service for the carriage of communications between any two technically feasible network transmission points, not being End User locations or Access Seeker<u>'s premises</u> ~~Points of Presence~~, on the Access Provider's network, via such network interfaces at such transmission rates as may be agreed between the Access Provider and the Access Seeker on a permanent or virtual basis.*

(b)   *Network interfaces may use any technology as may be agreed between the Access Provider and the Access Seeker including, for example, Ethernet interfaces <u>and Metro-E</u>.*

(c)   *The functionalities of the Trunk Transmission Service include:*

   (i)   *transmission and <u>any type of routing or</u> switching, whether packet<u>,</u> ~~or~~ circuit, <u>multi-layer or otherwise</u>;*

   (ii)   *the signalling required to support the technology or to provide a service;*

   (iii)   *termination at either end by a port, router, network termination unit, switch, submarine cable landing centre or earth station; and*

   (iv)   *a digital protocol including Internet Protocols.*

(d)   *A technically feasible network transmission point in subparagraph (a) may include a submarine cable or satellite link between Sabah and Sarawak and Peninsular Malaysia, submarine cable landing centre or an earth station.*

(e)   *The Trunk Transmission Service may be for the carriage of communications which comprise of content applications service.*

(f)   *An Access Seeker for the Trunk Transmission Service which includes but <u>is</u> not limited to a network facilities provider or network service provider which is only authorised*

to provide limited network facilities or network services such as in the last mile, but wishes to acquire the Trunk Transmission Service in order to connect its limited network facilities or network services.

Questions

Question 53:	Do you agree with the proposed changes to the service description for the Trunk Transmission Service to clarify that the service must also be supplied over Metro-E? If not, please provide detailed reasons for why this change would be detrimental to you as an access seeker or an access provider.
Question 54:	As an access provider, are you capable of supplying the Trunk Transmission Service per the proposed amended service description? If not, please provide details, including amendments you would propose to the service description to facilitate your supply of the regulated service?

Domestic Connectivity to International Services

Overview: Access to each submarine cable landing station and satellite earth station

13.182 A submarine cable landing station is a facility at which a submarine cable system terminates. Cable landing stations typically contain active equipment, such as power equipment and submarine line terminal equipment (**SLTE**) which allow for the transmission of data via the submarine cable.

13.183 Access to a cable landing station is essential for an access seeker to acquire or access capacity on a submarine cable system. This is because the cable landing station functions as the POI between the submarine cable system and downstream transmission links originating from other parts of Malaysia.

13.184 The MCMC prefers to adopt a functional, technology-neutral definition of a "cable landing station". In the MCMC's view, a "cable landing station" refers to the first point (from the shore-end downstream) at which an access seeker can interconnect for the purposes of accessing capacity on a submarine cable system. This is typically the facility at which the access seeker's SLTE will be located.

13.185 The MCMC's definition of a "cable landing station" therefore includes facilities dedicated to the termination of a specific cable or that have a shared use (such as a data centre). It also includes facilities that are located close to the shore-end or further downstream, provided that they are the first POI (from the shore-end) at which an access seeker can interconnect with the relevant cable system.

13.186 Access to a submarine cable landing station is a type of passive facility access. Accordingly, it is different to a transmission service connecting into a submarine cable landing station, which is discussed in paragraphs 13.10 to 13.32 above.

13.187 Given the above, the MCMC's preliminary view is that access to each submarine cable landing station and satellite earth station in Malaysia should be considered independently from a competition/service perspective.

Competition/LTBE Analysis

13.188   Given the geographic boundary for access to a cable landing station or earth station is limited to that particular landing station or earth station, the only possible supplier is the owner of the relevant landing station or earth station, as this is the only entity that has the ability to provide access and ancillary services (such as co-location) at that landing station or earth station.

13.189   Due to the facility-specific nature of supply, there is also no possibility of competitive entry, as no entity other than the owner of a landing station or earth station would have the ability to provide access and related services at such facility.

13.190   Some operators have submitted that access to cable landing stations is difficult to obtain, including due to security concerns cited by access providers with respect to co-location at these facilities. In the MCMC's view, this approach demonstrates the fact that owners of cable landing stations have the ability to act independently of competition and are not constrained by competitive forces or by countervailing buyer power.

13.191   Noting the remote and inaccessible location of these stations, the provision of transmission links is costly and impracticable and there are accordingly very high barriers to entry by an alternative provider seeking to build an alternative transmission link from a point of interconnect to a submarine cable landing station or satellite earth station, to compete with the submarine cable landing station or satellite earth station operator providing the initial link.

13.192   TM, who is the main operator of these facilities in Malaysia, has also submitted that further limitations should be imposed on access to these facilities due to prevailing security concerns. The MCMC considers that this is demonstrative of the general reluctance on the part of access providers to allow co-location at these facilities, in the knowledge that there are no alternatives to such access given the monopolistic characteristics of each such facility.

Service Description

13.193   Domestic Connectivity to International Services (Connectivity Only) is currently described in the Access List as follows:

4(8)   Domestic Connectivity to International Services

Domestic Connectivity to International Services is a Facility and/or Service which comprises physical connection services at the Access Provider's submarine cable landing station, between the Access Seeker's equipment and any submarine cable system to which the Access Seeker has informed the Access Provider that it has a right to connect.

13.194   Until 30 June 2010, the description of Domestic Connectivity to International Services also included "backhaul transmission service between a network transmission point and a submarine cable landing centre or an earth station". However, the 2009 Variation to the Access List provided that this component of the service description would only be in force until 30 June 2010.[52] This is

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[52] Variation to Commission Determination on Access List (Determination No. 1 of 2005), Determination No. 1 of 2009, [3].

because the backhaul transmission components of domestic connectivity to international services were incorporated within the description of the new generic Transmission Service that was introduced in the 2009 Variation to the Access List.[53]

13.195   Further, the MCMC expressed concern that connection services have been misinterpreted to require that equipment be co-located at the submarine cable landing station, as a prerequisite, and hence, an amendment was made to the service description accordingly. [54] Consequently, the current description of Domestic Connectivity to International Services only includes connection services and the description included in paragraph 13.193 has been edited to reflect this.

13.196   The scope of Domestic Connectivity to International Services (Connectivity Only) is illustrated in the diagram below:
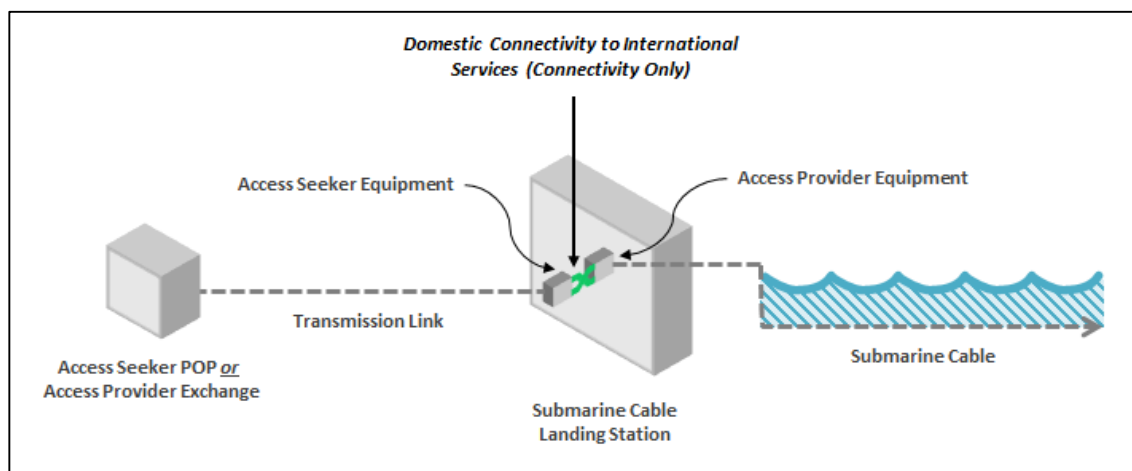
Figure 41 – Scope of Domestic Connectivity to International Services (Connectivity Only)

Submissions Received

13.197   Maxis acquires this service through a commercial "Point of Access" arrangement to connect to its wet portion of the international submarine cable capacity, and finds it usable as an input to the international services it provides to its customers including international calls and data. Under this arrangement, the parties will meet at a POI (e.g. manhole outside the cable landing station's boundary) and perform fibre splicing to connect the access seeker to the access provider's equipment in the cable landing station.

13.198   Maxis submitted that the above Point of Access arrangements should be included in the Access List given the "exorbitant" prices imposed by access providers for what Maxis cites is only a "few meters" of connection.

13.199   Maxis also noted again that it experiences difficulties in co-locating its equipment in the access provider's cable landing station, as outlined in paragraph 11.57 above.

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[53] MCMC, 2008 Access List Review Public Inquiry Report, pp. xi, 188.
[54] MCMC, 2008 Access List Review Public Inquiry Report, p. 90.

13.200　MyKris submitted that it does not require this service because domestic connectivity is usually already taken care of by the access provider or international service provider from whom MyKris acquires other services.

13.201　Myren, Ohana and Sacofa each submitted that they acquire Domestic Connectivity to International Services and experience no functional limitations.

13.202　TM supplies the Domestic Connectivity to International Service as an access provider and experiences no impediments in supplying the service. TM submitted that submarine cable landing stations are important and strategic telecommunications infrastructure which enable connectivity between Malaysia and the rest of the world. TM did not have any comments regarding the description of the service, but raised matters which will be dealt with separately in a later review of the MSA.

13.203　U Mobile says access to international carriers with greater bandwidth is essential to allow U Mobile's subscribers to obtain content from the internet.

MCMC Assessment

LTBE overview: Domestic Connectivity to International Service

13.204　Access to cable landing stations is a bottleneck service, with no scope for competitive entry. For this reason, the MCMC considers that including this service in the Access List is in the LTBE.

13.205　Stakeholders did not raise material issues in acquiring or supplying this service from an Access List perspective.

13.206　In relation to Maxis's comments that it faces difficulty in co-locating its equipment at the access provider's cable landing station, the MCMC refers to its comments in respect of the Network Co-Location service in paragraph 11.70, including the proposed amendments to the Duct and Manhole Access service, which the MCMC considers will assist access seekers in obtaining access to ducts and manholes, including those required to facilitate access to the Domestic Connectivity to International Service. In addition, the MCMC has clarified during the 2015 Access List Review that Point of Access arrangement is a connection service, and hence it falls within the service description of Domestic Connectivity to International Services.[55]

13.207　The MCMC will discuss in a later review of the MSA comments by operators in respect of security aspects at submarine cable landing stations.

MCMC Preliminary View

13.208　The MCMC's preliminary view is that it would be in the LTBE for Domestic Connectivity to International Services to remain in the Access List.

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[55] MCMC, Access List Review Public Inquiry Paper, 15 May 2015, p.135

Questions

> Question 55: Do you agree with retaining Domestic Connectivity to International Services in the Access List and do you have any comments on its service description?

Other services: Dark Fibre services

Overview: Wholesale access to dark fibre services

13.209   Access to dark fibre refers to the supply of access to optical fibre strands that have not been "lit" by the access provider. Dark fibre is a passive network element (supplied at Layer 1), rather than an active network service supplied at Layer 2 or above. It can theoretically be provided within both:

(a)   the access network (e.g. between a POI and an end user premises); and

(b)   the core network (e.g. between two access provider exchanges, or between a POI and a submarine cable landing station or satellite earth station).

13.210   If offered, dark fibre access is a wholesale product. It requires access seekers to install their own active equipment to "light" the fibre and utilise it to supply downstream communications services, which may potentially include retail or wholesale transmission services, broadband and data services, and fixed telephony services.

13.211   In Malaysia, the HSBB Network uses a point-to-multipoint gigabit passive optical network (**GPON**) network design, where there is no dedicated fibre strand running the whole length between the exchange and the end user premises. Accordingly, the MCMC understands that it is not currently possible, from a technical perspective, to provide dark fibre access in the access network (as it is not possible to unbundle a separate fibre pair from the rest of the network). Wholesale access to the HSBB Network can therefore only be provided at Layer 2 or above.

13.212   Conversely, the MCMC understands that, in Malaysia, access to dark fibre is provided over backhaul transmission routes (i.e. between two POIs or exchanges, rather than between an end-user premises and the first POI). Accordingly, dark fibre is an input into backhaul services rather than "last-mile" access services.

13.213   The MCMC's preliminary view was that there are two distinct areas in which dark fibre services are to be analysed:

(a)   access to dark fibre services in relation to each "exclusive zone" (i.e. where a supplier of dark fibre has been appointed by the landowner to have exclusivity over the area); and

(b)   access to dark fibre services outside of such zones, on a national basis.

13.214   Dark fibre services have not previously been listed on the Access List.

Competition/LTBE Analysis

13.215 The MCMC's preliminary view is that there are no substitutes for access to dark fibre, including because:

(a) the potential transmission capacity of dark fibre is significantly greater, so the value proposition of dark fibre varies significantly to alternatives such as microwave links or copper-based networks;

(b) wholesale transmission and managed data services are not an effective substitute because they provide much less control to the access seeker and are priced much higher than dark fibre services; and

(c) a price increase in respect of transmission services or managed data services is unlikely to cause an access seeker to switch to dark fibre because dark fibre would require a significantly greater level of investment from the access seeker.

13.216 In exclusive zones, the MCMC's preliminary view is that the entity supplying dark fibre services is the only supplier of dark fibre services in that exclusive zone. Some examples of which the MCMC is aware include:

(a) the Genting Highlands – agreement between Genting Group (landowner) and Touch Mindscape (telecoms operator);

(b) along LRT, MRT and BRT (rapid transit) lines – agreement between Prasarana (landowner) and Volksbahn Technologies (telecoms operator);

(c) KL Sentral – agreement between Malaysian Resources Corporation Berhad (landowner) and XMT Technologies (telecoms operator); and

(d) Kuala Lumpur International Airport – agreement between MAHB (landowner) and edotco (telecoms operator).

13.217 The MCMC's preliminary view is that the corporate group of TM, Fiberail and Fibrecomm face little competitive constraints in the supply of wholesale dark fibre services, because:

(a) TM has the largest and most extensive fibre network in Malaysia, with over 560,000 km of fibre optic cables;

(b) TM's fibre network has broad network coverage, covering all states of Peninsular Malaysia and East Malaysia;

(c) among stakeholders who acquire wholesale access to dark fibre, the MCMC understands that most acquire it from either one or both of Fiberail and Fibrecomm, each of which is majority-owned by TM; and

(d) TM does not currently supply dark fibre to other access seekers, but uses it for its own internal purposes as an input to the supply of active services. This failure to supply dark fibre to third parties is a further indicator of the absence of sufficient competitive constraints on TM in supply.

13.218   To further support this, the MCMC's preliminary view is that barriers to entry in the supply of national dark fibre services are likely to be high, given the substantial cost of building a duplicate network to compete with the incumbent operator. Further, the existence of SBCs in certain states operates to prevent new entrants from trenching activities.

Submissions Received

13.219   A small number of access seekers commented that they would like dark fibre services included on the Access List.

13.220   Celcom submitted that dark fibre services should be listed on the Access List.

13.221   DNB commented that fibre will be a key dependency for 5G backhaul, given the additional capacity requirements compared to LTE backhaul. DNB's backhaul capacity requirements may be up to 30Gbps per site, which can only be delivered economically through fibre.

13.222   The most economical and efficient architecture for DNB to deploy 5G RAN will require virtualisation and centralisation of DNB's RAN. This will require extensive use of fibre in two ways:

(a)   dark fibre to connect remote radio heads to baseband units, noting that standard vendor equipment includes an off-the-shelf optical interface both at the RRH and BBU ends, and therefore, this is the cheapest alternative to achieve the backhaul capacity and latency required by 5G; and

(b)   aggregation dark fibre, or alternatively optical lambdas, to connect BBUs to the centralised point of interconnection of traffic in each commercial area.

13.223   DNB's business model is dependent on the deal achieved for fibre, presenting the following challenges:

(a)   dark fibre is absolutely required for RAN sites in high demand areas, as it is the only economical alternative to leased capacity links (Gbps) and microwaves, and the only backhauling option to implement C-RAN;

(b)   building a dedicated fibre backhaul network is uneconomical (and might potentially be duplication of available industry resources), and DNB must benefit from sharing economics, noting that if that principle is the best alternative for RAN, it is equally important for fibre.

13.224   edotco is currently negotiating access to dark fibre in the core network from fibre network operators.

13.225   Sacofa submitted, in respect of the MCMC's upcoming inquiry on the MSA, that dark fibre services should be subject to reporting obligations.

13.226   YTL submitted that most access providers are not willing to offer fibre core services, although they have the infrastructure to offer such services/facilities. YTL considers that dark fibre services should be listed on the Access List to free

up spare fibre resources and allow smaller operators to speed up their network coverage and services, as well as help reduce overall network investment costs and the cost of services for consumers. YTL also noted that fibre infrastructure will be imperative for 5G rollout in order to ensure consistent high speeds, low latency and a reliable 5G network generally.

13.227   YTL considers that, as the sole and exclusive fibre provider in Putrajaya, TM should indiscriminately offer, provide and deliver fibre services to all access seeker locations at MSAP rates.

MCMC Assessment

LTBE overview: Dark fibre services

13.228   Dark fibre services promote downstream competition by enabling access seekers to acquire unlit fibre capacity that they may utilise to supply various types of downstream communications services (whether those downstream services are supplied at a retail or wholesale level). They will also form important inputs in the provision of 5G services, as noted by DNB.

13.229   In the course of the 2015 Access List Review, the MCMC declined to include wholesale access to dark fibre on the Access List for a number of reasons, including due to the apparent existence of workable competition in the supply of wholesale dark fibre access services.

13.230   The state of competition in the supply of dark fibre access has since changed. As described in paragraphs 13.215 to 13.218 above, the MCMC's view is now that there are few competitive constraints on the incumbent providers of these services.

13.231   In determining whether it is in the LTBE to list a service on the Access List, the MCMC will consider the costs associated with regulation, and weigh these against the benefits. The LTBE test also includes a consideration of whether access regulation would encourage the economically efficient use of and investment in communications infrastructure, which invites a consideration of factors beyond the conditions of competition under which a service is being supplied.

13.232   In this regard, the MCMC's view is that, at this stage, the costs associated with regulation of dark fibre services in the core network are likely to outweigh the LTBE. In particular, the MCMC notes that there is limited international market-based evidence regarding the viability of unbundling dark fibre in the core network (as detailed in the following paragraphs), meaning many of the associated costs and challenges are presently also unclear. However, based on the limited evidence available, the MCMC is not convinced that regulation of dark fibre services in the core network would encourage the economically efficient use of and investment in communications infrastructure. For example, as discussed in paragraph 13.233(b)(i) below, in Austria, one of only two European countries which has attempted to regulate access to dark fibre in the core network, the Austrian regulator has faced significant challenges in regulating such access, leading to perverse and unintended market outcomes.

13.233 This view is supported when examining international regulatory practice, where the MCMC has observed an ongoing reluctance to regulate dark fibre services even in the core network. For example:

(a) access to dark fibre is not regulated at all in many jurisdictions, including the United States, Canada and Australia. In Australia, the Australian Competition and Consumer Commission (**ACCC**) recently considered imposing record-keeping rules on providers of dark fibre services, which would have required providers to record and report to the ACCC on a quarterly basis information about supply and pricing of these services, but ultimately decided not to impose the rules;[56] and

(b) in Europe, only two out of 35 national regulatory authorities (**NRA**) regulate access to dark fibre in the core network, i.e. Market 4: Access to passive infrastructure (dark fibre).[57] In respect of those two NRAs (Austria and the United Kingdom), the MCMC notes that:

(i) Austria has still faced significant challenges in regulating dark fibre access, such as:

(A) no dark fibre circuits being requested by MNOs or communications providers in regulated communities, whereas in unregulated communities, there was considerable demand for dark fibre access at substantially lower prices; and

(B) the regulated price of dark fibre being four times more expensive than the price in unregulated areas;[58] and

(ii) in the United Kingdom, Ofcom has faced several challenges in its attempts to regulate dark fibre, and has to date only succeded in imposing dark fibre remedies in areas in which BT faces no competition from rival backhaul providers within a 100m distance.

