Malaysian Communications and Multimedia Commission

Review of Access List

Public Inquiry Paper

3 April 2026

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

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PREFACE

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 Access List**. In this PI Paper, 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 MCMC in full by **12 noon, 19 May 2026**.

Submissions should be addressed to:

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In the interest of fostering an informed and robust consultative process, MCMC proposes to make submissions received available to interested parties upon request. 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.

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ABBREVIATIONS AND GLOSSARY

A2P	Application-to-Person
API	Application Programming Interface
APN	Access Point Name
ATM	Asynchronous Transfer Mode
BoD	Bandwidth on Demand
BTS	Base Transceiver Station
CAPEX	Capital Expenditure
CAS	Common Antenna System
CASP	Content Application Service Provider
CAT-M1	Category M1
CMA	Communications and Multimedia Act 1998
CoS	Classes of Service
CPP	Calling Party Pays
DAS	Distributed Antenna System
DIS	Digital Indoor System
DTT	Digital Terrestrial Television
DTTB	Digital Terrestrial Television Broadcast
DWDM	Dense Wavelength Division Multiplexing
eMBB	Enhanced Mobile Broadband
EN-DC	E-UTRA New Radio Dual Connectivity
EPC	Evolved Packet Core
EPS	Evolved Packet System
eSIM	Electronic Subscriber Identity Module
FNP	Fixed Number Portability
FTA	Free to Air
FTTH	Fibre to the Home
FWA	Fixed Wireless Access
GGSN	Gateway GPRS Support Node
GPON	Gigabit Passive Optical Network
GPP-I	*Garis Panduan Perancangan Infrastruktur Komunikasi*
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
HDD	Horizontal Directional Drilling
HLR	Home Location Register
HSBB	High Speed Broadband
IBS	In-Building Solutions

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
IRU	Indefeasible Right of Use
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
Kbps	Kilo Bit Per Second
LEO	Low Earth Orbit
LTBE	Long-Term Benefit of the End User
LTE	Long-Term Evolution
LRT	Light Rapid Transit
Mbps	Mega Bit Per Second
MCMC	Malaysian Communications and Multimedia Commission
MEC	Mobile Edge Computing
Metro-E	Metro Ethernet
MMS	Multimedia Messaging Service
mMTC	Massive Machine-Type Communication
MNO	Mobile Network Operator
MOCN	Multi-Operator Core Network
MORAN	Multi Operator Radio Access Network
MSA	Mandatory Standard on Access
MSAP	Mandatory Standard on Access Pricing
MRT	Mass Rapid Transit
MVNO	Mobile Virtual Network Operator
MyCC	Malaysia Competition Commission
MyIX	Malaysia Internet Exchange
NB-IoT	Narrowband Internet of Things
NEF	Network Exposure Function
NFV	Network Function Virtualisation
NNI	Network-to-Network Interface
NOC	Network Operating Centre
NSP	Network Service Provider
NSSF	Network Slice Selection Function
OSI	Open Systems Interconnection
OTT	Over-the-Top

PAYU	Pay-As-You-Use
PDH	Plesiochronous Digital Hierarchy
PLMN	Public Land Mobile Network
POE	Point of Entry
POI	Point of Interconnection
POP	Point of Presence
PSTN	Public Switched Telephone Network
QoS	Quality of Service
RAN	Radio Access Network
RAO	Reference Access Offer
SAO	Standard Access Obligation
SBC	State-Backed Company
SDH	Synchronous Digital Hierarchy
SEAF	Security Anchor Function
SESB	Sabah Electricity Sdn Bhd
SEPP	Security Edge Protection Proxy
SFN	Single Frequency Network
SGSN	Serving GPRS Support Node
SIM	Subscriber Identity Module
SIP	Session Initiation Protocol
SLA	Service Level Agreement
SLTE	Submarine Line Terminal Equipment
SMS	Short Messaging Services
SSNIP	Small but significant non-transitory increase in price
SS7	Signalling System Number 7
SWN	Single Wholesale Network
TDM	Time Division Multiplexing
TRAI	Telecom Regulatory Authority of India
UDM	Unified Data Management
UDR	Unified Data Repository
UK	United Kingdom of Great Britain and Northern Ireland
ULL	Unconditioned Local Loop
USP	Universal Service Provision
VoIP	Voice Over Internet Protocol
VoLTE	Voice-over-LTE (Long-Term Evolution)
VoNR	Voice over New Radio
VPN	Virtual Private Network
VSAT	Very Small Aperture Terminal

WiMAX	Worldwide Interoperability for Microwave Access
WLLC	Wholesale Local Leased Circuit
2G	Second Generation
3G	Third Generation
3GPP	Third Generation Partnership Project
4G	Fourth Generation
5G	Fifth Generation
5GC	Fifth Generation Core

PART 1: BACKGROUND

1 Structure of this PI Paper

1.1 This PI Paper is comprised of three parts:

(a) **Part 1 (Background):** Sections 1 to 4 are an introduction to this Public Inquiry, providing details about this document, the Public Inquiry process, the legal and historical context, key concepts and MCMC's methodology to considering Access List changes.

(b) **Part 2 (Introduction):** Sections 5 to 6 are introductory sections which set out the key themes emanating from the review of the Access List and a high-level overview of the proposed changes to the Access List.

(c) **Part 3 (Priority Issues: New or Significantly Changing Access List Services):** Sections 7 to 13 focus on facilities and services on the Access List which, in MCMC's view, require significant changes or removal from the Access List. It also focuses on new facilities and services which MCMC proposes adding to the Access List. The PI Paper considers the potential changes to the facilities and services, summarises stakeholders' views and provides MCMC's preliminary views.

(d) **Part 4 (Non-Priority Issues: Current Access List Services with Minor or No Proposed Amendments):** Sections 14 to 23 focus on facilities and services on the Access List which are proposed to have only minor amendments to the service descriptions or are not changing at all. It also sets out other submissions received from stakeholders in relation to the access regime more generally. The PI Paper considers the potential changes to the facilities proposed by stakeholders; summarises stakeholders' views and provides MCMC's preliminary views.

2 Public Inquiry

Purpose of this Public Inquiry and PI Paper

2.1 Under section 55(1) of the CMA, MCMC may, from time to time, make a determination on any matter specified in the CMA as being subject to MCMC's determination. The relevant matters in this case are questions of access to services under Part VI, Chapter 3 of the CMA.

2.2 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. MCMC has adopted the widest possible consultative approach under the CMA in order to obtain maximum industry and public input. MCMC's approach is also designed to promote certainty and transparency in the exercise of its powers.

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

(a) the existing Access List facilities and services should be retained, retained with modification or removed; and

(b) any new facilities and services should be added to the Access List.

2.4 As discussed below, MCMC has already undertaken an information-gathering exercise, which included the circulation of a questionnaire for the Access List, followed by meetings with licensees, about the proposed Public Inquiry. MCMC has had regard to the feedback provided by the industry during this information gathering phase in preparing this PI Paper.

2.5 This PI Paper on Review of Access List is issued concurrently with a PI Paper on Review of the Mandatory Standard on Access.

Public Inquiry Process

2.6 The Public Inquiry process is subject to certain requirements under the CMA. Annexure 2 (Legislative Context) 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 MCMC to publish a report setting out the findings of an inquiry within 30 days of the conclusion of its Public Inquiry, which period may be extended by MCMC by not more than 30 days; and

(c) section 55(5) of the CMA requires MCMC to make a determination about a matter regarding which a public inquiry is held within 30 days of the publication of the report on the inquiry.

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

(a) publish a report setting out its findings in relation to the Public Inquiry during the 30-day period (or if extended by MCMC, 60-day period) following the close of the Public Inquiry; and

(b) make any determinations arising out of the Public Inquiry within a further 30 days.

2.8 An indicative timeline for this process is set out below:

Steps	**Timeline**
Close of Public Inquiry	19 May 2026
Issuance of Public Inquiry Report	30 days from the conclusion of Public Inquiry and may be extended by not more than 30 days

Steps	Timeline
Issuance of Commission Determination on Access List	Within 30 days from the publication of the Public Inquiry Report

Scope of Public Inquiry

2.9 In conducting this Public Inquiry, MCMC will undertake the following tasks:

(a) apply 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;

(b) review the state of competition in the Malaysian communications and multimedia industry under the current Access List and assess whether there are any potential access issues which arise, and whether any of these issues can be addressed by amending the current Access List or adopting a new access instrument model;

(c) analyse the likely competition/LTBE 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;

(d) draft and review the Access List to reflect any changes in the access regime and the accompanying mandatory standards arising from this Public Inquiry.

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

Matters outside scope

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

(a) determinations on pricing; and

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

Outputs from Public Inquiry

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

2.13 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.

2.14 The existing Access List is set out in the Commission Determination on Access List, Determination No. 6 of 2021. This Access List would be modified, varied or revoked under sections 56 and 146 of the CMA.

Legislative context

2.15 The legislative context for the Access List, and this Public Inquiry, is set out in Annexure 2.

3 Key Concepts

Long-Term Benefit of the End User

3.1 MCMC proposes to have regard to the "long-term benefit of the end-user" (**LTBE**) as its guiding principle when assessing whether a facility or service should be included in the Access List. This is consistent with the approach taken in MCMC's 2021 review of the Access List.

3.2 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, 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.

3.3 MCMC also considered other national policy objectives that were relevant to access regulation, including equitable and non-discriminatory provision of services over ubiquitous national infrastructure. These objectives are, to some extent, inherent in the LTBE concept. However, 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

3.4 In this review, MCMC will proceed on the presumption that the inclusion of 'bottleneck' facilities and services in the Access List is in the LTBE.

3.5 Access to bottlenecks or essential facilities which cannot feasibly be duplicated is a well-established concept in economic regulation. 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.

3.6 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) 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.

3.7 Accordingly, as it has stated previously, 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 MCMC may consider that the markets in which these facilities or services serve as inputs do not exhibit workable levels of competition. MCMC may accordingly decide to regulate those facilities and services in order to promote competition to a workable level in accordance with the LTBE.

4 Methodology

4.1 MCMC 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 MCMC's preliminary analysis of whether they should be retained in the Access List (with or without amendment), having regard to the above methodology.

4.2 In deciding to list a particular service in the Access List, 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 MCMC's public inquiries.

4.3 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 description of the service currently listed on the Access List;

(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), as well as competition in the supply of the facility or service;

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

(e) specific questions on the facility or service.

PART 2: INTRODUCTION

5 Context and Key Themes

5.1 The Malaysian communications sector has continued to evolve significantly since MCMC's previous review of the Access List in 2021, which resulted in the Commission Determination on Access List, Determination No. 6 of 2021.

5.2 There are five key themes that underpin MCMC's approach to the current review of the Access List. These themes, and the Access List amendments MCMC is proposing in response to these, are outlined below.

The need to improve mobile coverage and speed

5.3 There is a pressing need to improve Malaysia's mobile coverage, especially in rural and regional areas and within buildings, to ensure that all end-users have access to mobile services at a speed and quality level necessary to deliver the data-rich applications that are increasingly being used in the digital economy.

5.4 Malaysia's average mobile broadband speed reached 149.36 Mbps in February 2026, which ranks 29th globally. While this result is impressive, the country's average mobile broadband speeds were 171.05 Mbps in February 2025 (ranking 13th globally).[1] This recent decline suggests that greater efforts are needed to deliver high-quality mobile services to meet the increasing speed and bandwidth needs of end-users.

5.5 Mobile broadband coverage gaps also persist in rural and regional areas, especially in relation to the quality of coverage. For example, while 82% of the Malaysian population now has access to 5G networks,[2] there remain issues with low signal strength and low speeds in rural and regional areas, especially in relation to 4G services, which are still relied upon by segments of the population not served by 5G networks or those using older devices. Relating to this goal of improving mobile coverage, MCMC understands that certain smaller MNOs are facing challenges in rolling out their networks to lower-density areas, due to the high costs of network deployment and a lower ability to recover investment as compared to high-density areas. This is resulting in lower levels of competition in retail markets, with end-users in low-density areas not having access to the full choice of operators available to end-users in high-density areas.

5.6 In-building coverage also remains challenging. This is due to a mixture of increasing connectivity needs within buildings, driven by increasing data demand, as well as the technical characteristics of 5G networks, where high-frequency signal delivered from outdoor radio access infrastructure has a lower ability to propagate within indoor spaces than 2G, 3G or 4G networks. This is making deployment and access to in-building mobile systems increasingly critical to the mobile services supply chain.

[1] Ookla, Speedtest Global Index – Malaysia, https://www.speedtest.net/global-index/malaysia#mobile (accessed 11 February 2026).
[2] "Malaysia's 5G blind spot: Indoor coverage and the coming Agentic AI surge", TechWire Asia, 24 December 2025, https://techwireasia.com/2025/12/indoor-5g-coverage-gap-malaysia-ai.

5.7 MCMC proposes to respond to these challenges by ensuring that Access Seekers have robust access to the wholesale mobile inputs required to deliver high-quality, high-speed retail mobile services, including within buildings and in rural and regional areas.

5.8 To this end, MCMC proposes to:

(a) list a new 4G Multi-Operator Core Network (MOCN) Access service, giving smaller MNOs the ability to more efficiently roll out network infrastructure through active network sharing and therefore driving competition in retail markets; and

(b) list a new Access to In-Building Mobile Systems service, which would cover access to both active and passive in-building mobile infrastructure, used for both 4G and 5G services. This would replace the current listing of Common Antenna Systems as part of the Infrastructure Sharing service, which only covers access to passive in-building infrastructure.

Increasing issues with infrastructure exclusivity in certain areas

5.9 Based on stakeholder responses to the informal questionnaire and meetings with stakeholders, MCMC understands that there remain continuing and growing concerns regarding infrastructure exclusivity in certain areas. This includes state authorities or landowners granting specific operators exclusivity over fibre infrastructure in a given area, which prevents competing operators from rolling out their own infrastructure.

5.10 These exclusivity arrangements diminish the ability for facilities-based competition to develop within exclusive areas. This ultimately affects the vigour and quality of competition in downstream markets, as Access Seekers are required to obtain regulated or commercial access to telecommunications services, such as transmission services, over the Access Provider's network rather than rolling out their own fibre infrastructure to compete more fully with the Access Provider.

5.11 MCMC proposes to respond to this issue by listing a new Access to Dark Fibre service which will (among other things) provide access to dark fibre where legal, policy or contractual barriers prohibit the deployment of new fibre infrastructure and there are fewer than three independent operators on a given route. This will ensure that, in exclusive zones, Access Seekers are able to obtain regulated access at the lowest possible level of the OSI model (Layer 1) short of building their own infrastructure. MCMC expects that this will drive better competitive outcomes in downstream markets that rely on fibre infrastructure as an input.

The growth of data centres

5.12 Data centres are playing an increasingly critical role within the communications sector and the Malaysian economy more broadly.

5.13 A wide range of application services, such as cloud storage services, content services and generative AI services, rely on data centres to store their data and ultimately to power their services. Data centres are also increasingly acting as interconnection hubs, allowing licensees to connect to international capacity (on

international submarine cables) or to application and content service providers for the benefit of their end-users.

5.14 Encouraging the growth of data centres in Malaysia is critical to bolstering Malaysia's digital economic and broader economic competitiveness. This is because many of the industries that rely on data centres, such as AI, machine-to-machine communications and robotics, form part of the "fourth industrial revolution" that is predicted to add significant value to Malaysia's economic productivity.

5.15 For data centres to flourish in Malaysia, licensees require high-quality and competitive connectivity options into data centres. This is critical both to creating the connectivity ecosystem that will encourage global data centre providers to establish a greater presence in Malaysia, and to ensure Malaysian licensees are able to take advantage of data centre growth and provide communication services to and from data centres.

5.16 In response to this, MCMC proposes to list a new Access to Dark Fibre service that will allow Access Seekers to obtain dark fibre connecting to points of entry into data centres, where such points of entry are facing space or capacity constraints or contractual restrictions on new fibre infrastructure. Similarly to the listing of Access to Dark Fibre in exclusive zones, this will ensure that, where licensees are unable to roll out their own infrastructure to a data centre point of entry, they will be able to obtain access via the next-best option, dark fibre at Layer 1.

Updating the Access List to reflect technological and economic developments

5.17 A key aspect of the Access List review is to ensure that the Access List remains relevant in light of technological and economic evolutions in the Malaysian communications sector. This requires careful analysis of whether there is still a regulatory basis for listing current services and facilities on the Access List.

5.18 Since the previous Access List review in 2021, there has been a continued transition towards IP-based interconnection, which now appears to be effectively complete. Very few licensees continue to interconnect via SS7-based interconnection and, where such interconnection occurs, this is largely the result of legacy arrangements. Accordingly, MCMC proposes to remove SS7-based interconnection from the scope of the Interconnect Link Service, while also adding new bandwidth increments to the scope of IP-based interconnection. This will ensure that the service remains future-proof and in line with technological developments.

5.19 MCMC also understands that there is now increasing competition in relation to the IP peering and transit options that licensees rely on to access global Internet connectivity and provide downstream Internet access services to end-users. In particular, there are now IP peering options available in East Malaysia, which diminish the need for regulated access to IP transit. ISPs are also increasingly able to obtain IP transit through overseas locations, such as Singapore. For this reason, MCMC considers there is no longer a sufficient regulatory basis to continue listing the IP Transit Service, and proposes to remove this service from the Access List.

Ensuring Access List services are intuitively and practically structured

5.20 A final theme of MCMC's review of the Access List is to ensure that the description and structure of the services and facilities on the Access List reflect the way that Access Providers are providing their services and Access Seekers are using such services.

5.21 The MSA requires Access Providers to prepare a RAO in relation to each Access List service and facility, with Access Seekers then obtaining supply through an Access Agreement. To avoid duplication of services across RAOs and Access Agreements, MCMC recognises the convenience of grouping Access List services in a manner that reflects their supply structure.

5.22 Accordingly, MCMC proposes to:

(a) include access to poles for fixed network deployments within a new expanded "Pole, Duct and Manhole Access" service (and remove such access from the scope of the current Infrastructure Sharing service), since this more closely reflects how access to poles for fixed deployments are being acquired in practice; and

(b) list a new Access to In-Building Mobile Systems service to bring together both passive and active elements of in-building mobile systems, across both 4G and 5G technologies – this will also allow the Infrastructure Sharing service to be focused more closely on access to outdoor infrastructure such as towers and street furniture, primarily for mobile rather than fixed deployments. It will also allow access to in-building mobile systems to be regulated as a separate service via the MSA or MSAP (if appropriate), which is needed given the critical role played by in-building coverage in driving broader mobile coverage and connectivity improvements.

5.23 For clarity, these structural changes do not reduce the scope of the services and facilities regulated under the Access List, but are intended to ensure that the Access List operates in a more convenient and practical manner for both Access Providers and Access Seekers.

6 Overview of Proposed Changes to Access List

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 Facilities and Services	Proposed amendments		Section reference
Fixed Network Origination Service	=	Retain service on Access List without any modification.	14
Fixed Network Termination Service	=	Retain service on Access List without any modification.	14
Mobile Network Origination Service	=	Retain service on Access List without any modification.	14
Mobile Network Termination Service	=	Retain service on Access List without any modification.	14
Interconnect Link Service	▲	Retain service on Access List with modifications to remove Signalling System Number Seven (SS7)-based interconnection and to add new bandwidth increments.	13
Wholesale Local Leased Circuit Service	▲	Retain service on Access List with minor modifications.	15
Infrastructure Sharing	▲	Retain service on Access List with modifications to remove Common Antenna Systems and access to poles for fixed deployments. Common Antenna Systems will be covered by the new Access to In-Building Mobile Systems service, which will capture both passive and active elements of in-building mobile systems (for 4G and 5G). Access to poles for fixed deployments will be covered as part of the expanded Pole, Duct and Manhole Access service.	11
Domestic Connectivity to International Services	=	Retain service on Access List without any modification.	16
Network Co-Location Service	▲	Retain service on Access List with minor amendments to clarify that it applies at premises	18

Existing Access List Facilities and Services	Proposed amendments		Section reference
		or facilities owned or operated by the Access Provider.	
Digital Terrestrial Broadcasting Multiplexing Service	=	Retain service on Access List without any modification.	19
Layer 2 HSBB Network Service with Quality of Service ("QoS")	▲	Retain service on Access List, renamed as "Layer 2 HSBB Network Service", with modifications to reflect the availability of higher speed tiers for the service and other minor modifications.	20
Trunk Transmission Service	▲	Retain service on Access List with modifications to exclude broadcasting transmission, which will be covered by the proposed new Broadcasting Transmission Service.	15
Duct and Manhole Access	▲	Retain service on Access List, renamed as "Pole, Duct and Manhole Access", with modifications to cover access to poles for fixed network deployments, and to capture "ducts" and "sub-ducts" generally.	17
Layer 3 HSBB Network Service	▲	Retain service on Access List with modifications to reflect the availability of higher speed tiers for the service and other minor modifications.	20
End-to-End Transmission Service	▲	Retain service on Access List with modifications, including to exclude broadcasting transmission, which will be covered by the proposed new Broadcasting Transmission Service.	15
MVNO Access	▲	Retain service on Access List with minor modifications to clarify that it applies to facilities or services owned or operated by the Access Provider.	21
Domestic Inter-Operator Roaming Service	=	Retain service on Access List without any modification.	22
5G Standalone Access	▲	Retain service on Access List with minor technical modifications and amendments to exclude access to 5G in-building mobile systems, which will be covered under the proposed new Access to In-Building Mobile Systems service.	9

Existing Access List Facilities and Services	Proposed amendments		Section reference
4G Evolved Packet Core ("EPC") with 5G Radio Access Network ("RAN") Access	⚠	Retain service on Access List with minor technical modifications and amendments to exclude access to 5G in-building mobile systems, which will be covered under the proposed new Access to In-Building Mobile Systems service.	9
IP Transit Service	✖	Remove service from Access List.	12

Addition of New Access List Facilities and Services

New Access List Facilities and Services	Section reference
Access to Dark Fibre	7
4G Multi-Operator Core Network (MOCN) Access	8
Broadcasting Transmission Service	10
Access to In-Building Mobile Systems	11

PART 3: PRIORITY ISSUES – NEW OR SIGNIFICANTLY CHANGING ACCESS LIST FACILITIES AND SERVICES

7 Access to Dark Fibre

Overview

7.1 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.

7.2 Dark fibre can be provided within both:

(a) the access network (e.g. between a POI and an end user premises); and

(b) the backhaul or core network (e.g. between two Access Provider exchanges, or between a POI and a submarine cable landing station or satellite earth station).

7.3 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.

7.4 MCMC understands that certain industry participants use the term "dark fibre" to refer to fibre-based transmission services (i.e. which involve the Access Seeker obtaining access to fibre along with a "lit" service running over that fibre). In this PI Paper, the term "dark fibre" is used to refer only to the provision of fibre as a passive element (at Layer 1). This is typically done through a lease or indefeasible right of use over the fibre. Under this arrangement, the Access Provider does not provide any carriage service over the fibre, and the Access Seeker remains solely responsible for installing active equipment to "light" the fibre and deliver communications over the fibre.

7.5 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, MCMC understands that it is not currently possible, from a technical perspective, to provide dark fibre access in the broadband 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 Layer 3.

7.6 Conversely, MCMC understands that access to dark fibre is possible over backhaul transmission routes (i.e. between two POIs or exchanges, rather than between an end-user premises and the first POI) and in relation to non-HSBB portions of the access network (e.g. transmission links to data centres or large business premises).

7.7 Access to dark fibre has not previously been listed on the Access List.

Submissions Received

Acquiring access to dark fibre

7.8 Altel, Astro, CelcomDigi, Fibrecomm Network, Maxis, MYTV, SACOFA, TIME, U Mobile and YTLC acquire access to dark fibre and use dark fibre for various reasons including to support high-capacity transmission needs such as mobile backhaul, core and trunk connectivity, inter-site and data centre links, enterprise services, broadcasting contribution services and the transport of uncompressed video. Some operators also rely on dark fibre where self-deployment is constrained or infeasible, and to enhance network reach and service continuity in areas where they lack their own fibre infrastructure.

7.9 A mobile operator and another licensee submitted that they do not currently acquire access to dark fibre but have proposed dark fibre be included on the Access List to enhance availability. The mobile operator relies on transmission and microwave services for 5G backhaul but may consider dark fibre if there is availability or cost is favourable. The other licensee does not acquire access to dark fibre due to the limited number of dark fibre providers in Malaysia.

7.10 OCK submitted that it does not acquire dark fibre access.

7.11 Tune Talk noted that it will acquire dark fibre once it has its Network Service Provider (**NSP**) licence.

7.12 Edotco, NTM, OCK, Pr1ma, SACOFA and another operator do not acquire dark fibre for the following reasons:

(a) **Edotco:** as a passive infrastructure provider, it offers dark fibre services but does not acquire them itself;

(b) **NTM:** it leases its dark fibre on an open access basis to other service providers, following an internal policy not to compete with its customers in bandwidth or retail business;

(c) **OCK:** commercial constraints such as exclusive rights held by certain telcos or fibre providers, the absence of dark fibre infrastructure (requiring self-build) and unfavourable commercial terms (like high IRU costs or non-standard SLAs) limit its ability to acquire dark fibre. OCK also foresees barriers in new townships and exclusive developments due to operator exclusivity, and in rural or semi-urban areas due to lack of existing infrastructure, both of which hinder its ability to offer competitive FTTH or backhaul services or require costly new builds;

(d) **Pr1ma:** its services are only offered at dedicated sites, and its network setup does not require dark fibre arrangements;

(e) **SACOFA:** it generally builds its own fibre network; and

(f) Another operator highlighted dark fibre is not a required wholesale input for its MVNO services, as its architecture is service-layer based and relies on the host's radio, transport and core network.

7.13 CelcomDigi submitted that dark fibre is not required where alternative connectivity such as microwave links or leased lines are available, as these alternatives adequately meet its operational needs.

7.14 Astro, CelcomDigi, Maxis, TIME, U Mobile and other operators reported several barriers to accessing dark fibre as follows:

(a) **Astro:** high commercial costs constrain widespread adoption, the limited availability of dual and diverse routing options as not all fibre providers possess the capability to delivery such configurations and a lack of diverse connectivity options increases operational risk and limits Astro's ability to maintain uninterrupted services across its inter-site infrastructure and associated platforms;

(b) **CelcomDigi:** deployment constraints, such as exclusive zones and restrictions imposed by local authorities (e.g. "Common Ducting" routes in Johor), can prevent access to dark fibre. In some cases, commercial agreements are not practical due to minimum commitment requirements or exclusivity. CelcomDigi acknowledges that these challenges are context specific and that further evaluation is needed to determine whether dark fibre should be included in the Access List;

(c) **Maxis:** barriers and constraints are due to exclusivity arrangements between the Access Provider and the developer and the building owner and state government;

(d) **TIME:** high pricing of dark fibre services is greater than expected, insufficient availability of fibre cores particularly within high-demand corridors and mature commercial or industrial zones, prolonged or strategic delays during commercial negotiation and site-specific and infrastructure-related limitations where it cannot deploy its own infrastructure due to physical site limits, exclusive infrastructure control, rights-of-way restrictions and exclusivity granted to single providers in new developments;

(e) **U Mobile:** dark fibre is often exclusively provided by a single company in some areas, leaving no alternatives and resulting in high prices;

(f) An operator highlighted lack of commercial availability and transparency on route access act as significant barriers, along with cost and delivery timelines compared to transmission services. To mitigate these impacts, the operator suggested dark fibre be included in the Access List; and

(g) Another operator highlighted limited availability and coverage where connectivity is required and infrastructure is reserved for internal use by incumbents in some strategic locations which limits broader market participation.

7.15 Altel and YTLC noted that they do not face barriers or constraints on acquiring access to dark fibre but noted the following:

(a) **Altel:** exclusivity in new developments, high commercial pricing and limited availability outside Klang Valley are key barriers, which slow coverage expansion and limit enterprise services; and

(b) **YTLC:** there are limitations on the availability of dark fibre and geographical coverage, especially outside major urban centres.

Supplying access to dark fibre

7.16 CelcomDigi, Edotco, Fibrecomm Network, NTM, Pr1ma, TIME and other operators supply or can supply access to dark fibre and have faced the following impediments:

(a) **CelcomDigi:** it can supply access to dark fibre subject to end-to-end fibre availability and has faced various impediments such as in obtaining permit approvals by local authorities (e.g. restrictions on new trenching in "Common Ducting" routes or overcrowded rights-of-way) and geographical deployment challenges (e.g. in rural/remote areas and island/river crossings) where fibre installation costs can be uneconomical;

(b) **Edotco:** it supplies access to dark fibre, but provided no further comments;

(c) **Fibrecomm Network:** it supplies dark fibre at very limited locations (e.g. reselling SESB dark fibre in Sabah);

(d) **NTM:** impediments from inconsistent permitting process by local authorities to build dark fibre infrastructure (deposits, charges, duration, trenching methods) and damage caused by third-party contractors who fail to conduct proper underground surveys;

(e) **Pr1ma:** recurring damage to its network by irresponsible or unauthorised personnel, causing service disruptions and restoration costs;

(f) **TIME:** supplies dark fibre for submarine cable system consortiums and global Over-the-Top (**OTT**) service providers. It also cited several difficulties regarding the supply of dark fibre:

(i) difficulties obtaining rights-of-way approvals in certain states due to lengthy approval timelines and stringent/inconsistent local authority requirements (e.g. deposits and traffic management plans). Submits that the regulatory framework should prohibit any entity from both issuing rights-of-way permits/approvals and operating as a profit-seeking commercial provider, as these dual roles create inherent conflicts of interest;

(ii) non-cost-based rights-of-way charges, with approval fees set above cost, driving up deployment expenses and making long routes/low-density areas commercially unviable which is a barrier to dark fibre expansion;

(iii) in some states/localities, rights-of-way applications must go through profit-driven intermediaries, adding administrative layers, mark-ups and less transparency, promoting inefficiency and raising supply costs; and

(iv) strategic rights-of-way delays and conflicts of interest by certain One Stop Agency-appointed entities that delay approvals while building their own ducts/fibre, then offer those routes on their terms, creating unfair advantage, bottlenecks and market distortion.

(g) Other operators have highlighted high deployment and maintenance costs, permitting and local authority delays (e.g. rights-of-way approvals), strict excavation/micro-trenching restrictions in heritage and high-impact zones, limited fibre-core space on high-demand routes and costly civil works/relocations absent committed anchor demand. Additionally, impediments that include lengthy government approval processes, costly security deposits and prolonged finalisation of access agreements.

(h) YTLC reported that it supplies access to dark fibre and currently faces no impediments in doing so. However, YTLC added that, from time to time, deployment timelines are affected by matters outside of service providers' control, such as delays in local authority approvals.

(i) Maxis submitted that it:

(i) supplies dark fibre to other operators in limited locations where it has recently deployed and has not faced impediments in supplying; and

(ii) does not support listing dark fibre on the Access List, stating that existing pole/duct/manhole regulation and commercial frameworks are sufficient. It notes that nascent dark fibre deployment by alternative entrants fosters fixed infrastructure-based competition and that mandating dark fibre access could disincentivise new infrastructure rollout. Maxis cites international regulatory benchmarks to support its position which depicts non-existent or limited regulation of dark fibre in the United Kingdom, Australia, Singapore, Portugal, Finland, Norway and Thailand.

7.17 Altel, Astro, Celcom Timur, CelcomDigi, MYTV, OCK, TM and another operator do not supply access to dark fibre. CelcomDigi does not supply access to dark fibre in areas where it does not have a fibre network, if it has fibre in the area but faced limitations in terms of capacity, unrestorable fibre damage or access request for partial fibre route, or it is unable to meet specific service level agreement requirements requested by the Access Seekers. TIME noted it supplies managed dark fibre.

Exclusivity issues in relation to dark fibre

7.18 Altel, CelcomDigi, Fibrecomm Network, Maxis, NTM, OCK, REDtone, TIME, U Mobile and another operator all cite exclusivity barriers and constraints in gaining access to dark fibre as follows:

(a) **Altel and MYTV:** exclusivity over dark fibre and fixed-line infrastructure is likely to inflate costs and hinder fair negotiations;

(b) **CelcomDigi:** reports exclusivity barriers in Genting Highlands, Cyberjaya, Putrajaya and along Johor data-centre corridors. CelcomDigi proposes that MCMC review pricing structures for exclusive areas with consideration given to the Access Provider's role in managing the infrastructure and the deployment and ongoing maintenance costs incurred by the developer;

(c) **Fibrecomm Network:** submits that exclusivity and infrastructure control create practical and commercial challenges:

(i) delayed internal approvals to connect to POIs especially for cross-connects from its existing manholes;

(ii) restricted access in controlled zones as certain areas are governed by specific authorities or infrastructure managers and these zones are often managed under exclusive arrangements or special access protocols, making third-party entry difficult;

(iii) high access costs as commercial terms are often not aligned with market realities; and

(iv) infrastructure-level monopolies by certain local authorities or infrastructure owners (e.g transport corridor managers) limits open access and competition in key strategic areas;

(d) **Maxis:** developers and/or state-backed entities often grant exclusive rights to a single operator for fixed and mobile infrastructure, leading local authorities to deny permits for Maxis to deploy its own facilities and instead force reliance on wholesale access from the exclusive provider. Maxis states that impacts include limited customer choice, limited options for customers to avoid single points of failure (i.e. limited route diversity/resilience) and discouragement of infrastructure-based competition between operators impacting customer price, quality, resiliency and innovation.

7.19 Maxis also cited MCMC's GPP-I 2022 open-access guidance stating access should not be made exclusive to one operator as well as the joint MCMC–MyCC statement (17 Aug 2020), committing to address exclusivity issues. Maxis urges that the Access List and MSA be amended to prohibit exclusivity arrangements that prevent independent deployment, noting it will propose specific changes in the MSA Questionnaire.

7.20 NTM submitted that access is typically limited to bandwidth once a developer hands infrastructure to an exclusive operator (e.g. in Putrajaya). It recommends passive infrastructures be handed to a neutral operator practicing open access.

7.21 OCK submitted that developer-appointed single fibre providers and exclusive ISP arrangements in commercial areas (noted in Klang Valley townships and Selangor high-rise areas) prevent open-access FTTH and mobile backhaul deployments.

7.22 REDtone submitted that, in areas where exclusivity is granted, prices for access to dark fibre and fixed-line infrastructure may not be competitive.

7.23 TIME submitted that it has encountered numerous instances of formal and de facto exclusivity across states and strategic areas, and listed the specific areas where it faces such issues.

7.24 U Mobile submitted that, in areas where the single exclusive provider controls supply, prices remain high where there are no alternatives. In locations where access is controlled and without competition, it is challenging for Access Seekers to obtain a good offer.

7.25 Astro, Pr1ma and YTLC submitted that they have not faced exclusivity barriers with Astro and Pr1ma noting that:

(a) **Astro:** it is not building broadband homepasses itself; and

(b) **Pr1ma:** its deployments are at dedicated sites using its own infrastructure.

7.26 PPIT submitted that supply to its members is governed under access agreements, with minor commercial adjustments, and did not raise further exclusivity concerns.

MCMC Assessment

Access to dark fibre in exclusive zones with a single fixed infrastructure provider

7.27 MCMC has received a large number of stakeholder responses expressing concern about a significant and growing number of areas in Malaysia where specific licensees have been appointed as exclusive providers of fibre infrastructure from a legal or policy perspective. MCMC understands that this exclusivity is often given effect in different ways. For example:

(a) the exclusivity is often state-based, arising from state government policies that designate specific operators as exclusive providers of passive infrastructure in certain areas;

(b) in some instances, exclusivity over passive fixed infrastructure is granted by developers or landowners in relation to specific sites, such as KL Sentral or Kuala Lumpur International Airport, and may be reflected in the contracts between those landowners and the exclusive provider; and

(c) in other instances, the exclusivity may not be formally documented (through government regulations, policies or contracts) and instead arises from practices or conduct that practically have the effect of preventing operators other than the exclusive provider from rolling out their infrastructure in certain areas.

7.28 Regardless of the way in which the exclusivity is operationalised, the infrastructure deployed by the designated operators in exclusive zones has clear bottleneck characteristics. MCMC understands that exclusivity policies in these zones prevent licensees (other than the designed exclusive operator) from rolling out their own fixed-line infrastructure, either because licensees are unable to obtain permits for such infrastructure rollout or are unable to access the ducts and manholes they require to roll out fixed-line infrastructure.