13.234 Further, the MCMC notes that the amendments it is proposing to the inputs above and below dark fibre, being the Duct and Manhole Access service and the family of transmission services, are designed to increase competition in the supply of the relevant services and improve the availability of those services. In particular, the MCMC now proposes to open up duct and manhole access on a national basis as per paragraph 10.116, while regulated transmission services will be clarified to now include those services supplied with any technical parameters, as discussed earlier in this section 13. The MCMC considers that improvements to these inputs below and above access to dark fibre reduce the rationale for regulating dark fibre.

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[56] ACCC, Media Release, 'No reporting rules for dark fibre, NBN aggregation providers', 16 May 2019, https://www.accc.gov.au/media-release/no-reporting-rules-for-dark-fibre-nbn-aggregation-providers.
[57] BEREC, Access to physical infrastructure in the context of market analyses, June 2019, <https://berec.europa.eu/eng/document_register/subject_matter/berec/reports/8597-berec-report-on-access-to-physical-infrastructure-in-the-context-of-market-analysis>, Annex 1.
[58] SPC Network, Report for Jersey Competition and Regulatory Authority: Dark fibre access in the Business Connectivity Market: Technical considerations, international precedent and potential remedy design, October 2020, available at: https://www.jcra.je/media/598281/t-012-business-connectivity-market-review-draft-decision-dark-fibre-supporting-paper.pdf, pp. 17–19.

13.235   Finally, another argument against the regulation of dark fibre access is the potential impact on investment. In particular, the MCMC acknowledges that including a dark fibre access service in the Access List may result in reduced incentives to invest in dark fibre. As noted by Ofcom when imposing dark fibre remedies on BT, "Imposing a dark fibre remedy in areas where network-based competition may emerge risks disincentivising investment, so we have decided to impose it only where we are confident that competitive investment is unlikely to occur."[59]

13.236   Similarly, in Malaysia, the incumbent operator has invested in, and established its network in reliance on, commercial returns anticipated from the use of fibre assets. While the MCMC considers that requiring access providers to supply certain services to access seekers under the Access List can have some negative impact on investment incentives, this impact is typically outweighed by benefits to competition. In contrast however, regulation of a dark fibre access service would require an access provider to use fibre assets exclusively for a single access seeker, akin to forcing a quasi-lease upon those assets. In those circumstances, the MCMC considers that the potential risk for dark fibre regulation to harm investment incentives - either for a new operator establishing a rival network, or for the incumbent operator investing in and upgrading its existing network - is greater than for other services.

13.237   Given the above factors, particularly the potential costs and risks associated with regulating dark fibre in Malaysia's GPON-based networks, the MCMC considers that on balance, dark fibre services should remain unregulated in Malaysia (both in the access and core segments of the networks). The MCMC considers that this position aligns with promoting the LTBE and with the objective of encouraging the efficient use of, and investment, in communications infrastructure.

Regulation of dark fibre services in core network versus access network

13.238   The MCMC notes that Malaysia's current telecommunications network architecture presents certain challenges in the regulation of dark fibre, particularly in the access segment of the network. At the same time, the MCMC acknowledges barriers faced by operators such as YTL in acquiring dark fibre services to facilitate more rapid and cost-effective network deployment by access seekers.

13.239   Under Malaysia's GPON-based HSBB network architecture, several end-users can be connected to an access node (generally an ODF) using a shared fibre strand. This contrasts with a point-to-point network (**P2P**), where each end user premises is connected to the access node with its own dedicated fibre.

13.240   The provision of dark fibre requires the physical unbundling of fibre strands in order to facilitate the dedicated "unlit" strands required by each access seeker. This is simpler in a P2P network, where the relevant fibre strands in the access network are not shared. In these networks, unbundling can occur at a more centralised point in the network, leading to a more practical passive wholesale

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[59]   Ofcom, Final Report, 10 July 2015, 'Final Review of Ofcom - International Case Studies', <https://www.ofcom.org.uk/__data/assets/pdf_file/0016/72025/international_case_studies.pdf> p. 199.

product similar to local loop unbundling (**LLU**) in copper-based environments and allowing more effective (and cost-effective) regulation of dark fibre.[60]

13.241 In a GPON-based network, physical unbundling is more challenging and impracticable. Although unbundling can occur between the end user and the splitter, multiple splitters would be required at every splitter location and multiple fibres would be required between the splitter and the ODF. Aside from the fact that this would require new network build (which is beyond the scope of the Access List), splitter locations typically only serve a small number of end users, and splitter locations may also lack the required physical space, which creates economic and technical challenges to the unbundling of GPON networks at Layer 1.

13.242 Given the challenges of unbundling the GPON infrastructure in Malaysia's HSBB access network, the MCMC considers that at this stage, the regulation of dark fibre in Malaysia is not practicable at the *access* network level. This is supported by the views of regulators in Spain and Italy, who have also noted that it is not generally feasible to unbundle a GPON-based network.[61]

13.243 In the core network, there are fewer technical barriers to unbundling the network at the dark fibre level. However, although the MCMC has reached the preliminary view that there is evidence of limited competition in the supply of access to dark fibre services (with entities supplying dark fibre services in each exclusive zone being the only viable suppliers in each such zone), as the MCMC has previously noted, the existence of limited competition in the supply of certain services is not the sole determining factor in the regulation of those services.

MCMC Preliminary View

13.244 The MCMC's preliminary view is that it would not be in the LTBE for access to dark fibre services to be included on the Access List, given the technical barriers to mandating dark fibre access in respect of the HSBB access network, as well as the fact that (for the core network) the costs of regulating such access would likely outweigh the LTBE.

Questions

Question 56: Do you acquire access to dark fibre as an access seeker or supply access to dark fibre as an access provider?
Question 57: Are you experiencing any difficulty in acquiring or supplying access to dark fibre? If not, why not? (Please provide details).
Question 58: What similarities (in terms of state of competition or other factors) exist between jurisdictions that regulate dark fibre in the core network and Malaysia?

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[60] Ofcom, Final Report, 10 July 2015, 'Final Review of Ofcom - International Case Studies', <https://www.ofcom.org.uk/__data/assets/pdf_file/0016/72025/international_case_studies.pdf>, p. 21.
[61] Ofcom, Final Report, 10 July 2015, 'Final Review of Ofcom - International Case Studies', <https://www.ofcom.org.uk/__data/assets/pdf_file/0016/72025/international_case_studies.pdf> p. 25.

14 High speed broadband (HSBB) services

Introduction

14.1   The following facilities and services comprise the family of high speed broadband (HSBB) services in the Access List:

(a)   Layer 2 HSBB Network Service with QoS; and

(b)   Layer 3 HSBB Network Service.

14.2   In this section, the MCMC will consider each of the above HSBB services in turn.

Layer 2 HSBB Network Service with QoS

Overview: Wholesale fixed broadband services

14.3   A data service is a service that permits the transmission of data packets between an end-user device and another location, through the public Internet or another protocol. Unlike voice telephony or messaging services, which have a specific application or use-case, data services can be used to carry data for a wide range of applications (e.g. Internet browsing, multimedia content, over-the-top voice and video calls, messaging, file sharing, etc.).

14.4   Broadband services are a specific subset of data services that allow for transmission of data at speeds above 256 Kbps.[62] The transmission (download and upload) speed is also referred to as "bandwidth".

14.5   Wholesale access to fixed broadband and data services is supplied on a national basis, comprising all wholesale Internet access services which allow for data transmission rates of 256 Kbps or greater at a fixed end user location, and includes services delivered over all fixed-location technologies, such as:

(a)   digital subscriber lines (**DSL**), including ADSL and VDSL2;

(b)   cable networks;

(c)   fibre-to-the-premises (**FTTH**), including TM's HSBB Network;

(d)   fixed wireless; and

(e)   satellite.

14.6   The MCMC considers that these services are supplied with different fixed-location technologies and that speed and quality levels tend to be more significant

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[62] OECD, 'Revised OECD Telecommunication Price Baskets' DSTI/CDEP/CISP (2017)4/FINAL, 19 December 2017, https://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DSTI/CDEP/CISP(2017)4/FINAL&docLanguage=En, at paragraph [9].

differentiating factors rather than the underlying technology used to provide the service. However, in analysing the conditions under which these services are supplied, the MCMC considers it appropriate to exclude broadband services provided to a mobile end user location, through technologies such as Long Term Evolution (**LTE**) or WiMAX. As noted in paragraphs 8.52 to 8.55 above, mobile broadband services are not sufficiently close alternatives for fixed broadband services at the wholesale level.

14.7   Wholesale fixed broadband services enable the access seeker to on-supply the service to an end user. This includes both residential- and business-grade services. Unlike the *retail* supply of fixed broadband services, in respect of which the MCMC considers that business-grade and residential-grade services should not be treated the same for low-speed broadband services, the MCMC's preliminary view is that business-grade and residential-grade *wholesale* services can be treated the same for the purposes of this review.

14.8   The MCMC's preliminary view is that local access services (such as line sharing and unbundled local loop access) are not effective substitutes for transmission or broadband services. This is because local access services, which sit at Layer 1 of the OSI model, provide access seekers with a much greater degree of control and configurability (while also requiring greater investment) than wholesale fixed broadband access services, which sit at Layers 2 and 3 of the OSI model. Accordingly, local infrastructure access services are discussed separately to the wholesale fixed broadband services, in section 15 below.

14.9   As the vast majority of services are supplied on a national basis, the MCMC does not consider it necessary to consider the conditions of competition or LTBE perspectives on a more discrete geographic basis.

Competition/LTBE Analysis

14.10   At this time, the MCMC considers that mobile broadband services are only sufficiently substitutable with <u>low-speed</u> fixed broadband services. Accordingly, they cannot be said to presently impose sufficient competitive constraints on the supply of fixed broadband services.

14.11   The MCMC does not consider that there have been significant changes to the state of competition since the 2015 Access List Review. The MCMC's preliminary view is that there are two "very significant" barriers to entry in competition with the incumbent operator, TM:

(a)   first, rolling out a fixed broadband network involves very high capital costs and sunk investments, which makes this option available only to very well capitalised entities; and

(b)   second, due to the economic characteristics of broadband network infrastructure, it is unlikely to be efficient for a new operator to duplicate TM's national HSBB network in most parts of Malaysia. Accordingly, the economic incentives for any new operator to enter (at least on a nationwide basis) are relatively low.

Service Description

14.12   The Layer 2 HSBB Network Service with QoS is currently described in the Access List as follows:

4(18) *Layer 2 HSBB Network Service with Quality of Service ("QoS")*

(a)   *The Layer 2 HSBB Network Service with QoS is an access and transmission Facility and/or Service for the provision of Layer 2 connectivity for the carriage of certain communications, being data in digital form and conforming to Internet Protocols, between customer equipment at an End User's premises and a POI at the Access Seeker's premises, where in respect of the service:*

(i)   *the customer equipment is directly connected to an Access Provider's High-Speed Broadband Network;*

(ii)   *the Access Seeker selects the bit rate;*

(iii)   *the Access Seeker selects the QoS Class; and*

(iv)   *the Access Seeker assigns the Customer with an IP address.*

(b)   *The Layer 2 HSBB Network Service with QoS includes shared splitting services, interfaces to operational support systems and network information.*

(c)   *Nothing in this service description is intended to limit:*

(i)   *the number of concurrent Layer 2 HSBB Network Services with QoS acquired by an Access Seeker from an Access Provider associated with a single Customer;*

(ii)   *concurrent acquisition of Layer 2 HSBB Network Service with QoS and other HSBB Network Services by an Access Seeker from an Access Provider associated with a single Customer; or*

(iii)   *the number of HSBB Network Services that may be acquired by a single Access Seeker, either in a single location or at multiple locations (or permit an Access Provider to require an Access Seeker to acquire any minimum or maximum number of HSBB Network Services, either in a single location or at multiple locations), as a condition of an Access Provider supplying the Layer 2 HSBB Network Service with QoS.*

(d)   *The Layer 2 HSBB Network Service with QoS shall be supplied to the Access Seeker as follows:*

(i)   *at pre-defined speeds which are capable of providing the bit rates specified below, as selected by the Access Seeker:*

Bit rate		Note and example applications
Downstream	Upstream	
Unconstrained	Unconstrained	Access Provider does not constrain the speed of the service itself but would provide an unconstrained network service which the Access Seeker rate shapes, i.e. determines the speed. This option is only available with QoS Class 5.
32 kbps	32 kbps	Voice over Internet Protocol ("VoIP") service
64 kbps	64 kbps	
135 kbps	135 kbps	
1 Mbps	256 kbps	Residential and Entry level Business broadband services
1 Mbps	1 Mbps	
6 Mbps	1 Mbps	
6 Mbps	6 Mbps	
10 Mbps	5 Mbps	
10 Mbps	10 Mbps	
20 Mbps	5 Mbps	
20 Mbps	10 Mbps	
20 Mbps	20 Mbps	
25 Mbps	5 Mbps	Medium level Business broadband services
25 Mbps	10 Mbps	
25 Mbps	25 Mbps	
30 Mbps	5 Mbps	
30 Mbps	10 Mbps	
30 Mbps	30 Mbps	
50 Mbps	10 Mbps	Enterprise Grade Business broadband services
50 Mbps	20 Mbps	
50 Mbps	50 Mbps	
100 Mbps	40 Mbps	
100 Mbps	50 Mbps	
100 Mbps	100 Mbps	

(ii)   *in accordance with the following QoS Class, as selected by the Access Seeker:*

QoS Class	Latency	Jitter	Packet Loss	Notes and example applications
0	≤ 100 ms	≤ 50 ms	≤ 10^{-3}	Real-time, jitter sensitive, high interaction – VoIP
1	≤ 200 ms	≤ 50 ms	≤ 10^{-3}	Real-time, jitter sensitive, interactive – IPTV
2	≤ 100 ms	-	≤ 10^{-3}	Transaction data, highly interactive – signalling
3	≤ 400 ms	-	≤ 10^{-3}	Transaction data, interactive – business data
4	≤ 1 s	-	≤ 10^{-3}	Low loss only (short transactions, bulk data) – video streaming
5	-	-	-	Best efforts – traditional applications of default IP networks

14.13   The scope of the Layer 2 HSBB Network Service with QoS is illustrated in the diagram below:
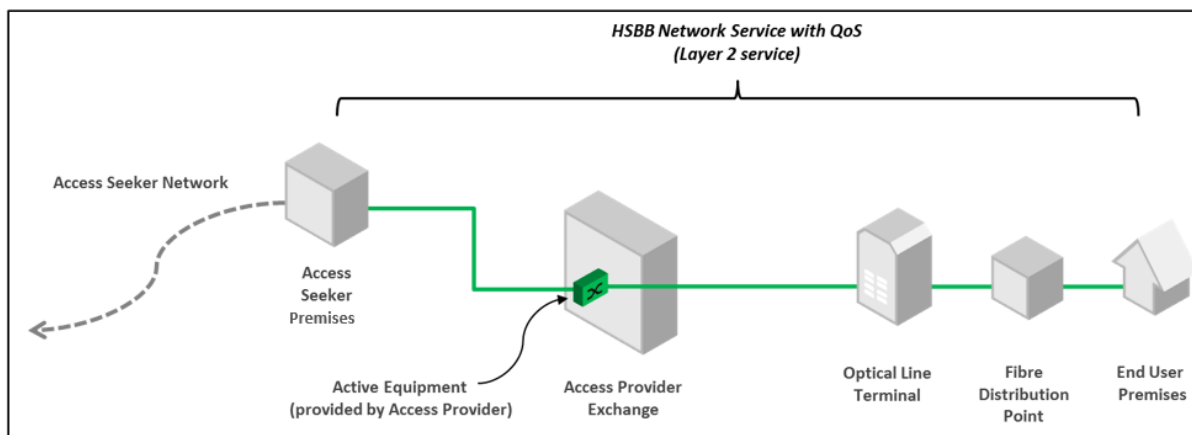
Figure 42 – Scope of Layer 2 HSBB Network Service with QoS

Submissions Received

14.14   Access seekers generally combined their submissions in respect of the Layer 2 HSBB Network Service with QoS and the Layer 3 HSBB Network Service. A summary of the submissions received in relation to these services, and the MCMC's assessment and preliminary views, is provided in paragraphs 14.58 to 14.87 below.

Layer 3 HSBB Network Service

Overview: Wholesale fixed broadband services

14.15   The Layer 3 HSBB Network Service is provided on a national basis alongside other wholesale fixed broadband services. The competition and service overview in respect of these services is set out in paragraphs 14.3 to 14.11 above.

Service Description

14.16   The Layer 3 HSBB Network Service is currently described in the Access List as follows:

> ***4(21) Layer 3 HSBB Network Service***
>
> *(a)*   *The Layer 3 HSBB Network Service is an access and transmission Facility and/or Service for the provision of Layer 3 connectivity for the carriage of certain communications, being data in digital form and conforming to Internet Protocols, between customer equipment at an End User's premises and a POI at the Access Provider's premises or the Access Seeker's premises, as selected by the Access Seeker, where in respect of the service:*
>
> > *(i)*   *the customer equipment is directly connected to an Access Provider's High Speed Broadband Network;*
> >
> > *(ii)*   *the Access Seeker selects the bit rate; and*
> >
> > *(iii)*   *the Access Seeker selects the Classes of Service ("CoS").*
>
> *(b)*   *The Layer 3 HSBB Network Service includes:*
>
> > *(i)*   *any hybrid Layer 2 and/or Layer 3 functionality required for the provision of the service;*
> >
> > *(ii)*   *shared splitting services;*
> >
> > *(iii)*   *interfaces to operational support systems; and*
> >
> > *(iv)*   *network information.*
>
> *(c)*   *Nothing in this service description is intended to limit:*
>
> > *(i)*   *the number of concurrent Layer 3 HSBB Network Services acquired by an Access Seeker from an Access Provider associated with a single Customer;*
> >
> > *(ii)*   *concurrent acquisition of the Layer 3 HSBB Network Service and other HSBB Network Services by an Access Seeker from an Access Provider associated with a single Customer; or*
> >
> > *(iii)*   *the number of HSBB Network Services that may be acquired by a single Access Seeker, either in a single location or at multiple locations (or permit an Access Provider to require an Access Seeker to acquire any minimum or maximum number of HSBB Network Services, either in a single location or at multiple locations) as a condition of an Access Provider supplying the Layer 3 HSBB Network Service.*
>
> *(d)*   *The Layer 3 HSBB Network Service shall be supplied to the Access Seeker as follows:*

(i)　　at pre-defined speeds which are capable of providing the bit rates specified below, as selected by the Access Seeker, subject to the maximum bit rate supported by the access technology used at particular End User premises:

Symmetric base bit rates
4 to 30 (inclusive) in 1 Mbps increments
32
50
60
100

Additional Bit Rates the Access Seeker may request	
Downstream	Upstream
32 kbps	32 kbps
64 kbps	64 kbps
128 kbps	128 kbps
256 kbps	256 kbps
512 kbps	512 kbps
1 Mbps	256 kbps
6 Mbps	1 Mbps
10 Mbps	5 Mbps
20 Mbps	5 Mbps
20 Mbps	10 Mbps
25 Mbps	5 Mbps
25 Mbps	10 Mbps
30 Mbps	5 Mbps
30 Mbps	10 Mbps
50 Mbps	10 Mbps
50 Mbps	20 Mbps
100 Mbps	40 Mbps
100 Mbps	50 Mbps

(ii)　　in accordance with the following CoS, as selected by the Access Seeker, with traffic in each CoS prioritised as set out below in the case of congestion:

Class of Service	Traffic Priority
VoIP	1
IPTV, Video-on-Demand	2
Management, Business Internet	3
Residential Internet, Best Efforts Connection	4

14.17　　The following diagram illustrates the scope of the Layer 3 HSBB Network Service with the POI, in this illustration, at an access provider network location:
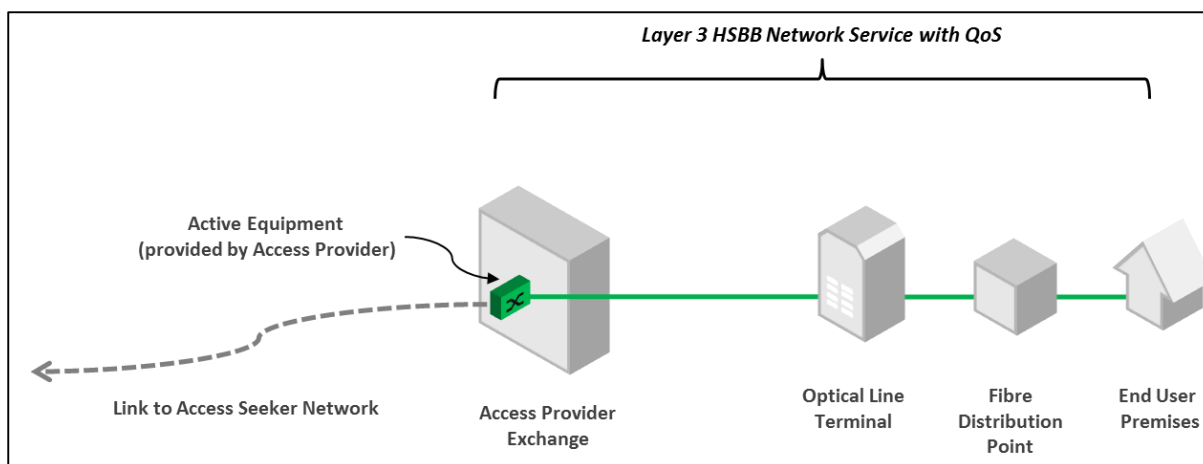
Figure 43 – Scope of Layer 3 HSBB Network Service

Submissions Received

14.18   Allo submitted that access providers currently supply a bandwidth profile of up to 800Mbps (downstream) and 200Mbps (upstream).

14.19   Astro acquires both Layer 2 HSBB Network Service with QoS and Layer 3 HSBB Network Service as an access seeker. Astro prefers the Layer 3 HSBB Network Service but proposed that the MCMC provide a table comparing this against the Layer 2 HSBB Network Service with QoS to provide readers with a distinct view of the functionality and differences between each service. Astro also submitted that the available bit rates included in the scope of the service should be updated in light of the JENDELA aims, given bit rates currently being offered by access providers are higher, e.g. TIME offers 1Gbps and TM offers up to 800Mbps.

14.20   The bandwidth profiles provided to Astro are as follows:

(a)   the bandwidth profile provided by TM is as provided to its own retail arm (i.e. equivalent to Unifi); and

(b)   the bandwidth profile provided by TIME is as stipulated in its RAO, which is similar to the Access List.

Astro submitted that TIME has updated its bandwidth profile up to 1Gbps, which is higher than the current profile limit in the Access List (100Mbps). Astro requests that the MCMC clarify whether TIME is allowed to extend the same profile to access seekers under the non-discriminatory clause of the MSA.

14.21   Astro would also like to see a comparison table between QoS and COS together with expected service availability to aid access seeker understanding. As the current Access List does not prescribe the expected service availability, some access providers have different interpretations of the service from what is described in the Access List.

14.22   Celcom Timur Sabah submitted that the downstream and upstream bandwidth profiles supplied are a maximum of 1Gbps for downstream profile and 200Mbps for upstream profile and this is used for each BTU/ONT. Celcom Timur Sabah submitted that the actual subscribed speed for the customer will be controlled by the ISP.

14.23   Celcom acquires the Layer 3 HSBB Network Service as an access seeker as an input to its fixed broadband products for residential and business customers. Celcom noted that services delivered over the HSBB network can be used as an input for IPTV services, subscription-based OTT audiovisual services (e.g. Netflix) and illicit streaming devices, including via Android TV boxes.

14.24   Celcom would prefer to acquire Layer 2 HSBB Network Service with QoS, but notes that it is not offered by the incumbent operator and is not listed in the incumbent's RAO. In Celcom's experience, the incumbent characterises its HSBB offering as a hybrid of layer 2 and layer 3 services to enable access seekers to deliver "triple play" services to end users. Celcom proposes that the Layer 3 HSBB Network Service definition be revised to ensure that the incumbent operator offers purely Layer 2 HSBB Network Service with QoS.

14.25   Celcom also proposed that the service description be specifically defined to reflect that the service acquired by the access seeker must enable the access seeker to provide the following services in accordance with the specified Quality of Experience under JENDELA:

(a)   video streaming;

(b)   webpage loading;

(c)   e-sports; and

(d)   IP voice and video calls.

14.26   Celcom would also like the service description revised to allow access seekers to build in-span interconnection instead of allowing access providers to mandate full-span interconnection.

14.27   Celcom submits that Layer 2 HSBB Network Service with QoS is supplied to the access seeker at predefined speeds which are capable of providing the following bit rates below (as selected by the access seeker):

Bit rate		Note and example applications
Downstream	Upstream	
Unconstrained	Unconstrained	Access provider does not constrain the speed of the service itself but would provide an unconstrained network service which the access seeker rate shapes i.e determines the speed. This option is only available with QoS Class 5
32 kbps	32 kbps	Voice over Internet Protocol ("VoIP") service
64 kbps	64 kbps	
135 kbps	135 kbps	
1 Mbps	256 kbps	Residential and entry level Business broadband service
1 Mbps	1 Mbps	
6 Mbps	1 Mbps	
6 Mbps	6 Mbps	

10 Mbps	5 Mbps	
10 Mbps	10 Mbps	
20 Mbps	5 Mbps	
20 Mbps	10 Mbps	
20 Mbps	20 Mbps	
25 Mbps	5 Mbps	Medium level business broadband service
25 Mbps	10 Mbps	
25 Mbps	25 Mbps	
30 Mbps	5 Mbps	
30 Mbps	10 Mbps	
30 Mbps	30 Mbps	
50 Mbps	10 Mbps	Enterprise grade business broadband services
50 Mbps	20 Mbps	
50 Mbps	50 Mbps	
100 Mbps	40 Mbps	
100 Mbps	50 Mbps	
100 Mbps	100 Mbps	

14.28   For Layer 3 HSBB Network Services, Celcom submits that, although not specified in the access provider's RAO, the access provider has, in principle, agreed with upstream and downstream symmetric-based bit rates. Celcom has yet to conclude an Access Agreement with the access provider.

14.29   Digi acquires both Layer 2 HSBB Network Service with QoS and Layer 3 HSBB Network Service as an access seeker and finds them usable as inputs to the services it supplies to its customers. Digi finds the number and location of POIs sufficient. Digi proposed that the HSBB services be reviewed and simplified if they are to be retained in the Access List.

14.30   Maxis acquires both Layer 2 HSBB Network Service with QoS and Layer 3 HSBB Network Service from a number of access providers, and finds these services usable as an input to the high speed fixed broadband services it supplies to its customers. Maxis also supplies the Layer 3 HSBB Network Service. Maxis considers that these services are not substitutable by any other facilities or services and accordingly should be retained on the Access List.

14.31   Maxis made a number of comments in relation to the ongoing need for regulation of fixed services generally. In particular, Maxis argued that:

(a)   competitive conditions in the fixed market are very different and more prone to monopolies than the mobile market. Wired access creates 'unlimited' bandwidth to a particular customer where one last mile connection per premises suffices to fulfil customers' capacity needs, given the high capacity and upgrade paths for fibre. Once built, wired access does not require significant additional investment/upgrades;

(b)   the characteristics of wired access mean that having more than one last mile connection per premises does not, in many cases, make sense economically – there would be large, extra costs to get a dedicated line to every premises. In addition, having only one last mile connection per

house is more efficient from an urban planning perspective (i.e. limiting physical assets being built and overcrowding streets and houses, e.g. duplicating ducts, wires, etc.);

(c) since the fixed markets are less competitive, Maxis observes that for wholesale fixed facilities/services, such as HSBB network services and transmission services, most access seekers prefer to enter into regulated access agreements as they provide more protection to the Access Seeker. Regulated access agreements also provide good guidance to the parties during negotiations, as the parties can refer to the terms of the MSA and MSAP. Parties also have recourse to refer disputes to the MCMC if they cannot be resolved, an option which is not available under commercial agreements. Access seekers also prefer to enter into regulated access agreements to secure MSAP rates from the access providers;

(d) there are issues in respect of the existing access regime which have necessitated access seekers to enter into commercial agreements. For example, access seekers may need to quickly market services and commercial agreements may offer this speed, as regulated access agreements require registration to be effective. Access providers may also not offer MSAP rates under regulated access agreements, or only offer inferior SLA/QoS, which then results in the Access Seeker accepting the superior SLA/QoS offered in the commercial agreement (even where the commercial agreement entails higher prices). Maxis is of the view that these unfavourable terms and conditions imposed by access providers limit the ability for access seekers to compete effectively; and

(e) the current access regime would also benefit from clearer technical specifications and requirements. Some services have components or aspects not currently provided for in the MSA and MSAP. These services are often priced at a premium in a commercial agreement. As some of these services are proven essential inputs for an access seeker to replicate the host network's retail offer, it is critical to ensure that such services are added to the MSA and/or MSAP. The Access List should make it clearer that access providers should offer all of its available services on an "equivalence of inputs" basis. The improvement in regulation will remove the need and scope for commercial agreement terms over time.

14.32 As such, Maxis strongly recommended MCMC to continue regulating the wholesale fixed services, to ensure that access seekers can continue to play a role in providing high quality and affordable fixed broadband services to end users, particularly in light of the JENDELA aspirations and the new normal, where working from home requires reliable fibre services.

14.33 Maxis also recommended a number of amendments to the Layer 2 HSBB Network Service with QoS and Layer 3 HSBB Network Service. In particular, Maxis proposed the following improvements:

(a) General

(i) Where access seekers elect for a POI at the access provider's premises (whether at the state or regional level), the access

provider should allow the access seeker to co-locate its equipment in the access provider's premises, including access route, network co-location service and duct and manhole access. Maxis considers that there should be no additional charges for this type of arrangement other than the BTU port charge, service gateway charge and network co-location charge.

(ii)   For Layer 2 HSBB Network Service with QoS, Maxis submitted that where the access seekers elect for a centralised POI (e.g. in a central region), the transmission services provided by the access provider should be from the HSBB Network in the other region up to the agreed access seeker's premises. Maxis noted that a certain access provider provides transmission services from its HSBB network in another region only to its designated POI in the central region, from which connection to the access seeker's premises in the central region results in additional charges for the access seeker.

(b)   Pre-defined speeds

(i)   Maxis submitted that the pre-defined speed ranges for the HSBB services should be increased up to 5Gbps or at any speed offered by the access provider to its end users on an equivalence of input basis. Maxis has experienced that some access providers deny any request from access seekers for speeds above 100Mbps.

(ii)   However, Maxis also submitted that, for downstream speeds of above 100Mbps, the access provider typically provides downstream and upstream bit rates on a mutually agreed basis, subject to a successful Proof of Concept.

(c)   Contention Ratio

(i)   Maxis proposed that the Access List should clearly define the access seeker's right to determine the contention ratio for its capacity requirements either at the service gateway or for the transmission link.

(ii)   Maxis also requested that the Access List clearly define the obligation of the access provider to ensure its OLT is split to meet the respective MSQoS for wired broadband services.

(d)   BTU port sharing/re-use of same BTU for churn/transfer process

(i)   Maxis submitted that the Access List should allow BTU port sharing or re-use of the same BTU for effective churn/transfer processes and to minimise customers' downtime during churn/transfer implementation.

(e)   Portal

(i)   Maxis submitted that the Access List should clearly define access providers' obligations to provide the access seeker with access to

portals for home pass information, service fulfilment and service assurance on an equivalence of input basis.

(f) QoS (Layer 3 HSBB Network Service)

(i) Finally, Maxis submitted that the Access List should also define the QoS for the Layer 3 HSBB Network Service, e.g. as to packet loss, network latency, etc.

14.34 For the Layer 2 HSBB Network Service with QoS, Maxis submitted that the access provider is willing to provide the service at the bitrates selected by the access seeker. However, Maxis submitted that TIME only offers bandwidth profiles of up to 100Mbps in its RAO, which Maxis considers inconsistent with the Equivalence of Inputs requirement in the MSA, given TIME's website offers high-speed broadband packages of up to 1Gbps.

14.35 While Maxis believes the best option for acquiring access to HSBB network services is through regulated access agreements (thus enabling access to MSAP rates), Maxis noted that access seekers may acquire services on a commercial basis where they have no other options, such as where the access provider only offers above MSAP rates with better terms and conditions. Maxis believes that improvement in the MSA and MSAP (such as inclusion of critical components required by the access seeker to replicate a retail offer of the access provider) will reduce the need and scope for commercial agreements over time.

14.36 In addition to the above, Maxis cites other potential benefits of acquiring access to HSBB services under commercial arrangements:

(a) premium portal;

(b) weekend installation;

(c) faster installation; and

(d) faster to market.

14.37 Maxis considers that an access seeker would typically prefer to acquire the Layer 2 HSBB Network Service with QoS over the Layer 3 HSBB Network Service, given the greater flexibility and options it provides for the access seeker to manage, control and differentiate its high speed retail broadband services.

14.38 Finally, Maxis noted that, given JENDELA ambitions of Gigabit access to 9 million premises, it is critical for the MCMC to maintain an access regime for HSBB network services which supports and facilitates the development of innovative products which are accessible to the rakyat. In particular, Maxis considers that any proposed exemptions or waivers of the regulations should be studied carefully and discussed in an open and transparent manner to ensure that they are aligned with the objectives of the CMA and do not weaken the integrity of the access regime.

14.39 Ohana submits that, for Layer 2 HSBB Network Services, it currently uses 1.2Gbps upstream and downstream bandwidth.

14.40   Redtone acquires the Layer 3 HSBB Network Service under a commercial arrangement that commenced prior to the service being listed on the Access List, but Redtone is progressing towards finalisation of an access agreement. Redtone finds the Layer 3 HSBB Network Service limited in functionality because the service is defined by the access provider, allowing only certain services to be provided by the access seeker. Redtone submitted that Layer 2 HSBB Network Service with QoS would provide it with more flexibility in creating downstream services.

14.41   Redtone currently acquires Layer 3 HSBB Network Services with the following predefined bandwidth profiles:

(a)   5Mbps upload/5Mbps download;

(b)   10Mbps upload/10Mbps download;

(c)   20Mbps upload/20Mbps download;

(d)   30Mbps upload/30Mbps download;

(e)   50Mbps upload/20Mbps download; and

(f)   100Mbps upload/20Mbps download.

14.42   Sacofa supplies the Layer 2 HSBB Network Service with QoS as an access provider. The packages it provides are as follows:

Access Seeker (Package) (Mbps)	Configure to	Celcom (Mbps) Downstream/ upstream	Maxis (Mbps) Downstream/ upstream
30	CELCOM/ MAXIS	30/30	30/30
40	CELCOM	40/40	N/A
100	CELCOM/ MAXIS	100/50	100/50
300	CELCOM/ MAXIS	300/50	300/50
500	CELCOM/ MAXIS	500/100	500/100
800	MAXIS	N/A	800/200

14.43   Sacofa also submitted that access seekers should be required to locate their POI in Sarawak.

14.44   TIME submitted that HSBB network services should be removed from the Access List. In TIME's view, HSBB network services require extensive customisation for individual providers, and standardising the service to a confined scope and design will not serve the expanded potential of the HSBB network. Instead, access seekers will end up adding many other value-added components to the pre-defined service, undermining the primary intended objective of the access

regime. If HSBB network services are to be retained, TIME submitted that installation timeframes be shortened to 14 days for RFS sites.

14.45   TIME submitted that, as stated in its RAO on Layer 2 HSBB Network Services, the following bandwidth profiles are supplied:

Bit rate		Note and example applications
Downstream	Upstream	
Unconstrained	Unconstrained	TIME does not constrain the speed of the service itself but would provide an unconstrained network service which the access seeker rate shapes i.e. determines the speed. This option is only available with QoS Class 5.
32 kbps	32 kbps	Voice over Internet Protocol ("VoIP") service
64 kbps	64 kbps	
135 kbps	135 kbps	
1 Mbps	256 kbps	Residential and Entry level Business Broadband services
1 Mbps	1 Mbps	
6 Mbps	1 Mbps	
6 Mbps	6 Mbps	
10 Mbps	5 Mbps	
10 Mbps	10 Mbps	
20 Mbps	5 Mbps	
20 Mbps	10 Mbps	
20 Mbps	20 Mbps	
25 Mbps	5 Mbps	Medium level Business Broadband service
25 Mbps	10 Mbps	
25 Mbps	25 Mbps	
30 Mbps	5 Mbps	
30 Mbps	10 Mbps	
30 Mbps	30 Mbps	
50 Mbps	10 Mbps	Enterprise Grade Business Broadband Services
50 Mbps	20 Mbps	
50 Mbps	50 Mbps	
100 Mbps	40 Mbps	
100 Mbps	50 Mbps	
100 Mbps	100 Mbps	

14.46   TM supplies the Layer 3 HSBB Network Service as an access provider. TM submitted that it may also acquire HSBB network services in the near future for its Unifi service, depending on the viability and feasibility of the service offering.

14.47   TM considers that the Layer 3 HSBB Network Service is sufficient to support JENDELA initiatives and submitted that the Layer 2 HSBB Network Service with QoS should accordingly be removed from the Access List. In TM's experience, the Layer 3 HSBB Network Service has been the most widely demanded HSBB product, effective in driving retail competition and reducing the duplication of infrastructure. In contrast, TM considers the demand for the Layer 2 HSBB Network Service with QoS is limited, with competitors withholding access to this service.

14.48   TM cited the "vibrant" level of competition in the retail market as a sign that the Layer 3 HSBB Network Service has been effective, with TM's retail market share declining from 80% in 2017 to 74% in 2019.

14.49   TM further submitted that the removal of the Layer 2 HSBB Network Service with QoS from the Access List will reduce duplication of infrastructure, as promoted under JENDELA. In TM's view, the Layer 2 HSBB Network Service with QoS requires both access seekers and access providers to make additional investment in network elements within existing coverage areas, leading to the duplication of network infrastructure. TM submitted that this investment could be used more effectively by the industry to expand coverage to non-fibre areas, achieving JENDELA aims.

14.50   TM also submitted that some access seekers request a level of customisation of HSBB network services which is inconsistent with the services listed in the Access List, necessitating negotiation and entry into a commercial arrangement.

14.51   TM commented that the services offered over the Layer 3 HSBB Network Service can be a substitute for traditional communication services (for example substituting low-speed copper-based broadband services for high-speed fibre-based broadband services, or traditional broadcasting/TV services over the air for IPTV multicast services over fibre). TM currently offers ten POIs for the Layer 3 HSBB Network Service, which TM considers sufficient to cover nationwide access to TM's HSBB network.