7.29 Importantly, such barriers are driven by non-economic factors. In other words, a new entrant is prevented from rolling out competing network infrastructure due to state-based rules or policies (or rules or practices imposed by the landowner), even if it may be economical or commercially prudent for the new entrant to deploy an alternative network. This means that the exclusivity acts as a "hard" constraint on new entry, rather than a "soft" economic constraint (which may change as economic conditions or supply characteristics change).

7.30 Accordingly, in exclusive zones, all licensees must rely on the designated exclusive operator's network to supply communications services in downstream markets. For example, a licensee must either acquire a transmission or bandwidth service from the exclusive operator (at Layer 2 or above) and use this as an input into its own services, or must acquire access to the exclusive operator's dark fibre (at Layer 1) and light this fibre to provide communications services.

7.31 The lack of viable alternatives at the infrastructure level means that, in an exclusive zone, the exclusive operator's fixed network is a bottleneck which is an essential input to supplying services in downstream markets. This creates a strong basis for regulating access to fixed-line infrastructure in exclusive zones, as a means of promoting the LTBE.

7.32 The Access List currently contains a range of transmission services, meaning that licensees are already able to obtain regulated access to exclusive infrastructure at Layer 2 or above, through a transmission service such as an End-to-End Transmission Service or Wholesale Local Leased Circuit Service.

7.33 However, MCMC's preliminary view is that restricting regulated access to Layer 2 or above is insufficient to create a vigorous level of competition in downstream markets.

7.34 The Access Provider maintains control over the technical specifications and design of a transmission service. This leaves a relatively narrow field for competitive differentiation by Access Seekers, as all competing Access Seekers will be required to acquire transmission services from the same exclusive provider and the downstream service provided by each Access Seeker will be constrained by the specifications of the transmission service acquired from the exclusive operator.

7.35 By comparison, access to dark fibre would provide Access Seekers with significantly greater control over the downstream services they are providing over the relevant fibre and allow them to more fully compete with each other in respect of such downstream services. This is because dark fibre access leaves the Access Seeker responsible for all active elements of the service, including the equipment used to "light" the fibre and the specifications of the services provided over the fibre. This is likely to allow for a much broader range of configurations and uses for exclusive fibre infrastructure, allowing Access Seekers to compete over a greater portion of the value chain and creating a richer level of competition in downstream markets.

7.36 Based on stakeholder submissions, MCMC understands that infrastructure operators in exclusive zones are either not supplying dark fibre access at all or are not doing so in an efficient manner. While several operators have stated in their written questionnaire responses that they acquire dark fibre in areas where they are unable to deploy their own infrastructure, MCMC understands from follow-up

meetings that, in practice, operators are often acquiring lit services from the Access Provider (akin to a transmission service), rather than acquiring dark fibre access at Layer 1 (which involves access to passive/unlit fibres, as explained at paragraph 7.4).

7.37 Several licensees also state that they face challenges in acquiring efficient access to dark fibre in exclusive zones. For example:

(a) U Mobile submitted that dark fibre in exclusive areas is supplied at high prices and it is challenging for Access Seekers to get a good offer;

(b) Altel and MYTV consider that exclusivity over dark fibre is likely to inflate costs and hinder fair negotiations;

(c) an MNO states that it has faced unreasonable terms and rates when leasing fibre infrastructure from a specific state-backed exclusive provider;

(d) REDtone submitted that, in exclusive areas, prices for dark fibre access may not be competitive; and

(e) NTM states that exclusive operators typically provide access on a limited basis (e.g. bandwidth-only), suggesting that some operators are not providing access to dark fibre at all.

7.38 These challenges suggest that, in the absence of regulation, dark fibre in exclusive zones is not being supplied at an efficient level commercially. On this basis, MCMC's preliminary view is that it would be in the LTBE for access to dark fibre in exclusive zones to be included in the Access List.

Three independent operators test

7.39 The written submissions and submissions of stakeholders in meetings with MCMC suggest that, in practice, in areas where there are legal or policy restrictions on fibre infrastructure construction, a single operator is designated as the exclusive provider, rather than there being multiple designated operators.

7.40 However, rather than limiting regulation of dark fibre only to areas where there is a single exclusive provider, MCMC considers that it would be in the LTBE to regulate access to dark fibre in any area where:

(a) legal, policy or contractual restrictions or other practices prevent the deployment of new fibre infrastructure (i.e. the area is an "exclusive zone"); and

(b) as at the date of the access request, there are fewer than three independent operators of fibre infrastructure for the relevant route being requested.

7.41 This would capture situations where two exclusive infrastructure providers have been appointed (rather than one), or where an exclusive provider has been appointed to build fibre infrastructure in addition to existing fibre infrastructure owned by a different operator (built before the second operator's exclusivity was granted).

7.42 While MCMC acknowledges that two infrastructure providers in an area would deliver a greater level of competition than a single infrastructure provider, MCMC considers that the presence of a duopoly market structure and strict barriers to further entry (due to exclusivity restrictions) would still result in insufficient incentives to commercially supply dark fibre on efficient terms.

7.43 It is only where there are three or more operators in an exclusive zone that there would be a minimum level of competitive pressure necessary to create incentives for efficient supply of dark fibre, in a context where further entry is constrained by exclusivity restrictions.

7.44 MCMC also notes that the "three independent operators" test is consistent with the exemption mechanism that MCMC previously proposed in relation to transmission services in the 2015 Access List Public Inquiry Report.[3]

Dark fibre connecting into data centres

7.45 As mentioned in section 5, data centres are playing an increasingly critical role in Malaysia's communications sector.

7.46 To enable interconnection within data centres and to allow data hosted in data centres to be delivered to end-users, licensees require high-quality connectivity into data centres. This can be achieved through a licensee either deploying fibre infrastructure to a data centre or relying on existing infrastructure (by acquiring dark fibre access at Layer 1 or acquiring a transmission service).

7.47 Several stakeholders have mentioned facing challenges obtaining connectivity into data centres. More specifically:

(a) Fibrecomm Network stated that a key challenge was obtaining connectivity into data centres for the last mile;

(b) Maxis stated that some Access Providers are prohibiting Access Seekers from using duct and manhole facilities to deploy their own fibres into data centres. Maxis also added that there are some developers who prohibit their entry due to developers' exclusive arrangement with the incumbent operator or the state government; and

(c) Maxis also mentioned that some data centre providers are only providing a single point of entry (**POE**) into data centres, which limits the ability of Access Seekers to provide redundancy for their downstream services.

7.48 In light of these challenges, MCMC considers that it would be in the LTBE for the Access List to include access to dark fibre connecting into data centres, where there are capacity constraints that limit new fibre deployment at a given POE. These capacity constraints may arise due to physical factors, such as ducts or manholes at the POE having no more space (which requires Access Seekers to rely on existing fibre infrastructure) or the data centre provider prohibiting the Access Seeker from

[3] MCMC, Access List Review, Public Inquiry Report, 7 August 2015, p. 71, https://mcmc.gov.my/skmmgovmy/media/General/pdf/Access-List-PI-Report-2015.pdf.

deploying its own infrastructure (e.g. due to the appointment of an exclusive infrastructure provider).

7.49 Similarly to legal and policy exclusivity in exclusive zones, capacity constraints at a POE require Access Seekers to rely on existing infrastructure. The inability for new market entry renders existing infrastructure an economic bottleneck. For the same reasons as described in paragraphs 7.35 and 7.36 above, MCMC considers that regulated dark fibre access would provide a greater level of control to Access Seekers and competitive differentiation compared to Access Seekers relying on transmission services (which are already regulated).

7.50 Accordingly, MCMC's preliminary view is that it would be in the LTBE to list dark fibre connecting into a data centre on the Access List, where there are capacity constraints at a POE into that data centre.

7.51 MCMC also considers that the existence of capacity constraints should be assessed on a POE-by-POE basis. That is, if there is a capacity constraint at a given POE, dark fibre to that POE will fall within the scope of the proposed Dark Fibre Access service on the Access List, even if Access Seekers are able to access the data centre through another POE. This is because, as mentioned in the submission of Maxis, Access Seekers typically require access to multiple POEs to allow for redundancy. Accordingly, the availability of duct space or dark fibre at one POE is not substitutable with the availability of duct space or dark fibre at a different POE.

Dark fibre in other areas

7.52 MCMC's preliminary view is that it would not currently be in the LTBE to generally list dark fibre on the Access List, outside exclusive zones or routes connecting directly into data centres.

7.53 In areas where there are no legal or policy restrictions preventing new fibre build, there remains a possibility of new market entry (even if there may only be one or two current fibre providers for a given route or area). The possibility of new market entry creates an additional level of competitive constraint that is not present in exclusive zones. This creates a less compelling rationale for access regulation as compared to exclusive zones.

7.54 Moreover, most of the stakeholders in favour of dark fibre regulation are seeking such regulation because they are prohibited from self-building fibre infrastructure in exclusive zones. This concern does not arise outside exclusive zones, where licensees have the option to deploy their own fibre infrastructure if they are unable to commercially obtain access from an existing infrastructure provider.

7.55 Finally, MCMC pursues a proportionate approach to regulation, where the benefits of regulation needs to be balanced against its costs.

7.56 Encouraging investment in communications infrastructure is one of the limbs of the LTBE, since such investment is ultimately necessary in delivering high-quality downstream communications services to end-users. Regulating dark fibre nationally risks lowering incentives to invest in fibre infrastructure. This would ultimately diminish facilities-based competition in downstream markets and therefore lead to an outcome that is contrary to what MCMC is seeking to promote

by regulating dark fibre in exclusive zones and to congested POEs in data centres, where MCMC is seeking to achieve a higher quality of competition and competitive differentiation.

7.57 Importantly, regulation of dark fibre does not diminish investment incentives in exclusive zones, since in these areas the possibility of new market entry is already prohibited by non-economic factors (i.e. exclusivity rules or practices). However, in areas where new facilities-based market entry is possible, the "first-best" option would be to encourage the rollout of competing new infrastructure rather than access at the dark fibre level. This is because new infrastructure rollouts result in greater investment, greater overall network capacity and greater competitive differentiation than regulated access to existing infrastructure at the dark fibre level, all of which result in this outcome being better at promoting the LTBE.

7.58 Accordingly, MCMC considers it preferable to focus regulation only on fibre infrastructure (e.g. in exclusive zones) that has well-established bottleneck characteristics and where there are barriers to new facilities-based market entrants. MCMC is not satisfied that it would be in the LTBE to regulate dark fibre access on a nationwide basis, outside exclusive zones and direct connections to data centres.

MCMC Preliminary View

7.59 MCMC's preliminary view is that, for the reasons set out above, a new Access to Dark Fibre service should be listed on the Access List. MCMC proposes the following service description:

Access to Dark Fibre

(a) Access to Dark Fibre is a Facility and/or Service for the provision of access to optical fibre cables between a POI at an Access Provider's premises and another location on the Access Provider's network, where at least one of these locations is:

(i) within an Exclusive Zone and there are fewer than three independent providers of optical fibre cables providing connectivity between the two locations to which the Access Seeker is requesting access; or

(ii) a Restricted Data Centre POE.

*(b) An "**Exclusive Zone**" means any area, including a state, a federal territory, a district, a development area or other location where, at the time of the access request, a prevailing law, regulation, policy, requirement, contract, arrangement, understanding or practice prohibits or materially hinders the deployment of new fibre infrastructure by a licensee in that area.*

*(c) A "**Restricted Data Centre POE**" means a point of entry into a data centre to which the Access Seeker is:*

(i) unable to deploy its own fibre infrastructure because of space or capacity constraints in the relevant ducts or manholes at that point of entry; or

(ii) prohibited from deploying its own fibre infrastructure because of contracts, arrangements, understandings or practices between the Access Provider and any person.

(d) Access to optical fibre cables under paragraph (a) includes the Access Seeker's right to install equipment to enable the carriage of communications over the relevant fibre cables and to use the fibre cables for such carriage of communications.

7.60 The scope of the proposed Access to Dark Fibre service is illustrated in the diagram below (noting that this service will only apply in respect of Exclusive Zones and Restricted Data Centre POEs, as set out in the text of the proposed service description):

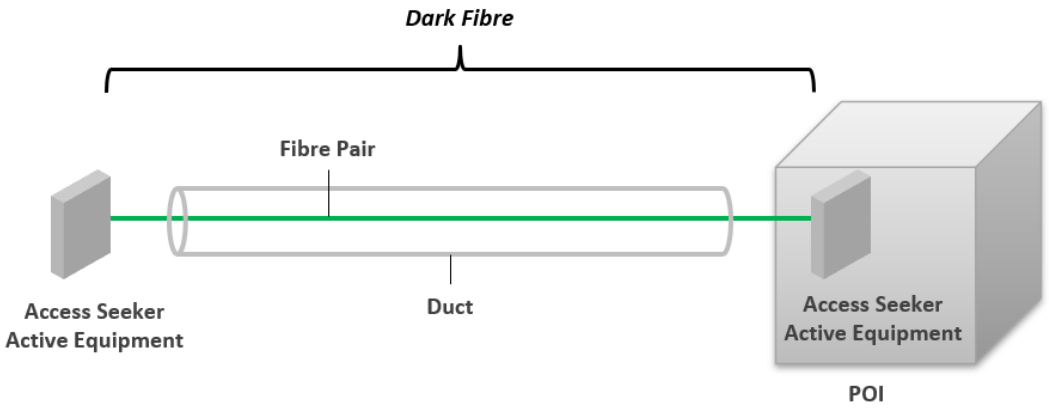


Figure 1 – Scope of proposed Access to Dark Fibre

Questions

Question 1:	Do you agree that Access to Dark Fibre should be listed on the Access List, within the scope set out in the proposed service description?
Question 2:	Do you agree with MCMC's proposed approach to limiting the scope of the Access to Dark Fibre service to Exclusive Zones and Restricted Data Centre POEs?
Question 3:	Do you suggest any amendments to the proposed service description, including the definitions of Exclusive Zones and Restricted Data Centre POEs?

8 Mobile Network Sharing Arrangements

Overview

8.1 Mobile network sharing refers to arrangements whereby two or more MNOs share the active network infrastructure used to transmit communications to and from end-user devices.

8.2 The two main types of mobile network sharing arrangements are Multi-Operator Core Network (**MOCN**) and Multi-Operator Radio Access Network (**MORAN**).

8.3 MOCN involves the integration of an existing MNO's core network with another MNO's radio access network (**RAN**) at a technically feasible POI. MOCN allows the

host MNO's spectrum to be shared by all operators who participate in the MOCN arrangement.

8.4 MORAN also involves the integration of an existing MNO's core with the host network's RAN at a technically feasible POI. However, MORAN requires dedicated spectrum to be allocated per MNO, with the sharing arrangement only extending to RAN elements such as the base station, site infrastructure and transmission equipment are shared.

8.5 MOCN and MORAN are mechanisms through which MNOs can more efficiently roll out and utilise network infrastructure, by allowing such infrastructure to be shared rather than separately deployed (i.e. duplicated) by each MNO. This tends to be particularly useful in regional and rural areas, where deployment of separate RAN infrastructure by each MNO may not be economically efficient.

8.6 Access to MOCN or MORAN arrangements is not currently listed in the Access List. However, in previous Access List reviews, MCMC has received submissions requesting active network sharing arrangements to be included within the Access List.

Submissions Received

Submissions in support of listing MOCN or MORAN arrangements

8.7 GTP Network, PDC and PPIT, SACOFA, TM, TIME, REDtone, Tune Talk and YTLC all support listing MOCN/MORAN arrangements on the Access List.

8.8 TM considers that it has been denied fair access to 4G MOCN arrangements by other licensees, due to unjustifiably high pricing, selectively inconsistent site availability, resale and innovation restrictions and the lack of a regulatory safety net during negotiations. TM argues that unregulated 4G MOCN/MORAN arrangements have left operators vulnerable to exclusion, discrimination and unreasonable pricing. TM has suggested its own service description to be included on the Access List. TM considers that access to MOCN/MORAN arrangements would allow TM to correct structural disadvantages that have been affecting the quality, affordability and coverage of services that TM provides.

8.9 TM has also submitted a document covering 4G MOCN arrangements separate to its Access List and MSA questionnaire responses. In this document, TM expresses its preference for MCMC to introduce a comprehensive regulatory access framework based on 6-way 4G MOCN sharing arrangements.

8.10 TIME has not yet sought access to any MOCN/MORAN arrangements. TIME submits that, if TIME did seek access in the future, regulation of these arrangements would allow TIME to consider a broader pool of providers.

8.11 TIME and U Mobile concur that MOCN/MORAN arrangements improve coverage in remote and rural areas by reducing the operational costs of rolling out in these areas. U Mobile adds that the increasing regulatory burden of rollouts in rural areas makes MOCN/MORAN arrangements more important.

8.12 U Mobile has obtained access via 2G domestic roaming and also sought access to 4G MOCN arrangements but has not always been successful in these attempts. U

Mobile believes network sharing should be voluntary for non-USP sites but mandated for government-funded sites, with pricing left unregulated and up to commercial negotiation.

8.13 YTLC has attempted to negotiate 4G MOCN arrangements covering suburban, rural and remote areas and in-building systems but has faced issues in relation to pricing transparency, unclear service obligations, and a lack of a central costing model.

8.14 YTLC prefers MOCN over MORAN arrangements and supports the listing of 6-way MOCN arrangements, particularly in policy-driven and high-cost deployment areas. YTLC argues that the 6-way model has been proven to be more viable and sustainable than the traditional 4-way MOCN model. YTLC believes this will improve network coverage and efficiency while ensuring fair and non-discriminatory access for operators.

8.15 A range of stakeholders who own or operate towers (or represent licensees who do so) have made submissions on the impact that listing MOCN/MORAN arrangements would have on tower tenancies. More specifically:

(a) GTP Network considers that listing MOCN/MORAN arrangements on the Access List will deliver transparency regarding infrastructure occupancy, allow Access Providers to ensure infrastructure integrity, and ensure Access Seekers have specific disclosure and performance obligations.

(b) Similarly, PDC and PPIT and SACOFA consider that listing MOCN/MORAN arrangements on the Access List will provide transparency regarding the identity of Access Seekers and other users under the arrangement, and the specifications of equipment accessing the infrastructure.

(c) Edotco considers that MOCN/MORAN arrangements increase site utilisation and support more stable, long-term tenancies.

8.16 CelcomDigi and an operator acknowledge that MOCN/MORAN arrangements provide accelerated rollouts. CelcomDigi additionally considers that these arrangements deliver wider coverage, enhanced network resilience and a temporary coverage solution.

8.17 The above-mentioned operator sees the benefits in the form of cost efficiencies, improved service quality and resilience, and the expansion of national connectivity.

8.18 The above-mentioned operator supports MOCN/MORAN arrangements on a commercial basis and currently provides wholesale 5G services to Access Seekers using MOCN architecture. The operator is exploring the option of a network sharing collaboration with U Mobile to expand the coverage of its 5G network and seeks clarification on whether 4G and 5G MOCN/MORAN arrangements will be included as a single service on the Access List.

8.19 Another operator, as an MVNO, does not negotiate MOCN/MORAN arrangements directly. This operator notes that such arrangements ensure footprint parity with host MNOs, reduce risks of quality degradation and improve outage and upgrade transparency.

Submissions opposing listing of MOCN or MORAN arrangements

8.20 CelcomDigi and Maxis oppose listing MOCN/MORAN arrangements on the Access List.

8.21 CelcomDigi has experience negotiating temporary commercial event-based MOCN arrangements. CelcomDigi considers that MOCN/MORAN arrangements are not a standalone service and instead are a means of providing a service. CelcomDigi considers that, given the complex and customisable nature of these arrangements, and the varying cost structures this entails, a single categorisation would be inappropriate. Furthermore, since there is already an effective industry guideline in place, more time is needed before additional regulations can be considered.

8.22 Maxis has successfully implemented 4G MOCN sharing commercially with other mobile operators on a commercial and non-commercial (USP) basis without requiring regulatory intervention. Maxis suggests there is already sufficient regulation and that any regulatory intervention would not only be against international best practice but would stifle existing MOCN arrangements. Maxis argues that encouraging more infrastructure-based competition is preferable to further regulation. Maxis sees the primary benefit of MOCN/MORAN arrangements as improving coverage in remote areas or challenging terrain where individual rollouts are not feasible.

8.23 While GTP Network expresses support for listing MOCN/MORAN arrangements on the Access List, GTP Network, Edotco, PDC and PPIT submit that MOCN/MORAN arrangements decrease their rental revenue from tower tenancies and increase structural demands on their towers, thereby diminishing the capacity available for other Access Seekers.

Other submissions

8.24 Astro, Radio Kita and REDtone responded that MOCN/MORAN arrangements are not relevant to their operations.

8.25 Tune Talk submitted that it is moving towards a MOCN arrangement with CelcomDigi and is open to entering similar arrangements with other operators.

8.26 REDtone considers there should be designated POIs for MNOs to access MOCN/MORAN arrangements.

8.27 Edotco considers that, if MOCN/MORAN arrangements are listed on the Access List, any accompanying obligations must reflect that these arrangements are more than just space or capacity sharing and involve active coverage and service quality functions.

MCMC Assessment

Competition/LTBE Analysis

8.28 MCMC's preliminary view is that it would be in the LTBE for 4G MOCN Access to be listed on the Access List.

8.29 The various network elements that comprise a RAN act as an essential input into the supply of mobile telephony and data services in retail markets. This is because, without access to a RAN, an MNO is unable to carry mobile communications to and from its core network to end-user devices.

8.30 Beyond the status of RAN elements as essential inputs into retail mobile services from a technical perspective, there are two additional reasons why RAN elements are "bottleneck facilities" from an economic perspective.

8.31 First, it is largely economically inefficient for smaller or new-entrant MNOs to roll out their own RAN on a ubiquitous nationwide basis, so as to permit them to supply mobile services to their customers. Mobile networks are being used by end-users to deliver higher amounts of traffic at higher speeds, which in turn places increasing demands on RAN infrastructure. This has increased the capital investment needed for MNOs to roll out their own RAN infrastructure. This issue is particularly pressing in regional and rural areas, where rollout costs are higher for geographic reasons (e.g. due to difficult terrain) and the return on investment tends to be lower due to lower population density, which results in a smaller customer base on a per-site basis.

8.32 In this context, smaller MNOs rely on accessing the RAN infrastructure of other MNOs to achieve coverage and supply services in specific areas, meaning that access to RAN infrastructure in these areas is an economic bottleneck.

8.33 This point is supported by a range of submissions. For example, both CelcomDigi and an operator acknowledge the benefits of MOCN and MORAN arrangements in allowing for accelerating network rollout and coverage, achieving cost efficiencies and improving service quality and resilience. Even Maxis (who opposes listing MOCN and MORAN arrangements on the Access List) acknowledges that these arrangements can improve coverage in remote areas or areas of challenging terrain, where individual rollouts are not feasible. TM also submits that access to active RAN sharing would allow it to correct structural disadvantages it faces, and that affect the quality, affordability and coverage of its mobile services.

8.34 Second, there appear to be practical challenges faced by licensees when attempting to access another operator's RAN infrastructure through MOCN or MORAN arrangements. MCMC acknowledges that, in most parts of Malaysia, there are competing RANs (owned by the different MNOs) that serve specific geographic areas, which should ordinarily create a degree of competition at the wholesale level between Access Providers.

8.35 However, in practice, stakeholders have submitted that they are facing challenges entering into MOCN or MORAN arrangements on a commercial basis. For example, both TM and YTLC have identified challenges in relation to this, ranging from high prices, lack of access to all sites, resale restrictions and unclear service obligations. These challenges make it difficult for MCMC to accept the position put forward by certain operators that MOCN and MORAN access should continue to remain available only on a commercial (unregulated) basis.

8.36 Instead, the challenges faced by smaller MNOs suggest that existing RAN infrastructure is practically acting as a bottleneck and that the level of competition between MNOs at the wholesale level is not sufficient to create a vibrant and

competitive market for access to MOCN or MORAN arrangements on a commercial basis.

8.37 Taken together, the high and inefficient costs of self-deploying RAN infrastructure and the practical challenges of commercially accessing the infrastructure of other operators suggest that there is a market failure in relation to access to RAN infrastructure.

8.38 Regulating access to RAN infrastructure is therefore likely to be necessary to promote greater access to such infrastructure (through MOCN or MORAN arrangements). This is likely to result in Access Seekers competing more vigorously in retail mobile markets, through higher-quality service offerings and more widespread network coverage. This higher level of competition will deliver benefits for end-users, which would ensure that regulated access to RAN infrastructure is in the LTBE.

8.39 Such regulated access would also encourage the economically efficient use of RAN infrastructure, as RAN infrastructure sharing would allow such infrastructure to be used by a larger number of operators and ensure that each unit of infrastructure generates greater value than in the absence of sharing.

Interaction with existing Access List services

8.40 MCMC considers that existing services and facilities on the Access List are insufficient at dealing with the market failures and challenges faced by operators in relation to RAN access, and that listing a new MOCN or MORAN service on the Access List would be the most appropriate way of dealing with these challenges.

8.41 While the Access List currently contains a Domestic Inter-Operator Roaming Service, this provides a lower level of customisation and control to Access Seekers than MOCN or MORAN arrangements. In discussions with MCMC, several licensees have mentioned that domestic roaming arrangements must be acquired on a nationwide or regional basis, rather than on a site-by-site basis. This "all-or-nothing" approach results in domestic roaming not acting as a practicable option in circumstances where an MNO wishes to provide services in some but not all areas where it lacks its own network infrastructure.

8.42 MCMC also understands that MOCN or MORAN arrangements allow for a greater level of competitive differentiation than domestic roaming. Under domestic roaming arrangements, Access Seekers have a lower ability to control the specifications of the service they are acquiring from the Access Provider (and therefore the downstream services provided to end-users). Relying solely on the Domestic Inter-Operator Roaming Service for access to RAN infrastructure would therefore not drive the same vigorous and diversified competition outcomes in retail mobile markets as MOCN or MORAN access.

8.43 Similar issues arise in relation to the MVNO Access service listed on the Access List. MVNO Access could theoretically provide an option for smaller MNOs to achieve coverage in areas where they have not deployed network infrastructure. However, MVNO Access would not facilitate the level of competitive differentiation needed to deliver a high level of competition in retail markets. MVNO Access is also intended for Access Seekers that do not have any RAN infrastructure (on a nationwide basis)

and is therefore not readily adaptable for use by Access Seeker MNOs to improve coverage on a site-by-site basis.

8.44 MCMC considers that the ability for MOCN services to be acquired on a site-by-site basis is a key benefit of such services. This allows Access Seekers to enter into MOCN arrangements in a manner that is targeted and proportionate to their needs, which ultimately removes barriers to access and facilitates improved network coverage and competition in downstream mobile markets. MCMC therefore proposes to clarify that access can be acquired on a site-by-site basis in the service description of the proposed 4G MOCN Access service, as set out at paragraph 8.55.

Regulation of MOCN vs MORAN arrangements

8.45 MCMC considers it would be in the LTBE to list only MOCN arrangements on the Access List, and not MORAN arrangements.

8.46 The key distinction between MOCN and MORAN arrangements is that MOCN arrangements involve the use of shared spectrum, whereas MORAN arrangements still require the participating MNOs participating in such arrangement to use their own spectrum to deliver communications from physical elements of the RAN to end-user devices.

8.47 The fact that MOCN permits Access Seekers to pool spectrum with the Access Provider (rather than relying on their own dedicated spectrum) makes it less burdensome for smaller MNOs, or MNOs that have lower spectrum holdings, to access MOCN arrangements as compared to MORAN arrangements. On this basis, MCMC considers that Access Seekers are more likely to seek participation in MOCN arrangements compared to MORAN arrangements.

8.48 Conversely, if only MORAN arrangements were listed on the Access List, MCMC considers that smaller MNOs will still face challenges accessing such arrangements, on the basis that they may have insufficient spectrum to use for delivering communications from the shared RAN to their end-users.

8.49 By promoting greater participation and access among MNOs, MOCN arrangements are more likely to drive competition in retail mobile markets and network coverage improvements in regional and rural areas. Greater levels of participation will also promote more economically efficient use of infrastructure for MOCN as compared to MORAN. Taken together, MCMC considers that the LTBE would be better served by listing MOCN arrangements on the Access List, as compared to MORAN arrangements.

8.50 MCMC has also considered whether MORAN arrangements should be listed in addition to MOCN arrangements. However, if MOCN arrangements are listed, MCMC's preliminary view is that it would not be proportionate to also list MORAN arrangements. Since MORAN arrangements require Access Seekers to use their own spectrum, such arrangements are likely to be attractive to larger MNOs who are also likely to have a more significant network presence and bargaining power in relation to such arrangements. MCMC therefore considers that commercial access to MORAN arrangements is more likely to be successful as compared to MOCN arrangements, which minimises the basis for regulatory intervention.

Application to 4G networks

8.51 MCMC has also considered the specific RAN technology types to which access should be regulated under a proposed MOCN service on the Access List.

8.52 MCMC's preliminary view is that a new MOCN access service should apply only to 4G RAN infrastructure.

8.53 The Access List already contains 5G Standalone Access and 4G EPC with 5G RAN Access services. These enable Access Seekers to obtain access to 5G RAN infrastructure operated by DNB and U Mobile, through MOCN arrangements. Accordingly, there is no need for a new MOCN access service to apply to 5G networks.

8.54 There is also no sufficient regulatory basis for MOCN arrangements to apply to earlier generations of mobile technology, such as 2G and 3G. The use of these technologies to deliver mobile communications is becoming increasingly marginal and has been largely superseded by 4G and 5G networks. Access to 4G MOCN arrangements (and to 5G networks via existing Access List services) are therefore likely to be sufficient to enable Access Seekers to achieve the RAN infrastructure access they require to compete effectively in retail markets.

MCMC Preliminary View

8.55 MCMC's preliminary view is to include 4G Multi-Operator Core Network (MOCN) Access on the Access List as follows:

4G Multi-Operator Core Network ("MOCN") Access

(a) 4G MOCN Access is a Service for access to a 4G radio network, whether or not as part of a Mobile Network, for the purpose of the Access Seeker providing:

(i) MVNO Access or another Service and/or Facility on the Access List that uses access to a 4G radio network as an input;

(ii) services to enterprise and/or government Customers;

(iii) public cellular services to the public; or

(iv) wireless or mobile broadband services to the public.

(b) 4G MOCN Access may include access to Facilities and/or Services used by the Access Seeker to provide one or more of voice, data and application services, as selected by the Access Seeker, provided that the Access Seeker has integrated its 4G core with the Access Provider's eNodeB.

(c) The functionalities of 4G MOCN Access include:

(i) integration between the Access Provider's eNodeB and the Access Seeker's 4G core network; and

(ii) support for 3GPP Release 15 and any updates to that standard from time to time.

(d) 4G MOCN Access must be made available by the Access Provider on a site-by-site basis at any site where the Access Provider has installed components of its 4G radio network.

8.56 The scope of the proposed 4G Multi-Operator Core Network (MOCN) Access is illustrated in the diagram below:

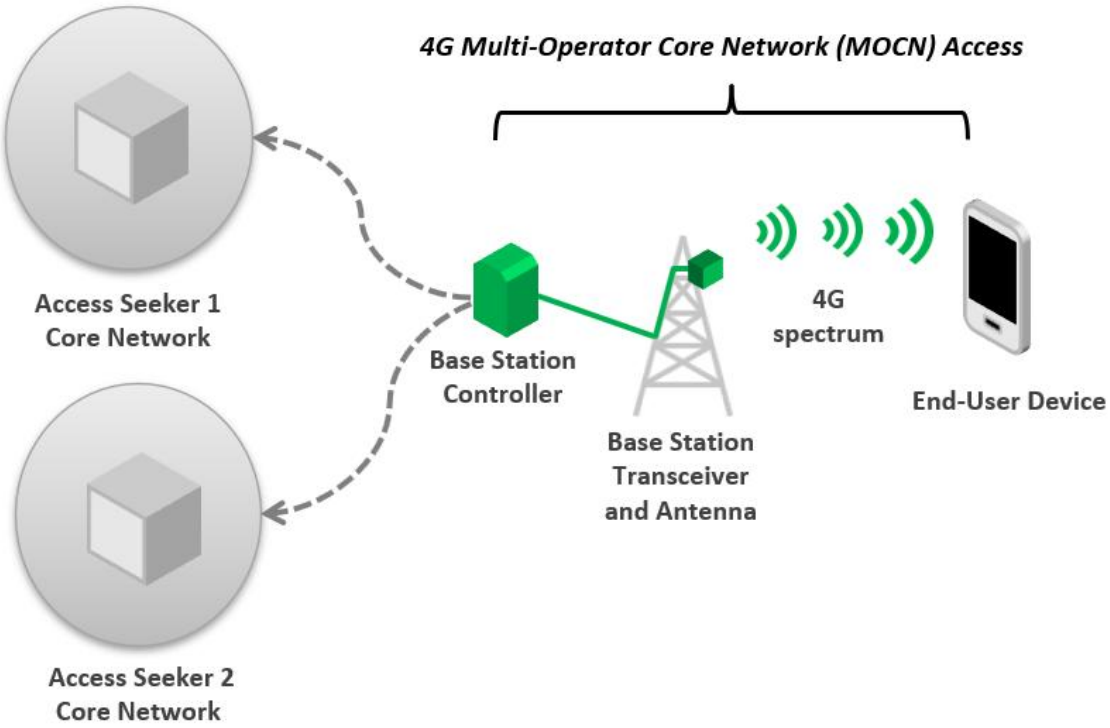


Figure 2 – Scope of proposed 4G Multi-Operator Core Network (MOCN) Access

Questions

Question 4:	Do you agree with listing a new 4G MOCN Access service on the Access List? Please provide reasons.
Question 5:	Do you have any proposed amendments to the proposed service description of 4G MOCN Access?

9 5G Services

Introduction

9.1 The following facilities and services comprise the family of 5G services on the Access List:

(a) 5G Standalone Access; and

(b) 4G Evolved Packet Core ("EPC") with 5G Radio Access Network ("RAN") Access

(together "**5G Services**").

9.2 In this section, MCMC will consider each of the above 5G services.

Service Descriptions

9.3 The 5G Standalone Access service is currently described in the Access List as follows:[4]

5G Standalone Access

(a) 5G Standalone Access is a Facility and/or Service for access to a 5G New Radio radio network, whether or not as part of a 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, provided that where the Access Seeker has integrated its 5G core with the Access Provider's gNodeB, the Access Seeker is solely responsible for any voice service capability (and for the avoidance of doubt any such voice services may be delivered using the Access Provider's radio network).

(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) integration between the Access Provider's gNodeB and the Access Seeker's 5G core (5GC);

(iii) Network Slice Selection Function (NSSF and 5G Network Slices as selected by the Access Seeker;

(iv) Unified Data Management (UDM);

(v) Unified Data Repository (UDR);

(vi) Network Exposure Function or (NEF);

(vii) Mobile Edge Computing (MEC);

(viii) Network Function Virtualisation (NFV);

(ix) security-related functions, such as Security Anchor Function (SEAF) and Authentication Server Function (AUSF);

[4] MCMC, Commission Determination on Access List, Determination No.6 of 2021.

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

(xi) customer billing; and

(xii) customer relationship management.

(d) The 5G Standalone Service shall be supplied to the Access Seeker in compliance with 3rd Generation Partnership Project ("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 (or similar services), as selected by the Access Seeker:

(i) mobile broadband services;

(ii) massive IoT services; and

(iii) mission-critical services.

9.4 The scope of 5G Standalone Access service is illustrated in the diagram below:

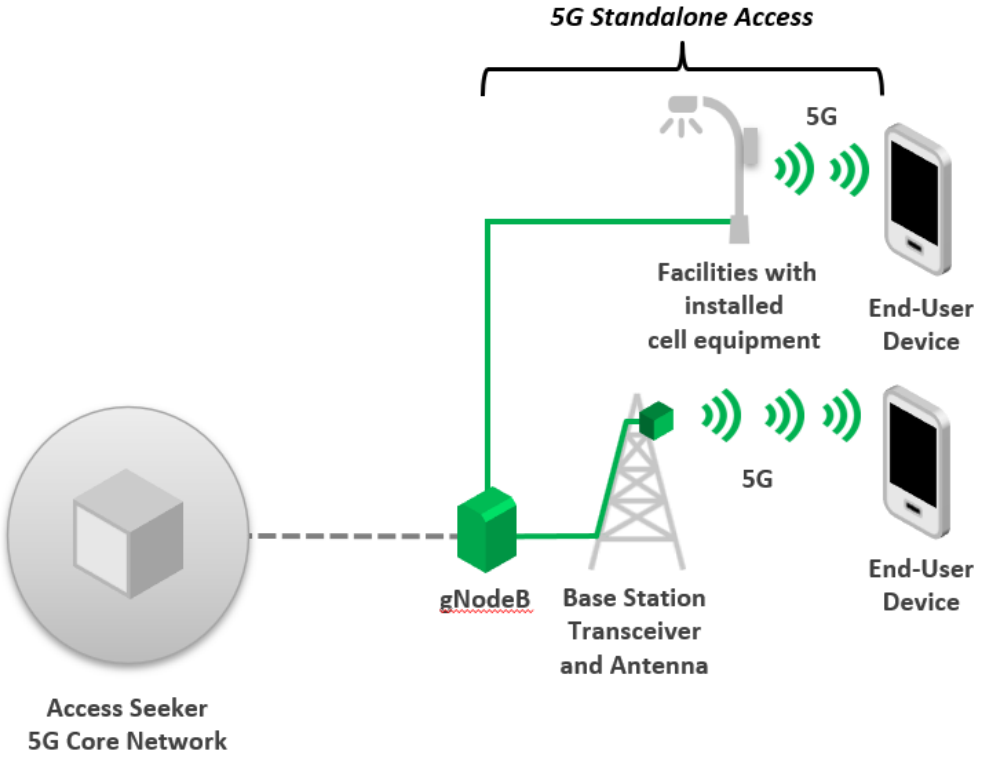


Figure 3 – Scope of 5G Standalone Access

9.5 The 4G EPC with 5G RAN Access service is currently described in the Access List as follows:[5]

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, provided that the Access Seeker is solely responsible for any voice service capability (and for the avoidance of doubt any such voice services may be delivered using the Access Provider's radio network).

(c) The functionalities of 4G EPC with 5G RAN Access include:

(i) integration between the Access Provider's gNodeB and the Access Seeker's 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 mobile broadband and similar services.

[5] MCMC, Commission Determination on Access List, Determination No.6 of 2021.

9.6 The scope of 4G EPC with 5G RAN Access service is illustrated in the diagram below:

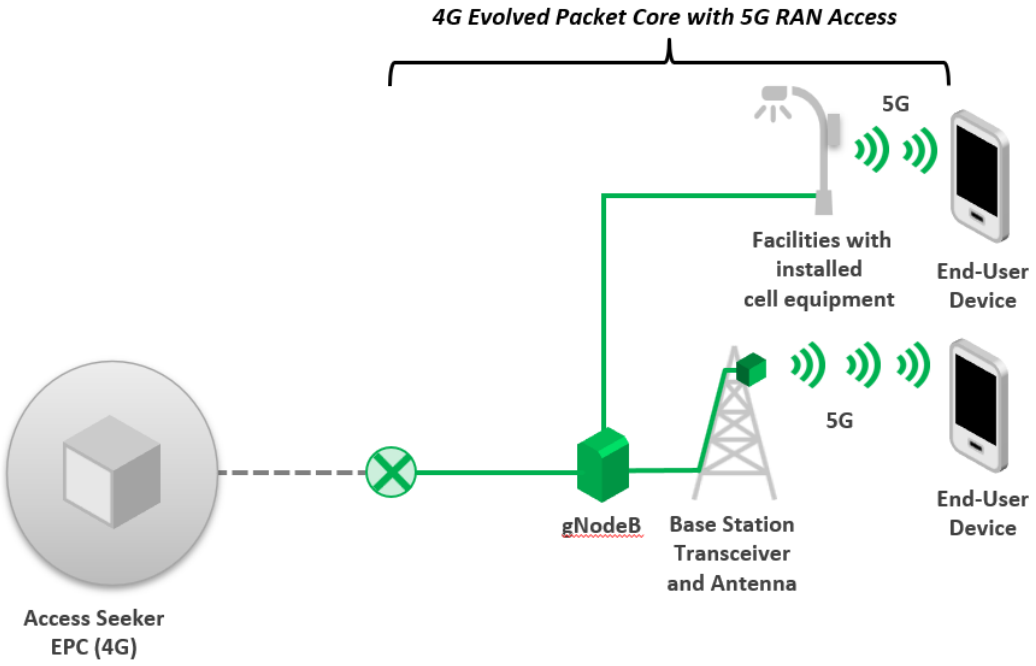


Figure 4 – Scope of 4G EPC with 5G RAN Access

Overview

9.7 5G technology supports a diverse range of services with varying data traffic profiles. Unlike previous generations, 5G introduces the New Radio (**NR**) interface, which provides the flexibility to handle both IP and non-IP traffic, short data bursts and sustained high-speed transmissions through network virtualisation and the use of Application Programming Interface (**API**s).

9.8 5G technology also enables a wide range of new characteristics at the core network level, including critical elements such as network slicing, mobile edge computing and network capability exposure.

9.9 Broadly, 5G access networks are deployed in one of two configurations:

(a) **Standalone Architecture (SA):** 5G Radio Access Networks (**RAN**) connected directly to a 5G Core (**5GC**). This is regulated under the "5G Standalone Access" service in the Access List.

(b) **Non-Standalone Architecture (NSA):** 5G RAN integrated with an existing 4G/Long Term Evolution (**LTE**) Evolved Packet Core (**EPC**). This is regulated under the "4G EPC with 5G RAN Access" service.

9.10 In 2021, the above 5G Services were added to the Access List to regulate the provision of 5G services over DNB's network. At that time, 5G services were supplied under a single wholesale network (**SWN**) model, where DNB was the only operator of 5G RAN infrastructure. The monopolistic nature of this model warranted regulation of access to 5G wholesale services.

9.11 The market structure has evolved significantly since then. In 2025, U Mobile became the operator of a second 5G network under the ULTRA5G brand, with the market now being characterised by a dual-network model, with both DNB and U Mobile operating 5G RAN infrastructure. U Mobile is a vertically integrated operator, supplying 5G and other mobile services in retail markets.

Submissions Received

Acquiring access to 5G Services and usability

9.12 Maxis, Tune Talk, U Mobile and YTLC acquire 5G Services as Access Seekers and find them usable as an input to the other services they supply to their customers, with the following additional context:

(a) Maxis noted it currently acquires these services from DNB but may seek access from U Mobile once U Mobile reaches network parity with DNB.

(b) YTLC finds that 5G SA offers a superior customer experience where data and voice are both on 5G.

9.13 CelcomDigi only acquires the 4G EPC with 5G RAN Access service as an Access Seeker and finds it usable as an input to the other services it supplies to its customers.

9.14 TM acquires 4G EPC with 5G RAN Access and plans to acquire the 5G SA service in selected service areas, which TM believes will allow them to deliver differentiated enterprise-grade services. TM currently uses 4G EPC with 5G RAN Access as a foundational input for consumer mobile broadband, MVNO traffic and FMC proposition including fixed wireless access.

9.15 Celcom Timur, DNB, Fibrecomm Network, Radio Kita, REDtone, TIME and another operator do not acquire either of the 5G Services as an Access Seeker.

9.16 DNB is an Access Provider for 5G Services, supplying wholesale 5G services to Access Seekers under its RAO.

Functionality of 5G Services

9.17 CelcomDigi, Maxis, Tune Talk and YTLC consider that the services they acquire provide the functionality which they need and further note the following:

(a) **CelcomDigi:** listed services provide the functionality for 5G related service offerings such as eMBB, 5G IBC, 5G inbound roaming, FWA, Voice over New Radio (**VoNR**), Network Slicing, mmTC, IOT/Redcap.

(b) **YTLC:** while 5G Services generally provide the functionality required, there are functional limitations in certain use cases, particularly for private 5G and enterprise deployments, where the availability of spectrum and bandwidth is constrained.

9.18 TM identified a number of functional limitations in a dual-network context (noting the current description was based on a single wholesale network). TM argues that the existing service descriptions lack critical mandates for inter-PLMN signaling, cross-network roaming and synchronised mobility management, creating

significant friction for seamless service continuity. Furthermore, the absence of clear frameworks for voice continuity (VoNR and EPS fallback), EN-DC support obligations, and 5G-specific performance KPI (such as slice metrics, MEC latency, jitter, roaming attach) prevent Access Seekers from guaranteeing enterprise-grade SLAs or ensuring a consistent user experience. TM asserts that updating these service descriptions is essential to resolve these technical gaps, enable fair competition, and support the interoperability required for a resilient dual-network ecosystem.

Impediments in gaining access to, or supplying, 5G Services

9.19 While Maxis does not face any major impediments in gaining access to DNB as the 5G network operator, other operators such as CelcomDigi, TM, YTLC and another operator found that there are impediments in gaining access to, or supplying the 5G Services.

9.20 CelcomDigi's submission identifies several systemic impediments to 5G access:

(a) lack of standardised commercial frameworks and structured product offerings, which lead to unpredictable SLAs and a cumbersome procurement process;

(b) lengthy lead times and resource-intensive procedures that often span several months;

(c) misalignment between the services currently offered and the evolving technical and commercial requirements of industry stakeholders; and

(d) a lack of transparency regarding product roadmaps and long-term sustainability, creating significant strategic uncertainty for Access Seekers attempting to plan for future service evolution and digital engagement.

9.21 An operator asserted that the MSA is overly prescriptive, as its detailed procedural obligations, which were originally designed for a single wholesale network (SWN) model, are too resource-intensive even for introduction of 5G services that include private networks, enterprise, and government segments. The operator highlighted that these rigid processes, including extensive consultations and committee approvals, create significant administrative burdens and delay time-to-market for innovative services. To mitigate these impediments, the operator advocates for a streamlined MSA framework that prioritises flexibility and practical commercial negotiations over one-size-fits-all regulatory mandates, thereby enabling faster deployment and more efficient 5G adoption across the digital economy.

9.22 TM reported that the transition to a dual 5G network has allowed DNB to propose revised RAO terms that are materially more onerous, prohibitive, and incompatible with TM's technical frameworks. These non-price barriers, combined with a proposed cost-recovery structure, create a structural conflict of interest where Access Seekers effectively subsidise the Access Provider's own retail operations. TM asserts that these conditions undermine affordability, national digital inclusion goals and fixed-mobile convergence, cautioning that without regulatory intervention to ensure neutrality and fairness, these disproportionate obligations could effectively force TM out of the mobile market.

9.23 YTLC noted that where 5G in-building services rely on DAS architecture, if infrastructure providers do not permit access by multiple 5G wholesale providers, this may result in access restrictions or de facto exclusivity.

9.24 Another operator identified a lack of explicit MVNO access rights, undefined onboarding timelines, and limited transparency on network slicing and QoS parity as the main impediments.

Proposed changes to service descriptions

9.25 While Celcom Timur, Fibrecomm Network, TIME and Tune Talk do not propose any amendments to the service descriptions, CelcomDigi, Maxis, TM, U Mobile, YTLC and other operators believe that the service descriptions for 5G services should be updated as a result of a dual-5G network model.

9.26 CelcomDigi believes further study of the market is required to determine whether modifications are necessary. In light of the shift from SWN model to a dual network model, CelcomDigi proposes amendment to the descriptions of the 5G Services to share the responsibility for voice service capability between the Access Provider and the Access Seeker:

"...the Access Seeker is solely responsible for any voice service capability (and for the avoidance of doubt any such voice services may be delivered using Access ~~Provider's~~ Seeker's radio network). Voice service capability delivered using Access Provider's radio network and Access Seeker's Core network are shared responsibility between Access Seeker and Access Provider."

9.27 Maxis proposes adding the following new facilities/services to the description of 5G Standalone Access: Private Network, Reduce Capability and High-Performance Machine Type and suggests deleting some functionalities typically managed by the Access Seeker rather than the Access Provider (these include UDM, UDR, NEF, MEC, NFV, security related functions, value-added service platforms, customer billing and customer relationship management). It also proposes adding "Private Networks" to paragraph (d) of the 4G EPC with 5G RAN service.

9.28 TM proposed several amendments to the descriptions to reflect the dual-network environment:

(a) enable interworking/roaming with other domestic 5G networks. Scope should include roaming, handover and service continuity. It requires standardised inter-PLMN signalling, robust roaming architectures and alignment with 3GPP and GSMA guidelines.

(b) include voice continuity mechanisms. TM recommends that service descriptions should explicitly recognise VoNR and EPS Fallback to LTE/Voice over LTE (**VoLTE**) when VoNR is unavailable as core obligations. To support this, Access Providers must be required to publish their IMS interworking parameters, fallback configuration (redirection policies) and roaming profiles.

(c) mandate cross-network service orchestration. Require Access Providers to expose standardised APIs such as NEF and NSSF, allowing advanced

features like network slicing and MEC to function consistently across network boundaries.

(d) strengthen transparency and accountability regime to prevent vendor lock-in and ensure fair competition. TM recommended mandating monthly KPI reporting, covering metrics such as handover success rates, latency, and packet loss.

9.29 U Mobile believes that service description should be updated to reflect the transition to a dual network, including by updating definitions to ensure they apply neutrally to any 5G network provider, and the definition should reference "IMT-2020 and beyond" rather than just "3GPP Release 15" to automatically cover 5G-Advanced (5.5G) without requiring a new Access List determination. U Mobile also suggested excluding speed tiers and pricing from the MSA. It further proposed that RAN sharing deployment models, commercial and operational models should not be prescribed to allow flexibility to foster innovation and service differentiation.

9.30 Another operator believes that the service description should be updated to more clearly articulate MVNO 5G access rights to ensure fair and transparent access across both 5G networks.

9.31 YTLC submitted that the description should reflect key developments since 2021, including the availability of VoNR, network slicing capabilities, and dedicated or private 5G deployments for enterprise use cases.

9.32 An operator proposes a review of the current descriptions of 5G Services to ensure they remain clear, targeted, practical and future-proof. The operator further argued that the descriptions are broad enough to cover all other 5G services, which creates ambiguity in a market characterised by dual network competition, emerging private network/enterprise solutions, new deployment models and technology evolution. In particular, it recommended review of the following areas:

(a) **5G MOCN/MORAN:** If MCMC intends to list a new service for MOCN/MORAN, the operator seeks clarification on whether it applies only to 4G MOCN/MORAN while 5G MOCN/MORAN remains under 5G Services, or both 4G and 5G MOCN/MORAN will be listed separately. The operator seeks clear regulatory demarcation between different network sharing models to avoid technology disparity. The operator also suggests reviewing the MSA to reduce the regulatory obligations initially designed for SWN model.

(b) **Private network, enterprise and government services:** the operator advocates for a departure from the one-size-fits-all regulatory approach for specialised services. Procedural obligations (like RAO approvals and planning committees) designed for a SWN are unsuitable for bespoke enterprise/government solutions. The operator suggests streamlining these rules.

(c) **5G In-Building Solutions (IBS):** the operator seeks clarification on whether the 5G In-Building Solution falls under 5G Services or Infrastructure Sharing as there is currently ambiguity. Certain IBS deployments involve active radio elements, which resemble 5G Services, while others are passive

infrastructure, which aligns with Infrastructure Sharing. The ambiguity could lead to inconsistent application of MSA obligations.

Impact of U Mobile on obtaining access to, or supplying access to, 5G Services

9.33 In response to MCMC's question in the informal questionnaire on whether the entry of U Mobile as a second 5G network operator had any impact on the way operators obtained access to, or supplied access to, 5G Services, the operators had varied responses, which are summarised below.

9.34 Most operators viewed the transition as a positive move, highlighting that a dual network model allows Access Seekers to adopt a portfolio strategy, reducing the risk of a single point of failure and increasing service resilience. Competition between the two wholesale providers also created healthier commercial negotiations, potentially optimising costs and encouraging innovation.

9.35 DNB saw an opportunity for infrastructure collaboration with U Mobile to accelerate the national goal of 98% 5G coverage by 2030, avoiding unnecessary duplication of investment.

9.36 CelcomDigi, Fibrecomm Network, Maxis, TIME, TM and YTLC raised several concerns:

(a) CelcomDigi pointed to high establishment costs in transitioning to a new 5G network provider, including Point of Interconnection (**POI**), transport, security, and testing, which may limit the practical ability to leverage both networks.

(b) CelcomDigi also argued that a "full operator" like U Mobile can maximise its Single RAN setup for efficiency, a benefit that wholesale Access Seekers, who must manage separate 4G networks, cannot replicate. On the same issue, Maxis and TM warned of a structural conflict of interest now that both 5G providers can offer retail services. They feared Access Seekers may inadvertently subsidise the wholesale providers' retail arms.

(c) CelcomDigi and TM also questioned the quality of inter-network mobility, specifically regarding voice services that rely on 4G fallback (VoLTE) and the lack of advanced features such as RedCap, network slicing and In-Building Solutions.

(d) TM and Maxis highlighted the critical need for a long-term spectrum roadmap, with TM specifically advocating for dedicated spectrum for enterprise 5G services to expand 5G use-cases across key verticals, such as agriculture, education, energy, healthcare, manufacturing and logistics.

(e) TM strongly advocated for a Pay-As-You-Use (**PAYU**) model, citing past experiences where 4G wholesale charges were significantly higher than retail benchmarks.

(f) YTLC submitted that it was too early to assess the impact of U Mobile's 5G network as it has yet to be fully rolled out. However, in-building coverage could be impacted if both DNB and U Mobile build exclusive networks. YTLC submitted that both operators should allow their networks to be accessed

by all 5G users, through spectrum pooling and MOCN arrangements, and that MOCN arrangements will reduce the cost of rolling out in-building coverage (through cost sharing).

(g) An operator reported that U Mobile imposes stringent, restrictive policies on indoor 5G equipment procurement. TM and YTLC also call for the harmonisation of indoor standards to prevent coverage disparity between outdoor and indoor environments. TM noted that around 30-40% of mobile traffic is generated from in-building.

(h) Fibrecomm Network noted that the consolidation of 5G deployments has actually reduced demand for certain supporting infrastructure, putting downward pressure on pricing that may threaten the viability of some sites.

MCMC Assessment

Competition/LTBE Analysis

9.37 In 2021, MCMC determined that it was in the LTBE to regulate access to 5G wholesale services because such regulation would promote competition, given that DNB was then the sole provider of 5G wholesale services. Access regulation was viewed as a primary driver for achieving any-to-any connectivity among an increasing number of connected devices, including IoT ecosystems, while simultaneously encouraging economically efficient investment in and use of network infrastructure by DNB. At the time, MCMC expressed concern that DNB, as a wholesale monopolist, would lack competitive constraints and could consequently increase prices or vary access terms unilaterally. This necessitated the regulation of 5G wholesale services to protect the interests of the broader market.

9.38 Competitive dynamics have shifted following recent changes in the regulatory landscape. The entry of a second 5G network operator has introduced a degree of direct infrastructure-based competition for DNB. However, there are three reasons why MCMC considers the market for wholesale 5G access remains uncompetitive and 5G RAN infrastructure remains a bottleneck facility, outlined below.

(a) The entry of U Mobile has transformed the market from a monopoly to a duopoly. However, a duopoly structure does not represent a sufficiently competitive market structure. Each of DNB and U Mobile is only competitively constrained by the other, which is unlikely to provide the degree of competitive vigour that is needed to support efficient outcomes in terms of access to 5G networks.

(b) Since the number of licensees able to provide 5G RAN infrastructure is a matter for government policy, there is currently a strict barrier to any future entry into the 5G wholesale market. In other words, DNB and U Mobile are not competitively constrained by the threat of a future third or fourth operator, as such new entrant cannot roll out its own infrastructure under the current dual-network model. This inability for new licensees to enter the market also reduces the level of countervailing buyer power by Access Seekers. This is because Access Seekers cannot credibly use the threat of market entry (i.e. rolling out their own 5G networks) to competitively constrain DNB and U Mobile's wholesale service offerings.

(c) The entry of U Mobile has changed the economic incentives of the two Access Providers, as compared to the previous wholesale-only single wholesale network model. As a wholesale-only operator, DNB had incentives to maximise take-up of its network (by providing services that satisfied the demand of Access Seekers), as this was the only way it could recoup its significant capital investment. The new market structure creates a risk that U Mobile may self-preference its own downstream operations as compared to its wholesale services to Access Seekers.

9.39 For these reasons, MCMC strongly considers that it remains in the LTBE to regulate access to the 5G Services via the Access List.

Impediments in gaining access to, or supplying, 5G Services

9.40 Regarding the impediments raised by CelcomDigi and other operators concerning the lack of standardised frameworks and unpredictable service levels, MCMC maintains that the RAO remains the primary instrument for ensuring transparency and non-discrimination. MCMC acknowledges that lengthy lead times and cumbersome procurement processes stifle innovation. It will consider these issues in the parallel review of the MSA.

9.41 With respect to CelcomDigi's submission regarding lack of transparency regarding product roadmaps, MCMC refers to paragraph 6.15.10(d) of the MSA which requires the Access Provider, at quarterly intervals, to publish on its website information relating to its product development roadmap for the upcoming 24 months. If the Access Providers have not been publishing these roadmaps, Access Seekers can lodge a complaint with MCMC.

9.42 DNB's submissions on the MSA are more appropriate for the parallel review of the MSA so MCMC will address these concerns as part of its parallel review of the MSA.

9.43 Addressing TM's concerns regarding onerous RAO terms and potential conflicts of interest in the dual-network model, MCMC reiterates that under section 149 of the CMA, all Access Providers must provide access on reasonable, equitable and non-discriminatory terms. There are severe penalties for contravention of this section.

Access to 5G in-building mobile systems

9.44 Regarding an operator's request for clarification about which service 5G In-Building Solutions (**IBS**) fall under, MCMC's preliminary view is that a separate Access to In-Building Mobile Systems service should be listed on the Access List. The basis for this is explained in section 11 (Infrastructure Sharing). As set out in that section, the new Access to In-Building Mobile Systems service would be used for access to both passive and active elements of IBS, across both 4G and 5G network technologies.

9.45 Accordingly, where a provider of wholesale 5G services (including DNB and U Mobile) supplies access to 5G IBS, such access would be provided under the proposed new Access to In-Building Mobile Systems service, not under the 5G Standalone Access or 4G EPC with 5G RAN Access service.

9.46 To avoid overlap, MCMC proposes clarifying in the descriptions of the 5G Services that they do not include access to in-building mobile systems. MCMC invites views from stakeholders on this proposed approach.

9.47 On the issue of infrastructure providers not permitting access by multiple 5G wholesale providers raised by YTLC, MCMC reiterates that the Access List only applies to activities by licensees. MCMC does not have jurisdiction under the Access List to compel non-licensees to provide space for DAS or other IBS within buildings. However, where a licensee owns or operates a passive or active IBS facility within a building, it would be mandated to provide access to this facility under the proposed new Access to In-Building Mobile Systems service, discussed in section 11.

Other adjustments to service descriptions

9.48 In response to CelcomDigi's suggestion that the description of 5G Services be amended to share the responsibility for the voice service capability between the Access Provider and the Access Seeker, MCMC refers to the 2021 Access List review submissions where DNB clarified that voice services are delivered via the core network. Under the 4G EPC with 5G RAN Access model, Access Seekers use their own 4G core networks and therefore provide voice services independently.

9.49 In a 5G Standalone Access model, DNB indicated a willingness to deliver voice services if Access Seekers chose not to do so via their own 5G core networks. Consequently, the service description for 4G EPC with 5G RAN Access excludes voice capability, and the 5G Standalone Access description similarly excludes it where the Access Seeker has integrated its own 5G core with the Access Provider's gNodeB.

9.50 MCMC invites further submissions on whether the underlying technological framework supports a shared responsibility model for voice service capability.

9.51 With respect to an operator's request for clarification on the scope of a new MOCN/MORAN service, MCMC confirms that it proposes to list a new 4G MOCN Access service (see section 8 above). This service will only apply to 4G MOCN arrangements. Access to 5G network infrastructure through a MOCN model will continue to fall under the 5G Standalone Access and 4G EPC with 5G RAN Access services.

9.52 In response to Maxis' suggestion to add new facilities and services, MCMC requests further information about the specific capabilities that Maxis would like added to paragraph (c) of the 5G Standalone Access service and paragraph (d) of the 4G EPC with 5G RAN Access service. In particular:

(a) MCMC would like to understand whether Maxis' reference to "Private Networks" is a reference to "Non-Public Network" functionality, a term introduced in 3GPP Release 16. If so, MCMC does not in-principle have objections to adding a reference to "Non-Public Networks" in paragraph (c) of the 5G Standalone Access service description and paragraph (c) of the 5G EPC with 5G RAN Access service description. However, MCMC would first like to obtain further views from stakeholders about the best way to refer to this within the relevant service descriptions.

(b) MCMC understands that "Reduced Capability" and "High-Performance Machine Type" are technical capabilities rather than distinct facilities or services. Paragraph (d) of the 5G Standalone Access and 4G EPC with RAN Access service descriptions already refers to "*all technical capabilities*" required by the Access Seeker to provide mobile broadband, massive IoT and mission-critical services (or mobile broadband and similar services, in the case of 4G EPC with RAN Access). While this would capture Reduced Capability and High-Performance Machine Type capabilities if offered by the Access Provider, MCMC would like to understand from stakeholders whether further amendments should be made to paragraphs (c) or (d) of the 5G Standalone Access and 4G EPC with RAN Access service descriptions to explicitly refer to these technical capabilities. MCMC would also like to understand if Access Providers have the ability to supply these capabilities as part of their 5G Services.

9.53 MCMC does not agree with Maxis' suggestion to delete certain functionalities from the description of 5G Standalone Access. No other stakeholder has asked for these functionalities to be deleted. Additionally, it is not mandatory for Maxis to acquire these functionalities from the Access Provider if it manages them itself. The description is flexible enough to allow Access Seekers to request access to their required functionalities only. Paragraph (c) of the 5G Standalone Access description states that these are "*Examples of Facilities and Services to which the Access Seeker may request access*", which makes it clear that the Access Seeker is not mandated to acquire all of these facilities or services as a bundle when acquiring 5G Standalone Access.

9.54 MCMC notes TM's submission and agrees that, for a dual-network model to succeed, inter-PLMN handover and service continuity must be treated as a regulated obligation. MCMC intends to mandate that Access Providers implement roaming and interworking in accordance with the 3GPP standards to ensure that technical barriers do not hinder the LTBE. This will include the requirement for Access Providers to support the Security Edge Protection Proxy (**SEPP**) and standardised signalling interfaces to facilitate seamless transitions between domestic 5G networks. MCMC proposes to include these obligations in the MSA as well as explicitly add "N32 interface" and SEPP to paragraph (c) of the 5G Standalone Access service description. MCMC invites stakeholder submissions in relation to these amendments.

9.55 In response to TM's suggestion to include VoNR and EPS Fallback to LTE/VoLTE when VoNR is unavailable, MCMC would like to understand:

(a) whether the Access Providers of 5G Services are currently capable of providing this functionality; and

(b) how inclusion of VoNR and EPS Fallback within the service descriptions would interact with the current limitation in paragraph (b) of the 5G Standalone Access service description, which states that the Access Seeker is solely responsible for voice service capability, where the Access Seeker has integrated its 5G core with the Access Provider's gNodeB.

9.56 With respect to TM's suggestion that Access Providers should be required to expose standardised APIs such as NEF and NSSF, allowing features like network slicing and MEC to function consistently across network boundaries, MCMC states that NEF and Network NSSF are already explicitly listed at paragraph (c) of the 5G Standalone Access service description. MCMC is considering including an obligation for Access Providers to expose standardised APIs to Access Seekers in the MSA (refer to the PI Paper on Mandatory Standard on Access). MCMC also considers TM's suggestion to strengthen transparency and accountability regime in the PI Paper on Mandatory Standard on Access.

9.57 With respect to U Mobile's suggestion regarding adding references to IMT-2020 to the service descriptions, MCMC clarifies that IMT-2020 is a framework set by the International Telecommunication Union. It is a set of minimum requirements that any technology must meet to be officially called 5G. It includes requirements such as speeds of up to 20Gbps, latency as low as 1ms and 1 million devices per square kilometre. Differently, the 3GPP provides the technical specifications that explain how the goals referred to under IMT-2020 can be achieved. For the purposes of the service descriptions, the relevant standard is 3GPP, not IMT-2020.

9.58 Further, the current service descriptions refer to 3GPP as follows:

(a) **5G Standalone Access:** "3GPP Release 15 and any updates to that standard from time to time"; and

(b) **4G EPC with 5G RAN Access:** "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".

9.59 The reference to "*and any updates to that standard from time to time*" captures all Releases following Release 15. This means that Access Providers are required to provide the key features added under new Releases, for example, Private Networks under Release 16 and Reduced Capability (RedCap) under Release 17, even if the current service descriptions do not explicitly refer to these features. MCMC proposes to amend the service description of both 5G Services to clarify that "*new releases*" are captured by the wording "*any updates to that standard*".

9.60 Finally, MCMC notes that the shift to a dual 5G network model now creates the possibility of the two network providers entering into 5G MOCN arrangements with each other. The service description for 5G Standalone Access envisages the provision of access to Access Seekers on a MOCN basis. Accordingly, this same service could technically also be used in circumstances where one 5G network operator wishes to obtain access to the RAN equipment of the other 5G network operator through a MOCN arrangement. MCMC is interested in obtaining stakeholder views about whether 5G MOCN arrangements between the two 5G network providers should be captured within the scope of 5G Standalone Access and, if so, whether any changes are needed to the service description to enable this.

MCMC Preliminary View

9.61 MCMC's preliminary view is to retain 5G Standalone Access and 4G EPC with 5G RAN Access in the Access List with the amendments set out below. 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 descriptions for 5G Standalone Access and 4G EPC with 5G RAN Access is as follows:

5G Standalone Access

(a) *5G Standalone Access is a Facility and/or Service for access to a 5G New Radio radio network, whether or not as part of a 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, provided that where the Access Seeker has integrated its 5G core with the Access Provider's gNodeB, the Access Seeker is solely responsible for any voice service capability (and for the avoidance of doubt any such voice services may be delivered using the Access Provider's radio network).*

(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) *integration between the Access Provider's gNodeB and the Access Seeker's 5G core (5GC);*

(iii) *Network Slice Selection Function (NSSF and 5G Network Slices as selected by the Access Seeker);*

(iv) *Unified Data Management (UDM);*

(v) *Unified Data Repository (UDR);*

(vi) *Network Exposure Function or (NEF);*

(vii) *Mobile Edge Computing (MEC);*

(viii) *Network Function Virtualisation (NFV);*

(ix) *security-related functions, such as Security Anchor Function (SEAF), ~~and~~ Authentication Server Function (AUSF), Security Edge Protection Proxy (SEPP) and N32 interface;*

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

(xi) *customer billing; and*

(xii) *customer relationship management.*

(d) *The 5G Standalone Service shall be supplied to the Access Seeker in compliance with 3rd Generation Partnership Project ("3GPP") Release 15 and any updates to that standard (including new releases) 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 (or similar services), as selected by the Access Seeker:*

(i) *mobile broadband services;*

(ii) *massive IoT services; and*

(iii) *mission-critical services.*

(e) Despite anything to the contrary in paragraphs (a) to (d), 5G Standalone Access does not include any Facilities or Services within the scope of Access to In-Building Mobile Systems.

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 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, provided that the Access Seeker is solely responsible for any voice service capability (and for the avoidance of doubt any such voice services may be delivered using the Access Provider's radio network).*

(c) *The functionalities of 4G EPC with 5G RAN Access include:*

(i) *integration between the Access Provider's gNodeB and the Access Seeker's 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 (including new releases) from time to time, and with all technical capabilities as may be required to enable the Access Seeker to provide mobile broadband and similar services.*

(e) Despite anything to the contrary in paragraphs (a) to (d), 4G EPC with 5G RAN Access does not include any Facilities or Services within the scope of Access to In-Building Mobile Systems.

Questions

Question 6:	In light of the inherent technical differences between 5G Standalone Access (which allows for the native VoNR via the 5G core) and 4G EPC with 5G RAN Access (which relies on the Access Seeker's 4G core), stakeholders are invited to comment on: (a) whether the service descriptions for 5G Standalone Access and 4G EPC with 5G RAN Access should explicitly distinguish the responsibility for voice capability based on the network architecture used; and (b) the technical and operational feasibility of a "shared responsibility" model for voice services?
Question 7:	Do you consider that the service descriptions of the 5G Services should be amended to reflect that voice service capability is a shared responsibility of the Access Provider and Access Seeker (rather than a responsibility of the Access Seeker only)?
Question 8:	How should "Non-Public Network" functionality introduced in 3GPP Release 16 be captured in the service descriptions of the 5G Services?
Question 9:	Do you consider that Reduced Capability and High-Performance Machine Type capabilities should be explicitly referred to in the service descriptions of the 5G Services? If you are an Access Provider, are you currently providing these capabilities?
Question 10:	Do you agree with specifically referring to SEPP and N32 interface in the examples of Facilities and Services to which Access Seekers may request access under the 5G Standalone Access service?
Question 11:	Do you consider that VoNR and EPS Fallback to LTE/VoLTE should be explicitly referred to within the service descriptions of the 5G Services?
Question 12:	Do you agree that access to in-building 5G mobile systems (both passive and active elements) should be regulated under a new Access to In-Building Mobile Systems service and not under the 5G Services? Please provide reasons.
Question 13:	Should 5G Standalone Access cover 5G MOCN arrangements between the two 5G network providers under the dual network model? If so, are any amendments required to the service description to enable this?
Question 14:	Are there any other changes you consider should be made to the service descriptions of 5G Standalone Access and 4G EPC with 5G RAN Access? Please provide details.

10 Broadcasting Transmission Service

Overview

10.1 Transmission to broadcasting towers refers to transmission services between the play-out facilities of television and radio broadcasters and the broadcasting towers that are used to transmit television and radio signals to end-user premises. 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 or over-the-top content services, which are delivered over satellite networks or HSBB networks.

10.2 Transmission to broadcasting towers is generally supplied by TM through its Broadcast Transmitter Service, which is a specialised form of transmission link.

10.3 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.

10.4 Transmission to television and radio broadcast towers is also not substitutable with other transmission services (e.g. trunk transmission between two exchanges or tail transmission services from an exchange to an end-user premises). Access seekers specifically require transmission services to a television or radio broadcast tower (which are often in remote locations) to broadcast their services, and transmission services to other locations would not achieve this objective.

10.5 As a result, MCMC's preliminary view is that transmission services to DTTB towers and analogue radio broadcast towers must be considered separately from other transmission services from a competition and LTBE perspective.

10.6 MCMC further notes that "Broadcasting Transmission Service" was listed as a separate service in the Commission Determination on Access List No. 1 of 2005. It was integrated into the broader transmission services in 2009 and in the current Access List, it is included within the service descriptions of the Trunk Transmission Service and the End-to-End Transmission Service as follows:

Trunk Transmission Service *(refer to paragraph 12(e), current Access List)*

"(e) The Trunk Transmission Service may be for the carriage of communications which comprise of content applications service."

End-to-End Transmission Service *(refer to paragraph 15(e), current Access List)*

"(e) The End-to-End Transmission Service may be for the carriage of communications which comprise a content applications service."

10.7 MCMC notes that digital television broadcasting from the broadcasting tower downstream (to end-user premises) is delivered wirelessly, using multiplexing equipment and repeaters. Access to multiplexing services is discussed separately, in section 19. This section 10 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.

Submissions Received

10.8 In the informal questionnaire, MCMC asked stakeholders whether they would be supportive of listing Broadcasting Transmission Service as a new service in the Access List.

10.9 Allo, Celcom Timur, Tune Talk and Maxis confirmed they were supportive. Radio Kita was also supportive of listing a new transmission service for radio stations.

10.10 Celcom Timur said listing broadcasting transmission service would ensure there is a regulatory body to monitor the performance of terrestrial broadcasting services. Fibrecomm Network and TIME expressed no preference or view.

10.11 On the other hand, YTLC and TM did not support the listing of a terrestrial broadcasting transmission service as a separate service. While YTLC did not provide reasons for its objection, TM submitted that terrestrial broadcasting transmission services should not be included as a new service in the Access List as it is a fully managed end-to-end solution, which included customised service design based on customer requirements at specific locations, and a comprehensive managed service rather than a standard wholesale transmission link. TM explained that the terrestrial broadcasting service uses purpose-built, dedicated infrastructure tailored to each customer's coverage, frequency, and SLA needs, with costs recovered through recurring charges that also cover operations and maintenance. Further, TM stated that site selection and technology upgrades are customised to customer requirements, with migrations dependent on fulfilling contractual obligations.

MCMC Assessment

Competition/LTBE Analysis

10.12 TM is the only known national supplier of transmission services to digital terrestrial television (**DTT**) broadcast towers. This means the supply of these services by TM exhibits monopolistic characteristics, given:

(a) the significant barriers to entry in the supply of these services, which would require significant investment in infrastructure; and

(b) the limited degree of countervailing buyer power to which TM is subject from free-to-air broadcasters.