14.52   With regards to bandwidth profiles, TM offers symmetrical bandwidths for speeds below 50Mbps, and offers asymmetrical bandwidths for speeds of 50 Mbps and above. TM submitted that it offers the same downstream and upstream bandwidth that it offers to its own retail arm.

14.53   Finally, TM proposed a number of amendments to the description of the Layer 3 HSBB Network Service:

(a)   in section 21(a)(iii), TM recommended replacing the phrase "Class of Service" with "Type of Service", whereby the access seeker will select the Type of Service instead of the Class of Service. The access provider will map the service to its relevant Traffic Priority based on the selected Type of Service (as shown below):

Type of Service	Traffic Priority
VoIP	1
IPTV, Video-on-Demand	2
Management, Business Internet	3
Residential Internet, Best-Efforts Connection	4

(b)   in section 21(d)(i), TM submitted that the bit rate selection table is not specific enough to reflect the different types of speed that may be applicable to different types of services. TM considers that the table could be misconstrued to mean that lower speeds are also applicable to internet services. TM accordingly recommended that the table be amended as follows:

Type of Service	Starting Speed
VoIP, Management	128kbps
IPTV	The download bandwidth is dependent on the channel resolution quality to be defined by Access Seeker.
Internet	i. 30Mbps to 100Mbps with increments of 10Mbps
	ii. 100Mbps to 800Mbps with increments of 100Mbps These profiles are defined to optimise the profile creation and management in the Access Provider's network.

14.54   U Mobile submitted that access providers must supply both Layer 2 HSBB Network Service with QoS and Layer 3 HSBB Network Service. U Mobile has observed a trend of lower retail prices even as speeds have increased, and considers that pricing for wholesale components must accordingly be competitive. U Mobile has also experienced situations where the pricing under an access provider's RAO does not align with the MSAP rates, leading to commercial negotiation that favours access providers.

14.55   Further, U Mobile considers that some components are not captured or clearly defined (e.g. HSBT), and no options or alternatives are provided, allowing access providers to leverage these deficiencies and charge higher prices. In U Mobile's view, these impediments make market entry more difficult, strengthen monopolies, impact initiatives to increase adoption, and hurt the Rakyat.

14.56   Additionally, U Mobile submitted that the bandwidth profile provided by Access Providers should allow subscribers to experience downstream services according to the MSQoS, e.g. subscribers should be able to get 90% of the speed subscribed at 90% of the time. U Mobile also submitted that the access provider should enable the access seeker to comply with the requirements of the QoS. In U Mobile's view, there is a dependency on both how the access provider dimensions its network, as well as the hardware deployed. Nevertheless, U Mobile considers that the access provider must enable the access seeker to meet the pertinent QoS requirements in its delivery of services to the end user.

14.57   YTL is currently not acquiring any HSBB network services because certain access providers require these services to be bundled with other services and will not supply them as stand-alone services. In YTL's experience, these access providers

do not comply with the Access List or MSAP rates, and the locations of their POIs are unknown and not advertised. To overcome these challenges, YTL submitted that it would like the MCMC to add to the Access List an unbundled HSBB data-only service.

MCMC Assessment

LTBE overview: HSBB Network Services

14.58   In the 2015 Access List Review, the MCMC introduced the Layer 3 HSBB Network Service as a step in the ladder of investment ahead of Layer 2 HSBB Network Services with QoS, and two steps ahead of Layer 2 HSBB Network Service without QoS. At the time, the MCMC was concerned regarding the lack of access seekers taking up the then (Layer 2) HSBB Network Service without QoS, given the requirement for access seekers to build, or separately acquire, network access to the aggregation point at which they interconnect with the access provider – essentially, requiring the access seeker to build out part of the access network.

14.59   Since that time, the Layer 3 HSBB Network Service has been more widely acquired, with the MCMC having received four Layer 3 HSBB access agreements for registration. In addition, the MCMC has also received Layer 2 HSBB Network Service with QoS access agreements for registration.

14.60   However, as the MCMC noted at the time of including the Layer 3 HSBB Network Service in the Access List, the intention was for this service to remain on the Access List together with the Layer 2 HSBB Network Service with QoS in order to:

(a)   ensure effective access to the HSBB Network for access seekers; and

(b)   facilitate competition in the supply of downstream retail fixed broadband and data services, in line with the MCMC's incremental approach.

14.61   The ongoing regulation of the Layer 3 HSBB Network Service together with the Layer 2 HSBB Network Service with QoS is also supported by submissions by Access Seekers in response to the MCMC's informal Access List Questionnaire. In particular:

(a)   the fixed broadband service features very significant barriers to entry, reducing the competitive constraint on the incumbent operator, TM. This is prima facie evidence that there is no basis to remove regulation;

(b)   access seekers continue to report issues in acquiring these services, particularly the Layer 2 HSBB Network Service with QoS which provides access seekers with a greater scope of flexibility in retail product differentiation, which is in the LTBE; and

(c)   de-regulation of HSBB network services would be inconsistent with the approaches of international regulators, despite the increasing maturity of fibre-based broadband services.

14.62   The MCMC considers that the Layer 3 HSBB Network Service provides access seekers with an efficient investment avenue by allowing incremental investment in networks as they move up the OSI stack. In other words, the inclusion of this service is a stepping stone towards promoting stronger downstream competition.

14.63   The MCMC's preference however, as is the preference of international regulators, is for access seekers to have the ability to acquire a service where they have the greatest amount of control over the innovative aspects of service. This ability is offered at Layer 2, rather than Layer 3.

14.64   The MCMC remains open to removing regulation of the Layer 3 HSBB Network Service, but understands that there continue to be difficulties in the acquisition of Layer 2 HSBB Network Service with QoS. If these impediments were to be removed by access providers, the MCMC would have greater inclination to remove regulation at layer 3.

14.65   However, until those impediments are removed, the MCMC's view is that it remains in the LTBE to continue regulating access to the Layer 3 HSBB Network Service together with the Layer 2 HSBB Network Service with QoS, given the investment and competition benefits outlined above.

Bandwidth profiles for HSBB Network Services

14.66   The MCMC thanks stakeholders for their submissions on HSBB Network services, which remain a key focal area for the MCMC, as they were in the context of the 2015 Access List Review.

14.67   As the MCMC has noted in informal information sessions with operators, the supply and regulation of HSBB services has matured since these services were first listed in the Access List in 2009, at a time when the development of high-speed broadband services in Malaysia and globally was still in its infancy.

14.68   Like other leading telecommunications regulators around the world, the MCMC has since developed extensive experience and insight into the appropriate settings for regulation of wholesale access to high-speed broadband services.

14.69   The MCMC is concerned, however, at the growing number of complaints by access seekers that access providers are seeking to subvert the regulatory instruments by supplying regulated services with minor points of differentiation, e.g. superior latency, availability, etc, and in so doing, arguing that the services they supply should be subject to commercial agreements, rather than access agreements. The MCMC would like to clarify that as both Layer 2 HSBB Network Service with QoS and Layer 3 HSBB Network Service are regulated services in the Access List, parties should enter into access agreements. These access agreements can accommodate these additional points of differences so long as they comply with requirements under the CMA.

14.70   The MCMC agrees with submissions from Astro and Maxis that the available bandwidth profiles for the Layer 3 HSBB Network Service should be updated to reflect that access providers are now able to offer speeds above 100 Mbps. The MCMC proposes to include a general requirement for both Layer 2 and Layer 3 HSBB Network services that the access provider must provide such speeds that

it makes available to its own retail arm, on an equivalent of input basis. The MCMC also proposes to expressly list the following bit rates in the service descriptions for these services:

(a)   250 Mbps downstream / 100 Mbps upstream;

(b)   500 Mbps downstream / 100 Mbps upstream;

(c)   600 Mbps downstream / 100 Mbps upstream;

(d)   700 Mbps downstream / 100 Mbps upstream; and

(e)   800 Mbps downstream / 200 Mbps upstream.

14.71   The MCMC also proposes to list an additional bandwidth profile of 1 Gbps downstream / 500 Mbps upstream in respect of the Layer 2 HSBB Network Service with QoS.

14.72   These bandwidth profiles reflect submissions by a majority of operators that these bitrates are available in the market today, and also align with the regulation of higher speed tier wholesale services in other jurisdictions. For example:

(a)   in Australia, NBN Co's Layer 2 "Home Ultrafast" product is supplied with a bandwidth profile of up to 1000 Mbps downstream;

(b)   in the United Kingdom, Openreach's Generic Ethernet Access premium connection is supplied with a bandwidth profile of up to 1000 Mbps;

(c)   in New Zealand, Chorus's Hyperfibre Business service is offered with a bandwidth profile of up to 4,000 Mbps, with plans to increase to 8,000 Mbps; and

(d)   in Singapore, Singtel offers a bundled fibre broadband plan with a bandwidth profile of 10 Gbps.

14.73   The MCMC intends that, taken together with the amendments it is proposing to the family of transmission services (as set out in section 3 above), the amendments to the HSBB services will address the issues raised by Maxis regarding the importance of regulating fixed services generally and of including technical parameters in the scope of these services, in order to avoid the potential for access providers to force access seekers onto commercial agreements where access agreements are preferred.

14.74   For the same reasons, the MCMC rejects TM's proposal that the Layer 2 HSBB Network Service with QoS should be removed from the Access List. The MCMC's approach to regulation is not contingent on whether the JENDELA plan can be supported through the Layer 3 HSBB Network Service, but rather depends on the state of competition and the LTBE, as described in the previous paragraph.

14.75   Given the above, the MCMC proposes to amend the service descriptions of each of the Layer 3 HSBB Network Service and the Layer 2 HSBB Network Service with QoS:

(a)   to remove lower speed tier services below 30 Mbps, given the MCMC's understanding that these are already in limited demand and increasingly unlikely to be of relevance under the JENDELA ambitions;

(b)   to reflect the higher speed tiers that access providers now offer for the Layer 3 HSBB Network Service and the Layer 2 HSBB Network Service with QoS; and

(c)   to clarify that even if an access seeker supplies a service with different parameters or standards, provided the service meets the basic description of the service in the Access List, it will still be deemed as a service supplied under the Access List.

Other amendments

14.76   The MCMC notes Celcom's submission that the Layer 3 HSBB Network Service definition be amended to ensure the incumbent operator offers Layer 2 HSBB Network Service with QoS as a stand-alone (rather than "hybrid" service). The MCMC stresses that the Access List already requires each of the Layer 2 and Layer 3 HSBB services to be offered on a stand-alone basis. For clarity, the reference to "hybrid" functionality in subparagraph 4(21)(b)(i) of the Layer 3 HSBB Network Service is intended to ensure that the service is supplied as described regardless of whether certain "Layer 2" elements are required to provide the Layer 3 service. It is not intended to give any access provider the option of merely supplying a hybrid Layer 2 / Layer 3 service to comply with its SAOs.

14.77   In response to Celcom's proposal that the service descriptions be amended to specifically require access providers to supply certain retail services in accordance with the Quality of Experience targets specified under JENDELA, the MCMC does not consider it appropriate at this time to include obligations associated with JENDELA in the MCMC's access regulation. As many industry participants have noted, JENDELA sets out ambitious government targets on a range of connectivity-related matters and national infrastructure. Given the aspirational nature of these targets, the MCMC does not propose to include them within the Access List.

14.78   Regarding Digi's submissions on end-to-end installation and portal API integration, the MCMC will discuss these issues in a later review of the MSA as part of installation, order management, port availability and other similar matters.

14.79   Astro, Celcom and Maxis each submitted that access providers must offer a greater number of POIs. POI requirements are set out under the MSA and are also the subject of a later MSA review.

14.80   The MCMC understands from one access provider that it is capable of supplying Layer 2 HSBB Network Service with QoS between customer equipment at an End User premises and a POI at its own premises. This benefits the access seeker, given the MCMC's understanding that some access providers are charging access seekers to acquire transmission services to carry traffic back to the access provider's POI from the access seeker's POI.

14.81 Accordingly, the MCMC proposes to amend the scope of the Layer 2 HSBB Network Service with QoS to align with the service description of the Layer 3 HSBB Network Service, which allows the access seeker to elect whether it wishes to interconnect at its own POI or a POI at the access provider's premises. Naturally, access providers who are able to supply under either model must supply on the basis requested by an access seeker.

14.82 Finally, the MCMC also proposes to amend the service descriptions of the Layer 2 HSBB Network Service with QoS to clarify the listed "Note and example applications", to align with the maturity and application of HSBB Network services observed by the MCMC.

14.83 A diagram of the proposed amended Layer 2 HSBB Network Service with QoS is set out below:
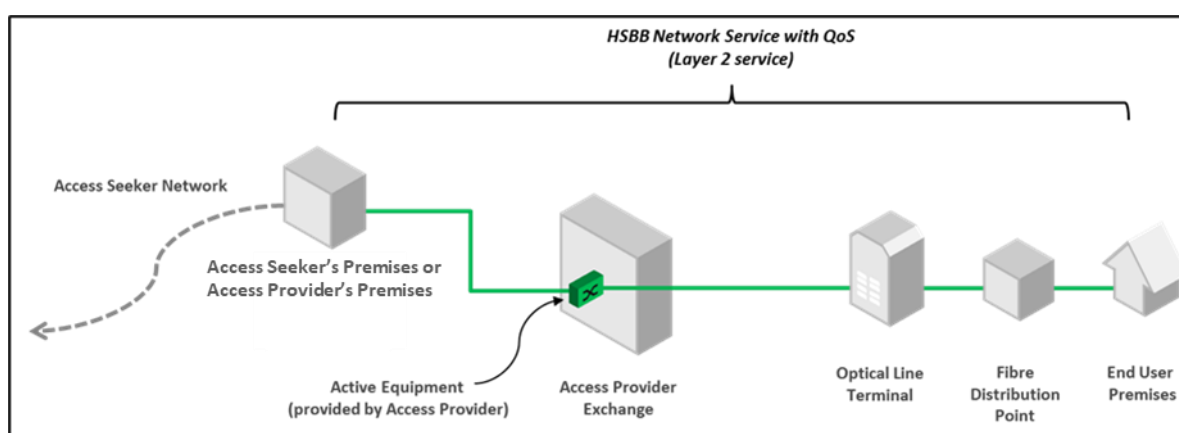
Figure 44 – Scope of proposed revised Layer 2 HSBB Network Service with QoS

MCMC Preliminary View

14.84 The MCMC's preliminary view is that it is in the LTBE for the Layer 2 HSBB Network Service with QoS and Layer 3 HSBB Network Service to each be retained in the Access List.

14.85 The MCMC proposes to make modifications to the service description to remove lower speed tiers below 30 Mbps, to reflect the availability of higher speed tiers for these services, and to broaden the scope of the services to cover any technical parameters with which they are supplied. The MCMC also proposes to amend the Layer 2 HSBB Network Service with QoS to reflect that it includes carriage of communications between customer equipment at an End User's premises and a POI at an access provider's premises, in alignment with the description of the Layer 3 HSBB Network Service.

14.86 The MCMC proposes to substitute the existing description of the Layer 2 HSBB Network Service with QoS with the following description. Words that appear in underlined red text have been added relative to the existing description while words that appear in strikethrough text are proposed to be deleted:

4(18) Layer 2 HSBB Network Service with Quality of Service ("QoS")

(a) The Layer 2 HSBB Network Service with QoS is an access and transmission Facility and/or Service for the provision of Layer 2 connectivity for the carriage of certain communications, being data in digital form and conforming to Internet Protocols, between customer equipment at an End User's premises and a POI at the Access Seeker's premises *or the Access Provider's premises, as selected by the Access Seeker*, where in respect of the service:

(i) the customer equipment is directly connected to an Access Provider's High-Speed Broadband Network;

(ii) the Access Seeker selects the bit rate;

(iii) the Access Seeker selects the QoS Class; and

(iv) the Access Seeker assigns the Customer with an IP address.

(b) The Layer 2 HSBB Network Service with QoS includes shared splitting services, interfaces to operational support systems and network information.

(c) Nothing in this service description is intended to limit:

(i) the number of concurrent Layer 2 HSBB Network Services with QoS acquired by an Access Seeker from an Access Provider associated with a single Customer;

(ii) concurrent acquisition of Layer 2 HSBB Network Service with QoS and other HSBB Network Services by an Access Seeker from an Access Provider associated with a single Customer; or

(iii) the number of HSBB Network Services that may be acquired by a single Access Seeker, either in a single location or at multiple locations (or permit an Access Provider to require an Access Seeker to acquire any minimum or maximum number of HSBB Network Services, either in a single location or at multiple locations), as a condition of an Access Provider supplying the Layer 2 HSBB Network Service with QoS.

(d) The Layer 2 HSBB Network Service with QoS shall be supplied to the Access Seeker as follows:

(i) at pre-defined speeds which are capable of providing the bit rates specified below, as selected by the Access Seeker:

Bit rate		Note and example applications
Downstream	**Upstream**	
Unconstrained	Unconstrained	Access Provider does not constrain the speed of the service itself but would provide an unconstrained network service which the Access Seeker rate shapes, i.e. determines the speed. This option is only available with QoS Class 5.

Bit rate		Note and example applications
Downstream	Upstream	
~~32 kbps~~	~~32 kbps~~	~~Voice over Internet Protocol ("VoIP") service~~
~~64 kbps~~	~~64 kbps~~	
~~135 kbps~~	~~135 kbps~~	
~~1 Mbps~~	~~256 kbps~~	~~Residential and Entry level Business~~ <u style="color:red">Low-speed</u> broadband services ~~Medium level Business broadband services~~
~~1 Mbps~~	~~1 Mbps~~	
~~6 Mbps~~	~~1 Mbps~~	
~~6 Mbps~~	~~6 Mbps~~	
~~10 Mbps~~	~~5 Mbps~~	
~~10 Mbps~~	~~10 Mbps~~	
~~20 Mbps~~	~~5 Mbps~~	
~~20 Mbps~~	~~10 Mbps~~	
~~20 Mbps~~	~~20 Mbps~~	
~~25 Mbps~~	~~5 Mbps~~	
~~25 Mbps~~	~~10 Mbps~~	
~~25 Mbps~~	~~25 Mbps~~	
30 Mbps	5 Mbps	
30 Mbps	10 Mbps	
30 Mbps	30 Mbps	
50 Mbps	10 Mbps	<u style="color:red">High-speed residential, business broadband services, or</u> Enterprise Grade Business broadband services
50 Mbps	20 Mbps	
50 Mbps	50 Mbps	
100 Mbps	40 Mbps	
100 Mbps	50 Mbps	
100 Mbps	100 Mbps	
<u style="color:red">250 Mbps</u>	<u style="color:red">100 Mbps</u>	
<u style="color:red">500 Mbps</u>	<u style="color:red">100 Mbps</u>	
<u style="color:red">600 Mbps</u>	<u style="color:red">100 Mbps</u>	
<u style="color:red">700 Mbps</u>	<u style="color:red">100 Mbps</u>	
<u style="color:red">800 Mbps</u>	<u style="color:red">200 Mbps</u>	

Bit rate		Note and example applications
Downstream	Upstream	
1000 Mbps	*500 Mbps*	
Any other bit rates specified or utilised by the Access Provider from time to time		

(ii) *in accordance with the following QoS Class, as selected by the Access Seeker:*

QoS Class	Latency	Jitter	Packet Loss	Notes and example applications
0	*≤ 100 ms*	*≤ 50 ms*	$\leq 10^{-3}$	*Real-time, jitter sensitive, high interaction – VoIP*
1	*≤ 200 ms*	*≤ 50 ms*	$\leq 10^{-3}$	*Real-time, jitter sensitive, interactive – IPTV*
2	*≤ 100 ms*	*-*	$\leq 10^{-3}$	*Transaction data, highly interactive – signalling*
3	*≤ 400 ms*	*-*	$\leq 10^{-3}$	*Transaction data, interactive – business data*
4	*≤ 1 s*	*-*	$\leq 10^{-3}$	*Low loss only (short transactions, bulk data) – video streaming*
5	*-*	*-*	*-*	*Best efforts – traditional applications of default IP networks*

(iii)   *any other technical parameters or standards specified or utilised by the Access Provider from time to time.*

14.87   The MCMC also proposes to substitute the existing description of the Layer 3 HSBB Network Service with the following description. Words that appear in underlined red text have been added relative to the existing description while words that appear in strikethrough text are proposed to be deleted:

4(21) Layer 3 HSBB Network Service

(a)   *The Layer 3 HSBB Network Service is an access and transmission Facility and/or Service for the provision of Layer 3 connectivity for the carriage of certain communications, being data in digital form and conforming to Internet Protocols, between customer equipment at an End User's premises and a POI at the Access Provider's premises or the Access Seeker's premises, as selected by the Access Seeker, where in respect of the service:*

(i)   *the customer equipment is directly connected to an Access Provider's High Speed Broadband Network;*

(ii)   the Access Seeker selects the bit rate; and

(iii)   the Access Seeker selects the Classes of Service ("CoS").