10.13 MCMC considers that the level of competitive constraints on Access Providers in the supply of these services remain very low.

10.14 There is also a lack of substitutability as retail broadcasters cannot switch to standard HSBB or satellite for tower backhaul due to the specific synchronisation (**SFN**) and MPEG-TS requirements of terrestrial broadcasting.

10.15 Accordingly, MCMC's preliminary view is that broadcasting transmission services constitute a bottleneck and it remains in the LTBE to maintain such services on the Access List.

Listing broadcasting transmission as a separate service

10.16 As mentioned above, broadcasting transmission services are already regulated under the Access List, under the Trunk Transmission Service and End-to-End Transmission Service.

10.17 Most stakeholders have expressed their support or listing broadcasting transmission as a new separate service (which would necessarily entail removing it

from the scope of the Trunk Transmission Service and End-to-End Transmission Service).

10.18 The two stakeholders that objected, YTLC and TM, did not provide reasons specifically why broadcasting transmission services should be kept within the scope of the existing transmission services on the Access List, rather than being listed as a new service.

10.19 MCMC's preliminary view is that it would be beneficial to list broadcasting transmission services separately on the Access List, for two reasons.

10.20 First, MCMC understands (including from follow-up meetings with licensees) that broadcasting transmission services are supplied with a range of ancillary services. These include network operations centre (**NOC**) services and equipment maintenance services. These ancillary services are specific to broadcasting transmission services and are not currently included in the description of the Trunk Transmission Service and End-to-End Transmission Service. Adding a new Broadcasting Transmission Service to the Access List would allow these ancillary services to be included within the service description without affecting other transmission services. It would also ensure that the scope of the regulated broadcasting transmission service reflects the actual scope of the service as supplied in practice (which include transmission to broadcast towers, plus ancillary services).

10.21 As set out in the proposed service description below, MCMC proposes that these ancillary services apply on a modular basis – i.e. under the scope of the proposed Broadcasting Transmission Service, Access Seekers could either acquire "bare" transmission (without any ancillary services), or could acquire transmission in combination with one or more ancillary services. This modularity would ensure that ancillary services clearly fall within the regulated scope of the service (if Access Seekers wish to acquire them), while not compelling Access Seekers to acquire ancillary services under the regulated scope of the service.

10.22 Second, broadcasting transmissions services have very specific supply and demand characteristics compared to other transmission services. They are supplied over specific routes to a specific type of end-point (broadcast towers), are acquired by a specific group of customers (broadcasters and MYTV) and currently use specific Synchronous Digital Hierarchy (**SDH**)-based technology. This makes them distinct to other transmission services. Having broadcast transmission services listed separately on the Access List would allow MCMC to more readily apply different regulated terms of access to such services in the future, via the MSA or MSAP, to reflect the different technical and economic characteristics of broadcasting transmission services.

Customised nature of broadcasting transmission services

10.23 In objecting to the listing of broadcasting transmission services as a new Access List service, TM contended that these services are "fully managed end-to-end solutions" and "customised" for specific customer needs rather than standard wholesale transmission links.

10.24 MCMC understands TM's submission on this point as expressing a general objection to the regulation of broadcasting transmission services via the Access List (rather than a more specific objection to listing broadcasting transmission as a separate service, distinct from the other transmission services).

10.25 MCMC considers that the managed or customised nature of a service does not preclude it from being listed as a regulated service. Most wholesale services, including the regulated transmission services, involve a degree of end-to-end management and technical oversight. Customisation does not diminish the bottleneck nature of the underlying infrastructure required to deliver these services.

10.26 Furthermore, MCMC considers that the Broadcasting Transmission Service is not a fundamentally new regulatory concept. While MCMC proposes to update the specific functionalities and technical parameters, and include the provision of ancillary services, broadcasting transmission services have a long history of regulation via the Access List (including through inclusion in the Trunk Transmission Service and End-to-End Transmission Service).

MCMC Preliminary View

10.27 MCMC's preliminary view is that, for the reasons set out above, a new Broadcasting Transmission Service should be listed on the Access List. MCMC proposes the following service description:

Broadcasting Transmission Service

(a) The Broadcasting Transmission Service is a Facility and/or Service for the carriage of communications, which comprise a content applications service, between any two technically feasible network transmission points 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, synchronous digital hierarchy ("SDH"), or any other applicable technology which is currently available, or which may be developed in future.

(c) The functionalities of the Broadcasting Transmission Service include:

(i) transmission and any type of routing or switching, whether packet, circuit, multi-layer or otherwise;

(ii) the signalling and synchronisation required to support the technology or to provide a service;

(iii) termination at either end by a port, router, network termination unit, switch or earth station; and

(iv) a digital protocol including Internet Protocols and MPEG-TS.

(d) The Broadcasting Transmission Service includes any Broadcasting 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 <20ms;

(iii) any jitter of <10ms;

(iv) zero or more routes of redundancy; and

(v) any other technical parameters specified or utilised by the Access Provider from time to time, including parameters of a type referred to in subparagraphs (i) to (iv) above.

(e) An Access Seeker requesting access to the Broadcasting Transmission Service may, at its discretion, also request the Access Provider to provide any one or all of the following ancillary services, which the Access Provider shall provide:

(i) broadcasting network operations centre services;

(ii) operation and maintenance services (including repair and replacement) in respect of Access Seeker equipment used in connection with the service described in paragraph (a); and

(iii) any other service ancillary to the service described in paragraph (a), as may be agreed between the Access Provider and the Access Seeker.

10.28 The scope of the proposed Broadcasting Transmission Service is illustrated in the diagram below:

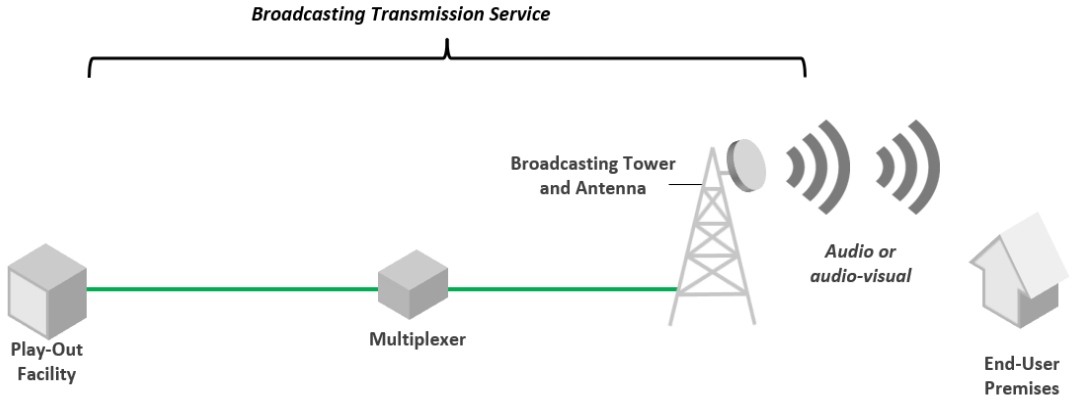


Figure 5 – Scope of proposed Broadcasting Transmission Service

10.29 MCMC also proposes deletion of paragraph (e) from the service descriptions for the Trunk Transmission Service and End-to-End Transmission Service (see proposed amended definitions at paragraph 15.68). This is to ensure removal of references to broadcasting transmission services from the scope of the Trunk Transmission Service and End-to-End Transmission Service.

Questions

Question 15:	Do you acquire broadcasting transmission services as an Access Seeker or supply broadcasting transmission services as an Access Provider? If so, do you currently acquire or supply these services commercially or using the broadcasting transmission component of the Trunk Transmission Service or End-to-End Transmission Service?
Question 16:	Are you experiencing any difficulties in acquiring or supplying broadcasting transmission services?
Question 17:	Do you agree that broadcasting transmission services should be listed under a new Broadcasting Transmission Service, rather than being a component of the Trunk Transmission Service and End-to-End Transmission Service? Please provide reasons.
Question 18:	Do you have any comments on the proposed new service description for the Broadcasting Transmission Service, including the functionalities and technical parameters?

11 Infrastructure Sharing

Service Description

11.1 The Infrastructure Sharing service is currently described in the Access List as follows:[6]

(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 (including rooftop 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 in, along, or in close proximity to:

(A) a street;

(B) a road;

(C) a path;

(D) a railway corridor;

[6] MCMC, Commission Determination on Access List, Determination No.6 of 2021.

(E) a park; or

(F) such other outdoor area that may be accessed by members of the public,

including but not limited to billboards, public transit shelters, poles, traffic light poles, bridges, and road gantries.

(c) Physical access includes power (including right-of-way for power installation by the Access Seeker), 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.

Overview

Access to towers and rooftop space

11.2 Mobile network operators require towers and rooftop space to install active equipment that forms part of their radio access network (i.e. enables wireless transmission of traffic to mobile end-user devices).

11.3 Towers and rooftop space are used for installing base station equipment in connection with macrocells, which allow network coverage over a wide area. The suitability of towers and rooftop space for infrastructure colocation 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.

11.4 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.

Access to poles and street furniture

11.5 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). 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.

11.6 With the rollout of 5G networks, which demands the installation of network equipment that is denser and closer to end-user devices, poles and street furniture remain important.

11.7 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 MCMC's understanding of the coverage area of microcell equipment.

Access to common in-building mobile systems in each building

11.8 Common in-building mobile systems refer to dedicated in-building equipment which is used to achieve or improve mobile signal coverage for end-users within a building. In-building mobile systems typically consist of a central equipment room within the building which houses the following passive and 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;

(c) a multi-band distributed antenna system, which distributes the radio signal throughout the building; and

(d) other equipment such as master units, remote units, bi-directional amplifiers and small cells.

11.9 Access to in-building mobile systems 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;

(c) access to a multi-band distributed antenna system, which distributes the mobile signal throughout the building; and

(d) access to other active elements, such as master units, remote units, bi-directional amplifiers and small cells, which are used to amplify, filter and convert radio frequency signals for distribution.

11.10 Access to in-building mobile systems 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) in-building mobile systems involve 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.

11.11 Accordingly, access to external infrastructure such as towers and mastheads is not a viable substitute for access to in-building mobile systems for mobile network operators that seek to achieve a high level of in-building mobile coverage.

11.12 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 on a building-by-building basis.

Submissions Received

Acquiring Infrastructure Sharing services

11.13 CelcomDigi, Celcom Timur, DNB, Maxis, OCK, Pr1ma, TIME, TM, Tune Talk, U Mobile and YTLC all acquire the Infrastructure Sharing service. The operators acquire access to a range of network facilities including towers, poles, rooftop space, monopoles, smart poles, Common Antenna Systems, in-building antenna systems, equipment rooms (Main Distribution Frame, Intermediate Distribution Frame, Broadband Node rooms, telco risers), fibre manholes and handholes for connection, water tanks and billboards.

11.14 Fibrecomm Network, Tune Talk and SACOFA do not acquire the Infrastructure Sharing service. Celcom Timur submitted that it acquires only minimal Infrastructure Sharing services as it builds its own infrastructure.

11.15 Edotco noted that, as an Access Provider, it is of the view that its services are delivered in accordance with the commercial terms agreed between Edotco and its customers.

Usability and functionality of the Infrastructure Sharing service

11.16 CelcomDigi, Celcom Timur, DNB, OCK, Pr1ma, REDtone, TIME, U Mobile and YTLC agree that the Infrastructure Sharing service is usable as an input into the services supplied to customers with the following added context: the service is essential for avoiding duplication of infrastructure and accelerating nationwide 5G coverage; it allows optimisation of costs by leveraging existing assets rather than building new structures; and it is critical for mobile network deployment for operators, backhaul and transmission links, indoor coverage (DAS/DIS/IBS) and FTTH and GPON open-access projects.

11.17 Maxis and TM agreed that the service is generally usable but noted the following constraints:

(a) **Maxis:** certain Access Providers find it difficult to sustain their operational costs causing interrupted provision of services (e.g. non-payment to utilities, landlord, local councils). This has impacted Maxis' delivery of services to its end users. Certain exclusive Access Providers are unable to deliver new sites in certain states to the Access Seeker. There are also issues of IBC designs failing to meet the Mandatory Standard on Quality of Service and refusal by

Access Providers to improve and rectify the issues (e.g. in relation to coverage within IOI Mall, MRT2 and LRT line 2). The key challenges include the refusal by some Access Providers to improve operational inefficiencies (e.g. SLAs) and Access Providers attempting to impose additional charges not set out in agreements and deliberately preventing access when the uncontracted fees are refused;

(b) **TM:** faces significant constraints because the system that exists on paper does not translate into real, workable access on the ground even though indoor systems, street-level infrastructure and tower sharing are essential. It notes that the service is usable in principle as follows:

(i) indoor systems (CAS/DAS/IBS) are essential for high-quality 4G/5G user experience in mission-critical, high-footfall environments like hospitals, universities, transport hubs, stadiums and government buildings;

(ii) street-level infrastructure such as microcells, smart poles, and lamp posts is vital for network densification under the Dual Network model; and

(iii) tower infrastructure sharing enables TM to accelerate rollout at lower cost and supports the Government's indoor-first strategy for 5G.

11.18 CelcomDigi, Celcom Timur, REDtone, TIME, Tune Talk and U Mobile believe that the Infrastructure Sharing service generally provides the functionality needed to build services for their customers.

11.19 Other operators such as Maxis, OCK, Pr1ma, TM, YTLC and an operator noted the following functional limitations of the Infrastructure Sharing service:

(a) **Maxis:** functional limitations arise from how Infrastructure Sharing is defined and applied in practice, with Access Providers imposing additional charges or restrictive conditions even when deployments remain within the allocated physical footprint (including government-driven MOCN projects where multipliers are insisted upon), creating artificial constraints;

(b) **OCK:** limited space availability on rooftops, risers and equipment rooms restrict multi-operator installations and neutral host solutions and lack of standardisation in power, earthing and structural requirements increases deployment cost and delays rollout;

(c) **Pr1ma:** dependency on Access Providers' installation timelines, restricted upgrade flexibility and limited control over space availability;

(d) **TM:** the service is only partially adequate because, while it references rooftop space and CAS/DAS systems, it does not explicitly require neutral host, multi-operator indoor systems for 4G/5G or uniform, nationwide permitting standards. As a result, TM faces selective access, inconsistent facility readiness, long activation delays and uncertainty around upgrades or multi-operator use. TM notes this weakens its ability to use the service effectively, especially under Malaysia's dual network model, where indoor-

first deployment in key public areas is critical. In practice, TM struggles to deliver on national expectations due to inconsistent rules, opaque fees and resistance from building owners, making infrastructure sharing usable only on paper without enforceable, nationwide regulations;

(e) **YTLC:** practical limitations such as delays in electricity supply (from Tenaga Nasional Berhad) result in delays to site energisation and coordination challenges with utility and land authorities (i.e. where Access Provider's rights do not extend to Access Seekers) affect deployment. YTLC suggests refining ancillary service obligations to include utilities, physical access, rights-of-way for backhaul/fibre and ensuring structures remain licensed under local authority by-laws; and

(f) An operator submitted that the current definition of Infrastructure Sharing covers only passive network elements, while the evolution of CAS includes active elements (e.g. active DAS and DIS) that do not seem to be captured and therefore require clarification.

Impediments in gaining access to or supplying Infrastructure Sharing Services

11.20 Allo is the only operator which submitted it does not face any impediments. All other operators faced some form of impediment as discussed below:

(a) **CelcomDigi:** exclusivity to build in certain areas is a key impediment, which restricts the deployment of infrastructure, limits network expansion and reduces service redundancy in high-demand or strategic locations. CelcomDigi suggests MCMC review such exclusivity arrangements to ensure fair access, support network growth and support competitive provision;

(b) **Celcom Timur:** as an Access Provider, it faces constraints in granting access to poles due to current height limitations and limited available space already utilised for its own fibre. It also faces challenges in managing access and safety governance for Access Seekers. As an Access Seeker, it experiences difficulties in coordinating with infrastructure owners such as SESB where shared access to poles is not clearly regulated;

(c) **Edotco:** as deployment of infrastructure is dependent on site acquisition, permit applications and approvals, it notes that delivery timeframes must accommodate these risks and compliance requirements. There are also land-access complexities where government-owned land has different requirements and added complexity compared to individually-owned land, and Edotco requests that MCMC take these distinctions into account when determining delivery timeframes for Infrastructure Sharing;

(d) **GTP Network**:

(i) bureaucratic inconsistencies in local authority requirements with excessively complex approval processes, prohibitive permit fees, and cumbersome in-building infrastructure processes in government facilities that can cause deployment delays of up to one year;

(ii) stakeholder interference where non-technical objections from neighbours or political figures and exclusivity rights on State or Federal lands delay approvals;

(iii) public resistance driven by unfounded EMF radiation concerns that stunts rollout and requires stronger MCMC advocacy to educate the public; and

(iv) outdated technical guidelines such as 10–20 metre setback requirements that are incompatible with 5G densification. Telecommunications infrastructure should be accorded "essential utility" status like electricity and water to allow for waived or reduced buffers in dense urban environments to ensure coverage;

(e) **Maxis:** the widespread practice of granting exclusivity rights to a single Access Provider by state authorities or private building owners create a *de facto* monopoly and forecloses the market, which impedes both the supply of the service by creating insurmountable barriers for other or new Access Providers, and access to the service by eliminating choice for Access Seekers and locking them into a single provider regardless of performance or quality;

(f) **OCK:** as an Access Seeker, it faces exclusive site-control by certain operators or building owners that prevents entry, insufficient technical documentation such as as-built drawings and load certificates and space constraints in equipment rooms or risers. As an Access Provider, it encounters delays in obtaining local authority approvals for new towers or rooftop strengthening, rights-of-way challenges especially for fibre additions, and limited room in older ducts or risers that affects multi-tenant sharing;

(g) **PDC and PPIT:** many impediments exist beyond the scope of access regulations, including lengthy or costly permit and licence processes from local authorities, inconsistent or overly complex requirements and the need for approvals from unrelated parties. Even on government or federal land, approvals can be slow and exclusivity arrangements further complicate access. High rental costs and increased public complaints also hinder roll-outs, while current buffer 10 or 20-meter buffer guidelines for telecom structures are outdated for 5G needs and should be revised. Restrictions in heritage and high-impact zones, such as UNESCO areas, add further complications. Standard guidelines and fees across all local authorities would help ensure consistency and reduce these barriers;

(h) **Pr1ma:** prolonged coordination and approval processes, particularly for technical assessments and site readiness checks;

(i) **SACOFA:** as an Access Provider, access to its own facilities may be impeded by easement rights or right-of-way requirements when there is a need to traverse over other owners' land;

(j) **TIME:** it is unable to obtain access to poles owned by TM and Allo does not provide access to poles used in its fibre deployment on the basis that these poles belong to TNB, which leaves TIME unable to utilise these aerial infrastructure assets for network rollout or service delivery;

(k) **TM**:

(i) non-uniform permit processes and unpredictable approval pathways across states, councils and One-Stop Agencies with different forms, requirements, interpretations and timelines that lead to weeks-to-months delays and a lack of digital access to infrastructure records such as available height to share;

(ii) opaque, inconsistent and sometimes excessive fee structures including widely varying EMF test fees that create financial unpredictability and disproportionately burden Access Seekers; and

(iii) building-owner and Joint Management Body refusals that prevent indoor access despite CAS/DAS/IBS being part of the listed service, even in high-usage public facilities such as hospitals, universities, shopping complexes, government buildings, stadiums and transport hubs,

all of which undermines its ability to deliver uniform nationwide coverage, strengthen the indoor 4G/5G experience, densify networks efficiently and meet public expectations for fast, reliable connectivity;

(l) **U Mobile:** exclusivity sites owned by Bestarinet, particularly where local school grounds in many rural areas are the only viable locations for a tower, have locked other telcos out of school grounds and prevented the expansion of coverage without building expensive, duplicate towers nearby;

(m) **YTLC:** limited availability of IBS capacity from Access Providers, requirements to undertake interference or additional technical testing even where there are no apparent capacity constraints or interference risks and arrangements that require all existing parties to agree to the inclusion of a new party with cases where one or more parties have refused approval, which introduces additional procedural complexity and delays that make timely access to IBS infrastructure more challenging; and

(n) An operator commented that common impediments faced by the industry include lengthy approval processes, limited availability of suitable sites in high-demand areas, exclusivity agreements between site owners and other operators as well as high site rental costs.

Proposed changes to the service description and scope of service

11.21 CelcomDigi, GTP Network, Maxis, OCK, PDC and PPIT, Pr1ma, REDtone, TM, YTLC and an operator suggested the following amendments to the description of Infrastructure Sharing:

(a) **CelcomDigi:** it would be helpful to clarify that any equipment owned or operated by the Access Seeker (for example in MOCN deployments) should be excluded from the service description;

(b) **GTP Network:** expand definition of 'Tower' to all vertical assets (including street furniture, smart poles, rooftop tower and micro-structures essential for 5G), introduce a regulatory parity mechanism so that Network Facilities

Provider licensees are not disadvantaged against non-licensee infrastructure owners (e.g. local authorities) and list active and passive IBC DAS components separately as other licensees have requested for the two components to be distinctly reflected;

(c) **Maxis:** amend the definition and scope of Infrastructure Sharing so that it reaffirms that focus is only on the allocation and use of physical space and equipment regardless of the technology, Access Providers should not impose extra or different charges if deployment stays within agreed limits and Access Seekers should be allowed to deploy any equipment, passive or active as long as it fits within the allocated space;

(d) **OCK:** include mandatory transparency of available space, including up-to-date rooftop loading capacity, available rack space and fibre entry points/riser availability;

(e) **PDC and PPIT:** define 'tower' in the Access List to include all relevant facilities (including future ones) and only licensees should be allowed to own and/or operate towers and other network facilities used by Access Seekers;

(f) **Pr1ma:** clearer definitions of permissible equipment and power requirements to support newer technologies and higher-capacity solutions, more detailed service levels for site access/fault restoration/maintenance coordination and flexibility in co-location arrangements to support future network expansion, including 5G-ready and fibre-dense deployments;

(g) **REDtone:** suggests considering different variations of the service that allow for limited footprint sharing (for example, a point-to-point dish);

(h) **TM:** only poles meeting the MTSFB Technical Code be offered under the pole sharing offering and that the Infrastructure Sharing service explicitly include neutral-host indoor obligations for 4G/5G, enumerate low-impact minor infrastructure and smart street furniture and bind council/One Stop Agency permitting to GPP-I 2022 with published fee schedules and SLA shot clocks, with approvals granted upon demonstrated compliance with MTSFB codes;

(i) **YTLC:** refining the service description to reflect multi-operator and neutral host infrastructure (such as IBS and shared sites), clarifying non-exclusivity, scalability to support additional operators and the right to timely physical access for installation, maintenance and rectification; and

(j) An operator submitted that the definition of Infrastructure Sharing only covers passive network elements at present. It should be reviewed and expanded to cover active elements in Common Antenna Systems (e.g. active DAS and Digital In-Building Solutions) to facilitate 5G in-building infrastructure sharing.

11.22 Celcom Timur, Edotco, GTP Network, Maxis, OCK, PDC and PPIT, Pr1ma, REDtone and TM suggested expanding the scope of Infrastructure Sharing service as follows:

(a) **Celcom Timur:** expand the scope beyond the telecommunications industry, for example to cover SESB or local council infrastructure;

(b) **Edotco:** inclusion of "RAN sharing/neutral-host RAN services", adding a description such as RAN sharing (passive or active)/neutral-host RAN/multi-operator RAN (MORAN/MOCN) and where spectrum pooling or sharing of active infrastructure is involved, ensure the description captures both "passive infrastructure sharing" and "active RAN sharing with separate core networks (MOCN) or shared RAN with dedicated spectrum per operator (MORAN)";

(c) **GTP Network:** expand scope to include micro-structures essential for small cell transmitters (e.g. building façades, billboards, street furniture) and repeaters for small IBC solutions. GTP Network also noted the legal challenge that many of these assets are owned by non-licensees outside CMA jurisdiction;

(d) **Maxis:** expand the scope so that:

(i) Access Providers cannot impose different terms, conditions or charges based on the technology and the right to access is determined by the physical space entitlements;

(ii) it reaffirms the principle of technological neutrality; and

(iii) the service includes access to indoor facilities, rights-of-way for fibre installation and access to various types of infrastructure (e.g. riser, equipment rooms and cabins);

(e) **OCK:** expand the scope to include smart poles/multi-utility poles, building fibre risers/common telecom rooms and FTTH infrastructure for open-access GPON/ODN;

(f) **PDC and PPIT:** with 5G small cells, infrastructure such as rooftops, building façades, utility/decoration poles, billboards and street furniture should be included in the description. It is noted that there is an ownership/enforcement challenge with respect to capturing owners of this infrastructure under the CMA;

(g) **Pr1ma:** expand the scope (within permitted limits) to include additional types of infrastructure that are increasingly important for modern broadband and fixed wireless deployments;

(h) **REDtone:** the scope should include IBSs and IBC; and

(i) **TM:** expand the scope to explicitly cover smart street-furniture small cells, the seven nationally prioritised indoor environments and new categories of minor infrastructure (including rooftop microcells, corridor poles in universities and hospitals, neutral-host systems in government buildings and Portable Base Transceiver Stations).

Removal of Infrastructure Sharing from the Access List

11.23 Edotco, GTP Network, PDC and PPIT supported removing Infrastructure Sharing from the Access List for the following reasons:

(a) **Edotco:** while it has no issue retaining Infrastructure Sharing on the Access List it notes that:

(i) the market for passive infrastructure has matured and become competitive with independent TowerCos, SBCs and other players offering multiple options;

(ii) TowerCos are commercially incentivised to maximise tenancy ratios therefore market forces naturally drive TowerCos to offer competitive access terms; and

(iii) strict adherence to the Reference Access Offer can sometimes hinder flexible commercial arrangements; and

(b) **GTP Network**, **PDC and PPIT**:

(i) the provision of Infrastructure Sharing Services involves various parties who are not all CMA licensees and that a standalone tower without telecommunications equipment can be owned by any party, with the requirement to be a CMA licensee arising only when telecommunications equipment is installed; and

(ii) towers vary significantly and the ongoing 5G roll-out utilising street furniture relies on assets mostly owned by non-licensee local councils.

MCMC Assessment

LTBE analysis – access to towers and rooftop space

11.24 MCMC considers that the state of competition in the supply of access to towers, mastheads and rooftop space has become more complex since the last Access List review given the prevalence of SBCs in the provision of tower access in some states. Further, in some states in which 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**).

11.25 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.

11.26 Accordingly, 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.

LTBE analysis – access to poles and street furniture

11.27 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 MCMC to assess the conditions of competition in the supply of services in each local area.

11.28 However, 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.

LTBE analysis – access to common in-building mobile systems

11.29 Access to in-building mobile systems is critical to allowing MNOs to have in-building mobile coverage, which in turn is an essential input into the provision of retail mobile services. As established in section 5, in-building mobile coverage is an increasingly critical component of mobile networks, as the intensity of data usage from inside buildings increases and outdoor 5G infrastructure has lower propagation capabilities compared to previous generations of mobile technology.

11.30 MCMC notes that, while it is possible for an MNO to gain access to a building by constructing its own in-building mobile systems, this is likely to be significantly more expensive than obtaining shared access to in-building mobile systems, including the active elements. There may also be space constraints in some buildings as well as potential interference with existing in-building mobile systems, further limiting an operator's ability to construct its own in-building mobile systems.

11.31 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.

11.32 Accordingly, MCMC considers that it in the LTBE to regulate access to in-building mobile systems via the Access List.

Addressing impediments faced in obtaining and supplying Infrastructure Sharing

11.33 Stakeholders have reported various impediments, such as:

(a) difficulties in obtaining regulatory approvals, including lengthy processing times, high costs and inconsistent or overly complex requirements;

(b) complexities in accessing land owned by private individuals as well as the Government, including slow approvals and exclusivity arrangements;

(c) challenges arising from public perception and rights of third parties not subject to the access regulations, such as rollout difficulties caused by unfounded public health concerns regarding EMF radiation; objections from neighbours, political figures or unrelated third parties that delays approvals;

and difficulties in traversing private land or coordinating with non-CMA infrastructure owners like SESB or TNB; and

(d) building restrictions in heritage and high-impact zones such as UNESCO areas.

11.34 MCMC is concerned about the impediments faced by the operators and has taken into account these submissions. However, MCMC notes that these issues do not fall within the scope of the current inquiry as they do not relate to the scope or description of the regulated Infrastructure Sharing service. Further, MCMC does not have any jurisdiction in relation to state and local laws and regulations under which approvals are sought for the construction and installation of tower infrastructure. MCMC will consider issues relating to the MSA in the PI Paper on Mandatory Standard on Access.

11.35 With respect to a lack of available space on poles as reported by Celcom Timur (as an Access Provider), or space constraints in equipment rooms or risers as reported by OCK (as an Access Seeker), MCMC notes that an Access Provider can refuse access on the ground that it has insufficient capacity or space to provide the requested Facilities and/or Services (refer subsection 5.4.11 of the MSA). Access is granted on a first-come, first-serve basis. In instances where physical space has been exhausted by existing occupants (including the Access Provider's own requirements), MCMC cannot mandate the creation of additional capacity or the displacement of current tenants.

11.36 Many operators have also raised concerns about exclusivity arrangements between state authorities or private building owners and an Access Provider, which affects both supply of service by creation of insurmountable barriers for other or new Access Providers, and eliminates choice for Access Seekers by locking them into a single provider. MCMC does not have control over such exclusive arrangements but notes that any Access Provider who enters into such exclusive arrangements is required to provide access to Access Seekers, and such access must be on reasonable and non-discriminatory terms.

11.37 Operators such as GTP Network, TM have expressed concerns in relation to access to infrastructure owned by non-licensees. It is beyond the scope of the Access List to regulate the activities of non-licensees, such as local councils, since the standard access obligations in section 149 of the CMA only apply to licensees.

11.38 As to PDC and PPIT's suggestion that ownership and/or operation of towers and other network facilities should be limited to licensees only, MCMC reiterates that it does not have jurisdiction under the CMA to restrict ownership of such passive facilities to licensees only. The same explanation applies in response to Celcom Timur's suggestion to expand the scope of the licensing framework beyond the telecommunications industry to cover SESB and local councils. The focus of this Access List review is on determining which services and facilities should be listed on the Access List, rather than on reforming the licensing framework.

Listing of new Access to In-Building Mobile Systems service

11.39 Several operators (GTP Network, TM and another operator) have recommended either listing active and passive in-building mobile system components separately

or expanding the scope of Infrastructure Sharing to include active elements in Common Antenna Systems, such as active DAS and Digital In-Building Solutions to facilitate 5G in-building infrastructure sharing.

11.40 MCMC has considered these submissions, including those made by operators at meetings, and proposes to carve out paragraph (a)(ii) of the Infrastructure Sharing service, that is, *"provision of access to in-building Common Antenna Systems and physical access to central equipment room",* and include it as part of a proposed new service, Access to In-Building Mobile Systems.

11.41 As part of this new service, MCMC proposes to expand the provision of access to in-building CAS to also include access to active elements such as base transceiver stations (**BTS**), active multi-band DAS and any other active elements typically required in the provision of mobile IBS services. Therefore, the proposed service will cover both passive and active elements of IBS across both 4G and 5G network technologies.

11.42 Further, as mentioned at paragraph 9.45, MCMC intends the proposed service to be used by Access Seekers when acquiring access to 4G and 5G IBS rather than using 5G Standalone Access or 4G EPC with 5G RAN Access. MCMC has proposed amendments to the service descriptions of 5G Standalone Access and 4G EPC with 5G RAN Access to clarify this, as set out in paragraph 9.61.

Poles for fixed deployments, ducts and manholes

11.43 For the reasons described in paragraphs 17.38 to 17.41, MCMC proposes to expand the service description of Duct and Manhole Access to also cover poles used for fixed network deployments. Such poles are currently included within the scope of Infrastructure Sharing. To avoid overlap between this proposed amended service and the Infrastructure Sharing service, MCMC proposes to add language within the description of Infrastructure Sharing to clarify that poles, ducts and manholes which are included within the scope of the proposed expanded Pole, Duct and Manhole Access service are excluded from the scope of Infrastructure Sharing.

11.44 An additional benefit of this proposed amendment is to remove any ambiguity about whether ducts and manholes are covered under Infrastructure Sharing. This ambiguity may arise due to the inclusive language used at paragraph (b)(ii) of the service description of Infrastructure Sharing service, which refers to *"any other facility that supports, or has the capability to support, the installation of mobile or fixed network equipment in, along, or in close proximity to: … <u>including but not limited to</u> billboards, public transit shelters, poles, traffic light poles, bridges, and road gantries."*

11.45 This arguably captures ducts and manholes, since such facilities support the installation of fixed network equipment, even though access to these facilities is intended to be covered by the existing Duct and Manhole Access service (and the proposed Pole, Duct and Manhole Access service).

Adjustments to service description

11.46 A large number of operators have suggested other amendments to the service description and the scope of Infrastructure Sharing.

11.47 In response to CelcomDigi's suggestion to clarify that any equipment owned or operated by the Access Seeker is excluded from the service description of Infrastructure Sharing, MCMC is of the view that the description is unambiguous in that respect.

11.48 Further, MCMC does not agree with expanding the definition of "tower" (as suggested by GTP Network, PDC and PPIT) to include street furniture, smart poles, rooftop tower and micro-structures. Most of these facilities are already listed in the description of Infrastructure Sharing at paragraph (b)(ii), which itself is inclusive enough to capture other facilities not explicitly mentioned in the service description. MCMC, therefore, does not see the relevance of amending the definition of tower to list these facilities again.

11.49 MCMC agrees with Maxis' comment that Access Seekers should be allowed to deploy any equipment, passive or active, as long as it fits within the allocated space. However, it maintains that the service description already clearly reflects this position so an amendment in this regard is not required.

11.50 OCK's request for transparency of available space, rooftop loading capacity, available rack space and fibre entry points is more appropriately addressed as part of the parallel review of MSA.

11.51 Several operators have suggested expansion of the scope of Infrastructure Sharing to include micro-structures essential for small cell transmitters, rooftop microcells, smart poles, corridor poles in universities and hospitals, neutral host systems in government buildings, Portable Base Transceiver Stations, building fibre risers, billboards and street furniture generally (including smart street-furniture). MCMC notes that some of these facilities are already explicitly included in the current service description for Infrastructure Sharing. Moreover, MCMC clarifies that the list of facilities and services in paragraph (b) of the service description is a non-exhaustive list. The description covers all facilities that support, or have the capability to support, the installation of mobile or fixed network equipment, as long as they are along or in close proximity to one of the locations identified in sub-paragraphs (b)(ii)(A)-(b)(ii)(F). Nevertheless, for clarity, MCMC proposes minor amendments to the service description to include a reference to "*street furniture*".

Removal of Infrastructure Sharing

11.52 With respect to Edotco, GTP Network, PDC and PPIT's submissions calling for the removal of the Infrastructure Sharing service from the Access List, MCMC is of the view that Infrastructure Sharing must remain a regulated service on the Access List to ensure equitable access and to support the national transition to a dual 5G network model.

11.53 While MCMC acknowledges Edotco's point regarding maturation of the TowerCo market, MCMC maintains that passive infrastructure remains a bottleneck facility. MCMC notes that, while TowerCos are commercially incentivised to maximise tenancy, the RAO provides a necessary baseline for transparent and non-discriminatory terms. MCMC is of the view that the RAO does not preclude flexible commercial arrangements but acts as a safeguard against market foreclosure for smaller or new entrants.

11.54 In response to GTP Network, PDC and PPIT, MCMC recognises that much of the "street furniture" required for 5G is owned by non-licensee local councils. However, by retaining Infrastructure Sharing service on the Access List, MCMC can continue to standardise the technical and commercial expectations for CMA licensees who manage or sublease these assets.

11.55 MCMC reiterates that mandatory infrastructure sharing is essential to minimise continuous excavation works and visual pollution. Consolidation of equipment onto shared assets reduces the unnecessary duplication of towers and other facilities, resulting in economically efficient use of infrastructure, which is ultimately in the LTBE.

MCMC Preliminary View

11.56 MCMC's preliminary view is that the description of Infrastructure Sharing service should be amended to:

(a) delete paragraph (a)(ii) to remove Common Antenna Systems and related language and move it to the service description for the proposed new service, Access to In-Building Mobile Systems;

(b) exclude facilities and services covered as part of the new Access to In-Building Mobile Systems service from the scope of Infrastructure Sharing, to prevent overlap;

(c) exclude poles, ducts and manholes which are covered under the proposed amended service of Pole, Duct and Manhole Access; and

(d) include a reference to "street furniture" for clarity.