(b)   The Layer 3 HSBB Network Service includes:

(i)   any hybrid Layer 2 and/or Layer 3 functionality required for the provision of the service;

(ii)   shared splitting services;

(iii)   interfaces to operational support systems; and

(iv)   network information.

(c)   Nothing in this service description is intended to limit:

(i)   the number of concurrent Layer 3 HSBB Network Services acquired by an Access Seeker from an Access Provider associated with a single Customer;

(ii)   concurrent acquisition of the Layer 3 HSBB Network Service and other HSBB Network Services by an Access Seeker from an Access Provider associated with a single Customer; or

(iii)   the number of HSBB Network Services that may be acquired by a single Access Seeker, either in a single location or at multiple locations (or permit an Access Provider to require an Access Seeker to acquire any minimum or maximum number of HSBB Network Services, either in a single location or at multiple locations) as a condition of an Access Provider supplying the Layer 3 HSBB Network Service.

(d)   The Layer 3 HSBB Network Service shall be supplied to the Access Seeker as follows:

(i)   at pre-defined speeds which are capable of providing the bit rates specified below, as selected by the Access Seeker, subject to the maximum bit rate supported by the access technology used at particular End User premises:

Symmetric base bit rates
4 to 30 (inclusive) in 1 Mbps increments
32
50
60
100

Additional Bit Rates the Access Seeker may request	
Downstream	Upstream
32 kbps	32 kbps
64 kbps	64 kbps
128 kbps	128 kbps
256 kbps	256 kbps
512 kbps	512 kbps
1 Mbps	256 kbps
6 Mbps	1 Mbps
10 Mbps	5 Mbps
20 Mbps	5 Mbps

| Additional Bit Rates the Access Seeker may request ||
Downstream	Upstream
~~20 Mbps~~	~~10 Mbps~~
~~25 Mbps~~	~~5 Mbps~~
~~25 Mbps~~	~~10 Mbps~~
30 Mbps	5 Mbps
30 Mbps	10 Mbps
50 Mbps	10 Mbps
50 Mbps	20 Mbps
100 Mbps	40 Mbps
100 Mbps	50 Mbps
250 Mbps	*100 Mbps*
500 Mbps	*100 Mbps*
600 Mbps	*100 Mbps*
700 Mbps	*100 Mbps*
800 Mbps	*200 Mbps*
1000 Mbps	*500 Mbps*
Any other bit rates specified or utilised by the Access Provider from time to time	

> *(ii)*   *in accordance with the following CoS, as selected by the Access Seeker, with traffic in each CoS prioritised as set out below in the case of congestion:*

Class of Service	Traffic Priority
VoIP	1
IPTV, Video-on-Demand	2
Management, Business Internet	3
Residential Internet, Best Efforts Connection	4

> *(iii)   any other technical parameters or standards specified or utilised by the Access Provider from time to time.*

Questions

Layer 2 HSBB Network Service with QoS

Question 60: Could any changes be made to the Layer 2 HSBB Network Service with QoS's service description to better facilitate its supply? (Please provide details).

Question 61: Do you have any comments on the proposed clarifications to the service description for the Layer 2 HSBB Network Service with QoS?

Question 62: If the Layer 2 HSBB Network Service with QoS is amended to include new bitrates as proposed above, are there particular bit rates or increments of bit rates at which the service should be supplied? Please provide reasons including your ability to supply at particular bit rates or increments as an access provider, or your business need for particular bit rates or increments as an access seeker.

Layer 3 HSBB Network Service

Question 63: Could any changes be made to the Layer 3 HSBB Network Service's service description to better facilitate its supply? (Please provide details).

Question 64: Do you have any comments on the proposed clarifications to the service description for the Layer 3 HSBB Network Service?

Question 65: If the Layer 3 HSBB Network Service is amended to include new bitrates as proposed above, are there particular bit rates or increments of bit rates at which the service should be supplied? Please provide reasons including your ability to supply at particular bit rates or increments as an access provider, or your business need for particular bit rates or increments as an access seeker.

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15 Copper-based services (except in relation to HSBB connected premises)

Introduction

15.1   The following facilities and services comprise the family of copper-based services in the Access List:

(a)   Full Access Service;

(b)   Line Sharing Service;

(c)   Sub-Loop Service;

(d)   Bitstream Service; and

(e)   Digital Subscriber Line Resale Service.

15.2   In this section, the MCMC will consider each of the above copper-based services in turn.

Full Access Service

Overview: Access to copper-based local access services

15.3   Local access services are a category of services that permit access to network elements in respect of the "last mile" segment of communications infrastructure used to serve end-users. These may take the form of copper pairs or optical fibre lines which run from an end-user premises to a local exchange, roadside cabinet or other POI. Such services (except for bitstream services) are supplied at Layer 1 of the OSI model. They serve as "building blocks" of functionality used by access seekers to deliver a retail service to the end-user (e.g. a fixed broadband service or a fixed voice telephony services).

15.4   Copper-based local access services, including full access services, sub-loop services, line sharing services and bitstream services, are supplied in non-HSBB

areas or in respect of non-HSBB infrastructure.[63] The HSBB Network is unbundled at Layers 2/3 rather than Layer 1, and wholesale HSBB services are analysed as part of wholesale broadband and data services (see section 14).

15.5   The MCMC's preliminary view was that ULL, sub-loop services, line sharing services and bitstream services are effective substitutes for accessing the "last mile" of copper-based local access services, and accordingly can be treated as the same for the purposes of the current review.

15.6   In contrast, the following services do not appear to be viable alternatives to the above copper-based local access services:

(a)   duct access, because this would require the access seeker to self-provide the copper or fibre infrastructure in the 'last mile', which is unlikely given the very high barriers to entry in the 'last mile';

(b)   wholesale broadband and data services (layer 3), because they do not offer the same degree of control as copper-based local access services;

(c)   transmission services (layer 2), because they do not offer the same degree of customisation as permitted by copper-based local access services and are usually only supplied on an end-to-end basis; and

(d)   fixed wireless service (layer 2), because this would require the access seeker to either install specialised equipment or pay a significantly higher price for the service.

15.7   On the above basis, the MCMC considers that wholesale access to local access services includes unbundling of local loops, sub-loops, line sharing and bitstream services.

15.8   This overview (and corresponding competition/service overview in paragraphs 15.9 to 15.10) is not repeated below in respect of the remaining copper-based local access services (including the Line Sharing Service, Sub-Loop Service and Bitstream Services).

Competition/LTBE Analysis

15.9   Supply of copper-based local access services is highly concentrated, with TM the only listed supplier of wholesale local loop unbundling, line sharing and sub-loop services (notwithstanding that there is not currently any take-up of such services). TM's extensive network – the only nationwide copper network – spans over 246,000 km of copper cables that covers most of Malaysia.[64]

15.10   The MCMC also takes the preliminary view that there are high barriers to entry to the supply of national copper-based local access services due to:

(a)   the natural monopolistic characteristics of local access networks, which are not capable of economically efficient duplication;

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[63] Telekom Malaysia, Response to MCMC Questionnaire, pp. 10-11.
[64] Telekom Malaysia, Integrated Annual Report, '#EnablingDigital Malaysia - Corporate Overview', 2019, https://tm.listedcompany.com/misc/ar/ar2019.pdf

(b)   the high sunk costs that would be required for an operator to construct a parallel network; and

(c)   the fact that copper-based infrastructure is currently being phased out in Malaysia amidst the transition to fibre-based networks.

Service Description

15.11   The Full Access Service is currently described in the Access List as follows:

4(10)   Full Access Service

(a)   The Full Access Service is a Facility and/or Service for the use of Unconditioned Communications Wire between the Network Boundary at an End User's premises and a point on a network that is a potential POI located at, or associated with, a Customer Access Module and located on the End User side of the Customer Access Module.

(b)   The Full Access Service includes the use of optical fibre cable and associated transmission services between an Intermediate Point and the POI, associated tie cable services, shared splitting services, interfaces to operational support systems and network information.

15.12   The scope of the Full Access Service is illustrated in the diagram below:
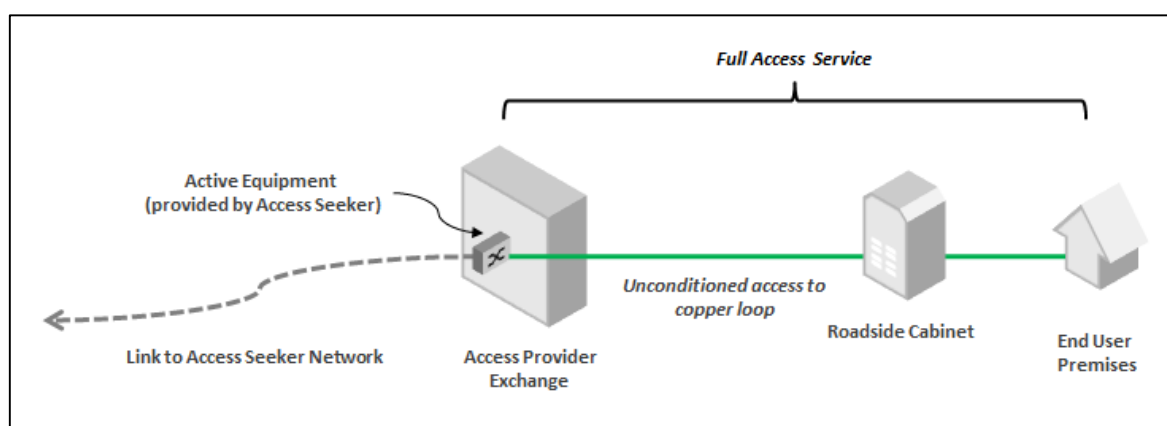
Figure 45 – Scope of Full Access Service

Line Sharing Service

15.13   The Line Sharing Service is currently described in the Access List as follows:

4(11)   Line Sharing Service

(a)   The Line Sharing Service is a Facility and/or Service for the use of the non-voiceband frequency spectrum of Unconditioned Communications Wire, over which wire an underlying voiceband PSTN service is operating, between the Network Boundary at an End User's premises and a point on a network that is a potential POI located at, or associated with, a Customer Access Module and located on the End User side of the Customer Access Module.

(b)   The Line Sharing Service includes the use of optical fibre cable and associated transmission services between an Intermediate Point and the POI, associated tie cable services, shared splitting services, interfaces to operational support systems and network information.

15.14   The scope of the Line Sharing Service is illustrated in the diagram below:
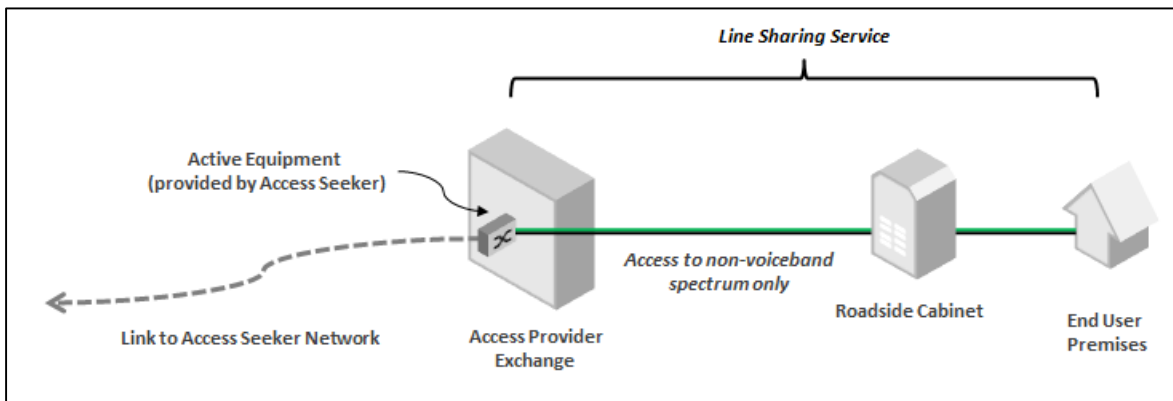
Figure 46 – Scope of Line Sharing Service

Sub-Loop Service

15.15   The Sub-Loop Service is currently described in the Access List as follows:

4(14) Sub-loop Service

(a)   *The Sub-loop Service is a Facility and/or Service for the use of Unconditioned Communications Wire between the Network Boundary at an End User's premises and a point on a network that is a potential POI located at, or associated with, a Customer Access Module and located on the End User side of the Customer Access Module. For Sub-loop Service, the Customer Access Module is housed in a roadside cabinet.*

(b)   *The Sub-loop Service includes the use of optical fibre cable and associated transmission services between an Intermediate Point and the POI, associated tie cable services, shared splitting services, interfaces to operational support systems and network information.*

15.16   The scope of the Sub-Loop Service is illustrated in the diagram below:
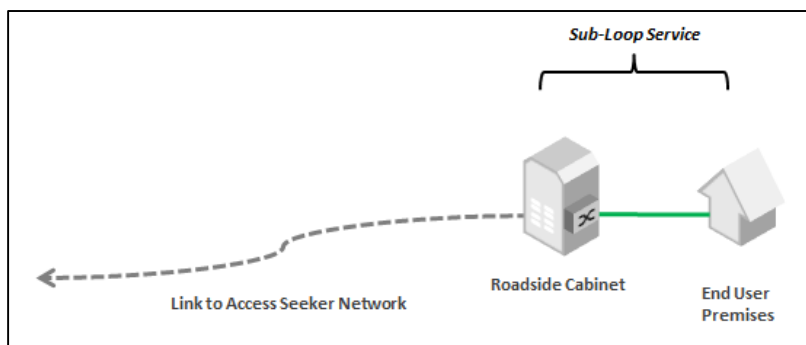
Figure 47 – Scope of Sub-Loop Service

Bitstream Services

15.17   Bitstream Services are currently described in the Access List as follows:

4(12) Bitstream with Network Service

(a)   *The Bitstream with Network Service is a Facility and/or Service for the provision of Layer 2 connectivity for the carriage of certain communications, being data in digital*

form and conforming to Internet Protocols, between customer equipment at an End User's premises and a POI at the Access Seeker's premises, where:

(i)   *the Customer's equipment is directly connected to an Access Provider's network; and*

(ii)   *the Access Seeker, but not the Access Provider, assigns the Customer with an IP address.*

(b)   *Bitstream with Network Service includes shared splitting services, interfaces to operational support systems and network information.*

4(13) Bitstream without Network Service

(a)   *The Bitstream without Network Service is a Facility and/or Service for the provision of Layer 2 connectivity for the carriage of certain communications, being data in digital form and conforming to Internet Protocols, between customer equipment at an End User's premises and a POI at the Access Provider's premises, where:*

(i)   *the Customer's equipment is directly connected to an Access Provider's network; and*

(ii)   *the Access Seeker, but not the Access Provider, assigns the Customer with an IP address.*

(b)   *Bitstream without Network Service includes shared splitting services, interfaces to operational support systems and network information.*

15.18   As can be seen in the service description above, there are two distinct Bitstream Services listed in the Access List. The key difference between the two services is the location of the POI:

(a)   for the Bitstream with Network Service, the POI is located at the access seeker's premises (meaning that the access provider provides transmission from the access provider's exchange to the access seeker's premises); and

(b)   for the Bitstream without Network Service, the POI is located at the access provider's premises (meaning that the access seeker must provide their own transmission to the access provider's exchange).

15.19   The scope of the Bitstream with Network Service is illustrated in the diagram below:
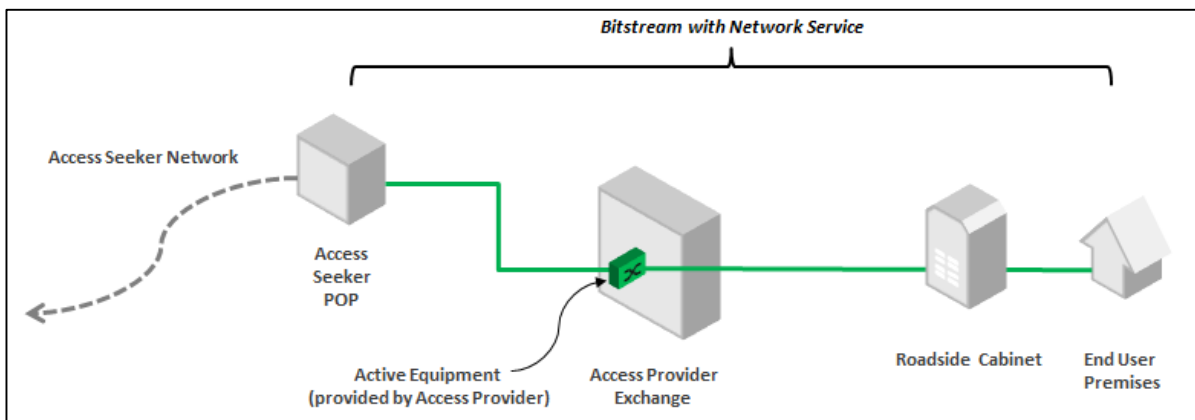
Figure 48 – Scope of Bitstream with Network Service

15.20   The scope of the Bitstream without Network Service is illustrated in the diagram below:
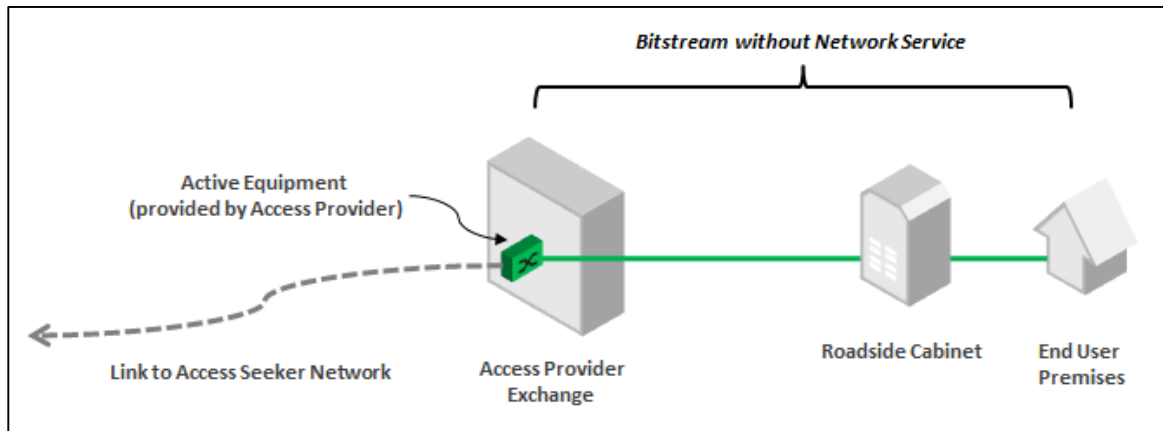

Figure 49 – Scope of Bitstream without Network Service

Digital Subscriber Line Resale Service

Overview: Wholesale fixed broadband services

15.21   The Digital Subscriber Line Resale Service can be considered alongside other wholesale fixed broadband services, as discussed in paragraphs 14.3 to 14.11 above in the context of the HSBB Services. That overview, and the corresponding competition/service discussion, are not repeated in this section.