11.57 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:

(9~~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 (including rooftop 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 in, along, or in close proximity to:

(A) a street;

(B) a road;

(C) *a path;*

(D) *a railway corridor;*

(E) *a park; or*

(F) *such other outdoor area that may be accessed by members of the public,*

including but not limited to street furniture (such as billboards, public transit shelters, poles, and traffic light poles), bridges, and road gantries.

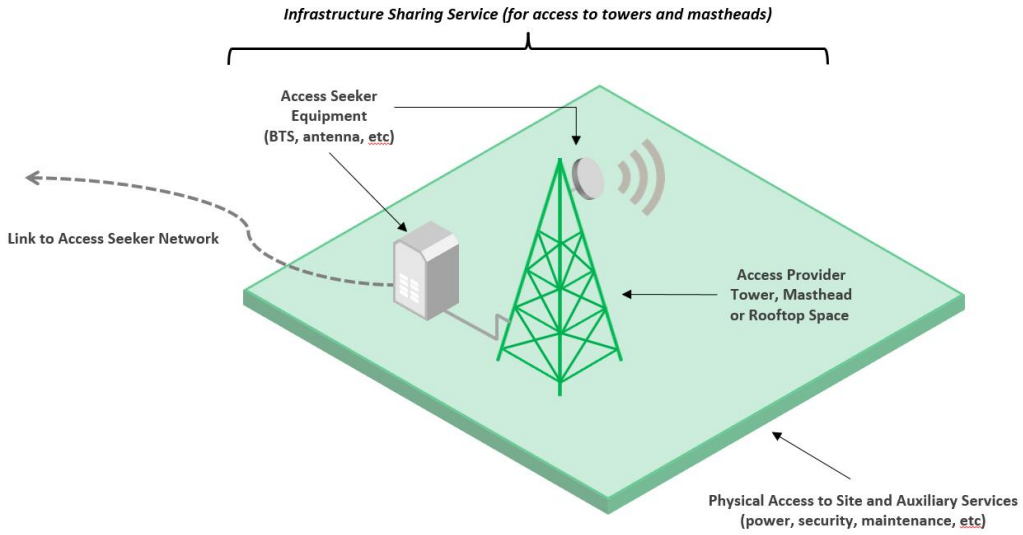
(c) *Physical access includes power (including right-of-way for power installation by the Access Seeker), environmental services (such as heat, light, ventilation and air-conditioning), security, site maintenance and access for the personnel of the Access Seeker.*

(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.*

(e) Facilities and/or Services that fall within the scope of Access to In-Building Mobile Systems are excluded from the scope of Infrastructure Sharing.

(f) Poles, ducts and manholes that fall within the scope of Pole, Duct and Manhole Access are excluded from the scope of Infrastructure Sharing.

11.58 The scope of the proposed amended Infrastructure Sharing service is illustrated in the diagrams below:



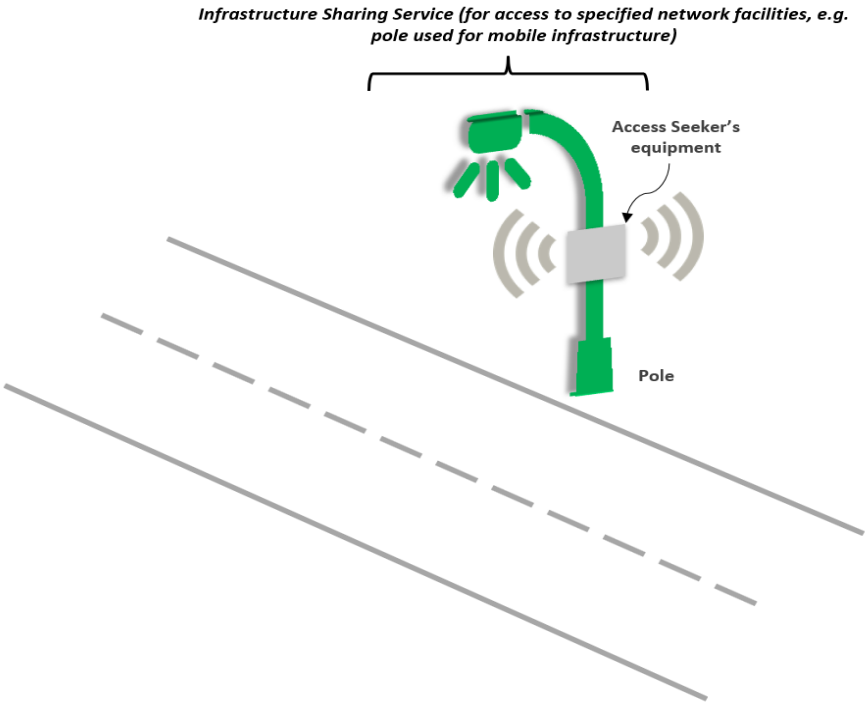


Figure 6 – Scope of proposed amended Infrastructure Sharing

11.59 MCMC also proposes adding a new service, Access to In-Building Mobile Systems, with the following service description:

Access to In-Building Mobile Systems

(a) Access to In-Building Mobile Systems is a Facility and/or Service which comprises:

(i) the provision of access to in-building Common Antenna Systems and Active In-Building Elements; and

(ii) the provision of physical access to the central equipment room of a building.

(b) Physical access includes power (including right-of-way for power installation by the Access Seeker), environmental services (such as heat, light, ventilation and air-conditioning), security, site maintenance and access for the personnel of the Access Seeker.

11.60 MCMC also proposes adding a new definition of "Active In-Building Elements" in the Access List:

"Active In-Building Elements" means powered hardware and associated software inside a building, including but not limited to a base transceiver station, active multi-band distributed antenna system, master units, remote units, bi-directional amplifiers and small cells, which amplify, filter and convert radio frequency signals for distribution through the Common Antenna System, and which are owned or operated by an Operator, including one or more Mobile Network Operators.

11.61 The scope of the proposed Access to In-Building Mobile Systems service is illustrated in the diagram below:

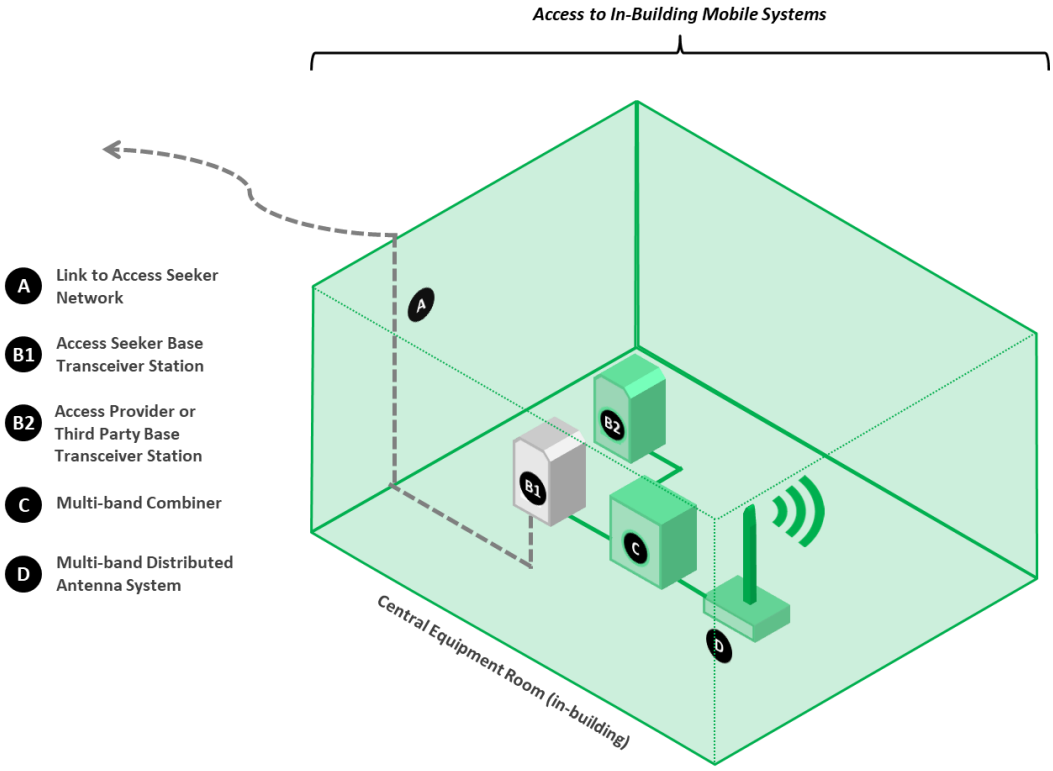


Figure 7 – Scope of proposed Access to In-Building Mobile Systems

Questions

Question 19:	Do you agree that Access to In-Building Mobile Systems should be listed as a new service instead of expanding the scope of Infrastructure Sharing service to include the active components of in-building solutions? Please provide reasons.
Question 20:	Do you have any comments on the proposed new service description for Access to In-Building Mobile Systems? Please provide your suggested amendments if you believe the service description should be amended.
Question 21:	Do you agree with the new concept and definition of "Active In-Building Elements", which seeks to capture all active elements relating to mobile in-building solutions within the scope of Access to In-Building Mobile Systems? If not, please propose alternatives for MCMC's consideration.
Question 22:	In relation to physical access to the central equipment room, are the proposed requirements for power, environmental services such as heating, ventilation and air-conditioning, and security sufficient to allow Access Seekers to access the service? If not, please provide suggestions on any ancillary services required.
Question 23:	As an Access Provider, do you anticipate any challenges in providing the proposed service? Please provide details.

12 IP Transit Service

Service Description

12.1 The IP Transit Service is currently described in the Access List as follows:[7]

(20) 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.

12.2 The scope of the IP Transit Service is reflected in the diagram below:

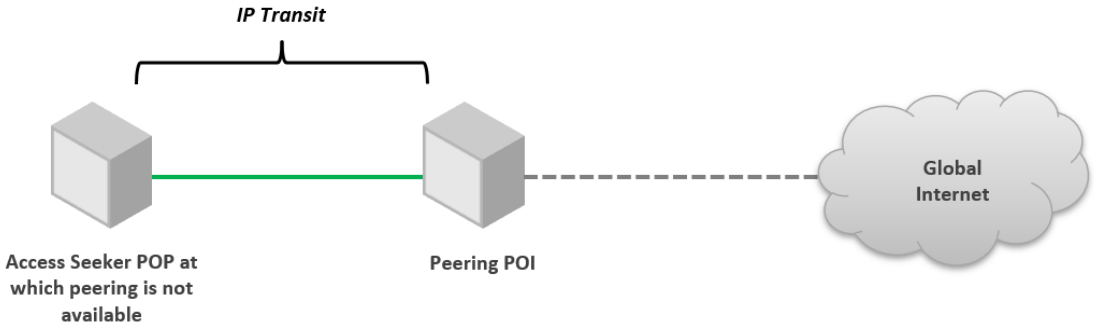


Figure 8 – Scope of IP Transit Service

Overview

12.3 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 any other ISP's network globally, through IP addressing). 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 (either directly or indirectly) through another location at which the first ISP does not have a point of presence.

12.4 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.

[7] MCMC, Commission Determination on Access List, Determination No.6 of 2021.

12.5 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.

12.6 The IP Transit Service was listed on the Access List in 2021 because it was considered a key bottleneck service. Operators were experiencing ongoing issues particularly in certain geographic areas, such as Sabah in East Malaysia. In Sabah, the unavailability of peering led to significantly higher pricing for IP transit prompting MCMC to consider regulating the IP Transit Service.

12.7 MCMC decided to regulate the IP Transit Service only in areas where peering was not available. The regulation of IP Transit Service would automatically cease to apply upon availability of peering services in the area. MCMC also remarked that it would later consider opportunities for a complete de-regulation of this service, if justified.

Submissions Received

12.8 CelcomDigi, Fibrecomm Network, Pr1ma, REDtone, TIME, TM and U Mobile support the removal of the IP Transit Service from the Access List for the reasons set out below:

(a) **CelcomDigi:** the IP transit market is developing well, with multiple providers offering competitive IP transit services. This has reduced dependency on any single provider and ensures Access Seekers can obtain IP transit on commercial terms without regulatory intervention. Malaysia also benefits from MyIX which enables local ISPs and content providers to exchange internet traffic. The availability of MyIX enhances connectivity, resilience and competitiveness in the IP ecosystem. Based on the current state of the market, it considers that regulation of IP transit services is no longer necessary;

(b) **Pr1ma:** it does not currently acquire the IP Transit Service and its service operations at Pr1ma Residences and PRR locations do not rely on this service. Removal of this service would align the Access List with current market practices and would not have any operational or commercial impact on its services. Operators typically acquire IP transit directly from service providers rather than through regulated access and removal would reflect market practices without affecting service availability;

(c) **TIME:** it does not acquire the IP Transit Service as it has its own gateway infrastructure. It also submitted that most ISPs source IP transit competitively from regional providers (e.g. those based in Singapore) where global carriers and major internet hubs are located reducing the industry reliance on domestically regulated IP transit offerings. Given the competitive, regional alternatives for IP transit, the market is better served by allowing competition to drive improvements in service quality, routing performance and pricing, rather than relying on regulation for a service that is not widely used within Malaysia;

(d) **TM:** it does not acquire IP Transit Services domestically. It has established its own peering arrangements via MyIX and through private peering with other operators, which it says are sufficient to fulfill the needs of Access Seekers. TM's peering facilities and services in East Malaysia improve local traffic exchange, latency and network resilience for Sabah and Sarawak. IP transit is typically obtained through commercial arrangements that can be adjusted based on bandwidth needs, routing requirements, network resilience and service levels; and

(e) **U Mobile:** IP transit access should be effectively governed by market forces, with competition keeping prices and performance in check.

12.9 Altel, Allo, Astro, Maxis, SACOFA and YTLC do not support the removal of the IP Transit Service from the Access List for the following reasons:

(a) **Altel:** the service is strategically important to Malaysia's overall connectivity ecosystem. While demand may be low today, future growth in cloud, enterprise apps, fintech and global e-commerce will increase reliance on regulated transit pathways. Retaining IP transit on the Access List ensures a fair, non-discriminatory route to global connectivity for smaller operators and new entrants, preventing foreclosure by incumbents;

(b) **Allo:** it acquires IP Transit Services and finds them usable for its operations;

(c) **Astro:** it recommends retaining the IP Transit Service in the Access List to enable flexibility for future business diversification and maintain strategic options for evolving market demands and technological advancements. This would ensure Astro can respond effectively to emerging opportunities in connectivity and digital services. Astro uses IP transit as an essential input for delivering fibre broadband services to its customers;

(d) **Maxis:** it acquires IP transit from an Access Provider at a Cyberjaya data centre and therefore proposes retaining the IP Transit Service on the Access List; and

(e) **YTLC:** it provided no reason for its support for maintaining the IP Transit Service on the Access List.

12.10 Celcom Timur, a provider and an acquirer of IP Transit Services, submitted that it remains impartial on removing the service from the Access List. It procures IP Transit Services solely through commercial arrangements. It also noted that there is insufficient capacity for large requirements between Sabah and Peninsular Malaysia and that the limited number of IP transit providers has constrained price competitiveness, impacting Celcom Timur's ability to offer more competitive IP Transit services.

12.11 Tune Talk submitted it is currently using CelcomDigi's IP Transit Services and may seek to acquire its own IP Transit Service in the future.

MCMC Assessment

12.12 In determining whether to retain or remove the IP Transit Service from the Access List, MCMC has applied the LTBE test, focusing specifically on the promotion of competition, the achievement of any-to-any connectivity, and the economically efficient use of infrastructure.

12.13 MCMC notes that the IP transit market has undergone significant structural shifts since inclusion of the IP Transit Service on the Access List in 2021. At that time, IP transit was identified as a critical "bottleneck" service, particularly in states like Sabah where the lack of local peering infrastructure led to prohibitive pricing. Current market data and stakeholder submissions indicate that the bottleneck characteristics of this service have substantially diminished:

(a) **Commercial availability:** major Access Providers, including CelcomDigi, TIME, and TM, now offer IP transit on competitive commercial terms. MCMC notes that several Access Seekers, such as SACOFA and Celcom Timur, successfully procure these services via commercial negotiations without recourse to regulated terms.

(b) **Alternative sourcing:** as submitted by TIME, the market is no longer domestic-centric. Advancements in regional connectivity allow local ISPs to source transit from global hubs, such as Singapore, placing competitive constraints on the supply of IP transit by Malaysian providers, including pricing.

(c) **Infrastructure growth:** the expansion of the MyIX and the introduction of peering points in East Malaysia have fundamentally changed the necessity for IP transit for local traffic exchange.

12.14 While any-to-any connectivity remains a cornerstone of the Internet, based on the stakeholder submissions, MCMC considers that this is now largely achieved through peering and commercial transit arrangements rather than the regulated IP Transit Service. The successful proliferation of MyIX and private peering (as noted by TM and CelcomDigi) ensures that local traffic is exchanged efficiently, which minimises the basis for requiring regulated access via the IP Transit Service.

12.15 MCMC is mindful of taking a proportionate approach to access regulation and ensuring that regulation does not discourage providers from innovating commercially or investing in their own gateway infrastructure. The fact that major players like TIME and TM have developed independent international gateways suggests that the market has reached a level of maturity where regulatory forbearance is more likely to encourage efficient investment than continued intervention.

12.16 MCMC acknowledges the concerns raised by Altel and Astro regarding future demand and the protection of smaller entrants. However, MCMC's views are that:

(a) a service being "strategically important" (as argued by Altel) does not inherently make it a bottleneck that requires regulation under the Access List – for a service to be a bottleneck, there need to be clear barriers to

entry or other structural factors that result in a sub-optimal level of competition or barriers to access in relation to such a service; and

(b) stakeholder submissions confirm that many operators do not currently acquire the regulated IP Transit Service, suggesting that the regulation of this service is no longer serving a significant practical purpose in this market segment.

12.17 Based on the above, MCMC's preliminary view is that the IP Transit Service no longer meets the criteria for inclusion in the Access List. The market for IP transit in Malaysia is now workably competitive, with sufficient alternatives and downward pressure on pricing driven by regional competition and local peering growth.

12.18 MCMC further notes that the original "bottleneck" concerns in Sabah have been largely mitigated by the recent availability of peering facilities in East Malaysia.

12.19 Consequently, MCMC proposes to remove the IP Transit Service from the Access List. This move aligns with MCMC's objective to regulate only where necessary and to promote a market-driven environment for Malaysia's communications sector.

MCMC Preliminary View

12.20 MCMC's preliminary view is that, for the reasons set out above, IP Transit Service should be removed from the Access List.

Question

Question 24:	Do you agree with MCMC's proposal to remove IP Transit Service from the Access List? Please provide evidence of any remaining bottleneck characteristics or market failures that would justify its retention.

13 Interconnect Link Service

Service Description

13.1 The Interconnect Link Service is currently described in the Access List as follows:[8]

(5) Interconnect Link Service

(a) An Interconnect Link Service is a Facility and/or Service which enables the connection between the network of an Access Provider and the network of an Access Seeker for the purpose of providing an Interconnection Service, including but not limited to:

(i) the interconnection of the IP-based network of an Access Provider to the IP-based network of an Access Seeker; 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.

[8] MCMC, Commission Determination on Access List, Determination No.6 of 2021.

(b) Interconnection of the kind described in subparagraph (5)(a)(i) above includes the provision of bandwidth at the following increments:

(i) 1 Gbps;

(ii) 10 Gbps; and

(iii) any other amount or increment of bandwidth agreed between the Access Provider and the Access Seeker.

13.2 The scope of the current Interconnect Link Service is illustrated in the diagrams below, which reflect that the service can be provided in a number of different ways:

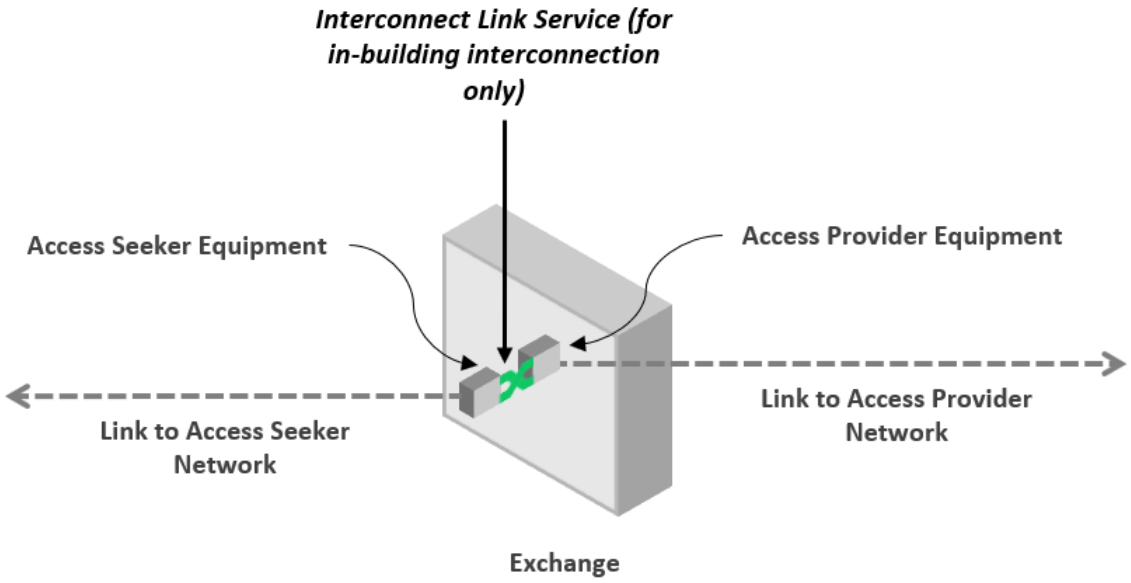


Figure 9 – Scope of Interconnect Link Service (in-building interconnection only)

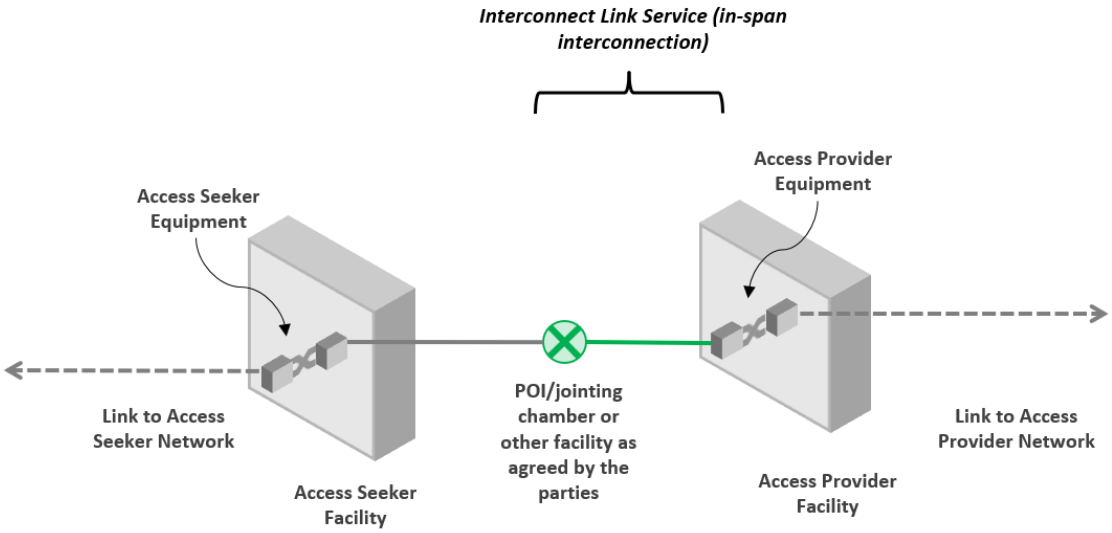


Figure 10 – Scope of Interconnect Link Service (in-span interconnection only)

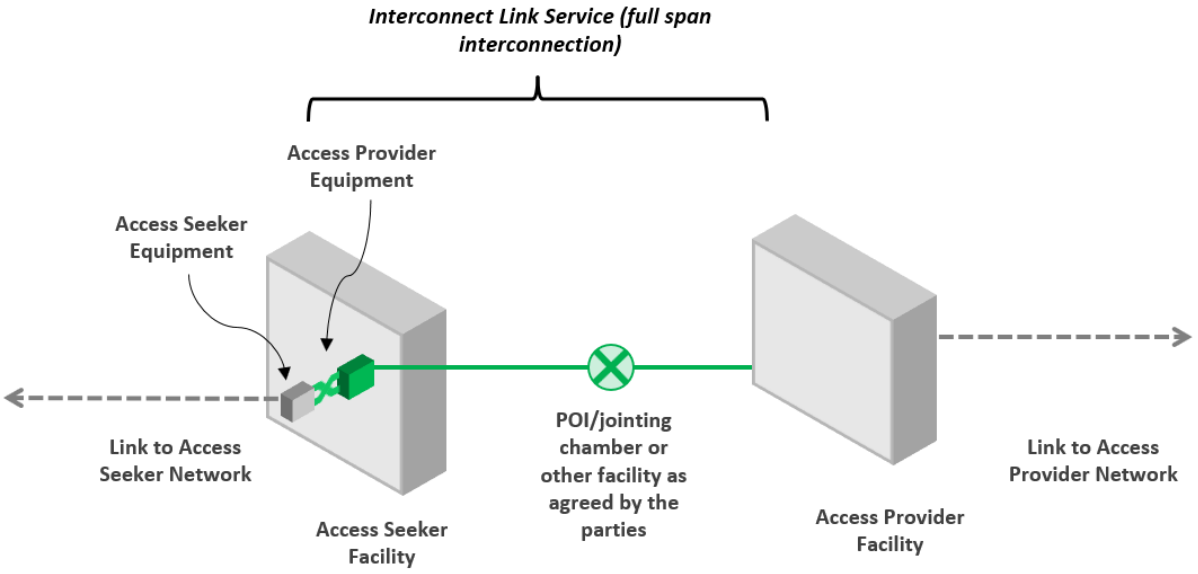


Figure 11 – Scope of Interconnect Link Service (full-span interconnection only)

Overview

13.3 Interconnect links are critical to ensuring any-to-any connectivity and, more broadly, to facilitating competition in the supply of communications services. 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.

13.4 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 point of interconnect (**POI**). This may be at an exchange building, POP or other relevant facility. Three key types of interconnect links exist:

(a) full-span interconnect links, where the Access Provider provides an interconnect link from the Access Provider's facility to the Access Seeker's facility (i.e. the Access Provider effectively "meets" the Access Seeker at the Access Seeker's facility for the purposes of interconnection);

(b) in-span interconnect links, where interconnection between two networks is achieved using 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

(c) in-building interconnect links, where interconnection occurs at an optical interface within one operator's premises (or at a third-party facility).

13.5 The specific technical properties of an interconnect link differ depending on which networks it seeks to interconnect. While modern voice telephony has largely transitioned to IP-based interconnection, where networks exchange traffic via the Session Initiation Protocol (**SIP**) at an IP exchange, there may still be legacy use

of time division multiplexing (**TDM**) technology. In these legacy circuit-switched environments, TDM provides the physical transmission path, while SS7 acts as the signalling protocol used to manage call setup and routing across these TDM circuits.

13.6 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

(b) IP-based interconnect links in different locations 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 heterogenous 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.

13.7 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, which are captured under the Network Co-Location Service.

13.8 MCMC understands that IP-based interconnection has become the most prevalent form of interconnection and that operators in Malaysia have largely transitioned away from using SS7-based interconnect links.

Submissions Received

Removal of SS7-based interconnect links

13.9 While a small number of operators do not support the removal of SS7-based interconnect links from the scope of the Interconnect Link Service, the majority of respondents do.

13.10 Maxis, Pr1ma, Symbio, TM and YTLC do not acquire, or no longer acquire, SS7-based interconnect link services and support their removal. The reasons and qualifications are set out below:

(a) Maxis submitted that it does not object to the removal of SS7-based interconnect links from the Access List, having migrated to IP-based interconnection. However, it sees no harm in retaining SS7-based links on the Access List in case some operators still require them;

(b) Pr1ma considers SS7 to be largely a legacy technology, with most operators having migrated to IP-based interconnection. It explains that remaining needs can be met through commercial agreements;

(c) Symbio prefers that all operators transition to modern IP-based SIP interconnect technology;

(d) Tune Talk supports the removal of SS7-based interconnect links only if there is a plan to sunset 2G services. It currently interconnects with CelcomDigi for SMS and 2G services (although it did not clarify if this is via IP-based or SS7-based interconnect links); and

(e) YTLC supports the removal of SS7-based interconnect links provided all OLNO (i.e. other local network operator) interconnections have been fully migrated to IP-based solutions and the transition is orderly with safeguards in place to avoid service disruption.

13.11 TIME noted that it only maintains SS7-based links with YTLC due to an unresolved dispute, and requests regulatory clarity on how legacy SS7 arrangements would be treated during and after the transition (noting that, without transitional guidance, removing the SS7-based Interconnect Link Service could prompt YTLC to claim legacy commercial SS7 arrangements should automatically fall under the IP-based Interconnect Link Service, widening the dispute and creating ambiguity in the interconnection framework).

13.12 CelcomDigi and another operator submitted that they do not support the removal of SS7-based interconnect links from the Access List:

(a) CelcomDigi is an Access Seeker for both in-span and full-span interconnection. It submitted that SS7-based links remain necessary for ensuring technology neutrality and any-to-any connectivity across networks. Maintaining SS7 on the Access List supports interoperability with operators still using legacy signalling platforms and ensures continuity of essential services, particularly legacy voice and SMS interconnection. However, in subsequent discussions with MCMC, CelcomDigi confirmed that it does not itself use SS7-based links and, when other operators interconnect with CelcomDigi, they do not require the use of SS7-based links.

(b) The other operator did not provide any reason for its objection to removal of the SS7-based interconnect links from the Access List. It does not acquire the SS7-based interconnect link as, under MVNO Access, interconnection is fully provided by the host.

13.13 Astro did not express a view, citing it is not applicable as SS7 is for GSM mobile voice services which Astro does not provide.

13.14 Media Prima TV and Media Prima Audio noted that they only use IP-based interconnection for the provision of interconnect link services and do not use SS7-based interconnection.

Additional bandwidth increments

13.15 Allo, Pr1ma, Maxis, REDtone, TM, TIME, YTLC and another operator agree that the existing bandwidth increments are appropriate. TM states that the total traffic utilisation that they currently capped logically on each of the Virtual Routing and Forwarding bandwidth are still under 1 Gbps or 10 Gbps.

13.16 Astro, CelcomDigi, Celcom Timur, Symbio and U Mobile have suggested changes to the current bandwidth increments:

(a) Astro submitted that while the existing 1 Gbps and 10 Gbps bandwidth increments have served the industry well, evolving technical capabilities, functional requirements and market dynamics necessitate greater flexibility. It proposed inclusion of Bandwidth on Demand (**BoD**) services to allow operators to dynamically scale bandwidth in response to real-time traffic demands, ensuring efficient peak management and optimised resource utilisation. This approach would align with global best practices and support the growing need for agility in handling unpredictable traffic patterns driven by high-definition content, cloud services and emerging applications. It would also enable the industry to better accommodate future technological advancements and consumer expectations without fixed increment constraints. It will also foster innovation, improve service quality and maintain competitiveness in the market;

(b) CelcomDigi considers the existing increments may no longer reflect current technical and market developments, but seeks clarification from MCMC on whether the Interconnect Link Service is intended to cover voice traffic only or includes data traffic, noting that 10 Gbps increments are sufficient for voice, but 100 Gbps increments are necessary for data-intensive applications;

(c) Celcom Timur suggests adding 100 Gbps and 400 Gbps increments as the current options are insufficient to support modern network deployments and future high-capacity needs including hyperscaler interconnects;

(d) Symbio submitted that a port/interface of 1 Gbps or 10 Gbps is appropriate but, for voice interconnect services, a minimum bandwidth of 100 Mbps should apply with 100 Mbps bandwidth increments; and

(e) U Mobile recommends adding 100 Gbps as another option.

Other submissions

13.17 Allo, Astro, Celcom Timur, Fibrecomm Network, Maxis, Pr1ma, TIME, TM, U Mobile, YTLC and another operator stated that they do not acquire or prefer any forms of unlisted interconnection services over those currently listed.

13.18 The other operator relies on the host MNO for interconnection and related facilities and has noted that a key limitation is a lack of transparency in how interconnection arrangements managed by the host MNO may affect MVNO service quality and resilience.

13.19 YTLC submitted that one of the key impediments encountered is difficulty in identifying and agreeing on a mutually acceptable meet up point for in-span interconnection.

MCMC Assessment

Removal of SS7-based interconnect links

13.20 The majority of licensees who responded to the informal questionnaire expressed their support for the removal of SS7-based interconnect links from the description of Interconnect Link Service, citing that they have migrated to IP-based technology and no longer use the legacy SS7-based interconnect links.

13.21 Based on the industry-wide submissions MCMC has received, there appear to be only two licensees, TIME and YTLC, which still claim to use SS7-based links. MCMC has not been able to validate with Tune Talk whether it is in fact using SS7-based interconnect links. TIME and YTLC's use are limited only to interconnection with each other, in the context of an unrelated access dispute.

13.22 In this context, maintaining SS7-based interconnect links on the Access List forces the industry to maintain obsolete assets that serve a diminishing user base, which is contrary to MCMC's objective of encouraging economically efficient use of and investment in communications infrastructure.

13.23 In particular, with the vast majority of licensees already migrated to IP-based technology, retaining SS7 for a shrinking minority of operators is not economically justifiable. It forces the industry to maintain costly, specialised legacy hardware that diverts investment away from essential 5G and fibre infrastructure.

13.24 Moreover, SS7 is a legacy protocol designed without modern encryption or authentication, leaving the network vulnerable to sophisticated attacks like location tracking and SMS interception. Removing it from the Access List encourages the remaining operators to migrate to more secure IP-based signalling (such as SIP), strengthening the overall resiliency of Malaysia's communications networks. As the industry moves towards an all-IP environment in 2026, MCMC considers that the regulatory framework must reflect this reality.

13.25 It is important to emphasise that the removal of SS7-based links from the Access List does not constitute a prohibition of the technology, nor does it mandate an immediate decommissioning of existing SS7-based interconnections. The delisting will simply result in SS7-based links no longer being subject to *regulated* access under the Access List, including MSA obligations. Operators who require continued SS7 connectivity for 2G services or legacy SMS interoperability remain free to maintain these links through bilateral commercial arrangements. This approach allows the industry to transition at a pace dictated by market demand while ensuring that MCMC's regulatory mandate remains focused on the efficient, modern and secure IP-based infrastructure that most operators are now using as an input into their services.

13.26 MCMC also clarifies that commercial SS7 arrangements will not be affected, since they are not made pursuant to RAO under the Access List. Further, removing SS7-based links from the scope of Interconnect Link Service lowers the risk of such commercial arrangements being captured, rather than heightening it.

LTBE analysis in relation to IP-based interconnect links

13.27 During the 2021 Access List review, MCMC had expressed the view that it does not consider IP-based interconnect links to act as a bottleneck facility. MCMC noted 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. It placed 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.

13.28 Given the fundamental role of interconnect links in achieving any-to-any connectivity (i.e. allowing communications to flow from customers of one licensee to another) and promoting competition, MCMC considers that it remains in the LTBE to include IP-based interconnect links in the Access List.

Bandwidth increments

13.29 The majority of licensees have submitted that the existing bandwidth increments (1 and 10 Gbps) are appropriate. Astro, CelcomDigi, Celcom Timur, Symbio and U Mobile have proposed certain amendments.

13.30 With respect to Celcom Timur, CelcomDigi and U Mobile's suggestion to add a new 100 Gbps increment, MCMC agrees that a new 100 Gbps increment should be added to the service description as such higher increment is required for future high-capacity needs, including hyperscaler connects and data-intensive applications.

13.31 MCMC also agrees with Symbio's recommendation that a minimum bandwidth of 100 Mbps with 100 Mbps increments be specified for voice interconnection services. This smaller increment would prevent Access Seekers like Symbio from being forced to purchase excess capacity for interconnect links they do not need for voice traffic, thereby lowering the barrier to entry and promoting greater competition in downstream markets.

13.32 Regarding Astro's suggestion for BoD, MCMC considers this a value-added feature rather than a core "standard access" requirement. In MCMC's view, BoD is best handled through bilateral commercial agreements. Mandating Access Providers to provide BoD is likely to impose an undue burden on Access Providers. However, MCMC invites submissions from operators on whether they would be willing to provide BoD as an Access Provider, or willing to obtain BoD as an Access Seeker, including potential challenges faced by Access Providers in providing BoD.

MCMC Preliminary View

13.33 MCMC's preliminary view is that the description of Interconnect Link Service should be amended to remove SS7-based interconnect link and add additional bandwidth increments of 100 Mbps and 100 Gbps. 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:

(5) Interconnect Link Service

(a) An Interconnect Link Service is a Facility and/or Service which enables the connection between the network of an Access Provider and the network of an Access

Seeker for the purpose of providing an Interconnection Service, including ~~but not limited to:~~

~~(i)~~ the interconnection of the IP-based network of an Access Provider to the IP-based network of an Access Seeker~~.~~ ~~; 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.~~

(b) Interconnection of an IP-based network ~~the kind described in subparagraph (5)(a)(i) above~~ includes the provision of bandwidth at the following increments:

(i) 100 Mbps;

~~(i)~~(ii) 1 Gbps;

~~(ii)~~(iii) 10 Gbps; ~~and~~

(iv) 100 Gbps; and

~~(iii)~~(v) any other amount or increment of bandwidth agreed between the Access Provider and the Access Seeker.

Questions

Question 25:	Do you agree with MCMC's proposal to remove SS7-based interconnection link from the Interconnect Link Service description? If not, please provide reasons.
Question 26:	Are bandwidth increments of 100 Mbps and 100 Gbps feasible to be mandated under the scope of the Interconnect Link Service? If not, please provide details.
Question 27:	What are your views on the inclusion of BoD as a feature of the Interconnect Link Service? As an Access Provider, would you face significant challenges in providing BoD if it is mandated under the Access List?

PART 4: NON-PRIORITY ISSUES – CURRENT ACCESS LIST FACILITIES AND SERVICES WITH MINOR OR NO PROPOSED AMENDMENTS

14 Origination and Termination Services

Introduction

14.1 The following facilities and services comprise the family of origination and termination services in the Access List:

(a) Fixed Network Origination Service;

(b) Fixed Network Termination Service;

(c) Mobile Network Origination Service; and

(d) Mobile Network Termination Service,

(together, the **O&T Services**).

Service Descriptions

14.2 The Fixed Network Origination Service is currently described in the Access List as follows:[9]

(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 (excluding Short Message Service and Multimedia Message Service Message 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 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 (excluding Short Message Service and Multimedia Message Service Message Communications).

[9] MCMC, Commission Determination on Access List, Determination No.6 of 2021.

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

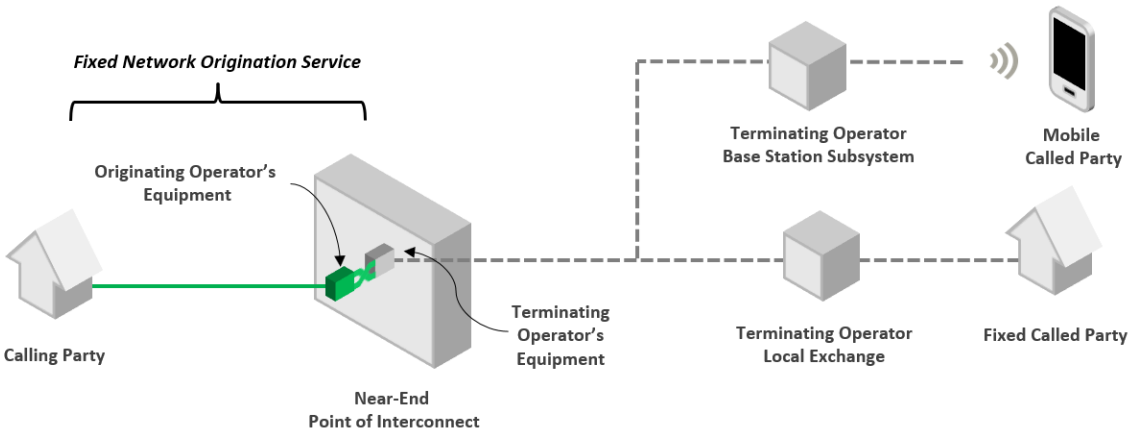


Figure 12 – Scope of Fixed Network Origination Service

14.4 The Fixed Network Termination Service is currently described in the Access List as follows:[10]

(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, 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.

[10] MCMC, Commission Determination on Access List, Determination No.6 of 2021.

14.5 The scope of the Fixed Network Termination Service is illustrated in the diagram below:

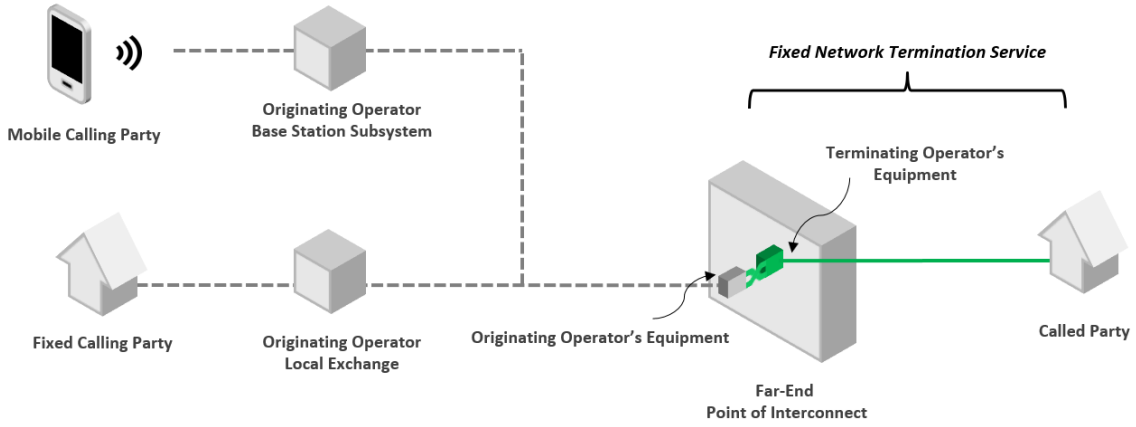


Figure 13 – Scope of Fixed Network Termination Service

14.6 The Mobile Network Origination Service is currently described in the Access List as follows:[11]

(3) Mobile Network Origination Service

(a) A Mobile Network Origination Service is an Interconnection Service for the carriage of Call Communications (excluding Short Message Service and Multimedia Message Service Message 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) 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 Call Communications

[11] MCMC, Commission Determination on Access List, Determination No.6 of 2021.

(excluding Short Message Service and Multimedia Message Service Message Communications).

14.7 The scope of the Mobile Network Origination Service is illustrated in the diagram below:

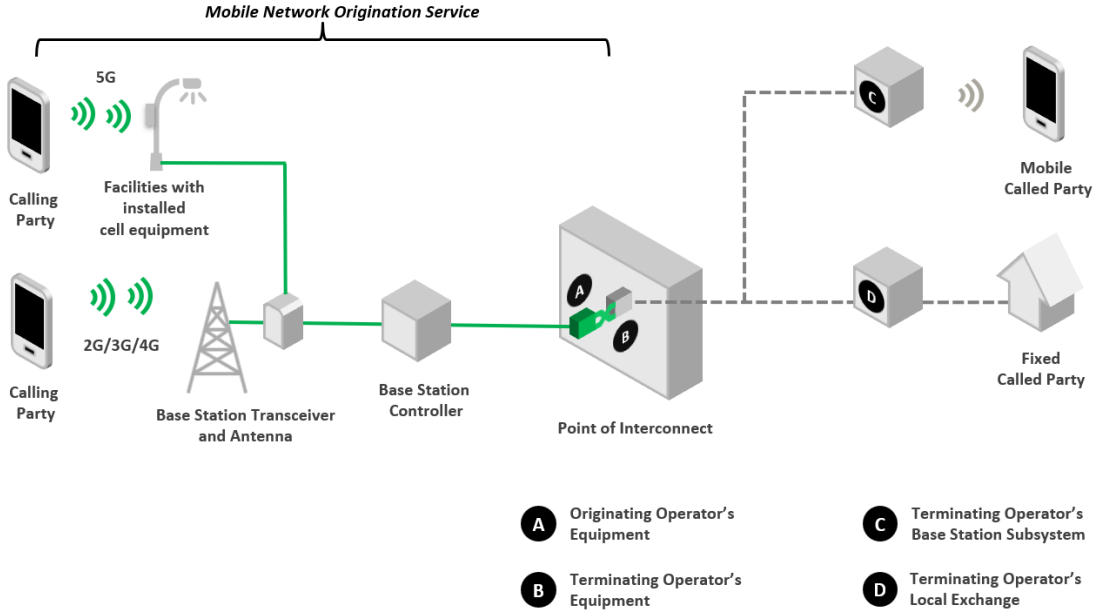


Figure 14 – Scope of Mobile Network Origination Service

14.8 The Mobile Network Termination Service is currently described in the Access List as follows:[12]

(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.

(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) GSM;

(ii) WiMAX;

(iii) LTE;

(iv) IMT-Advanced or LTE-Advanced;

[12] MCMC, Commission Determination on Access List, Determination No.6 of 2021.

(v) 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.

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

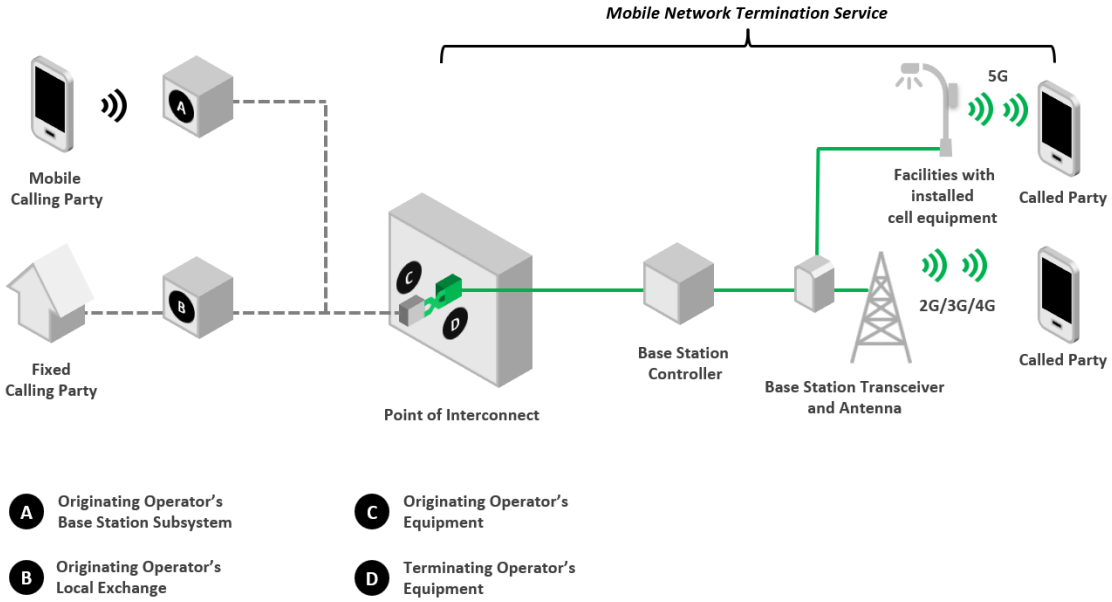


Figure 15 – Scope of Mobile Network Termination Service

Overview – origination and termination services

14.10 Origination is a wholesale service that 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 "calling party pays" (**CPP**) model, 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 the cost of origination from the terminating operator through a wholesale origination charge.

14.11 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 1300 at a local call rate and 1800 numbers 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.

14.12 Termination of voice calls and messages, together with origination, 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.

14.13 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.

14.14 Termination services are acquired by the A-party's service provider from a 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.

14.15 The need for wholesale termination services arises due to the prevalence of the 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.

Submissions Received

Fixed Network Origination and Termination Services

14.16 CelcomDigi, Maxis, Symbio, TM, TIME and YTLC acquire Fixed Network Origination and Termination Services and find them usable as an input to their communication services whilst providing competitive functionality. Astro, Celcom Timur, Media Prima TV, Media Prima Audio, Radio Kita and Tune Talk do not acquire these services as Access Seekers.

14.17 Astro does not acquire or provide these services, but does not identify any impediments or recommend any amendments.

14.18 CelcomDigi, Maxis, Radio Kita, REDtone, TM, TIME and YTLC do not report any impediments in accessing or supplying these services.

14.19 TIME notes issues with new NSP licensees preferring Network-to-Network Interface (**NNI**) over ILS arrangements.

14.20 Maxis submitted that most countries it had benchmarked (UK, Australia, Singapore, Portugal, Finland, Norway and Thailand) regulate fixed network origination and termination, although fixed origination is not regulated in Portugal, Finland and Norway. Maxis agrees with retaining fixed network origination and termination on the Access List.

14.21 With respect to proposed amendments to the service descriptions, Astro, CelcomDigi, Radio Kita, REDtone, TIME, and YTLC do not require any amendments to the service descriptions.

14.22 Maxis argues there is a need to facilitate fixed number portability (**FNP**) to reduce barriers to changing fixed line service provider. It submits that FNP is mandated by regulators under consumer protection and other regulations in most countries where the incumbent operator dominates the fixed telephony market and that FNP also improves competition. Maxis further argues that, where a call originates or

terminates via an IP fixed network, the cost should be significantly lower than if the full PSTN network was used.

14.23 Symbio notes that it would prefer if these services were always provided over IP-based networks and for IP-based services to be standardised.

14.24 TM contends that there should be differentiation between international and domestic fixed line traffic, so that Access Providers can set and justify different pricing for each category. TM suggests that international traffic should be moved to a commercial, market-based pricing framework rather than being bound by the regulated domestic rates (under the MSAP). This would prevent foreign entities from exploiting low local rates. It cited successful models in two countries: Singapore, where IMDA allows more commercial flexibility for international traffic, reducing regulatory burdens; and India, where TRAI shifted to a "forbearance framework", which stabilised rates and protected operators from rate manipulation by aggregators. It further argued that international calls require additional infrastructure, such as international gateways, which are more expensive to maintain. It argues that this change would have no impact on local Malaysians as it would only target inbound international calls (costs are paid by foreign operators).

Mobile Network Origination and Termination Services

14.25 CelcomDigi, Maxis, TIME, TM, Tune Talk and YTLC acquire Mobile Origination and Termination Services, find them usable as an input to the services they supply to their customers, and have not encountered any functional limitations or other impediments (except for TM and another operator, refer to paragraph 14.27). Celcom Timur, Fibrecomm Network, Media Prima TV, Media Prima Audio and Radio Kita do not acquire these services.

14.26 An operator acquires the services but finds that functional limitations arise when VoLTE, VoNR and advanced call quality features are not clearly assured under the service descriptions.

14.27 In terms of impediments:

(a) An operator reported that a key impediment related to limited transparency on service quality parity and a dependency on the host MNO's prioritisation of MVNO traffic; and

(b) TM submitted that subsequent to the migration to IP network, the requirement for POI at each closed number area is no longer relevant to the O&T services because all calls will be handed over to a single POI.

MCMC Assessment

LTBE overview

14.28 The Fixed Network Origination Service, Fixed Network Termination Service, Mobile Network Origination Service and Mobile Network Termination Service remain bottleneck services. 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.

14.29 In 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.

14.30 Similarly, 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.

14.31 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 person 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. MCMC has no evidence that, in practice, transit providers or resellers compete with terminating network operators in providing termination services to originating operators.

14.32 Given the above, MCMC considers that the rationale for regulating access to O&T Services remain valid, and there appears to be general consensus across the industry that these services should continue to be regulated.

Adjustments to service description

14.33 Operators have not raised any concerns regarding the basic definition of the O&T Services and MCMC is not aware of any material changes in the market that would justify fundamental changes to the descriptions of O&T Services.

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

Other issues

14.35 MCMC notes Maxis' submissions that FNP is a significant barrier to end users switching between fixed telephony services and to market entry by new operators. However, MCMC considers that this is not an Access List issue.

14.36 Under section 148 of the CMA, the Access List is only able to regulate network facilities, network services and other facilities or services which facilitate the supply of network services or applications services, including content applications services. A number does not fit within any of these categories – it is not a network facility or network services, nor a "facility" or "service" more broadly. Accordingly, the Access List cannot be used to mandate access to fixed or mobile numbers so as to enable FNP. This will need to be done through a different regulatory instrument, as is the case for MNP, which has already been implemented. Further, as operators are likely aware, MCMC has consulted on the implementation of FNP in Malaysia, and is in

the process of establishing an Industry Working Group to finalise implementation details.

14.37 In relation to TM's proposal that international inbound termination be differentiated from domestic calls so that they could be charged at a separate, higher rate, MCMC notes the following:

(a) Termination of international inbound calls to fixed numbers in Malaysia takes place over the same infrastructure as termination of other calls to fixed numbers. From a technical perspective, once an international call has reached the domestic network's POI, the resources used to terminate that call on a fixed or mobile handset are identical to those used for a domestic call. The international gateway infrastructure is part of the transmission function, not termination.

(b) In light of the above technical identicality, treating international calls less favourably than domestic calls violates the principle of non-discrimination. International calls should not be penalised with higher termination fees if the underlying service is the same.

(c) International gateways are commercial assets that provide multiple functions, allowing TM to recover the cost of international gateway infrastructure through the provision of other services.

14.38 In any case, TM's proposal here is a pricing matter that should be raised when MCMC conducts its next review of the MSAP, and does not warrant amendments to the service description.

14.39 MCMC has considered an operator's submission regarding the inclusion of VoLTE and VoNR within the service descriptions. MCMC maintains that the current descriptions are technology-neutral and functional in nature, thereby encompassing all current and future voice technologies. Concerns regarding the "assurance" of these features are more appropriately addressed through the quality of service obligations in the MSA.

14.40 Regarding an operator's concerns on service quality parity and traffic prioritisation, MCMC considers these to be operational and technical implementation issues rather than matters of service definition. Specific obligations for non-discriminatory treatment, transparency of performance and QoS parity are more appropriately addressed within the MSA.

14.41 Finally, MCMC disagrees with TM's view that IP migration justifies the consolidation of interconnection to a single POI. While MCMC acknowledges the technical efficiencies of IP-based networks, it considers the retention of multiple, geographically diverse POIs to be essential for network resilience and the prevention of a single point of failure.

MCMC Preliminary View

14.42 MCMC's preliminary view is that it would be in the LTBE for Fixed Network Origination Service, Fixed Network Termination Service, Mobile Network Origination

Service and Mobile Network Termination Service to remain on the Access List without modification.

Question

Question 28:	Do you agree with MCMC's position that Fixed Network Origination Service, Fixed Network Termination Service, Mobile Network Origination Service and Mobile Network Termination Service should remain on the Access List without modification?

15 Transmission Services

Overview

15.1 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 point of interconnect (**POI**) or point of presence (**POP**), or two POIs or POPs. 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.

15.2 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";[13]

(b) Frame Relay and asynchronous transfer mode (**ATM**);

(c) Metro Ethernet (or "**Metro-E**") or other Ethernet-based services;

(d) IP-based VPNs (**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.

15.3 The following facilities and services comprise the family of transmission services in the Access List:

(a) Wholesale Local Leased Circuit (**WLLC**) Service;

(b) Trunk Transmission Service; and

(c) End-to-End Transmission Service

[13] 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>, p7.

(together referred to as "**Transmission Services**" in this section).

Wholesale Local Leased Circuit Service

15.4 WLLC Service, also known as 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).

15.5 WLLC Service do not include, and are not alternatives for, ULL access services or line sharing services, which comprise local access services. 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.

15.6 The WLLC Service is currently described in the Access List as follows:[14]

(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 an Access Provider's premises and an End User location or an Access Seeker's Premises, available only at one end of a private 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, 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 ISDN, Metro Ethernet ("Metro-E"), IP based networks and Ethernet interfaces.

(c) Without limiting subparagraph 6(a) above, 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.

(d) The Wholesale Local Leased Circuit Service includes any Wholesale Local Leased Circuit Service supplied to the Access Seeker with:

[14] MCMC, Commission Determination on Access List, Determination No.6 of 2021.

(i) *any network availability between 99.90% and 99.992%, whether per month or otherwise;*

(ii) *any latency of between <1 ms and <40 ms;*

(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 subparagraphs (i) to (iii) above.*

15.7 The scope of the Wholesale Local Leased Circuit Service is illustrated in the diagram below:

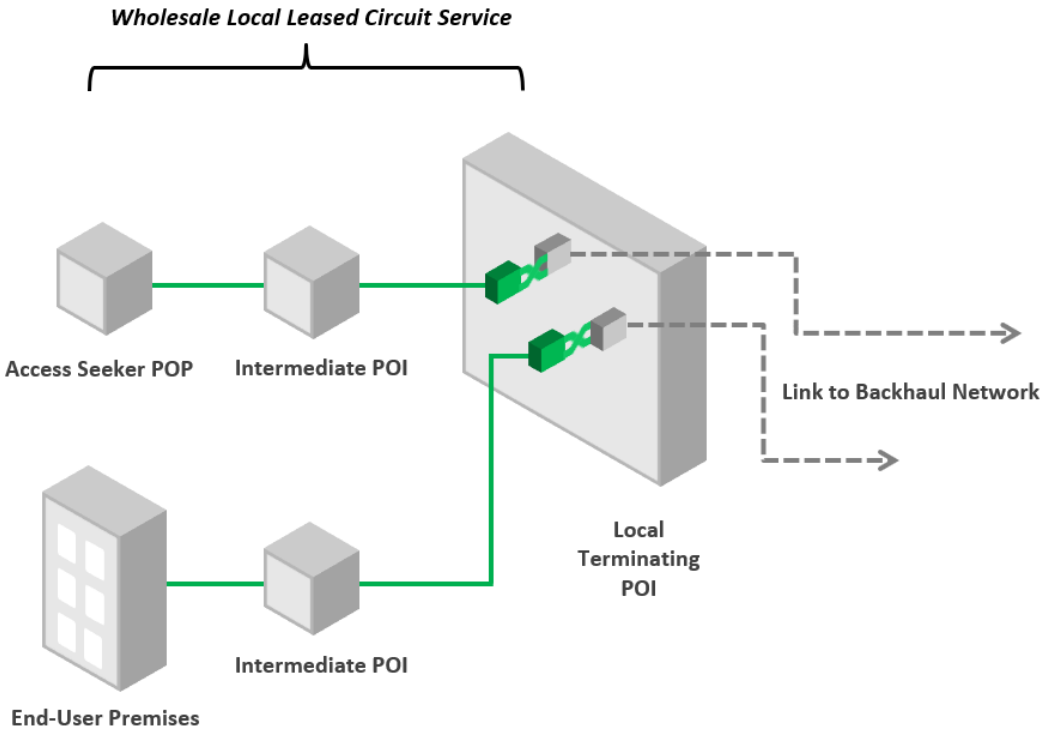


Figure 16 – Scope of Wholesale Local Leased Circuit Service

Trunk Transmission Service

15.8 Trunk Transmission Services allow 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.

15.9 The Trunk Transmission Service is currently described in the Access List as follows:[15]

(12) 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's premises, 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 and Metro-E.

(c) The functionalities of the Trunk Transmission Service include:

(i) transmission and any type of routing or switching, whether packet, 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) 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 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 Trunk Transmission Service in order to connect its limited network facilities or network services.

[15] MCMC, Commission Determination on Access List, Determination No.6 of 2021.

End-to-End Transmission Service

15.10 End-to-End Transmission Services are acquired by service providers to provide a complete, managed connectivity solution between two specific locations, including connecting:

(a) two separate end-user locations;

(b) two Access Seeker premises; or

(c) an end user location directly to an Access Seeker's premises,

spanning across the provider's entire network (including both local and trunk segments) to ensure seamless data carriage.

15.11 The End-to-End Transmission Service is currently described in the Access List as follows:[16]

(15) 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; or

(iii) between one End User location and one Access Seeker's premises,

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, 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 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.

[16] MCMC, Commission Determination on Access List, Determination No.6 of 2021.

(f) Technologies used to supply End-to-End Transmission Service, such as Metro-E, or any other applicable technology which is currently available or which may be developed in future, 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 <1 ms and <40 ms;

(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 subparagraphs (i) to (iii) above.

15.12 The scope of the End-to-End Transmission Service is illustrated in the diagram below:

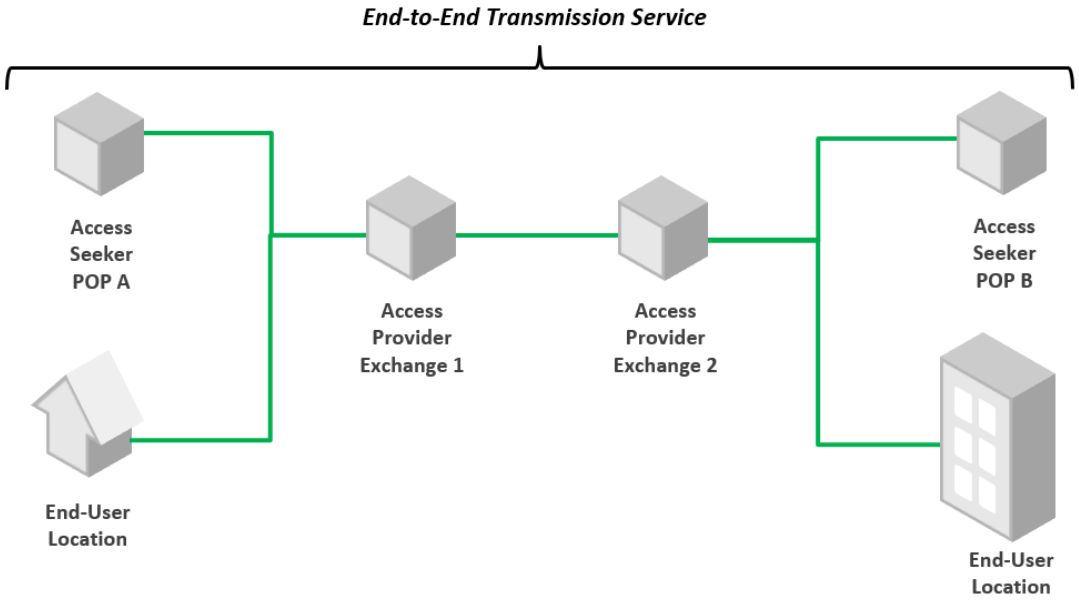


Figure 17 – Scope of End-to-End Transmission Service

Interaction between different transmission services

15.13 Tail, trunk and end-to-end transmission services cannot be treated as providing the same inputs into the competitive process. In particular:

(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 MCMC's understanding that there are different suppliers of each type of service.

Submissions Received

15.14 As the submissions in respect of Wholesale Local Leased Circuit Service, Trunk Transmission Service and End-to-End Transmission Service were combined, the following paragraphs set out submissions in respect of all three services.

Acquiring access to Transmission Services

15.15 Allo, Astro, CelcomDigi, Celcom Timur, Fibrecomm Network, Maxis, Media Prima Audio, Media Prima TV, Radio Kita, SACOFA, Symbio, TIME, TM, Tune Talk, U Mobile, YTLC and other operators acquire Transmission Services for various purposes such as diversity, backhaul, bandwidth, interconnection, direct internet access, private lease line connectivity, SD-WAN services, off-net customer activation and direct provision to enterprise customers. All the respondents reported they find the services usable as an input.

15.16 Astro, Allo, CelcomDigi, Celcom Timur, Fibrecomm Network, Maxis and U Mobile were generally satisfied with the functionality of services but highlighted the following issues:

(a) **Astro:** functionality could be improved by incorporating Bandwidth on Demand capabilities, which would provide greater flexibility and scalability to meet dynamic traffic demands.

(b) **CelcomDigi:** as a reseller, CelcomDigi may not have the same pricing advantage as the Access Provider. Although functionality is equivalent, the main differentiating factor for competitiveness in the market is the price offered.

15.17 Tune Talk disagreed the functionality of services was sufficient but provided no explanation. SACOFA and TIME did not express a definitive view but highlighted the following functional limitations:

(a) **SACOFA:** there are longer provisioning or fault restoration times due to the vast geographical area of Sarawak; and due to the current legacy network, redundancy and protection paths are not as efficient as modern network.

(b) **TIME:** in several cases, the SLAs provided to TIME are not equivalent to, or fall short of, the SLA levels that TIME is required to deliver to its own customers, which creates operational challenges and affects TIME's ability to meet its downstream service commitments.

Benefits of acquiring Transmission Services commercially rather than under the Access Agreement

15.18 Many of the operators acquire Transmission Services either commercially or under an Access Agreement or both. Some of the benefits of acquiring Transmission Services commercially, as stated by stakeholders, are set out below:

(a) **Allo:** acquires via commercial arrangements due to off-net service requirements.

(b) **Astro:** commercial agreements offer faster provisioning and implementation timelines, customised solutions, flexibility in capacity and service configuration, and enhanced support and service-level commitments.

(c) **CelcomDigi:** commercial arrangements provide the following benefits:

(i) greater flexibility;

(ii) allow capacity beyond the standard 10Gbps threshold prescribed under the MSAP;

(iii) enable bundling of Transmission Services with other business opportunities such as co-location, dark fibre, managed services or broader wholesale and enterprise solutions; and

(iv) allow parties to negotiate pricing terms that reflect actual deployment costs, demand conditions and risk sharing consdierations, enabling expansion into underserved or high-cost areas while ensuring the arrangement remains sustainable and beneficial to both parties.

(d) **Celcom Timur:** commercial arrangements result in improved pricing and quality of service, and can be combined with other non-regulated services e.g. premium package.

(e) **Fibrecomm Network:** commercial arrangements offer flexibility in pricing and commercial terms.

(f) **TM:** only acquires Transmission Services commercially, which provides additional flexibility including the ability to negotiate bespoke network designs, customised SLAs and commercial constructs tailored to specific operational or customer requirements. It also allows the Access Seeker and the Access Provider to jointly develop innovative terms such as long-term lease structures, bulk-capacity commitments, and tailored technical configurations that better support unique deployment scenarios or large-scale projects.

(g) **Tune Talk:** cheaper and easy to manage.

(h) **U Mobile**: concluded faster, offer greater flexibility and enable tailored service commitments.

15.19 A respondent reported that it is required to enter into commercial agreements since End-to-End Transmission Service is part of the managed service provided by the Access Provider. This is disadvantageous for the respondent as the prices are controlled by a single provider.

15.20 SACOFA and TIME highlighted the benefits of acquiring Transmission Services via an Access Agreement:

(a) **SACOFA:** the rights of Access Seeker on non-discriminatory basis are protected.

(b) **TIME:** acquiring Transmission Services via the Access Agreement allows TIME to obtain MSAP-based pricing, which provides greater cost predictability and transparency; and recourse to dispute resolution through MCMC.

15.21 **Maxis** submitted that there are no benefits in acquiring Transmission Services commercially compared to the Access Agreement route.

Impediments in gaining access to, or supplying, Transmission Services

15.22 Allo, Astro, Edotco, Radio Kita, REDtone, TM, Tune Talk and another operator all submitted that there are no impediments in gaining access to or supplying a Transmission Service.

15.23 Celcom Timur, CelcomDigi, Fibrecomm Network, Maxis, Media Prima Audio, SACOFA, YTLC and U Mobile and another operator reported the following impediments or suggestions:

(a) An operator pointed out industry-wide impediments faced by Access Seekers that are:

(i) provisioning delays in relation to wayleave approvals and slow rollout of civil works;

(ii) limited fibre availability in rural or underserved areas requiring alternative backhaul technology such as microwave backhaul;

(iii) capacity constraints as existing routes may not support high-capacity needs for 5G backhaul (≥10G), requiring upgrades or new builds;

(iv) high deployment costs – fibre installation and trenching in low-demand or rural areas can be prohibitively expensive; and

(v) limited or exclusive access to telecommunication equipment rooms, data centres and IBS facilities which can create bottlenecks.

(b) **Celcom Timur:** poor road access due to geographical conditions, safety and operational constraints when deploying and maintaining infrastructure, especially near power line corridors, dependence on third party availability

of utility poles, Horizontal Directional Drilling (**HDD**) services and delays in regulatory approvals.

(c) **CelcomDigi:** as an Access Provider, a key impediment is the requirement to deploy new or additional network equipment to meet service requests. Existing transmission infrastructure may lack adequate capacity, compatible technology, or available interfaces to deliver the requested service. The installation of new transmission equipment or supporting power and space facilities may not always be viable, particularly in areas of low demand or limited infrastructure.

(d) **Fibrecomm Network:** proposed the inclusion of a clear and standardised service demarcation diagram to provide clarity on network responsibility boundaries and to facilitate more efficient negotiations between Access Providers and Access Seekers.

(e) **Maxis:** some Access Providers do not conform to the Transmission Services description and use it as a reason for not complying with regulated rates.

(f) **Media Prima Audio:** currently pays MYTV high carriage fees of about RM400,000 per radio channel annually without receiving any audience data in return, making the cost difficult to justify. Media Prima Audio submitted that radio transmission should be treated as a free-to-air public service, with minimal fees and proper audience reporting if premium charges remain.

(g) **SACOFA:** faced impediments in serving transmission services in rural and remote areas in the Sarawak region. SACOFA already has over 11,000 kilometres of fibre in Sarawak and is able to complement new transmission services for the future.

(h) **YTLC:** refusal of Access Providers to provide access from the nearest feasible location. Access Providers should provide access from the nearest technically feasible point. YTLC submitted that it has also encountered impediments in gaining access to Transmission Services arising from overly narrow or literal interpretations of service definitions and performance parameters, which undermine the practical effectiveness of the access framework. Access Providers have relied on minor deviations in technical characteristics or service configurations to argue that a service falls outside the scope of regulated services although the service is functionally and substantively equivalent. YTLC requested clear, comprehensive and exhaustive standards which capture functional equivalence, close interpretational loopholes and ensure consistent enforcement aligned with policy intent.

(i) **U Mobile**: delivery timeline is an impediment.

Proposed changes to service description

15.24 Allo, Edotco, Maxis, Radio Kita, REDtone, Tune Talk, YTLC and other operators proposed no changes to the current description of the Transmission Services.

15.25 Astro, CelcomDigi, Celcom Timur, Fibrecomm Network, SACOFA, TM, TIME and U Mobile proposed certain amendments to the existing description of the Transmission Services as set out below:

(a) **Astro** proposed the inclusion of BoD capabilities for flexibility and scalability to meet dynamic traffic demands.

(b) **CelcomDigi** proposed removal of WLLC Service and Trunk Transmission Service from the Access List and streamlining of the service description of End-to-End Transmission Services. Operationally, managing a single end-to-end circuit is efficient, improves service quality, shortens provisioning timelines, and aligns with current customer demand for integrated, high-capacity connectivity rather than segmented access and trunk components. From a technical perspective, current network architectures and transmission technologies are designed to support seamless end-to-end connectivity, reducing the practical relevance of legacy service segmentation.

(c) **Celcom Timur** proposed updating the framework to support high-capacity interfaces (100G, 400G, and 800G-ready), clearly define demarcation points and responsibilities between Layer 1 and Layer 2 services, incorporate robust OAM, monitoring, and telemetry requirements. It also proposed including route transparency requirements and updating existing definitions to reflect evolving edge-to-cloud connectivity requirements.

(d) **Fibrecomm Network** proposed refinements to better align with current enterprise connectivity needs, including clearer bandwidth tiers, defined service demarcation points, and interface specifications. The descriptions should also maintain enough flexibility to adapt to evolving network architectures, ensuring the services remain practical and fit for purpose in the near term.

(e) **SACOFA** proposed amendments in relation to IoT Services.

(f) **TM** advocated for deregulation of Transmission Services in competitive and commercially dense areas; limiting technology scope to shared infrastructure to ensure delivery of services using standardised infrastructure, but excluding non-fibre access mediums (e.g. Very Small Aperture Terminal (**VSAT**), IP Radio); and limiting Transmission Services offerings to existing infrastructure only with any requirement for new rollout subject to commercial viability.

(g) **TIME** proposed deregulation of Transmission Services in markets with effective competition, where multiple providers offer equivalent options and no single operator holds significant market power, allowing pricing and innovation to be driven by market forces. Regulation should only apply where a single or very few providers, or exclusivity arrangements, exist to prevent market foreclosure and ensure fair wholesale access and service continuity.

(h) **U Mobile** proposed improvements for deterministic network performance and low latency services.

Routes to be excluded from End-to-End Transmission Service or Trunk Transmission Service

15.26 Allo, Astro, CelcomDigi, Maxis, Radio Kita, REDtone, Tune Talk and YTLC were against exclusion of certain routes from the scope of End-to-End Transmission Service or Trunk Transmission Service, for the following reasons:

(a) **CelcomDigi:** route-by-route obligations may be impractical given integrated network design. While certain routes, such as those serving islands, rural, remote or low-demand areas, may have unique cost and operational challenges, any exclusions should be based on detailed, evidence-driven market analysis to ensure proportionality and alignment with CMA objectives.