15.22   The Digital Subscriber Line Resale Service is currently described in the Access List as follows:

4(15) Digital Subscriber Line Resale Service

(a)   *The Digital Subscriber Line Resale Service is a Service for the provision of connectivity for the carriage of certain communications, being data in digital form and conforming to Internet Protocols, to customer equipment insofar as it relates to IP addresses directly and indirectly connected to the Access Provider's network. The Digital Subscriber Line Resale Service uses digital subscriber line technology for carriage over the Communications Wire between the Network Boundary at an End User's premises and the Customer Access Module of the Access Provider's network.*

(b)   *The Digital Subscriber Line Resale Service is limited to the wholesale provision of the digital subscriber line service ordinarily provided by the Access Provider to End Users.*

15.23   The scope of the Digital Subscriber Line Resale Service is illustrated in the diagram below:
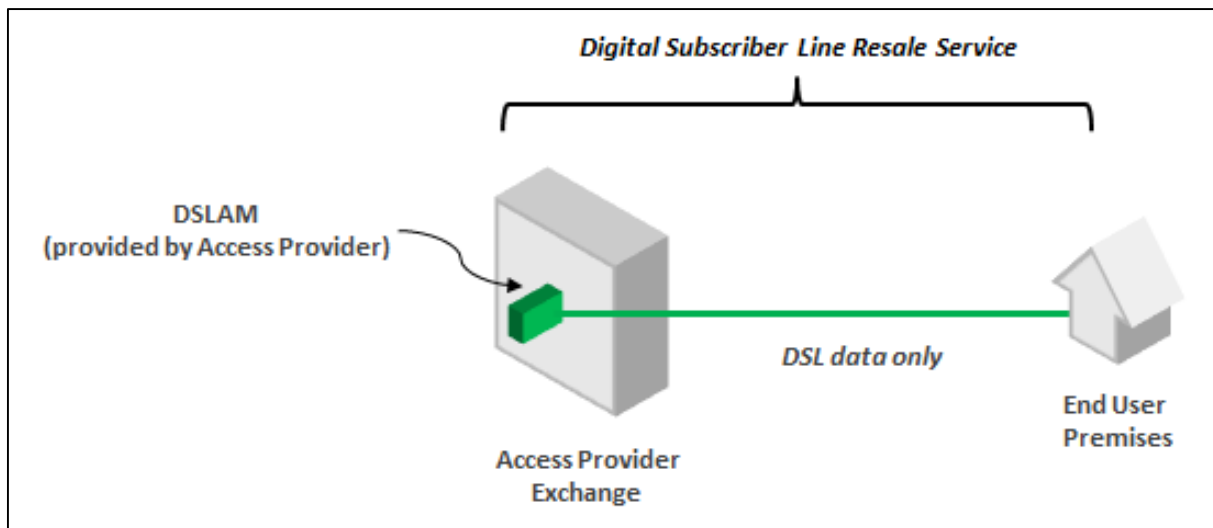
Figure 50 – Scope of Digital Subscriber Line Resale Service

Submissions Received: Copper-based services

15.24   Celcom does not acquire these services, but noted that operators are typically migrating to fibre-based networks to keep up with increasing bandwidth demand. Celcom proposed that the MCMC should revise the description of these local access services to include G.fast, which re-uses copper to deliver faster services.

15.25   edotco submitted that each of these services should be removed from the Access List.

15.26   Maxis acquires the Digital Subscriber Line Resale Service from the incumbent fixed operator, which Maxis uses as a back-up link for its MPLS services. Further, Maxis's access agreement with TM includes the following copper-based services, which it plans to acquire in future:

(a)   Bitstream with Network Service;

(b)   Digital Subscriber Line Resale Service;

(c)   Full Access Service;

(d)   Line Sharing Service; and

(e)   Sub-loop Service.

15.27   Maxis submitted that access providers typically require access seekers to subscribe to minimum ports per-card, which ranges from 32 to 192 ports per location. In Maxis's experience, access providers should offer access on a per-port basis, as it is difficult for access seekers to comply with the ports per-card requirement. Maxis noted that HSBB services are sold on a per-port basis and there is no requirement to buy a full line card or chassis.

15.28   Maxis submitted that each of the copper-based services should be retained in the Access List:

(a)   to allow end users in areas not served by the HSBB network to acquire competitive fixed broadband services from multiple service providers; and

(b)   because these services are not substitutable by alternative forms of broadband services unless the relevant areas are updated or migrated to the HSBB network.

15.29   Maxis also submitted that the definition of HSBB should cover hybrid fibre and VDSL solutions to avoid risks that access to such infrastructure is frustrated in the event the MCMC removes copper access regulation.

15.30   TM continues to provide copper-based services to some of its existing retail customers, but access seekers have not requested the service recently. TM expects future demand for copper-based networks to be limited given end user demand for HSBB services and the high CAPEX and maintenance requirements for copper services. TM notes that it will continue to consider access requests at fair pricing that accounts for full recovery of its implementation costs.

15.31   YTL requested that the MCMC clarify to all building owners and managers that MDF rooms in buildings must be open to all access seekers, not just legacy access providers.

MCMC Assessment

LTBE overview: Copper-based services

15.32   As noted in paragraph 15.6 above, the copper-based local access services are not substitutable with other facilities and services that provide access to the "last mile" of the telecommunications network, such as duct access services, transmission services or wholesale line rental. Accordingly, as observed by the MCMC in the 2015 Access List Review, the obligation to supply these copper-based local access services in respect of premises not connected to the HSBB network has traditionally been essential in order to facilitate downstream competition in the retail supply of fixed telephony and broadband services.

15.33   Although the copper-based local access services are not currently being acquired by any access seekers, the MCMC's view is that it may still be in the LTBE for these services to remain on the Access List. However, the apparent lack of demand for these services requires a more detailed LTBE assessment.

15.34   On one hand, retaining these services on the Access List preserves the ability for competition to be promoted in future, particularly given the copper-based network continues being used by TM to service some 573,633 copper-based broadband customers.[65]

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[65] This is based on data submitted by TM to MCMC as at 30 June 2021.

15.35   However, on the other hand, retaining services which are approaching end-of-life on the Access List may have a potential impact on investment incentives from both an access seeker and an access provider perspective:

(a)   some copper-based services, such as the Full Access Service and Sub-Loop Service, require significant investment by access seekers in the form of DSLAMs and other equipment required to connect to copper. However, in order to take advantage of these services, access seekers would need to make an investment that will likely be stranded before the investment can be recovered given the limited remaining life of the copper network; and

(b)   from an access provider perspective, retaining these services on the Access List may impact TM's investment incentives in maintaining and upgrading its copper network for the benefit of its remaining copper-based customers.

15.36   Nevertheless, services which are typically acquired for resale purposes, such as the Bitstream Services and the Digital Subscriber Line Resale Service, require less investment, and provide an opportunity for access seekers to supply services in competition with TM's legacy services, which continue to serve 573,633customers as noted above, with less chance of stranded investment.

15.37   In other jurisdictions, the regulation of copper-based access services has begun to be reduced as high-speed fibre-based broadband networks reach maturity. For example:

(a)   New Zealand

(i)   The incumbent operator in New Zealand, Chorus, was previously required, under the Telecommunications Act 2001, to supply wholesale copper phone and broadband services. Given the rollout of fibre networks across New Zealand under the Ultra-Fast Broadband Initiative, the Telecommunications Act was updated in November 2018 such that copper services are now deregulated in areas where fibre is available. Chorus is permitted to stop supplying regulated copper services in such areas, subject to complying with the Copper Withdrawal Code (a set of consumer protection requirements).[66] The regulation of copper services will continue in areas where fibre is not available.

(b)   USA

(i)   A shift towards deregulating copper-based services is also evident in the USA. In 2019, the Federal Communications Commission decided to eliminate regulatory intervention with respect to lower-speed legacy wholesale transport offerings over traditional copper wires, referred to as "time-division multiplexing" (**TDM**). In its

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[66] For further details, see Commerce Commission, 'Copper Withdrawal Code: Decisions and Reasons' Paper, 10 December 2020, available at: https://comcom.govt.nz/__data/assets/pdf_file/0031/229882/Copper-Withdrawal-Code-Decisions-and-reasons-paper-10-December-2020.pdf.

decision, the FCC found that imposing pricing and other regulations to such services led to unnecessary costs and harmful market distortions.[67]

(ii) In a separate decision in 2019, the FCC decided to remove two specific obligations imposed on Incumbent Local Exchange Carriers (**ILECs**). The FCC considered that such obligations led ILECs "*into preserving outdated technologies and services at the cost of a slower transition to next-generation networks and services that benefit American consumers and businesses*".[68] ILECs were no longer required to:

(A) unbundle two-wire and four-wire analog voice-grade copper loops, including the attached TDM equipment; and

(B) offer for resale, at wholesale rates, telecommunications services that the ILEC offered at retail to non-carrier customers.

(c) Singapore

(i) The IMDA is currently consulting on the deregulation of copper-based local loops, sub-loops and line sharing services and has proposed to remove them from the list of "Mandated Wholesale Services" under the upcoming Converged Competition Code for Telecommunications and Media Services. IMDA's proposal to de-regulate such services is based on the fact that there has been zero take-up over the years of the above copper-based services, and accordingly, "*these services are not necessary for market development and competition*".[69]

15.38 The MCMC understands that Phase 1 of the HSBB Network rollout is largely complete. The MCMC has received no access agreements which reflect take-up of these copper-based local access services, although as indicated by Maxis, it currently acquires the Digital Subscriber Line Resale Service and wishes to acquire the other copper-based services in future.

15.39 The MCMC further understands that the deployment of committed ports under Phase 2 of the HSBB Network rollout has also been completed. Nevertheless, there are approximately 573,633 premises still receiving copper-based broadband services. In this regard, the MCMC agrees generally with the submissions by Maxis regarding the ongoing relevance of regulating copper-based services, given:

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[67] FCC, FCC-19-66 - In the Matter of Special Access for Price Cap Local Exchange Carriers, 10 July 2019, available at: https://docs.fcc.gov/public/attachments/FCC-19-66A1.pdf, p. 2.
[68] FCC, FCC 19-72 - In the Matter of Petition of US Telecom for Forbearance Pursuant to 47 U.S.C. 160(c) to Accelerate Investment in Broadband and Next-Generation Networks, 26 July 2019, available at: https://docs.fcc.gov/public/attachments/FCC-19-72A1.pdf, p. 2.
[69] IMDA, Second Public Consultation on the Draft Code of Practice for Competition in the Provision of Telecommunication and Media Services, 5 January 2021, available at: https://www.imda.gov.sg/-/media/Imda/Files/Regulations-and-Licensing/Regulations/Consultations/2021/Code-of-Practice-for-Competition-in-the-Provision-of-Telecommunication-and-Media-Services/2nd-Consultation-Paper-for-Code.pdf?la=en, p. 70.

(a) it is not clear to the MCMC whether and when these remaining end users will be transitioned to the HSBB Network, meaning the end users will rely on the ongoing vibrancy of retail competition for copper-based local access services; and

(b) in any event, the MCMC understands that TM will continue supplying copper-based local access services until at least March 2025, meaning that for the majority of the upcoming regulatory period, copper-based local access services will continue being acquired.

15.40 Moreover, in Malaysia, as summarised in paragraph 15.6 above, these copper-based local access services should not be treated as the same functional inputs as wholesale broadband and data services, given the greater degree of customisation permitted by those local access services. As a result, the availability of HSBB services in certain areas does not affect competition in the supply of wholesale access to copper-based local access services.

15.41 The MCMC therefore has to balance the ongoing need for some wholesale access to copper based services and the relatively short remaining life of the copper network and not encouraging stranded investment. The MCMC considers that a balanced approach to deregulating copper-based services should be taken, by retaining the bitstream and resale based services on the Access List but removing the unbundled forms of copper based access. This will still require continued wholesale access to be provided by TM to its copper network but in a way that will not involve over-investment by access seekers or diverted investment away from copper by TM.

15.42 Regarding YTL's request that the MCMC clarify that MDF rooms must be open to all access seekers, not just legacy access providers, the MCMC reminds all operators that exclusivity arrangements between operators with property developers and building management companies owners deprive the end users the right to choose their preferred telecommunications service providers, leading to high prices and poor quality for broadband services. Therefore, exclusivity arrangements are prohibited. Further, the MCMC guideline entitled "Garis Panduan Perancangan Infrastruktur Komunikasi, (**GPP-I**)" which facilitates the planning and development of communications infrastructure in new property developments also prohibits exclusive arrangements between telecommunications service providers and property developers or building management companies.[70]

MCMC Preliminary View

15.43 Accordingly, the MCMC's preliminary view is that it would be in the LTBE for the following copper-based local access services to be removed from the Access List:

(a) Full Access Service;

(b) Line Sharing Service; and

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[70] MCMC, Garis Panduan Perancangan Infrastruktur Komunikasi, (GPP-I). https://www.skmm.gov.my/en/resources/guidelines/guidelines/garis-panduan-perancangan-infrastruktur-komunikasi

(c)   Sub-Loop Service.

15.44   Further, the MCMC's preliminary view is that it would be in the LTBE for the remaining resale-oriented copper-based local access services, being the Bitstream Services and the Digital Subscriber Line Resale Service, to be retained in the Access List.

15.45   The MCMC also proposes to make modifications to clarify that the Bitstream services are limited to copper-based services and are not technology-neutral. The MCMC does not propose to amend the Digital Subscriber Line Resale Service, which is already expressed as being supplied over a Communications Wire.

15.46   Words that appear in <u>underlined red text</u> below have been added relative to the existing description while words that appear in ~~strikethrough text~~ are proposed to be deleted, and the amended service description for the Bitstream Services are as follows:

4(12) Bitstream with Network Service

(a)   The Bitstream with Network Service is a <u>copper-based</u> Facility and/or Service for the provision of Layer 2 connectivity for the carriage of certain communications, being data in digital form and conforming to Internet Protocols, between customer equipment at an End User's premises and a POI at the Access Seeker's premises, where:

(i)   the Customer's equipment is directly connected to an Access Provider's network; and

(ii)   the Access Seeker, but not the Access Provider, assigns the Customer with an IP address.

(b)   Bitstream with Network Service includes shared splitting services, interfaces to operational support systems and network information.

4(13) Bitstream without Network Service

(a)   The Bitstream without Network Service is a <u>copper-based</u> Facility and/or Service for the provision of Layer 2 connectivity for the carriage of certain communications, being data in digital form and conforming to Internet Protocols, between customer equipment at an End User's premises and a POI at the Access Provider's premises, where:

(i)   the Customer's equipment is directly connected to an Access Provider's network; and

(ii)   the Access Seeker, but not the Access Provider, assigns the Customer with an IP address.

(b)   Bitstream without Network Service includes shared splitting services, interfaces to operational support systems and network information.

Questions

Question 66: Do you have any comments on the proposal to remove the Full Access Service, Line Sharing Service and Sub-Loop Service from the Access List?

Question 67:	As an access seeker, does the Bitstream Service provide any additional functionality which you are not able to obtain through the Layer 2 HSBB Network Service with QoS or Layer 3 HSBB Network Service (as applied to the HSBB Network)?
Question 68:	Should the Digital Subscriber Line Resale Service or Bitstream Services be removed from the Access List? Please provide details of any anticipated impacts from such a removal.

Part C Other submissions

16 Other submissions

Introduction

16.1   The MCMC also received a number of general submissions from operators in relation to the access regime and the MCMC's functions more generally. Those submissions, and the MCMC's preliminary discussion and response to those submissions, are set out in this section.

Access agreements versus commercial arrangements

Submissions Received

16.2   Astro prefers to obtain access on services governed under the Access List via an access agreement, rather than a commercial agreement, given the regulatory oversight function exercised by the MCMC.

16.3   Celcom submitted that it has entered into some commercial agreements which have benefited all parties in terms of cost savings. These agreements were concluded before the services governed by those agreements were mandated in the Access List. Celcom believes that acquiring such services under access agreements is more beneficial if the services listed in the Access List are well defined (without loopholes) and proper access procedures are in place and adhered to.

16.4   Celcom Timur Sabah stated that commercial agreements offer freedom and flexibility for parties to negotiate price. Celcom Timur Sabah further stated that there have been no disputes, as commercial negotiation without the constraints of a regulatory regime doesn't hinder the achievement of mutual agreement by both parties. This is the preferred approach towards service provision based on Celcom Timor's observation. Celcom Timor submitted that, ultimately, all commercial agreements should capture the principle of willing seller-willing buyer.

16.5   Digi stated, in respect of some services initially provided in a pilot or small scale, that the parties will negotiate for simpler terms to conclude agreements faster and to enable quicker go-to-market. Digi submitted that commercial negotiation provided flexibility on terms negotiated between the parties (based on both parties' requirements), including on pricing.

16.6   Fiberail submitted that commercial negotiation is much faster, easier and mutually beneficial to parties, depending on each party's set of terms, conditions and purpose. Fiberail found that access agreements, in comparison to commercial negotiation, are time consuming, as they involve the MCMC as a third party, whose role includes verifying, agreeing and registering access agreements, which Fiberail submitted further limits negotiations between willing buyers and sellers.

16.7   Fiberail further stated that, often, successful negotiations involve a 'give and take' or 'willing buyer-willing seller' approach being adopted by both parties, some risk and reward analysis by both parties and the parties' spirit of entering into a long term business venture together. Fiberail stated that, most of the time, this is enough to make a deal.

16.8   Fiberail also submitted that existing agreements that were commercially negotiated and agreed between access seekers and access providers are now being disputed by access seekers. Access seekers are requesting that the agreements be converted to access agreements (with MSA and MSAP terms applying). Fiberail found that such conversion to access agreements is a huge barrier for an access provider, as most of the commercially negotiated agreements involved customisations and higher specifications than the standard terms in the MSA and almost always led to the access provider making huge initial investments.

16.9   Fiberail stated that if the price of services in the MSAP is right, any form of agreements or descriptions of the services should not be an issue.

16.10   Fibrecomm submitted that, by acquiring services commercially, the access provider is able to deliver customised solutions in accordance with an access seeker's requirements. Fibrecomm stated that the commercial negotiation process was effective in catering for the access seeker's requirements. Fibrecomm is of the view that commercial arrangements are preferable because of the benefits that they have rather than the barriers that may exist by entering into access agreements.

16.11   MyKris submitted that commercial terms allow more flexibility than access agreements, which at times present more constraints and limitations on ad-hoc requests, especially when a Request For Quotation or tender timeline is tight.

16.12   Myren submitted that commercial agreements provide more room for negotiation, are usually project-based and no disputes occur.

16.13   Net2One submitted that several services and facilities on the Access List are being commercially negotiated, including due to the absence of a regulated price for the services and gaps between the three access instruments. In Net2One's view, the inconsistencies between the access instruments compels Access Providers to offer services on a commercial basis by tweaking the description of the service and adding conditional terms for the provision of the services. However, Net2One is cognisant of the MCMC's study of the competitiveness of Malaysian communications and multimedia markets, and submitted that the MCMC should have a broader view of the issues that have an impact on the relevant regulatory instruments in order to uphold the national policy objective of the CMA. Net2One also recommended that the MCMC look into the application of the technology neutrality principle across all access instruments to ensure an equitable provision of affordable services over ubiquitous national infrastructure.