(b) **Maxis**: disagreed there are any routes capable of being competitively serviced by multiple Access Providers and that can therefore be excluded from the scope of End-to-End Transmission or Trunk Transmission Service. Maxis explained that for End-to-End Transmission Service, it involves two local access parts which are very localised, that is, up to the specific building/premise in the specific location. It would be rare that there are multiple service providers connecting to the same building/premises. Maxis also explained that for Trunk Transmission Service, it is unlikely that on the Access Provider's network/premises, there are other operators that can act as another Access Provider. For example, Operator A can unlikely provide Trunk Transmission Services between Operator B's two exchanges. Maxis also noted that the market reality is that End-to-End Transmission Services are procured largely so actual duplication in the acquisition of WLLC and Trunk Service separately is rare.

(c) **YTLC:** noted that all routes covered under the End-to-End and Trunk Transmission Services are essential for service delivery and should be retained.

15.27 Celcom Timur, Fibrecomm Network, TM and TIME submitted that certain routes should be excluded from the scope of End-to-End Transmission Service or Trunk Transmission Service as follows:

(a) Celcom Timur submitted that submarine cable routes should be excluded from the scope of End-to-End Transmission Service or Trunk Transmission Service because of significant difference in cost (including landing station costs), ownership models, consortium arrangements, depreciation and regulatory obligations for submarine links as compared to terrestrial routes. Including submarine routes within the standard scope makes it impractical to provide these services on a uniform basis.

(b) Fibrecomm Network submitted that any routes that required or would require new investment be excluded as the costs of such new investment cannot be recovered under the prevailing MSAP pricing in light of rising deployment and operating costs.

(c) TM proposed the exclusion of routes located in commercially dense areas and neutral co-locations (such as a data centre where multiple providers

have existing infrastructure). It recommended that MCMC identify routes using the Communication Infrastructure Management System (**CIMS**) or similar tools that indicate provider availability in a given area.

(d) TIME considered that certain routes should be excluded where there is clear evidence of effective competition. Routes should be excluded where multiple service providers have already deployed fibre infrastructure and are able to supply transmission services on a commercial basis. These routes typically include major highways, inter-city corridors, buildings, commercial hubs and high-density areas already served by multiple fibre-based providers. In these locations, market forces are sufficient to govern pricing, service quality, and innovation, making continued regulation unnecessary and potentially counterproductive.

Locations or areas to be excluded from WLLC Service

15.28 Allo, Astro, Celcom Timur, Maxis, Radio Kita, REDtone, Tune Talk and TYLC confirmed that there are no locations or areas that should be excluded from the WLLC Services but Celcom Timur suggested that very remote areas such as Long Pasia, remote islands or similar should be subject to different service level agreements with lower QoS to reflect the higher costs and operational challenges of providing service in these areas.

15.29 SACOFA and TM submitted that the following locations should be excluded from the WLLC Service:

(a) **SACOFA:** the following should be excluded:

(i) remote and rural areas in the Sarawak region, where the provision of services is not economically feasible. This should be addressed under the Universal Service Provision (**USP**) framework instead;

(ii) locations requiring bespoke network builds and very high CAPEX;

(iii) locations which have challenging terrain (hills, mountains, rivers, dense forest) and limited basic infrastructure (electricity);

(iv) all greenfield fibre build, as the focus should remain on must-have connectivity, such as routes along highways or singular access roads; and

(v) areas or locations where multiple alternative providers are present such as urban town areas, major industrial areas and strategic commercial zones such as Samalaju and data centre areas. The Access Seekers have multiple options in these areas.

(b) **TM:** supports the exclusion of commercially dense areas and neutral co-locations, that is, data centres where multiple providers already have their own fibre infrastructure.

Sufficiency and relevance of technical parameters for End-to-End Transmission Service and WLLC Service

15.30 Edotco, Allo, Astro, REDtone and SACOFA confirmed that the current technical parameters in the description of End-to-End Transmission Service and WLLC Service are appropriate.

15.31 CelcomDigi, Celcom Timur, Fibrecomm Network, Maxis, TIME, TM, Tune Talk and YTLC proposed amendments to technical parameters of the transmission service, for the following reasons:

(a) **CelcomDigi:** suggested clarifying network availability parameters (99.9% and 99.992%) are indicative. Specific network availability should be determined by the service provider's capability and actual network measurements as higher availability requirements could have significant operational and cost implications. WLLC is increasingly less relevant and should be considered for removal. End-to-End Transmission Service provide operational efficiencies and simplified management.

(b) **Celcom Timur:** proposed that Access Providers be allowed to offer premium service at certain latency. Celcom Timur also requested clarity on the service expectations.

(c) **Fibrecomm Network**: proposed more detailed technical descriptions to ensure clarity, consistency and effective implementation of the Transmission Services.

(d) **Maxis:** proposed that the existing technical parameters for WLLC and End-to-End Transmission Service apply to Trunk Transmission Service by inserting a new paragraph (g) as follows:

> ***(12) Trunk Transmission Services***
>
> *…*
>
> *(g) The Trunk Transmission Service includes any Trunk Transmission Services 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 subparagraphs (i) to (iii) above.*

(e) **TIME:** proposed the consolidation of the current service descriptions for Leased Lines and Transmission Services into a single, unified service

category. TIME refers to the approach adopted in Australia through the Domestic Transmission Capacity Service framework in its submission.[17]

(f) **TM:** suggested that technical parameters in the End-to-End Transmission Service and WLLC Service should focus strictly on the minimum technical specifications (removing overly detailed requirements) to eliminate differences in interpretation between Access Seekers and Access Providers.

(g) **YTLC:** suggested that current technical parameters would benefit from further refinement in relation to quality-of-service parameters. It proposed the following revisions:

(i) **Network Availability:** introduce a clearly defined measurement period for network availability, for example:

- ≥ 99.9% on a monthly basis; or
- ≥ 99.99% on an annual basis.

Network availability of the transmission service should be determined by the segment with the lowest network availability.

(ii) **Latency (intra and inter region):** revise the latency parameter to specify a defined range of between 1 ms and 20 ms for intra-regional connectivity and between 20 ms and 35 ms for inter-regional connectivity, noting that the current Access List does not provide a capped latency limit.

(iii) **Quality of Service (QoS):** QoS should be measured on an end-to-end basis rather than segments of the circuit as there is a tendency for Access Providers to hype the QoS segement of the circuit to exclude it from the scope of regulated access.

MCMC Assessment

Competition/LTBE Analysis

15.32 The WLLC 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. Accordingly, MCMC considers that it would be in the LTBE for the WLLC Service to remain on the Access List.

15.33 Trunk Transmission Services are generally supplied over infrastructure assets that have high sunk costs and 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

[17] ACCC, Final Access Determination No. 1 of 2025 for the Domestic Transmission Capacity Service – June 2025, (16 June 2025) <https://www.accc.gov.au/system/files/public registers/other/Final%20Access%20Determination%20No.%201%20of%202025%20for%20the%20Domestic%20Transmission%20Capacity%20Service%20-%20June%202025.pdf>.

enabling competition in downstream markets. Accordingly, MCMC's preliminary view is that it would be in the LTBE for the Trunk Transmission Service to remain on the Access List.

15.34 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. 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, MCMC considers it would be in the LTBE for the End-to-End Transmission Service to remain listed on the Access List.

15.35 With respect to CelcomDigi's suggestion to remove WLLC and Trunk Transmission Services from the Access List, MCMC's response is as follows:

(a) the "last mile" remains a significant bottleneck and given that WLLC specifically addresses this bottleneck, MCMC is of the view this service must be retained in the Access List.

(b) removing the individual segments (WLLC and Trunk) would allow Access Providers to force-bundle them into an end-to-end product, effectively preventing Access Seekers from providing their own trunk and only buying the last mile.

15.36 MCMC also notes that several stakeholders have submitted that they acquire WLLC and Trunk Transmission Services, rather than only End-to-End Transmission Services. MCMC also understands that TM, a major Access Provider for Transmission Services, is making available the WLLC and Trunk Transmission Services, alongside End-to-End Transmission Service. The fact that WLLC and Trunk Transmission Services are being demanded and supplied in the market provides a further basis for retaining these services on the Access List.

Addressing impediments in gaining access to, or supplying, Transmission Services

15.37 Regarding limited fibre availability in rural or underserved areas requiring alternative backhaul technology, MCMC maintains the Transmission Services' descriptions are intentionally technology neutral. This ensures that Access Seekers can request alternative backhaul technologies, such as microwave backhaul, where fibre is not yet viable.

15.38 Other issues faced by stakeholders such as provisioning delays in relation to wayleave approvals, poor road access due to geographical conditions, safety and operational constraints in deploying and maintaining infrastructure and delays in regulatory approvals are beyond the scope of inquiry on Access List. Some of these matters can be more appropriately addressed in the parallel review of the MSA.

15.39 Regarding Media Prima Audio's concerns over high fees for radio transmission services, MCMC clarifies that pricing issues are outside the scope of the Access List inquiry, as they are a matter dealt with under the MSAP. MCMC also notes that it

proposes to introduce a new Broadcasting Transmission Service, which would capture radio transmission services (along with television broadcasting transmission services). This will allow distinct terms of access to be applied to broadcasting transmission services, including (potentially) price regulation if this regarded as appropriate under an upcoming MSAP review.

15.40 In response to YTLC's submission regarding impediments to gaining access to Transmission Services due to Access Providers' overly narrow interpretation of technical parameters, MCMC refers to the catch-all provision in the descriptions of WLLC and End-to-End Transmission Services, which captures "*any other technical parameters specified or utilised by the Access Provider from time to time*…" (see subparagraph (d)(iv) of the WLLC Service description and subparagraph (i)(iv) of the End-to-End Transmission Service description). Consequently, the Access Providers cannot refuse to provide transmission services with given technical parameters that the Access Provider itself specifies or uses (for example, as an input into the Access Provider's own downstream services). MCMC encourages Access Seekers to report any issues with obtaining access to specific technical parameters through the formal complaints process.

Exclusion of routes – End-to-End Transmission Service and Trunk Transmission Service

15.41 There are diverging views on the exclusion of routes between Access Seekers, who advocate for a broad, non-exclusive scope, and Access Providers, who seek exclusions largely based on cost or existing levels of competition.

15.42 MCMC concurs with CelcomDigi's submission that any exclusions should be based on detailed, evidence-driven market analysis to ensure proportionality and alignment with the CMA objectives. This evidence-based approach is further supported by Maxis' point that while trunk routes may appear competitive, the local access portion of an End-to-End Transmission Service is rarely duplicated. This tends to diminish levels of competition in respect of End-to-End Transmission Service between any two given points.

15.43 Regarding Celcom Timur's submission on exclusion of submarine cable routes, MCMC recognises that submarine routes (e.g. connecting Peninsular Malaysia to East Malaysia) involve distinct cost structures compared to terrestrial fibre. However, this does not provide a basis for removing such routes from the Access List. In listing a service on the Access List, MCMC is primarily concerned with the whether that service acts as an economic bottleneck, to which Access Seekers require access for downstream services (which in turn promotes competition in the markets for such downstream services). MCMC is satisfied that submarine cable routes, especially those between Peninsular Malaysia and East Malaysia, continue to have bottleneck characteristics, acting as an essential input into the provision of downstream communications services between Peninsular Malaysia and East Malaysia. To the extent the distinct cost structures require different terms of access for submarine cable routes compared to other transmission services, these are a matter for the MSAP review, rather than the Access List.

15.44 In response to Fibrecomm Network's concern regarding new investment recovery, MCMC notes that the standard access obligations under section 149 of the CMA only require an Access Provider to provide access to its existing network facilities

and services (where these are listed on the Access List). The Access List does not mandate that an Access Provider build new infrastructure where none exists.

15.45 Regarding TM's proposal to exclude routes located in commercially dense areas and neutral co-locations (such as data centres) and TIME's suggestion to exclude routes where multiple service providers have deployed fibre infrastructure, MCMC reiterates that the presence of multiple providers in dense areas does not, in itself, constitute evidence of effective competition. This is especially because high levels of competition in a high-density area does not mean that the full extent of an end-to-end route, connecting two end-points, is competitive (as this would require there to be multiple alternative providers connecting those two specific end-points).

15.46 If stakeholders consider that there are specific trunk or end-to-end transmission routes that have a high level of competition, MCMC invites stakeholders to provide more information identifying the specific routes (including the end-points) and to provide evidence for why these routes are competitive (including the Access Providers present on this route and information about supply characteristics that indicate a high level of competition, such as quality and pricing).

Competitive locations/areas – WLLC

15.47 An overwhelming majority of operators proposed no routes or areas be excluded from the scope of WLLC Service.

15.48 TM and SACOFA suggested exclusion of routes in dense areas where multiple providers have their own fibre infrastructure. MCMC notes that even in dense areas, the last-mile connection to a specific building (end-user premises) tends to remain a bottleneck. Multiple providers serving a street does not guarantee multiple options that enter into a specific premises.

15.49 Regarding SACOFA and Celcom Timur's concerns over remote areas (e.g. Long Pasia, Sarawak region), MCMC maintains that these areas require more regulatory protection, not less, to ensure equitable service provision. MCMC is of the view that high deployment costs and operational challenges are more appropriately handled via differentiated pricing (MSAP) and flexible terms (MSA), if appropriate, rather than removal from the Access List.

15.50 MCMC also disagrees with excluding new fibre builds in greenfield areas. Greenfield developments tend to have lower levels of competition than established areas, given that there has been less time for alternative providers to roll out additional infrastructure.

15.51 Consequently, MCMC's preliminary view is not to exclude any locations or areas from the scope of the WLLC Service.

Technical parameters

15.52 There are varied submissions regarding the technical parameters for the services. Although MCMC's specific question was focused on WLLC and End-to-End Transmission Services, several operators also provided suggestions regarding Trunk Transmission Services. MCMC addresses the submissions across all three categories below.

15.53 In response to CelcomDigi's request for clarification that network availability parameters (99.9% and 99.992%) are indicative, MCMC notes that this flexibility is already provided for by the catch-all provision in the current service descriptions, which states "*any other technical parameters specified or utilised by the Access Provider from time to time*…".

15.54 Regarding Maxis's submission that the Trunk Transmission Service should include the same technical parameters currently specified for WLLC and End-to-End Transmission, MCMC agrees that such parameters could improve clarity regarding the regulated scope. However, as no stakeholders commented on this specific point, MCMC invites further views on the necessity and appropriateness of extending these specific technical parameters to the Trunk Transmission Service.

15.55 While TIME suggested a unified Domestic Transmission category, MCMC believes maintaining the distinction between local (tail) and trunk segments is currently necessary for Access Seekers who only require specific parts of a circuit to complement their own infrastructure.

15.56 Regarding YTLC's suggestion to refine the quality-of-service parameters, MCMC notes that those quality-of-service parameters exist in the MSA so MCMC will consider these issues as part of the review of the MSA (in parallel with the Access List review).

15.57 There were other suggestions such as detailed technical descriptions (Fibrecomm Network) or a strict focus on minimum technical specifications (TM). MCMC is of the view that the current service descriptions are adequately balanced but it remains open to suggestions on specific amendments to the technical parameters.

Adjustments to service descriptions of Transmission Services

15.58 In response to Celcom Timur and Fibrecomm Network's proposals for high-capacity interfaces and telemetry, MCMC concurs that the regulatory framework must be future-ready. However, MCMC intends to keep the service descriptions technology-neutral. By defining the service by its functional output (e.g. the carriage of communications) rather than specific interface speeds, the Access List is able to accommodate new standards without frequent amendments to the service descriptions.

15.59 MCMC does not accept TM's suggestion that non-fibre access mediums (e.g. VSAT and IP Radio) be excluded from the technology scope as rural and remote areas may still rely on VSAT, IP Radio and similar technologies. The descriptions are currently technology-neutral and MCMC considers it would be in the LTBE to keep them broad, as the focus of the Access List is on regulating bottleneck services and facilities regardless of the technology used.

15.60 With respect to TM's request to limit the Transmission Services offerings to existing infrastructure only with any requirement for new rollout being subject to commercial viability, MCMC clarifies that neither the CMA nor the Access List requires rollout of new infrastructure by Access Providers. As mentioned above, section 149 of the CMA requires Access Providers to provide access to transmission services over their existing infrastructure, and does not require building new transmission routes in response to an access request.

15.61 With respect of Fibrecomm Network's proposal to include a clear and standardised service demarcation diagram, MCMC invites Fibrecomm Network and other stakeholders to provide a proposed diagram and MCMC will consider this.

Adjustments to reflect interactions with other services

15.62 MCMC proposes to delete paragraph (e) of the description of the End-to-End Transmission Service, which states:

> *"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."*

15.63 Contrary to how some stakeholders are applying this service description, the End-to-End Transmission Service does not necessarily need to comprise of a Trunk Transmission Service and two Wholesale Local Leased Circuit Services on each end. This approach is unduly limiting and does not reflect the service description as captured in paragraph (a).

15.64 The End-to-End Transmission Service is described clearly in paragraph (a) of the description, as a service for the carriage of communications between two End User locations, two Access Seeker premises or one End User location and one Access Seeker premises.

15.65 While paragraph (e) was not intended to limit the service description, MCMC considers that this paragraph is creating rather than removing ambiguity about the scope of the End-to-End Transmission Service, and should therefore be deleted. It is also not relevant, since not all elements of the Trunk Transmission Service or Wholesale Local Leased Circuit Service will necessarily be relevant to the End-to-End Transmission Service.

15.66 Lastly, MCMC proposes consequential amendments to the descriptions of Trunk Transmission Service and End-to-End Transmission Service, to reflect the fact that the Broadcasting Transmission Service is being proposed as a separate service in the Access List (see section 10 above and paragraphs 15.67 and 15.68 below). These amendments are intended to remove overlap between the Trunk Transmission Service and End-to-End Transmission Service, on the one hand, and the proposed new Broadcasting Transmission Service, on the other.

MCMC Preliminary View

15.67 MCMC's preliminary view is to retain the Wholesale Local Leased Circuit Service, Trunk Transmission Service and End-to-End Transmission Service in the Access List with the following amendments:

(a) amendments to exclude services provided over low earth orbit satellite networks;

(b) minor amendments to remove provisions relating to broadcasting transmission, which will now be dealt with under the separate Broadcasting Transmission Service;

(c) minor amendments to clarify that the Wholesale Local Leased Circuit Service and End-to-End Transmission Service capture services with any latency below 40 ms – the current reference to "between <1 ms and <40 ms" is likely to confuse, since latency of below 1 ms is already captured by the reference to "<40 ms"; and

(d) amendments to clarify interactions between the End-to-End Transmission Service and the Trunk Transmission and Wholesale Local Leased Circuit Services.

15.68 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 descriptions for the Wholesale Local Leased Circuit Service, Trunk Transmission Service and End-to-End Transmission Service are as follows:

(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 an Access Provider's premises and an End User location or an Access Seeker's Premises, available only at one end of a private 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, 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 ISDN, Metro Ethernet ("Metro-E"), IP based networks and Ethernet interfaces.

(c) Without limiting subparagraph 6(a) above, 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.

(d) The Wholesale Local Leased Circuit Service includes any Wholesale Local Leased Circuit 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 <1 ms and~~ <40 ms;

(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 subparagraphs (i) to (iii) above.

(7~~12~~) 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's premises, 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 and Metro-E.

(c) The functionalities of the Trunk Transmission Service include:

(i) transmission and any type of routing or switching, whether packet, 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) 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)~~(e) An Access Seeker for the Trunk 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 Trunk Transmission Service in order to connect its limited network facilities or network services.

(8~~15~~) 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; or

(iii) between one End User location and one Access Seeker's premises,

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, 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 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)~~(e) Technologies used to supply End-to-End Transmission Service, such as Metro-E, or any other applicable technology which is currently available or which may be developed in future, may be requested by Access Seekers and the Access Provider must supply End-to-End Transmission Service using these technologies on request.

~~(g)~~(f) 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)~~(g) 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 <1 ms and~~ <40 ms;*

(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 subparagraphs (i) to (iii) above.*

Questions

Question 29:	Should the Trunk Transmission Service be defined with the same technical parameters as those existing for the WLLC Service and End-to-End Transmission Service? If not, please provide details of any alternative parameters that should be included in the service description.
Question 30:	Do you consider that these are specific routes for Trunk Transmission Service, End-to-End Transmission Service and WLLC Service that should be removed from the Access List? If so, please identify the specific routes and provide evidence regarding the levels of competition and supply characteristics for these routes.

16 Domestic Connectivity to International Services

Service Description

16.1 Domestic Connectivity to International Services is currently described in the Access List as follows:

> ***(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.*

16.2 The scope of Domestic Connectivity to International Services is illustrated in the diagram below:

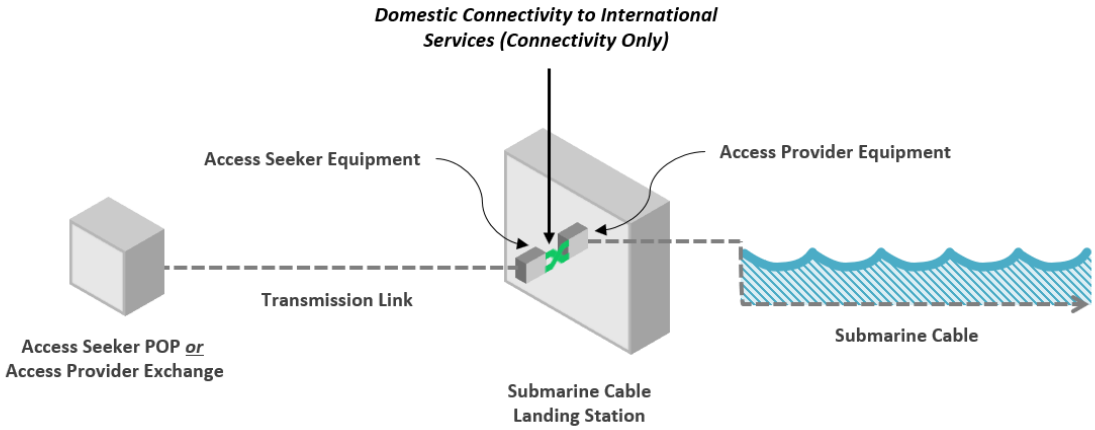


Figure 18 – Scope of Domestic Connectivity to International Services

Overview

16.3 A submarine cable landing station is a facility at which a submarine cable system terminates. These stations house the physical interconnection point and active equipment, such as power equipment and submarine line terminal equipment (**SLTE**) which allow for the transmission of data via the submarine cable.

16.4 Domestic Connectivity to International Services provides the physical connection essential for an Access Seeker to acquire or access capacity on a submarine cable system. This service functions as the physical interface at the POI between the international submarine cable system and downstream transmission links originating from other parts of Malaysia. The service only captures connectivity to international submarine cables, and therefore does not include connectivity to submarine links between Peninsular Malaysia and East Malaysia.

16.5 This service comprises connectivity only, at the submarine cable landing station. It does not capture:

(a) physical access to the submarine cable landing station where the connectivity occurs – this can be acquired separately under the Network Co-Location Service;

(b) the domestic transmission link connecting from a location in Malaysia to the submarine cable landing station – this can be acquired separately under a regulated transmission service (or similar Access List service); and

(c) capacity on the international submarine cable to which the Access Seeker wishes to connect – this capacity must be acquired commercially and is not regulated under the Access List.

16.6 MCMC adopts a functional, technology-neutral definition of this connectivity service. In MCMC's view, this service captures physical interconnection at the first point (from the shore-end downstream) at which an Access Seeker can link their equipment 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, which may be a shore-end cable landing station or a data centre.

16.7 This service includes connectivity links within facilities dedicated to the termination of a specific cable (i.e. a cable landing station) or those with shared use (such as a data centre). It encompasses the physical wiring at facilities located close to the shore-end or further downstream, provided that such facilities are the first POI at which an Access Seeker can interconnect with the relevant cable system.

Submissions Received

16.8 CelcomDigi, Media Prima TV, Tune Talk and another operator specified that they acquire Domestic Connectivity to International Services and find it usable as an input to the service supplied to their customers. CelcomDigi noted the service is essential in enabling CelcomDigi to provide reliable international data and voice services to its customers.

16.9 Astro and U Mobile acquire the service through commercial arrangements. Astro particularly noted it obtains the service through a commercial arrangement with CelcomDigi, using the Cross Peninsular–Sabah submarine cable to support fibre broadband services and establish infrastructure links (between Astro Broadcast Centre in Bukit Jalil and Celcom Timur Data Centre in Kota Kinabalu).

16.10 The above operators also agreed that the service provides the functionality needed to build a service for their customers which is competitive with the Access Provider's equivalent service. The only exception was CelcomDigi, which complained that it was challenging to compete effectively with the Access Provider's own end-to-end service offering. CelcomDigi further explained that reliance on the Access Provider's network and operational capabilities limited flexibility in customising service features, pricing, capacity and service levels for customers.

16.11 Allo, Celcom Timur, FibreComm Network, Maxis, REDtone, TIME, TM, YTLC and another operator do not acquire Domestic Connectivity to International Services for various reasons:

(a) The other operator highlighted that international connectivity is provided indirectly by the host MNO as part of the MVNO arrangement;

(b) **TIME:** connectivity is through its own Cable Landing Station (**CLS**) or through CLSs in other countries; and

(c) **YTLC:** does not own or participate in submarine cable systems. It currently relies on the IP Transit Service as an alternative path to reach international locations.

16.12 Media Prima TV noted that there is restricted control over routing and handover points, reduced flexibility in traffic management, and less ability to customise the service compared to the Access Provider's equivalent offering.

16.13 The operators identified no impediments in gaining access to, or supplying, the services and did not propose any changes to the service description.

MCMC Assessment

Competition/LTBE Analysis

16.14 MCMC considers that connectivity to each international submarine cable constitutes a bottleneck. The only way that an Access Seeker can interconnect with a particular submarine cable is by acquiring connectivity to that cable at a specific data centre or cable landing station – it is not possible to acquire direct connectivity to that cable via a different Access Provider at a different location. This is because each cable system only allows Access Seekers to interconnect at a given location, where the cable terminates.

16.15 An Access Seeker would have the theoretical option of bypassing this bottleneck by acquiring connectivity to an entirely different cable system. However, while there has been significant growth in the number of submarine cables landing in Malaysia, the economic and technical characteristics of each cable system are significantly different. Accordingly, where an Access Seeker faces issues acquiring *connectivity* to capacity on a given cable system, acquiring capacity on an entirely different cable system is unlikely to be a viable response that credibly constrains the behaviour of the connectivity Access Provider (i.e. the cable landing station operator). This is especially because the physical connectivity link at the cable landing station represents a very small portion of the overall value the Access Seeker obtains in connection with a submarine cable system (which vests mostly in the capacity offered over the international submarine cable system and the overseas locations to which it connects).

16.16 An Access Seeker could also acquire connectivity to international capacity *indirectly*, by purchasing an IP transit service. However, this does not constitute an effective substitute to direct connectivity to a specific submarine cable system. IP transit is a premium service that has different pricing characteristics to acquiring capacity on an international cable system directly. IP transit also provides significantly less control to the Access Seeker compared to acquiring capacity on an international cable system, with the latter being capable of a wide range of use-cases and of being acquired in a range of different capacities and legal forms. Accordingly, MCMC does not consider that acquisition of IP transit represents a

sufficient substitute to directly acquiring capacity on an international cable system (and therefore bypassing the need for acquire connectivity to that cable system via Domestic Connectivity to International Services at a specific landing station or data centre).

16.17 MCMC therefore considers that there are no effective competitive constraints on the provision of connectivity to each international submarine cable system.

16.18 For this reason, MCMC considers that including this service in the Access List is in the LTBE.

Issues raised by operators

16.19 The operators did not raise any material issues in acquiring or supplying this service from an Access List perspective and did not recommend any changes to the service description either.

16.20 In response to CelcomDigi's comments regarding challenges in competing with the Access Provider's end-to-end offering, MCMC clarifies that the Domestic Connectivity to International Services is designed specifically to provide the physical bridge to international capacity rather than a managed end-to-end retail product. By mandating access at the first possible POI, the service empowers Access Seekers to maintain full operational control over their service layers. The Access Provider merely provides the physical connection between a domestic transmission link (acquired separately by the Access Seeker) and the submarine cable, leaving the customisation of pricing, capacity management, and service levels entirely within the Access Seeker's domain.

16.21 Additionally, the Access Provider is bound by the non-discrimination provisions of section 4 of the MSA, which ensure a level playing field. Under these rules, the provider is legally required to deliver access to Access List services at a technical standard and quality at least equal to what it provides for its own downstream divisions. This is intended to deal with the risk of an Access Provider providing better terms of access to itself than to an Access Seeker (i.e. which would allow the Access Provider to supply more favourable downstream or end-to-end services).

MCMC Preliminary View

16.22 MCMC's preliminary view is that it would be in the LTBE for Domestic Connectivity to International Services to remain in the Access List without modification.

Question

Question 31:	Are the current scope and definition of Domestic Connectivity to International Services adequate to support a competitive international gateway market in Malaysia? If not, what specific physical connection services or operational enhancements should be mandated to ensure an equitable and non-discriminatory environment for all players?

17 Duct and Manhole Access

Service Description

17.1 Duct and Manhole Access is currently described in the Access List as follows:

(13) 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;

(ii) Mainline Ducts;

(iii) Inter-exchange Ducts;

(iv) manholes, including any manholes associated with Lead-in Ducts, Mainline Ducts or Inter-exchange Ducts; and

(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;

(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; and

(iii) provision of physical access in subparagraphs (i) to (ii) above will be subject to the security measures to be included in the Mandatory Standard on Access to mitigate security risk of Access Provider.

Overview

17.2 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.

17.3 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).

17.4 There are typically two main elements to a duct network:

(a) lead-in ducts – these are ducts that connect to a specific premises (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.

Submissions Received

Impediments in supply of Duct and Manhole Access

17.5 Maxis, REDtone and another operator have stated that they have not faced impediments as an Access Provider supplying the Duct and Manhole Access service.

17.6 Celcom Timur, CelcomDigi, Fibrecomm Network, TIME and U Mobile stated that they do not supply this service.

17.7 Pr1ma noted it had no significant impediments but faced minor operational challenges such as coordinating access, safety compliance and managing capacity constraints in certain routes.

17.8 PDC, TM and YTLC noted the following impediments:

(a) **PDC:** similar impediments as faced in respect of Infrastructure Sharing, particularly in relation to local authorities;

(b) **TM:** faced impediments supplying in a third-party area where the assets belong to the developer or the Joint Management Body. TM faces difficulty in obtaining formal handover documentation from the developer to TM as an official Access Provider. In some territories, state-backed entities impose high recurring charges on Access Providers for deploying underground infrastructure, which are not reflected in the MSAP creating unaccounted financial burden for Access Providers;

(c) **YTLC:** faces challenges due to high capital costs, long permit timelines, space constraints for newly constructed infrastructure which limits the number of ducts and delays arising from repairs and ongoing operation and maintenance.

Additional passive facilities or infrastructure to be regulated

17.9 PDC, Pr1ma, REDtone, TM and another operator do not consider any additional facilities or infrastructure should be regulated.

17.10 NTM considers Duct and Manhole Access should be removed from the Access List due to security and maintenance concerns.

17.11 Maxis, U Mobile and YTLC proposed that poles should be included as a regulated service:

(a) Maxis noted that currently fixed poles are regulated as part of the Infrastructure Sharing Service but considers that fixed poles should be reclassified and included within the scope of Duct and Manhole Access as

both serve a similar function as they are used to carry fibre cables and equipment.

(a) YTLC submitted that poles that are used in conjunction with ducts and manholes for the laying of overhead fibre should be included.

(b) U Mobile also suggested inclusion of poles.

17.12 TIME suggested that the current description is overly complex and may benefit from simplification, favouring a description that focuses on core duct-related infrastructure, including lead-in ducts, mainline ducts, inter-exchange ducts, associated manholes and sub-ducts. TIME further submitted that ducts and manholes should not be owned or funded by foreign entities who manage hyperscaler and OTT operations.

17.13 TM considered the categorisation of ducts necessary because different duct types serve different purposes, involve distinct operational and security requirements and justify differentiated charging, with inter-exchange ducts carrying higher risks and costs than lead-in ducts.

17.14 TM submitted that micro trench ducts should not be regulated. Micro-trenching is a deployment method rather than a distinct service. TM further noted that the site survey charges it imposes for duct and manhole access are cost based, reflecting duct length, labour and related travel expenses.

Issues in obtaining physical access as an Access Seeker

17.15 Pr1ma, REDtone and another operator noted that they have not faced challenges relating to the Duct and Manhole Access service, though CelcomDigi notes that some new operators may not fully understand the SAOs which can occasionally cause delays or confusion in implementing access arrangements.

17.16 Fibrecomm Network, Maxis, TIME, TM and YTLC have cited issues with Duct and Manhole Access as follows:

(a) **Fibrecomm Network:** faces issues obtaining Duct and Manhole Access from other providers, even when the service is included in access agreements;

(b) **Maxis:** faces significant and persistent issues in obtaining physical access to Duct and Manholes. The primary barrier is the prevalence of exclusivity arrangements. There is a constant back-and-forth between developers and Access Providers when requesting access to common ducts and manholes. Developers and building owners claim that the infrastructure has been handed over to a designated Access Provider and their approval is required. The designated Access Providers deny the handover has been completed and redirect Maxis to the developer or building owner, causing indefinite delays (even after escalation to MCMC), as seen in various locations. Maxis also submitted that, in certain states, exclusive arrangements with State-appointed Access Providers block them from deploying their own infrastructure. Permit applications to roll out own fibre infrastructure have also been denied;

(c) **TIME:** lead-in ducts in residential townships are usually built by developers and later owned and operated by TM, unlike ducts funded and maintained by operators. TIME believes access to developer-built ducts should be treated differently from operator-funded ducts, as they are common infrastructure for multi-operator services. Ducts and manholes in shared civil infrastructure should function as shared facilities managed by an appointed entity, with access based on cost-recovery charges rather than commercial wholesale pricing. Including these in the Access List may create administrative and operational barriers instead of facilitating easy access for multiple operators. TIME suggests that MCMC provide clearer guidance on township ducts and shared infrastructure to ensure access obligations are proportionate and practical, reflective of the underlying ownership model;

(d) **TM:** main issues relate to high charges imposed by other Access Providers and additional recurring chargeable items not within the MSAP, such as network management system and inventories. TM is of the view that this additional chargeable element falls under normal monthly recurring charge scope;

(e) **YTLC:** faces limited availability of unused ducts stemming from Access Providers' internal planning or reservation of capacity, therefore restricting access despite physical infrastructure being present. It suggests that the Access List would benefit from greater clarity on the scope and extent of physical access, including transparency around duct capacity availability and the basis on which capacity is reserved or deemed unavailable.

17.17 CelcomDigi highlighted that duct and fibre deployment costs vary significantly depending on geographic location, soil conditions and local authority requirements. CelcomDigi suggests that the Access List and MSA provide clearer guidance on how variable civil works costs are treated, recognise local authority-imposed cost components and allow pricing flexibility to reflect urban versus rural activities.

17.18 Celcom Timur does not acquire Duct and Manhole Access but noted acquisition remains an option if there is a good service for this and that it is beneficial to have further descriptions, scopes and requirements such as capacity verification, site access procedures and safety responsibilities.

17.19 U Mobile submitted that building manholes should be accessible to authorised telcos through formal agreements coordinated by building management, with requirements for physical security, notifications and adherence to safety regulations.

Improvements to the service description to cater for sub-ducts

17.20 Allo, Fibrecomm Network, Maxis, NTM, TM and U Mobile support improvements to the service description to cater for sub-ducts as follows:

(a) **Allo:** Duct and Manhole Access should explicitly allow the deployment of sub-ducts, with the terms set through commercial negotiation;

(b) **Maxis:** proposes amending the Duct and Manhole Access service description to permit Access Seekers to install their own sub-duct in the main duct if

Access Provider sub-ducts are fully utilised as certain Access Providers only allow Duct and Manhole Access via their existing sub-duct and Access Seekers cannot deploy their own when these are full. Maxis proposes adding the following words in the service description: '*Access Provider may allow Access Seeker to deploy their own sub-duct in case the Access Provider's sub-duct are fully utilised*.';

(c) **NTM:** if Duct and Manhole Access is retained in the Access List, the service description should clearly specify duct and manhole sizes and must be practical for sharing. Sharing options should also be specified;

(d) **TM:** supports Duct and Manhole Access being provided at the sub-duct level for efficiency and requires the charges to be consistent with MSAP; and

(e) **U Mobile:** agrees that the sub-duct provisions in the Duct and Manhole Access service description should be refined, such as to prevent new cables twisting around existing ones in the sub-duct.