16.14   Net2One additionally submitted that, as an instrument created to lift barrier to entry at the wholesale level, the access agreement should be the channel for access seekers to benefit from service offerings, which are at par with the major players in the market. However, based on experience, Net2One was compelled

to enter into a commercial agreement because several crucial elements of an access provider's service offerings were not covered by the access agreement. As an example, Net2One referred to the transmission service listed in the Access List and a managed data service that is being offered on a commercial basis. Net2One submitted that, on the surface, these services have the same underlying function, which is to facilitate the transmission of data between two points on a dedicated basis with a high-level quality of service. Net2One stated that the access agreement does not specify the level of quality of service that should be accorded to an access seeker to protect its business against network congestion and downtime. In order to minimise network disruption to its end users, Net2One opted for a managed data service, which was offered with a network monitoring service and a higher service level guarantee (SLG). Net2One suggested that, often, the SLG is accompanied by a service rebate, which is essential to cushion the impact to the business against network congestion and downtime concerns.

16.15   However, Net2One highlighted that the drawback of entering into a commercial agreement is that, in order to obtain a more competitive price through a commercial agreement, Net2One has to be bound by a long commitment period. With the cyclical three-year review period of the access instrument, specifically the determination on Access Pricing, the commercial prices granted to Net2One in the long run will no longer be competitive. As stated earlier by Net2One, one of the benefits of acquiring services under the access agreement is the certainty that the services are provided in a non-discriminatory and equitable basis. However, Net2One has noticed that the requirement to register an access agreement for it to be enforceable as stipulated in section 150 of the CMA, is being used as a ground to delay the provision of services, with most access providers not willing to start providing services until the access agreement is registered by the MCMC. Net2One opined that, to ensure a more efficient access to bottleneck services and facilities, the access agreement should remain as the main avenue for acquiring services mandated under the Access List.

16.16   Ohana stated that the commercial negotiation process is ineffective, leaving hardly any room for negotiation, and that it isn't clear to Ohana what the difference is between acquiring HSBB commercially and under the access agreement. However, if Ohana requires nationwide connectivity, it is unable to acquire the services under an access agreement. Aside from the costs being higher, Ohana considers that there isn't any particular advantage. Furthermore, there are no guarantees provided by the access provider, in terms of installation and/or response times, when the internet is down for its customers.

16.17   Redtone submitted that, in respect of commercial and access agreements:

(a)   commercial agreements entailed shorter negotiation periods, since they are less lengthy and drafted concisely, however they may be favourable to access providers;

(b)   the SLAs offered in the Access List are basic (minimum SLA, no redundancy, pricing in MSAP only applies for the basic requirement) and will not meet end user requirements, so in Redtone's experience, access providers only provide the required SLA under commercial arrangements.

As Redtone requires greater SLAs for service offerings to its customers, Redtone thus needs to acquire the service on a commercial basis;

(c) Access providers provide flexibility and bundling through commercial agreements. Customisation of commercial agreements is specific and includes all the requirements of the access seeker i.e. the SLA, parameters, etc. However, since pricing is not regulated and is mainly based on volume, there are times where a certain volume is required for the access seeker to enjoy a reduction in price. In addition, Redtone submitted that larger service providers are typically able to enter into "swap" arrangements, which are not comparable to one-sided commercial arrangements involving smaller operators who cannot swap access to these services; and

(d) commercial arrangements make implementing services efficient, but the trade-off is that the access seeker may need to agree on clauses that are more beneficial to the access provider.

16.18 Sacofa submitted that commercial offers contained more flexible terms and conditions.

16.19 TIME submitted that there are extensive requirements to be fulfilled under access agreements, which can be cumbersome for both parties to comply with and to conclude negotiations. As a result, access agreements may require a long period of time to conclude prior to their registration and enforceability, particularly compared with commercial arrangements. In TIME's view, commercial agreements offer a better route, especially in the case of service providers who wish to launch their products quicker to the market. TIME suggested that commercial negotiations are also based on win-win situations and, often, serve the business objectives of both negotiating parties. TIME submitted that whilst the function of an access provider and access seeker still exists in a commercial negotiation, neither party is limited by the framework of the regulation, thus inviting a wide array of possible arrangements to serve the business purpose.

16.20 TIME also submitted that, with regards to the description of the services in the Access List, telecoms providers are known to have differences in the interpretation of the services' scope and specifications, which can lead to extended negotiation and dispute resolution.

16.21 TM faces barriers as an access seeker to enter into commercial arrangements for Duct and Manhole Access services and A2P messaging (discussed above in sections 10.891 and 8.103 respectively). In contrast, as an access provider, TM does not face any barriers in supplying services under commercial arrangements for the following reasons:

(a) commercial agreements offer a level of flexibility and freedom to negotiate terms and conditions, offering customisation of the service design and taking effect immediately upon signing; and

(b) there are facilities and services in the Access List that are competitive with readily available substitutes in the market. As such, these facilities

and services can be commercially negotiated and can be removed from the Access List.

16.22 U Mobile submitted that the industry contracts with providers for infrastructure sharing services through commercial agreements due to historical practices. It submitted that, without careful planning, the evolution to a 5G environment may create further challenges for regulatory oversight as operators may not be able to secure the necessary sites for the rollout of service coverage due to exclusive arrangements and/or indiscriminate use of street furniture and/or 'smart cells'. U Mobile suggested that this situation can be further improved with intervention by the MCMC now through a thorough study to set the policy and, ultimately, mandated price principles to ensure that prices are cost-based and cost-efficient.

16.23 U Mobile further submitted that transmission, which is typically based on long-term commercial agreements, saves costs based on wholesale prices, which are significantly below the mandated ceiling prices. However, U Mobile submitted that this may also indicate that mandated prices need to be carefully reviewed. Bottleneck services, such as transmission, must be mandated and invite the scrutiny of the MCMC to ensure that the services are provided at reasonable terms and prices. However, U Mobile found that the commercial negotiation process for access to facilities and services is generally smooth.

16.24 U Mobile additionally submitted that, while some key services are mandated in the Access List, it is a perennial dilemma for parties to enter into an access agreement, as opposed to a "commercial" agreement, for the following reasons:

(a) the description of the services could technically be defined differently to the Access List (U Mobile referred to TM's definition of End-to-End Transmission Services and HSBB services);

(b) in respect of commercial terms, parties often agree on terms that are not addressed in the MSA (e.g. discounts for bulk order); and

(c) there is a tendency for parties to be reluctant in disclosing other commercially sensitive terms in the process of registering the access agreements.

16.25 Webe submitted that:

(a) a commercial agreement is normally the choice when the services being negotiated include a combination of Access List items and non-Access List items;

(b) a commercial agreement is beneficial when access seekers are willing to commit to large volumes and longer tenure;

(c) commercial negotiation typically goes through a procurement process (where services are selected based on technical and commercial criteria); and

(d) commercial considerations include pricing, contract term, discounts, as well as other salient terms and conditions, relating to provision of the service.

However, Webe has experienced long and unresolved disputes for some services, which are currently not included in the Access List.

16.26   YTL submitted that no services should be removed from the Access List, as the Access List provides minimum standards as a baseline for commercial negotiation, from which parties are free to agree to higher standards. YTL considers that if services are removed from the Access List, smaller operators will face difficulty in bargaining with larger operators, who are able to avoid their SAOs. In YTL's experience, most access providers have refused to provide services and facilities in accordance with the MSAP even for services and facilities listed on the Access List.

16.27   YTL further submitted that access agreements and commercial agreements should be kept separate. Access agreements should deal with services and facilities covered in the Access List. YTL submitted that where a service or facility is regulated, it forces access providers to open up their facilities according to SAOs. YTL further suggested that access agreements ensure non-discriminatory terms and conditions. Commercial agreements are more private and confidential and can cover scenarios where bespoke or customised services or facilities are involved or where the terms required are of higher standard than those in the MSA. Commercial agreements should also result in lower cost / better pricing than the MSAP. However, YTL found that it is time consuming to negotiate commercial agreements.

16.28   Finally, YTL submitted that the main barrier is the requirement for an access agreement to be executed, which may be difficult to conclude quickly as it includes other facilities and services and completing discussions may take time. On the other hand, YTL stated that a commercial agreement is already in effect for the supply of facilities and services for which the prices are now regulated under the MSAP 2017. For existing commercial agreements, the application of MSAP prices should be immediate and not be subject to the conclusion of an access agreement. YTL additionally stated that the adherence and enforcement of the MSAP by all service providers should be closely monitored and managed by the MCMC to ensure that the benefits of such MSAP terms have been fully utilized and the cost-savings have been passed on to the Rakyat.

MCMC Discussion

16.29   The MCMC thanks stakeholders for their detailed submissions on the advantages and disadvantages of entering into access agreements and commercial arrangements.

16.30   Generally, stakeholders commented that commercial arrangements were preferable over access agreements with respect to:

(a)   provision of customised solutions and services;

(b)   flexibility as to timing, given the need for access agreements to be registered with the MCMC;

(c)   flexibility as to pricing; and

(d)   bundling, including of Access List items and non-Access List items.

16.31   Commercial arrangements allow access seekers and access providers to reach agreement on a commercial basis where mutually beneficial to the parties. The benefits of commercial negotiation have been recognised by international regulators, including through embedding their primacy in the access regimes adopted in those countries.[71]

16.32   However, the MCMC seeks to ensure that in Malaysia, access seekers are not forced to enter into commercial arrangements (which are not enforceable under the CMA) due to the inability or unwillingness of access providers to enter into access agreements, which are enforceable under the CMA, including through the MCMC's dispute resolution function. Commercial arrangements may not always lead to efficient or beneficial outcomes given these arrangements are typically confidential, are not subject to regulated prices or terms, and there may be an imbalance in bargaining power between the parties to a commercial arrangement.

16.33   In this regard, the MCMC notes that:

(a)   it has proposed a number of amendments to broaden the scope of services listed in the Access List such that even where they are supplied with different technical parameters, those services are considered regulated services under the Access List;

(b)   the MCMC will consider the inputs on the process of registration of access agreements, being mindful that registration of access agreements requires compliance with sections 150 and 91 of the CMA. The MCMC will also consider other issues such as minimising the time required to enter into an access agreement in the separate review on MSA. In so doing, the MCMC intends to limit the scenarios reported by some access seekers of being forced to enter into commercial arrangements due to timing constraints; and

(c)   while the current inquiry does not cover matters relating to pricing, the MCMC will review the MSAP at a later date to ensure that it aligns with the principles and intention of the Access List, including any amendments made in the course of this Access List Review.

16.34   Most stakeholders agreed that access agreements were generally beneficial where available, either through ensuring enforceability under the CMA, setting a baseline for commercial arrangements, or providing generally favourable terms and conditions.

16.35   The MCMC will seek to ensure that, through the changes it is proposing to the Access List, as well as the subsequent planned review of the MSA and the review of the access agreement registration process subject to the registration requirements under CMA, it is able to address the issues raised by stakeholders in this regard.

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[71] See, for example, Australia's *Competition and Consumer Act 2010* (Cth) Pt XIC, which prioritises commercially negotiated access agreements in the regulatory hierarchy.

16.36   In response to Fiberail's comments that converting commercial arrangements to access agreements presents a huge barrier for access providers, the MCMC notes that Malaysia's access regime offers access providers and access seekers flexibility by enabling parties to enter into commercial arrangements should they wish to do so. However, to the extent that services or facilities are subject to standard access obligations under the Access List (and regulated pricing under the MSAP), the regime does not contemplate that access seekers will forfeit their rights to enter into access agreements for those services or facilities. The MCMC considers that this is necessary to ensure that access seekers and providers alike are able to benefit from the regulation of services, by encouraging parties to enter into enforceable access agreements where possible.

MCMC approach to regulation

Submissions Received

16.37   Celcom stated that the most important criteria for access regulation is to regulate only the essential and bottleneck access facilities and services, the provision of which is non-competitive. As such, Celcom submitted that the flexibility of commercial arrangements for regulated services is inappropriate. In Celcom's view, the flexibility of commercial arrangements for regulated services is evident where the access provider claims that it does not offer access as per the description on the Access List, thus pushing for commercial arrangement. access seekers are unable to provide comments to the access provider unless they have detailed information regarding the access provider's network. Celcom accordingly suggested that it is best that the MCMC verifies the specific access provider's claims.

16.38   Celcom stated that non-competitive access services, such as the HSBB Network Service, should be maintained under the Access List. On the other hand, Celcom stated that competitive access services, such as MVNO access, should be dropped from the Access List and be subject to commercial arrangements. Celcom's position in respect of this is discussed in section 14.23 and 8.58 in greater detail.

16.39   Celcom Timur Sabah proposed that the MCMC seriously consider regulating not only licensees, but also players from other industries that provide similar facilities under infrastructure sharing. This will facilitate the provision of services by access providers, as the prices chargeable by them will be regulated, preventing them from charging Celcom Timur Sabah arbitrarily and creating unfair competition within the telecoms industry.

16.40   Edotco submitted that Malaysia has a very complex and highly regulated wholesale market, with 23 wholesale markets regulated and 4 new markets added in the 2015 Access List review. From its analysis, edotco stated that Malaysia has more regulated markets than Australia, the European Union etc. It further noted that technology advances have also resulted in certain services not being used or relevant in 2021 and beyond.

16.41   Edotco further highlighted that the retention of legacy classification or proposals to extend regulation into bespoke areas, like inbuilding systems (IBS) etc., are not just academic issues. The non-removal of legacy services, the non-

streamlining of access regulation and the imposition of inappropriate access regulation means real costs for operators and, tower companies. Edotco also submitted that this slows down the deployment of innovative services and more efficient technology in Malaysia. Edotco stated that generally, the Malaysian telecommunications market is more competitive as a result of regulation, but that focusing access regulation on key distorting activities, like SBCs and state monopolies, would be a better use of the MCMC's resources.

16.42   MYTV submitted that in accordance with the JENDELA policy, support is required to accelerate project delivery. MYTV also believed that the MCMC should consider the standardisation of electricity tariff for communications services. It also submitted that electricity tariffs should be regulated across all access instruments.

16.43   Net2One has yet to be involved in any discussions on the JENDELA action plans but is of the view that, as a licensee, its involvement in such discussions is vital. Net2One hopes to get an opportunity to be part of the steering committee that is expected to convene soon.

16.44   Ohana submitted that it faces resistance from other operators to enter into access agreements. It finds that bigger operators prefer to build their own infrastructure, instead of entering into access agreements.

16.45   TIME is of the opinion that the MCMC implement asymmetric access regulation, whereas TIME considers that access regulation should only be applied to operators that are dominant or have significant market power in the applicable markets. This would encourage investments by Alternate Network Operators (ANO), since it allows the ANOs sufficient returns on the investment made. TIME submitted that it is inconceivable to expect most ANOs to obtain sufficient returns on investments made, based on the costs structure of an incumbent, since the incumbent would already have existing infrastructure from the many decades of its operations.

16.46   TIME further submitted that asymmetric regulation also encourages access seekers with monopsony power to use the access instruments to their advantage in gaining access to infrastructure that has not produced sufficient returns to the investments made by ANOs. The ANOs have the potential to end up as an "infrastructure contractor" to access seekers who do not invest in strategic national infrastructure, such as Fibre to the x (**FTTx**), which then leads to an unsustainable economic return for the ANOs.

MCMC Discussion

16.47   The MCMC thanks the several stakeholders who commented on the MCMC's approach to access regulation more generally.

16.48   In relation to Celcom's comments that only bottleneck infrastructure should be regulated, that commercial arrangements are inappropriate for regulated services, and that competitive access services should be removed from the Access List, the MCMC notes that:

(a) the fact that a facility or service is characterised as bottleneck infrastructure is not the sole determinant of whether or not that facility or service should be regulated. As the MCMC has noted in the past and throughout this PI Paper, there are a number of factors which the MCMC takes into account in determining which facilities or services should be regulated, such that it may elect to regulate non-bottleneck infrastructure, for example to promote competition in downstream markets, to promote the LTBE, or in anticipation of changing technologies or market dynamics;

(b) as noted earlier in this section 16, the MCMC acknowledges that there may be advantages to commercial arrangements, and it would not be appropriate or in the LTBE to prohibit access seekers and access providers from entering into commercial arrangements where mutually beneficial and agreed. However, the amendments the MCMC is proposing to the services and facilities on the Access List are designed to prevent access providers from forcing access seekers onto commercial arrangements where this is not mutually desired, as raised by both Celcom and Ohana; and

(c) the MCMC's position in respect of each of the facilities and services in the Access List, including the state of competition in the supply of the relevant services, are as set out in sections 7 to 15 of this PI Paper.

16.49 Regarding Celcom Timur Sabah's comments that the MCMC should consider regulating non-licensees, this is further discussed in paragraph 16.54 and onwards.

16.50 The MCMC notes edotco's comments regarding the fact that Malaysia has more regulated markets than Australia or the European Union. While the MCMC takes into account international benchmarks in its approach to regulation, the MCMC's focus is on regulating in a manner that is consistent with the competitive and economic factors present in Malaysia. Any comparison between the regulation of markets in the European Union and Malaysia is not appropriate, given each reflect different regulatory frameworks and for this reason the MCMC does not consider it relevant to analyse whether Malaysia has a greater number of regulated markets than other jurisdictions. Further, the MCMC is concerned in this review with the regulation of specific *services*, rather than *markets* (which are regulated pursuant to the MCMC's separate power to find licensees dominant in a communications market under section 137 of the CMA). The MCMC accordingly does not consider a discussion regarding the regulation of markets to be within the scope of this review. The MCMC's views on retaining or removing legacy or lower-demand services is set out in sections 7 to 15 of this PI Paper.

16.51 The MCMC notes MYTV's submissions regarding electricity tariffs, but notes that electricity tariffs are beyond the scope of this inquiry. The MCMC also notes Net2One's comments to participate in JENDELA discussions. However, as the matter is beyond the scope of this inquiry, Net2One is encouraged to engage with the MCMC separately on this.

16.52   The MCMC rejects TIME's submission that the MCMC should adopt an asymmetric approach to regulation. In Malaysia, as is the case in many other comparable jurisdictions, all service providers are regulated equally. The MCMC's focus in regulation is on the nature of the relevant service or facility, not on the provider of the service. In the MCMC's view, if a service or facility comprises bottleneck infrastructure, i.e. if it cannot be replicated, or if there is a limited availability of supply, then it should be subject to regulation, regardless of who is providing that service.

16.53   The MCMC also notes that jurisdictions in which asymmetric regulation is imposed (e.g. in the EU) are typically asymmetric by design, such that access regulation is imposed as a "remedy" following findings that an operator is dominant. This is distinct from the regulatory regime in Malaysia, where the MCMC has the power to find operators dominant, and separately – as per the scope of this inquiry - to list "services" and "facilities" on the Access List, based on a range of considerations including, fundamentally, the LTBE. For this reason, the MCMC's current view is that asymmetric regulation would require a fundamental change to the regulatory regime in Malaysia that is potentially inconsistent with the intention behind the regime.

Acquiring services from unlicensed entities

Submissions Received

16.54   In its supplementary questionnaire, the MCMC enquired whether any operators were currently acquiring, or would like to acquire, any facilities or services from operators who are not licensed or otherwise consider themselves exempt from the Access List and SAOs.

16.55   Allo, Celcom Timur Sabah, Digi, Fiberail, My Evolution, ALTEL, Net2One, MYTV, Ohana, Redtone and Sacofa all responded that they did not acquire any facilities or services from operators who are not licensed or otherwise consider themselves exempt.

16.56   ALTEL, Net2One and MYTV would be open to consider acquiring services or facilities from such operators in the future if there are needs and requirements for the facilities/services offered.

16.57   While Astro is not considering acquiring services from non-licensed operators, Astro Radio's broadcasting facilities or services are acquired via TM and Celcom's infrastructures. Astro believes that both access providers have the necessary licenses to lease their facilities and services.

16.58   Celcom is currently negotiating an Access Agreement for HSBB Layer 2 Services with a licensed nominated facilities provider, who is negotiating on behalf of an unlicenced owner of a network facility. The challenge Celcom faces is in respect of an agreement clause pertaining to termination of convenience without reasonable justification. Since unlicensed, the owner is not subject to the termination clause under the MSA, which requires consent from the MCMC.

16.59   Celcom also submitted, in respect of 5G deployment, it foresees potentially seeking access from more unlicensed operators and owners, such as the

government or state authorities, of facilities, such as utility poles and street furniture (e.g. lamp poles, Rapid Assembly Pole (Rapole), etc.).

16.60   While edotco acquired regulated facilities and services only from licensees under the CMA, the operation and maintenance services for its telecommunications infrastructures are currently managed by OnSite Services Sdn Bhd. Onsite Services Sdn Bhd is a subsidiary of edotco Malaysia Sdn Bhd and is not a licensee under the CMA.

16.61   Fibrecomm submitted that it acquired facilities and/or services from landlords for rental of space for POP or Right of Way (ROW) and from Tenaga Nasional Berhad (TNB) and Sabah Electricity Sdn Bhd for co-location.

16.62   Maxis commented that it would like to acquire services and facilities from operators who are not licensed, and supports any intention to allow access to such facilities and services owned by non-licensed or third party organisations such as TNB, Indah Water Konsortium (IWK), and state or local authorities such as DBKL and MBSA. Maxis considers that it would benefit operators to provide additional options for their network rollout plans and potentially overcome existing issues faced by operators such as delays in issuing permits and approvals, and higher processing and permitting fees.

16.63   TIME submitted that Duct and Manhole Access and Network Co-location services were currently acquired from operators, such as property developers and building owners.

16.64   TM submitted that it is currently acquiring, and will in future continue acquiring, facilities and services from operators who are not licensed or who consider themselves exempt from the Access List, including local authorities, developers, commercial building owners and private owners. The types of services TM acquires from these operators includes right of way, duct and manhole access, floor space for in-building connectivity, trunking, access to MDF rooms and access to other form of utility infrastructure.

16.65   TM faces challenges in acquiring these services, including unfair terms and conditions and exorbitant charges. TM submitted that the same standard access obligations applicable to licensees should also be applicable to specific bottleneck facilities operated by non-licensees, to support the industry moving forward.

16.66   U Mobile submitted that, in order to meet customer demands and government targets, operators are increasingly considering to roll-out fibre on facilities, such as lamp poles, utility cables and ducts, owned by non-licensees or TNB (in the case of ducts). It submitted that the MCMC should strongly consider ensuring that all utilities that provide such facilities or services, and support the provision of communications services under the CMA, are regulated. Regulation should cover access to facilities, the rates payable and terms on which facilities are provided.

16.67   Webe suggested that there were a lot of facilities and services it acquired, and will continue to acquire, from operators who are not licensees, such as infrastructure facilities, commercial building owners (i.e. trunking, telecommunication room/space etc.) and local councils. Webe proposed that a

bottleneck facilities and service operator should include non-licenced operators under the SAO.

MCMC Discussion

16.68   The MCMC notes that most operators did not report acquiring facilities or services from unlicensed operators or operators who otherwise consider themselves exempt from the Access List and SAOs.

16.69   Where facilities or services were acquired from or supplied by unlicensed or exempt operators, such as in the case of Astro, edotco, Fibrecomm and TIME, many operators did not report experiencing any issues with such arrangements.

16.70   However, the MCMC notes comments from Celcom, Maxis and TM that they have experienced some difficulties in acquiring facilities and services from non-licensees.

16.71   In response to these difficulties, the MCMC first notes that any network facilities provider or network service provider (not just licensees) are required to provide facilities and services listed on the Access List. In turn, the provision of network facilities and network services each comprise a licensable activity for the purposes of the CMA.

16.72   Secondly, the MCMC notes that the vast majority of regulated facilities and services are supplied by licensed operators. This is evidenced by the relatively limited number of submissions by stakeholders regarding difficulties in accessing facilities and services from non-licensees.

16.73   Thirdly, the MCMC notes that some amendments it has proposed to the Access List in Part B above are likely to increase access to some of the key facilities and services referred to by the operators in the context of services that may be provided by non-licensees. For instance, in response to Celcom's and U Mobile's submissions that facilities are owned and provided by non-licensed operators, such as lamp poles and street furniture, the MCMC notes that it has expanded the definition of Infrastructure Sharing to include poles and street furniture to facilitate access to a broader range of facilities. As discussed in paragraph 10.50, the MCMC acknowledges that access to poles and street furniture will be critical in small cell deployment underpinning 5G network rollout.

16.74   The MCMC also repeats its discussion in paragraph 10.58(f) above with respect to making complaints under section 69 of the CMA.

16.75   At this stage, the MCMC does not consider that any further amendments to the Access List would be required to address issues of the nature raised by some operators in relation to the provision of facilities and services by non-licensees. However, the MCMC will continue to explore opportunities for ensuring that the supply of telecommunications facilities and services remains competitive regardless of who provides these services. To the extent that the MCMC's current purview under the CMA does not allow the MCMC to impose regulatory relief that will promote the LTBE through competition, efficient use of and investment in infrastructure, and achieving any-to-any connectivity, the MCMC will engage

with stakeholders, including industry and government, to determine other solutions through which it can achieve these objectives.

Questions

Question 69: Do you agree with the MCMC's approach in paragraph 16.75? If not, please provide details in support of your views.

Annexure 1 Summary of questions

Question 1: Do you agree with the MCMC's view to retain Fixed Network Termination Service in the Access List? Please provide details of your views.

Question 2: Should the Fixed Network Origination Service remain in the Access List? Please provide details.

Question 3: Should SMS and MMS messages be removed from the service description for the Fixed Network Origination Service? Please provide details.

Question 4: Do you agree with the preliminary view of MCMC to retain Wholesale Line Rental Service in the Access List? Please provide details.

Question 5: Have there been any relevant changes in the supply of wholesale fixed telephony services that would justify removal of the Wholesale Line Rental Service from the Access List? (Please provide details).

Question 6: Do you have any comments on the proposed amendments to the service description for the Mobile Network Termination Service (including the proposed amendments to the definition of "Interconnection Service"?

Question 7: Should WiMAX continue to be included in the scope of the service description for Mobile Network Termination Service?

Question 8: Do you have any comments on the proposed amendments to the service description for the Mobile Network Origination Service?

Question 9: Should WiMAX technology remain in the scope of the service description for the Mobile Network Origination Service?

Question 10: Are any further amendments required to the MVNO Access Service beyond the amendments for 5G technology and 3G technology set out above?

Question 11: Do you have any comments on the proposal to include a new End-to-End A2P Messaging Service in the Access List or to its service description?

Question 12: Are any further amendments required to either the Mobile Network Termination Service or the new End-to-End A2P Messaging Service?

Question 13: Should the Domestic Roaming Service described above be listed on the Access List?

Question 14: Have you experienced any discrimination or refusals to supply Domestic Roaming Services from existing MNOs?

Question 15: If a Domestic Roaming Service were listed on the Access List on a temporary basis, for what period should the service remain listed?

Question 16: Should the scope of any regulated Domestic Roaming Service be limited to specific regions, rather than on a national basis?

Question 17:	Should any RAN sharing or MOCN arrangements be listed on the Access List?
Question 18:	Do you currently acquire or supply a Mobile Fronthaul Service?
Question 19:	Should a Mobile Fronthaul Service be listed on the Access List?
Question 20:	Can Mobile Fronthaul Services be acquired under the existing transmission services in the Access List? If not, what amendments should be made to the transmission services to include Mobile Fronthaul Services?
Question 21:	Do you agree with the MCMC's regulatory principles for 5G access regulation as outlined in paragraphs 9.33 and 9.34 above? Please provide details, including whether you consider any other factors should be relevant to the MCMC's regulatory analysis.
Question 22:	Do you have any comments on the proposed draft service descriptions for the 5G Standalone Access service and 4G EPC with 5G RAN Access service? Please provide details, including any key elements of the service that should be included in, or removed from, either or both service descriptions.
Question 23:	Will the 5G Standalone Access service and 4G EPC with 5G RAN Access service allow you to supply 5G retail or enterprise services to your Customers? If not, please provide details, including any suggested amendments to enable such supply.
Question 24:	Should the service description for 4G EPC with 5G RAN Access refer specifically to MOCN technology, or do the service descriptions allow MOCN arrangements as currently drafted?
Question 25:	If both 5G Standalone Access and 4G EPC with 5G RAN Access services were to be listed on the Access List, which service do you plan to acquire and why? If you plan to acquire both services, please provide details including any anticipated timeframes and forecasts.
Question 26:	As an access seeker for 5G services, have you deployed, or do you plan to deploy, a 5GC network? If so, should the 5G Standalone Access service include integration between the access provider's RAN and your 5GC network?
Question 27:	Should the description of the Infrastructure Sharing Service be expanded to cover poles and other street furniture?
Question 28:	Do you have any comments on the proposed amendments to the Infrastructure Sharing Service to cover poles and street furniture? Please provide details of any other amendments required, including as to the proximity of such furniture or equipment to public outdoor areas.
Question 29:	Do you agree that the MCMC should continue to regulate access to duct and manhole infrastructure? If not, please provide reasons.

Question 30:	If you agree, do you agree that the scope of the duct and manhole infrastructure which the MCMC now proposes to regulate (lead-in ducts, mainline ducts, inter-exchange ducts, each on a nationwide basis) is the correct scope for access regulation? If not, please provide your proposed alternative scope for regulation and reasons.
Question 31:	Do you have any comments on the proposed new definition for "Inter-exchange Duct"?
Question 32:	What related or downstream services do you require IP-based interconnection for?
Question 33:	Do you acquire or supply IP-based interconnection on a commercial basis? If yes, do you face any barriers in doing so? (Please provide details).
Question 34:	Do you agree with the MCMC's proposed approach to including IP-based interconnection within the Interconnect Link Service?
Question 35:	What other features of IP-based interconnection need to be included in the service description if it is amended?
Question 36:	Should bandwidth be included within the Interconnect Link Service? If so: (a) should it be included for both SS7 and IP-based interconnection?; and (b) at what increments should such bandwidth be offered?
Question 37:	Do you have any comments on the proposed amendments to the Network Co-Location Service as set out above?
Question 38:	Have you experienced any issues in acquiring sufficient capacity of internet interconnection services?
Question 39:	Do you have any comments on the proposal to include an IP transit service in the Access List where peering is not available e.g. in Sabah? Please provide details, including any comments on the proposed service description.
Question 40:	Do you have any feedback on IP peering arrangements in Sarawak and on the IP transit prices in Sarawak?
Question 41:	Should digital radio broadcasting services be included within the description of the Digital Terrestrial Broadcasting Multiplexing Service or included as a new service on the Access List?
Question 42:	Can you suggest any further refinements to the description of the Digital Terrestrial Broadcasting Multiplexing Service (including for the purpose of including digital radio broadcasting services within the service)? If so, please provide details and reasons for such refinements.
Question 43:	Do you intend to acquire 5G broadcasting services as an access seeker or intend to supply 5G broadcasting services as an access provider?

Question 44:	Should 5G broadcasting services be included within the description of the Digital Terrestrial Broadcasting Multiplexing Service or should they be included as an example of a 5G use case that DNB must support under the proposed new 5G services on the Access List, per section 9?
Question 45:	What is your view on the amendments proposed to the description of the End-to-End Transmission Service, including the proposed technical parameters? Should any other parameters be listed in the description of the service?
Question 46:	As an access provider, are you capable of supplying the End-to-End Transmission Service per the proposed amended service description? If not, please provide details, including amendments you would propose to the service description to facilitate your supply of the regulated service?
Question 47:	Should the Access List include a specific definition for "network availability" or "latency"? If so: (a) kindly propose the definition for "network availability"; and (b) please review the current definition for "Latency", and provide your feedback whether it is sufficient for the purposes of End-to-End Transmission Service or should there be any further amendments?
Question 48:	What is your view on the changes proposed by the MCMC to include a new subparagraph (c) to the description of the Wholesale Local Leased Circuit Service to include within the Wholesale Local Leased Circuit Service any Trunk Transmission Service required for the provision of the Wholesale Local Leased Circuit Service between a POI at the access provider's premises and the relevant End User location or access seeker premises?
Question 49:	As an access provider, are you capable of supplying the Wholesale Local Leased Circuit Service according to the proposed amended service description? If not, please provide details, including amendments you would propose to the service description to facilitate your supply of the regulated service?
Question 50:	As an access provider that is required to provide the onward transmission via Trunk Transmission Service to enable connectivity, what is the typical distance, and what is the furthest distance for the trunk component, at which access seeker networks are capable of interconnecting?
Question 51:	Do you have any comments on the MCMC's proposal to clarify that the Wholesale Local Leased Circuit Service should include Metro-E technology?
Question 52:	Should the Wholesale Local Leased Circuit Service be defined with the same technical parameters as those proposed for the End-to-End Transmission Service? If not, please provide details of any alternative parameters that should be included in the service description.
Question 53:	Do you agree with the proposed changes to the service description for the Trunk Transmission Service to clarify that the service must also be supplied over Metro-E? If not, please provide detailed reasons for why this change would be detrimental to you as an access seeker or an access provider.

Question 54:	As an access provider, are you capable of supplying the Trunk Transmission Service per the proposed amended service description? If not, please provide details, including amendments you would propose to the service description to facilitate your supply of the regulated service?
Question 55:	Do you agree with retaining Domestic Connectivity to International Services in the Access List and do you have any comments on its service description?
Question 56:	Do you acquire access to dark fibre as an access seeker or supply access to dark fibre as an access provider?
Question 57:	Are you experiencing any difficulty in acquiring or supplying access to dark fibre? If not, why not? (Please provide details).
Question 58:	What similarities (in terms of state of competition or other factors) exist between jurisdictions that regulate dark fibre in the core network and Malaysia?
Question 59:	Please comment on the viability of unbundling the access and core segments of GPON-based networks, providing details of any challenges or alternative solutions.
Question 60:	Could any changes be made to the Layer 2 HSBB Network Service with QoS's service description to better facilitate its supply? (Please provide details).
Question 61:	Do you have any comments on the proposed clarifications to the service description for the Layer 2 HSBB Network Service with QoS?
Question 62:	If the Layer 2 HSBB Network Service with QoS is amended to include new bitrates as proposed above, are there particular bit rates or increments of bit rates at which the service should be supplied? Please provide reasons including your ability to supply at particular bit rates or increments as an access provider, or your business need for particular bit rates or increments as an access seeker.
Question 63:	Could any changes be made to the Layer 3 HSBB Network Service's service description to better facilitate its supply? (Please provide details).
Question 64:	Do you have any comments on the proposed clarifications to the service description for the Layer 3 HSBB Network Service?
Question 65:	If the Layer 3 HSBB Network Service is amended to include new bitrates as proposed above, are there particular bit rates or increments of bit rates at which the service should be supplied? Please provide reasons including your ability to supply at particular bit rates or increments as an access provider, or your business need for particular bit rates or increments as an access seeker.
Question 66:	Do you have any comments on the proposal to remove the Full Access Service, Line Sharing Service and Sub-Loop Service from the Access List?

Question 67:	As an access seeker, does the Bitstream Service provide any additional functionality which you are not able to obtain through the Layer 2 HSBB Network Service with QoS or Layer 3 HSBB Network Service (as applied to the HSBB Network)?
Question 68:	Should the Digital Subscriber Line Resale Service or Bitstream Services be removed from the Access List? Please provide details of any anticipated impacts from such a removal.
Question 69:	Do you agree with the MCMC's approach in paragraph 16.75? If not, please provide details in support of your views.

Amendments to Existing Access List facilities and services

Quick guide to amendments

= Retain service on Access List without any modification.

△ Retain service on Access List with modifications.

✗ Remove service from Access List.

Existing Access List service		Proposed amendments	Page reference
Fixed Network Termination Service	=	Retain the service in the Access List without any modification.	19
Fixed Network Origination Service	=	Retain the service in the Access List without any modification.	22
Wholesale Line Rental Service	=	Retain the service in the Access List without any modification.	26
Mobile Network Termination Service	△	Retain the service in the Access List with minor amendments to clarify that the service includes wholesale end-to-end A2P messaging services and wholesale A2P termination services and to underscore that 5G is included in the scope of these services.	31
Mobile Network Origination Service	△	Retain the service in the Access List with minor amendments to underscore that 5G technology is included in the scope of these services.	35
MVNO Access Service	△	Retain the service in the Access List with minor amendments to underscore that 5G technology is	43

Existing Access List service		Proposed amendments	Page reference
		included in the scope of these services and to correct typographical errors in the description.	
Infrastructure Sharing Service	🔺	Retain the service in the Access List with modifications to expand the scope of the services to cover access to poles and street furniture	147
Duct and Manhole Access	🔺	Retain the service in the Access List with modifications to broaden the scope of duct infrastructure included within the listed service and to clarify the obligation of access providers to provide access to the land upon which such infrastructure is located.	158
Interconnect Link Service	🔺	Retain the service in the Access List with modifications to include IP-based interconnection	167
Network Co-Location Service	🔺	Retain the service in the Access List with modifications to clarify the premises at which co-location must be supplied.	173
Digital Terrestrial Broadcasting Multiplexing Service	🔺	Retain the service in the Access List with modifications to the definition of "Transport Stream" to reflect that this service is capable of being supplied as an audio-visual or audio-only service.	183
End-to-End Transmission Service	🔺	Retain the service in the Access List with modifications to include certain technical parameters and to clarify the scope of the service.	206
Wholesale Local Leased Circuit Service	🔺	Retain the service in the Access List with modifications to clarify that the service includes the provision of a Trunk Transmission Service (where required for the provision of the service) and the service may be incorporated into a Metro-Ethernet network.	214
Trunk Transmission Service	🔺	Retain the service in the Access List with minor modifications to clarify that the service may be incorporated into a Metro-Ethernet network.	220
Domestic Connectivity to International Service (connectivity only)	🟢	Retain the service in the Access List without any modification.	224

Existing Access List service		Proposed amendments	Page reference
Layer 2 HSBB Network Service with QoS	⚠️	Retain the service in the Access List with modifications to reflect the availability of higher speed tiers for the service, and to broaden the scope of the service to cover any technical parameters with which the service is supplied.	253
Layer 3 HSBB Network Service	⚠️	Retain the service in the Access List with modifications to reflect the availability of higher speed tiers for the service, and to broaden the scope of the service to cover any technical parameters with which the service is supplied.	253
Full Access Service	❌	Remove the service in the Access List.	269
Line Sharing Service	❌	Remove the service in the Access List.	269
Sub-Loop Service	❌	Remove the service in the Access List.	269
Bitstream Service	⚠️	Retain the service in the Access List with minor modifications to clarify that the services are limited to copper-based services and are not technology-neutral.	269
Digital Subscriber Line Resale Service	=	Retain the service in the Access List without any modification.	269

Addition of New Access List facilities and services

New Access List service	Page reference
End-to-End A2P Messaging Service	52
Domestic Inter-Operator Roaming Service	65
5G Standalone Access	128
4G EPC with 5G RAN Access	130

Annexure 2 Proposed timeline for Public Inquiry and Access List revision

Steps	Timeline
Close of Public Inquiry	18 October 2021
Issuance of Public Inquiry Report	30 days after close of Public Inquiry
Issuance of Commission Determination on Access List	45 days after close of Public Inquiry