17.21 Celcom Timur does not acquire the Duct and Manhole Access service but has submitted that the service description should be improved to provide clearer treatment of sub-duct access, including technical and safety requirements for shared sub-duct usage, responsibilities for maintenance and fault rectification and capacity reservation for future network expansion.

17.22 CelcomDigi, Pr1ma, REDtone and YTLC consider the current service description sufficient with Pr1ma also noting that the current service description already includes sub-ducts where there is no room for the Access Seeker to install its own and this is sufficient.

MCMC Assessment

Competition/LTBE Analysis

17.23 Ducts and manholes represent a bottleneck in the supply chain of a range of telecommunications services. The deployment of ducts and manholes is constrained by high capital costs as well as legal and regulatory barriers (e.g. challenges with obtaining permits from local councils). This creates high barriers to entry, with duplication of duct networks also tending to be inefficient from an economic perspective (as compared to sharing of existing ducts).

17.24 Further, 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. Therefore, MCMC's view is that ducts and manholes remain bottleneck facilities.

17.25 An inability to acquire duct and manhole infrastructure can have detrimental effects on downstream competition. If an Access Seeker is unable to acquire duct and manhole access, it will not be able to deploy its own fibre network. In turn, this curtails facilities-based competition and requires the Access Seeker to acquire access at higher levels of the supply chain (such as dark fibre or transmission

services) in order to supply downstream services. This reduces the level of competitive differentiation in downstream markets.

17.26 Consequently, MCMC's preliminary view is that it remains in the LTBE for Duct and Manhole Access to be included in the Access List.

Addressing impediments faced by stakeholders in supplying Duct and Manhole Access

17.27 Most of the impediments to Duct and Manhole Access faced by the stakeholders are not related to the scope of this service under the Access List and therefore cannot be resolved by amending the service description in the Access List. Examples are difficulties in obtaining formal handover documentation from developers, long permit timelines and issues with local authorities.

17.28 TM's concern regarding state-backed entities imposing high recurring charges for deployment of underground infrastructure, which is not reflected in the MSAP and which therefore creates unaccounted financial burden for Access Providers, would more appropriately be addressed as part of a future review of the MSAP.

17.29 Pr1ma's operational challenges of coordinating access and safety compliance are better addressed through the MSA. MCMC will consider these concerns during the parallel MSA review.

Addressing issues in obtaining physical access as an Access Seeker

17.30 With respect to issues faced by Maxis in obtaining physical access to ducts and manholes due to the prevalence of exclusivity arrangements, MCMC reiterates that the designated Access Provider must still comply with its SAOs in respect of the facilities and services in the Access List. Where an Access Provider refuses access to its ducts and manholes on the basis that it (or another provider) is the exclusive provider of fibre infrastructure, such refusal of access may only be made pursuant to one of the recognised grounds of refusal in the MSA.

17.31 Due to concerns from stakeholders about exclusivity arrangements, MCMC also proposes to list access to dark fibre in exclusive zones on the Access List, as discussed in section 7. This would practically assist Access Seekers who are otherwise unable to access ducts and manholes in exclusive zones and are prevented from rolling out their own fibre infrastructure. Dark fibre would also ensure the highest level of competitive differentiation possible, short of operators deploying their own fibre infrastructure via Duct and Manhole Access.

17.32 In response to TIME's submissions, MCMC does not agree that regulation of access to ducts and manholes should be distinguished based on whether they are developer-funded ducts or operator-funded ducts. Where developer-funded ducts are later owned and operated by a licensee, that licensee is bound by the Access List and the MSA and must provide access to Access Seekers. Moreover, listing ducts and manholes on the Access List is specifically intended to ensure that such ducts can be used by multiple operators. Accordingly, it is not clear to MCMC why TIME considers that including developer-funded ducts on the Access List creates administrative and operational barriers instead of facilitating easy access for multiple operators.

17.33 TM's issues relating to high charges imposed by other Access Providers and additional recurring charges not within the MSAP are more appropriately addressed through a future review of the MSAP.

17.34 With respect to YTLC's call for greater transparency around duct capacity availability, YTLC can request such information from the Access Provider by relying on the disclosure obligations under the MSA. Access Providers are under a general duty to provide any information which is reasonably necessary for the negotiation, conclusion and implementation of the provision of access as contemplated under the MSA. On the second issue, the basis on which capacity is reserved or deemed unavailable is set out in subsection 6.11.14 (Capacity Allocation Policy) of the MSA. The allocation of available space is on a first-come, first-serve basis and based on efficient allocation principles to minimise space wastage. If YTLC is of the view that an Access Provider is in breach of subsection 6.11.14 of the MSA, it has the option to lodge a complaint with MCMC.

17.35 In response to CelcomDigi's complaints on costs, MCMC reiterates that issues relating to price are not directly relevant to the scope of services on the Access List and are a matter for an upcoming review of the MSAP.

17.36 With respect to U Mobile's submission that building manholes should be accessible to authorised telcos through formal agreements, MCMC does not have jurisdiction to mandate building owners to enter into agreements with telecommunication companies, as building owners are not licensees under the CMA. However, where an operator has entered into an arrangement with the building owner to own or operate manholes, the operator (who then becomes an Access Provider in relation to the relevant manholes) is then obliged to provide access to an Access Seeker under section 149 of the CMA.

Inclusion of poles for fixed deployments

17.37 Maxis, U Mobile and YTLC proposed including poles for fixed network deployments under the same Access List service as Duct and Manhole Access.

17.38 The Infrastructure Sharing service currently includes a reference to "*poles*" that support, or have the capability to support, "*the installation of mobile or fixed network equipment in, along or in close proximity to*" a range of locations, such as a street, road or other outdoor area accessible to the public. This means that access to poles for fixed network deployments is already regulated under the Access List and licensees can request such access under the Infrastructure Sharing service.

17.39 However, given that poles used for fixed network deployments have a similar function to ducts and manholes, MCMC agrees with adding such poles to the service description of Duct and Manhole Access. A key benefit of adding poles for fixed deployments to Duct and Manhole Access is that an Access Seeker would be able to request access to poles, ducts and manholes under the same regulated service, rather than having to request ducts and manholes under one service and poles under the Infrastructure Sharing service. This is likely to be simpler for both Access Providers, who can prepare a single RAO for fixed poles, ducts and manholes, and Access Seekers, who can enter into a single Access Agreement for access to these facilities.

17.40 MCMC's preliminary view is that the Duct and Manhole Access service be amended to "Pole, Duct and Manhole Access". MCMC proposes that access to "poles" under the amended service of Poles, Duct and Manhole Access will be only for poles that support, or have the capability to support, the installation of fixed network equipment, not mobile equipment. Access to poles for the installation of mobile network equipment will continue to be covered under the Infrastructure Sharing service.

17.41 MCMC also proposes adding a new defined term, "Pole", which will be used under the amended Pole, Duct and Manhole Access service and be defined as follows:

"Pole" means any pole, including a utility pole or traffic pole, that supports, or has the capability to support, the installation of fixed network equipment.

References to specific types of ducts

17.42 MCMC acknowledges TIME's submission that the current description should be simplified to focus on duct-related infrastructure generally. In its follow-up discussions with stakeholders, MCMC understands that the delineation between lead-in, mainline and inter-exchange ducts is not always clear and that, in practice, Access Providers are often providing duct access on a general basis (e.g. based on distance), regardless of whether a duct is characterised as "lead-in", "mainline" or "inter-exchange".

17.43 To minimise the risk of disputes between whether a given duct segment is a lead-in, mainline or inter-exchange duct (and what terms of access apply to it), MCMC proposes to introduce a new catch-all category of "ducts" within the service description, which would have its ordinary (general) meaning. To avoid inadvertently limiting the scope of the service description, MCMC proposes to clarify that "ducts" includes any or all of Lead-in Ducts, Mainline Ducts and Inter-exchange Ducts (as currently defined in the Access List).

Sub-ducts

17.44 MCMC acknowledges the submissions received in respect of sub-ducts, including suggestions that access to ducts be mandated at the sub-duct level. MCMC proposes amending the service description to capture "*sub-ducts*" generally, rather than only in circumstances where "*there is no room for the Access Seeker to install its own sub-ducts*". Allowing for general access at the sub-duct level would promote the efficient use of existing sub-duct infrastructure (which is in the LTBE) and would minimise potential disputes about whether there is room for the Access Seeker to install its own sub-ducts. Access Providers would continue to have the ability to refuse access to sub-ducts under the grounds of refusal stipulated under the MSA.

17.45 In response to Maxis's submission that the service description be amended to explicitly allow an Access Seeker to deploy their own sub-ducts in case the Access Provider's sub-ducts are fully utilised, MCMC points out that this is already accommodated under the service description. Paragraph (b)(i) of the description refers to space at each specified network facility (including a duct) "*to enable an Access Seeker to install and maintain its own lines, equipment and sub-ducts*". An Access Seeker is therefore already able to use this service to install and maintain its own sub-ducts, regardless of whether the Access Provider's sub-ducts are full.

Other proposed amendmends to service description

17.46 MCMC proposes to amend paragraph (b) of the service description for clarity. This is because paragraph (b)(iii), which refers to security measures, applies to the requirements in paragraphs (b)(i) and (b)(ii). It is therefore preferable to move paragraph (b)(iii) to a new paragraph (c), to clarify this interaction.

17.47 Lastly, MCMC is not in favour of specifying the sizes of ducts and manholes, or including micro trench ducts. MCMC acknowledges that one licensee has requested that a minimum size or diameter requirement be included in the service description, as small or micro ducts have space constraits and should not be subject to access regulation.

17.48 In MCMC's view, regulation of ducts and manholes at this level of granularity is not justified and risks unduly narrowing the scope of the ducts subject to access regulation. In particular, MCMC notes that paragraphs 5.4.11(c)-(d) of the MSA already allows refusal to access where access is not technically feasible or where the Access Provider has insufficient capacity or space to provide the requested facility. MCMC considers that this principles-based approach is preferable to imposing a minimum size threshold, which is likely to be over-inclusive (i.e. it would exclude ducts below the size threshold, where access may be feasible and available).

MCMC Preliminary Views

17.49 MCMC's preliminary view is to retain Duct and Manhole Access in the Access List with amendments to:

(a) bring poles for fixed deployments within the scope of Duct and Manhole Access;

(b) clarify that the description includes "ducts" generally, rather than being restricted to Lead-in Ducts, Mainline Ducts and Inter-exchange Ducts;

(c) include sub-ducts within the description generally, rather than only where there is no room for the Access Seeker to install its own sub-ducts; and

(d) to add clarity to paragraph (b).

17.50 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:

(15~~3~~) Pole, Duct and Manhole Access

(a) Pole, 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) Poles;

(ii) ducts, including any or all of the following;

~~(i)~~(A) Lead-in Ducts;

~~(ii)~~(B) Mainline Ducts; and

~~(iii)~~(C) Inter-exchange Ducts;

~~(iv)~~(iii) manholes, including any manholes associated with a duct~~Lead-in Ducts, Mainline Ducts or Inter-exchange Ducts~~; and

~~(v)~~(iv) 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

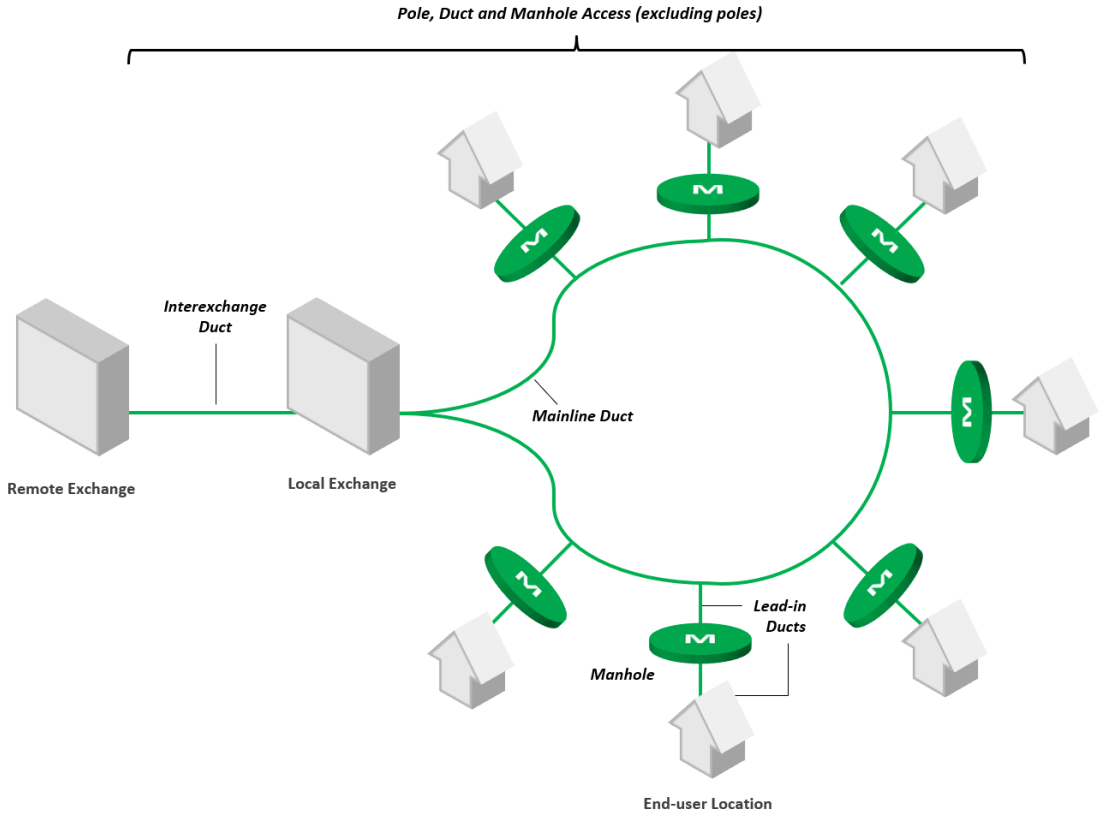
(ii) access for the personnel of the Access Seeker, including to the land upon which any Lead-in Ducts, Mainline Ducts, Inter-exchange Ducts, sub-ducts and manholes are situated.~~; and~~

~~(iii)~~(c) ~~p~~Provision of physical access in subparagraphs (b)(i) ~~to~~and (b)(ii) above will be subject to the security measures to be included in the Mandatory Standard on Access to mitigate security risk of Access Provider.

17.51 MCMC also proposes the following new definitions:

"**Pole**" means any pole, including a utility pole or traffic pole, that supports, or has the capability to support, the installation of fixed network equipment.

17.52 The scope of the proposed Pole, Duct and Manhole Access is illustrated in the diagrams below:



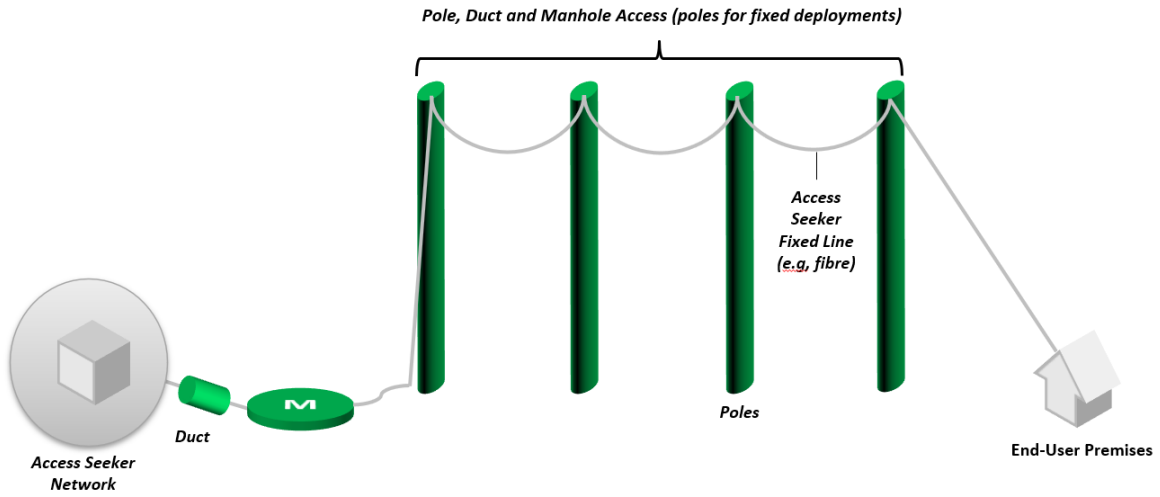


Figure 19 – Scope of Pole, Duct and Manhole Access

Questions

Question 32:	Do you have any comments on the proposed amendments to the description of Duct and Manhole Access?
Question 33:	Do you have any comments on the proposed definition of Pole, including its scope? Please provide your suggested amendments if you believe the definition should be modified.

18 Network Co-Location Service

Service Description

18.1 The Network Co-Location Service provides Access Seekers with access to facilities where they can locate and maintain their network equipment, to allow them to provide downstream services and interconnect with other operators. The service captures both physical access to premises, as well as physical space (i.e. rack or room space), power and ancillary services such as cooling, security and maintenance.

18.2 Network Co-Location Service is currently described in the Access List as follows:[18]

(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;

[18] MCMC, Commission Determination on Access List, Determination No.6 of 2021.

(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, any location where a main distribution frame is housed and such other network facilities locations associated with the provision of a Facility or Service in the Access List.

18.3 The scope of the Network Co-Location Service is illustrated in the diagram below:

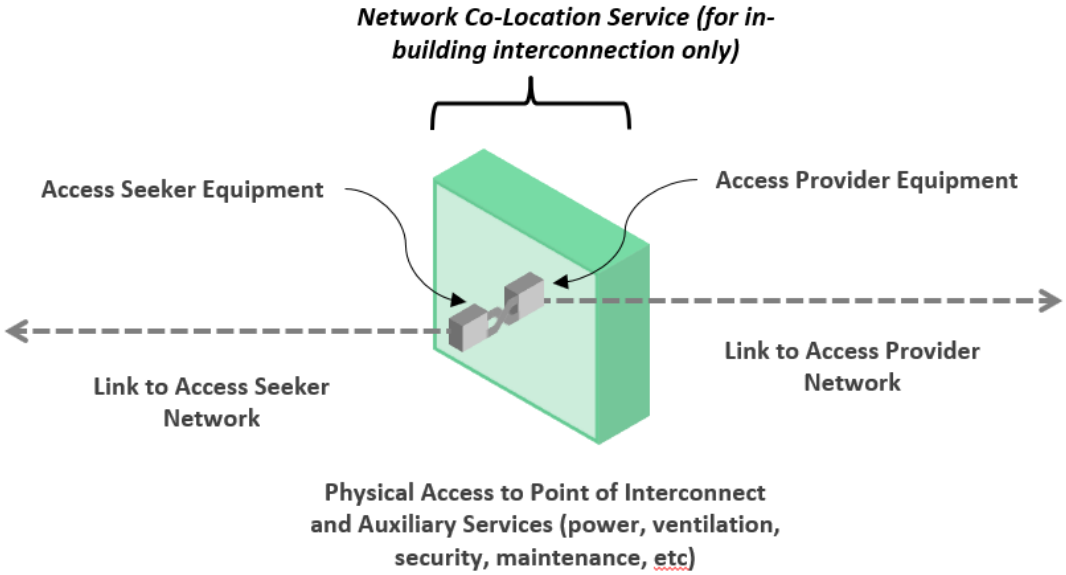


Figure 20 – Scope of Network Co-Location Service (in-building interconnection only)

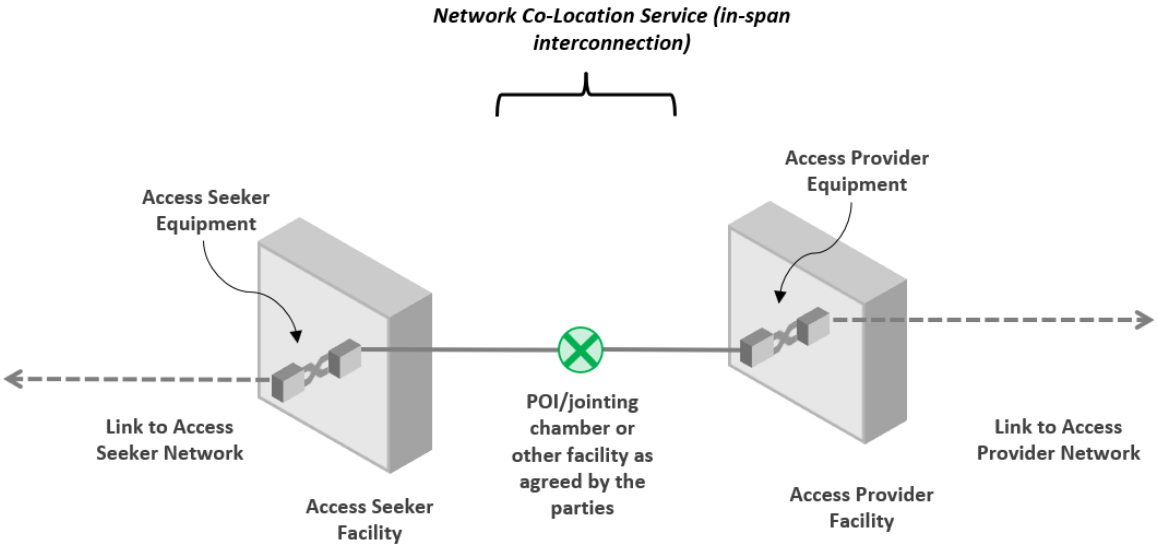


Figure 21 – Scope of Network Co-Location Service (in-span interconnection only)

Submissions Received

Acquisition of Network Co-Location Service

18.4 Allo, Astro, Celcom Timur, CelcomDigi, Fibrecomm Network, Maxis, MYTV, Pr1ma, TM, Tune Talk, U Mobile and YTLC acquire the Network Co-Location Service for various reasons including on a project-only basis, as an input to services supplied to customers.

18.5 MYTV uses physical co-location services for its transmission sites and disaster recovery centre. Maxis uses physical Network Co-Location Service to connect the HSBB networks of the Access Provider and Access Seeker and for provision of bandwidth services to customers in the data centres. TIME, TM and YTLC have explicitly stated they acquire in-span interconnection.

18.6 Allo, CelcomDigi, Fibrecomm Network, Maxis, MYTV, Pr1ma, REDtone, TM, TIME, Tune Talk and U Mobile generally agree that the Network Co-Location Service provides the required functionality.

18.7 Pr1ma further states that limitations may include dependency on the Access Provider's infrastructure for certain routes or capacity constraints during peak usage periods. The availability and scalability of co-location space may also impact rapid expansion, particularly in high-demand locations.

18.8 Two operators have confidentially stated that while the listed Network Co-Location Service provide the basic functionality for Digital Terrestrial Television services, significant limitations impact competitiveness and reliability. Redundancy at critical sites is weak, backup power systems are sometimes non-functional, fibre redundancy is often ineffective and power supply stability at co-location facilities in Sabah and Sarawak is inconsistent. These factors increase operational risk and downtime, affecting the ability to maintain high availability standards.

18.9 SACOFA, TIME and another operator do not acquire the Network Co-Location Service for the following reasons:

(a) **SACOFA:** service is not required based on SACOFA's current services offering;

(b) **TIME:** the interconnection is via in-span interconnection either at AIMS Data Centre or at Subang Hi-tech; and

(c) Another operator highlighted that it does not operate network infrastructure and relies on its host MNO.

18.10 REDtone and another operator acquire the Network Co-Location Service through commercial arrangements.

18.11 Allo, Astro, CelcomDigi, Celcom Timur, Fibrecomm Network, Maxis, MYTV, Pr1ma, REDtone, TM and U Mobile have not reported any significant impediments in gaining access to the Network Co-Location Service. YTLC, on the other hand, submitted that a key impediment is the difficulty in identifying and agreeing on mutually acceptable meetup point for in-span interconnection.

Proposed amendments to service description

18.12 Allo, Astro, Fibrecomm Network, REDtone, TIME, U Mobile, YTLC do not propose any changes to the service description of the Network Co-Location Service.

18.13 Celcom Timur, Maxis, Pr1ma and TM proposed the following changes:

(a) **Celcom Timur:** update the definition of Network Co-Location Service to better accommodate high-density environments such as data centres and submarine cable landings, where meet-me room access, power density, and structured cabling need to be clearly defined.

(b) **Maxis:** expand the service description to explicitly include data centres at paragraph (b) of the service description as shown in red below:

> *Network premises at which co-location is to be provided includes switching sites, submarine cable landing centres, earth stations, exchange buildings, data centres, other Customer Access Modules including roadside cabinets, any location where a main distribution frame is housed and such other network facilities locations associated with the provision of a Facility or Service in the Access List.*

(c) **Pr1ma:** the current description is largely appropriate but recommends expressly referencing:

(i) **submarine cable interconnection** to facilitate co-location and interconnection for operators connecting to submarine CLSs; and

(ii) **high-density data centre deployments** to ensure scalable space, power and connectivity options to meet the needs of high-capacity data centres.

(d) **TM:** remove virtual co-location as most operators are not clear on how to implement this as an Access Provider.

18.14 CelcomDigi has no specific changes to the service description at this stage but notes that, with the growth of submarine cable landings and data centres, further study may be needed to determine if modifications are required.

18.15 TM also noted that data centre facilities are mostly operated by non-licensees and function as commercial, competitive offerings rather than bottleneck facilities and do not have systemic access issues. TM submitted that including them in the service description is unnecessary and risks over-regulation.

MCMC Assessment

Competition/LTBE Analysis

18.16 MCMC considers that network co-location remains a typical "bottleneck" or "essential facility" within the Malaysian communications landscape. This is for two reasons.

18.17 First, co-location primarily involves access to physical premises such as exchange buildings, submarine cable landing stations, and established switching centres, including data centres. These facilities tend to be characterised by high barriers to entry, including significant sunk costs, difficulties with land acquisition (including due to permitting and zoning issues) and geographic uniqueness. These facilities cannot be feasibly or economically duplicated by new entrants and smaller players in the market, which means that licensees must rely on access to existing facilities to locate the equipment they require to provide downstream communication services. This gives access to such facilities an essential role in promoting competition in downstream markets. Access to existing facilities also promotes economic efficiency, by avoiding the wasteful duplication of facilities that would be created if an Access Seeker had to construct an entirely separate facility to co-locate its equipment.

18.18 Second, facilities such as exchange buildings and submarine cable landing stations often provide the only feasible point at which a licensee can interconnect with another operator's services. Even if an Access Seeker could conceivably build their own facility (and this was economically efficient), that Access Seeker would still only generally be able to interconnect with a specific operator at a given facility. For example, to interconnect with an international submarine cable, an operator will need access to the cable landing station where that cable terminates and the operator building its own landing station will not resolve this bottleneck. This makes facilities such as exchange buildings and cable landing stations an essential enabler for interconnection, which is in turn required to achieve any-to-any connectivity.

18.19 Accordingly, MCMC considers that it remains in the LTBE to list the Network Co-Location Service on the Access List.

Adjustments to service description

18.20 With respect to the requests by Celcom Timur, Maxis and Pr1ma to include "*data centres*" and "*submarine cable interconnection*" in the service description, MCMC is

of the view that the existing wording in paragraph (b) is sufficient to deal with these concerns.

18.21 The service description specifically refers to "*submarine cable landing centres*", meaning that access to a cable landing station to interconnect with a submarine cable is already expressly caught within the scope of the Network Co-Location Service.

18.22 In relation to access to data centres, MCMC has the following observations:

(a) Where a data centre is owned or operated by a non-licensee, MCMC does not have the ability to regulate access to such facility through the Access List. This is because the standard access obligations under section 149 of the CMA only apply to licensees.

(b) Where a data centre is owned or operated by a licensee, the service description already requires access to "*such other network facilities locations associated with the provision of a Facility or Service in the Access List*". Accordingly, the service description already captures access to a data centre that is owned or operated by a licensee and is associated with provision of another Access List facility or service (e.g. an interconnection service or a transmission service). MCMC does not consider that any further amendments are necessary to clarify this within the service description.

(c) Where a data centre is not associated with the provision of any Access List service or facility (even where the data centre is owned or operated by a licensee), access to that data centre is not within the scope of the Network Co-Location Service. MCMC considers this to be a reasonable position, as such data centre would be used to access non-Access List services (e.g. cloud computing services) and does not act as a bottleneck facility that is necessary to access any regulated services or facilities. MCMC does not consider that there is a sufficient regulatory basis to regulate access to data centres in these specific circumstances.

18.23 Regarding TM's suggestion to remove virtual co-location from the service description, MCMC notes that this specific proposal was not mirrored by other stakeholders. To ensure that such a change would not inadvertently limit access options for smaller operators, MCMC invites further feedback to determine the continued relevance and demand for virtual co-location services across the industry.

18.24 Furthermore, MCMC acknowledges the confusion highlighted by several licensees regarding the interpretation of "Access Provider's premises" and "Access Provider's network facilities". MCMC clarifies that the intent of the regulation is to ensure access regardless of the underlying property ownership model (i.e. regardless of whether the Access Provider owns the premises or operates it under a lease or licence). To resolve any ambiguity as to whether this applies only to owned property or also to leased or occupied premises and facilities, MCMC proposes to amend the phrase to premises or network facilities "*owned or operated by the Access Provider*".

Other issues raised by operators

18.25 MCMC is concerned by submissions from two operators regarding the inconsistent power supply and lack of redundancy in Sabah and Sarawak. The service description for Network Co-Location involves not only the provision of floor space and physical entry to a site, but also power and other environmental services. MCMC will consider whether refinements can be made to address this issue in its review of the MSA.

MCMC Preliminary View

18.26 MCMC's preliminary view is to retain Network Co-Location Service in the Access List with amendments to clarify that "Access Provider's premises" or "Access Provider's network facilities" refers to premises or network facilities owned or operated by an Access Provider. 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 Network Co-Location Service is as follows:

(11~~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~~ a premises owned and/or operated by the 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~~ a premises owned and/or operated by the 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~~ the network facilities owned and/or operated by an Access Provider 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, any location where a main distribution frame is housed and such other network facilities locations associated with the provision of a Facility or Service in the Access List.

Questions

Question 34:	Have you acquired or offered virtual co-location services in the last 24–36 months?
Question 35:	If you have considered but ultimately decided against using virtual co-location, what were the primary deterrents? (e.g., pricing, lack of physical control over equipment, or better alternatives)
Question 36:	If virtual co-location were removed from the Access List, would this create a barrier to entry for smaller licensees or new market entrants who lack the capital to invest in their own physical hardware?
Question 37:	Do you have any comments on the proposed amendments to the description of Network Co-Location Service?

19 Digital Terrestrial Broadcasting Multiplexing Service

Service Description

19.1 Digital Terrestrial Broadcasting Multiplexing Service is currently described as follows:[19]

(10) 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 and regardless of the system used to deliver that Transport Stream to receivers.

19.2 The scope of the Digital Terrestrial Broadcasting Multiplexing Service is illustrated in the diagram below:

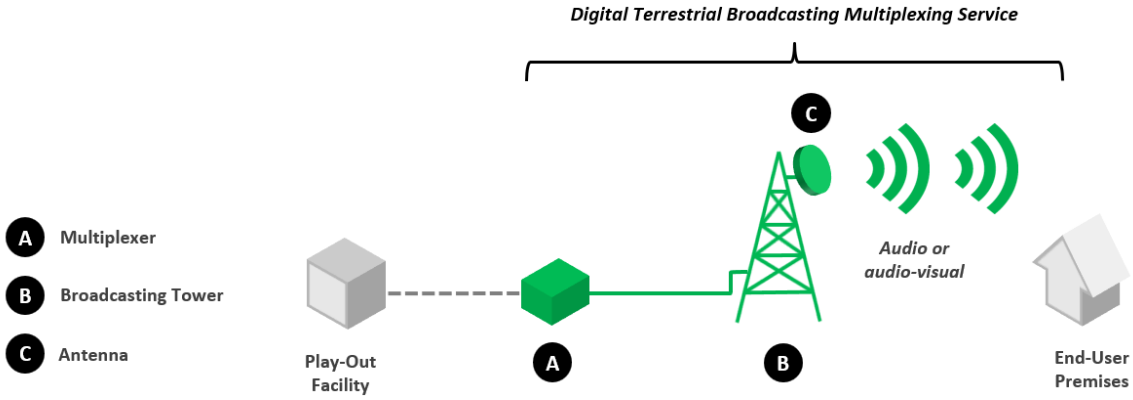


Figure 22 – Scope of Digital Terrestrial Broadcasting Multiplexing Service

[19] MCMC, Commission Determination on Access List, Determination No.6 of 2021.

Overview

19.3 Malaysia has fully transitioned to digital television broadcasting. Two main network elements involved in the process of digital television broadcasting are:

(a) **a fixed-line transmission link**, which carries the broadcaster's content from the broadcaster's play-out facilities to a broadcast tower – this currently falls within the scope of the transmission services, but will fall within the scope of the separate proposed Broadcasting Transmission Service discussed in section 10, under MCMC's preliminary view expressed in this PI Paper; and

(b) **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.

19.4 In 2014, MYTV Broadcasting Sdn Bhd (**MYTV**) was granted a concession from the Malaysian Government to build and operate digital terrestrial television multiplexing infrastructure for 30 years. Based on this concession, MYTV operates a nationwide network of multiplexing equipment (installed at broadcasting towers) as well as a range of transmitters that convey the multiplexed signal to the end-user premises.

19.5 MYTV provides access to the digital terrestrial television multiplexing infrastructure to FTA broadcasters, as well as any other licensed content application service provider (**CASP**). MYTV is a monopoly, as it is the only entity permitted to supply digital terrestrial television multiplexing services in Malaysia.

Submissions Received

19.6 MYTV noted that it is the designated Access Provider for Digital Terrestrial Broadcasting Multiplexing Services. It submits that, from the perspective of their licensed broadcasters, the service is usable and essential as an input to their operations, enabling them to deliver digital terrestrial television content nationwide in a reliable and efficient manner.

19.7 Astro submitted that they find the Digital Terrestrial Broadcasting Multiplexing Services a usable input for their services and does not find any impediments in gaining access to the listed service.

19.8 CelcomDigi, Celcom Timur, Maxis, REDtone, TIME, Tune Talk and YTLC do not acquire this service as they do not provide broadcasting services.

19.9 MYTV noted that it faces no technical or operational barriers since its multiplexing platform is fully established and integrated into the national digital terrestrial television network, but faces challenges in maintaining adequate redundancy, regional distribution, and resilience of its infrastructure to ensure uninterrupted coverage across Malaysia.

19.10 Astro confirms that there are no impediments to gaining access to this listed service.

19.11 MYTV does not propose any changes to the description of the Digital Terrestrial Broadcasting Multiplexing Service at this time.

MCMC Assessment

19.12 The Digital Terrestrial Broadcasting Multiplexing Service has been on the Access List since 2005.[20] Access to the service continues to exhibit bottleneck characteristics, due to the existence of a monopoly provider in the form of MYTV.

19.13 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.

19.14 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, MCMC considers that it would be in the LTBE for this service to remain on the Access List.

19.15 MCMC is not aware of any evidence of any alternative transmission options that are effective substitutes to digital multiplexing services.

19.16 In particular, despite the increased use of online distribution of content via high-speed broadband services, MCMC does 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).

19.17 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 economically inefficient investment in communications infrastructure, at odds with the LTBE.

19.18 MCMC does not believe that there has been any material change in the state of competition in the supply of these services since the 2021 Access List Review, noting MYTV's concession was granted before that review commenced.

MCMC Preliminary View

19.19 MCMC's preliminary view is that it would be in the LTBE for the Digital Terrestrial Broadcasting Multiplexing Service to remain on the Access List without any modification.

[20] MCMC, Commission Determination on Access List, Determination No. 1 of 2005.

Question

Question 38:	Do you agree that Digital Terrestrial Broadcasting Multiplexing Service should remain on the Access List without any modification to the service description? If not, please provide reasons, including suggested amendments to the service description.

20 High-speed Broadband (HSBB) Services

Introduction

20.1 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

(together referred to in this section as "**HSBB Services**").

20.2 The HSBB Services are fixed broadband services that permit the transmission of data packets between an end-user device and another location. Unlike voice telephony or messaging services, or broadcasting transmissions services, which have a specific application or use-case, broadband 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.).

20.3 Broadband services are a specific subset of data services that allow for transmission of data at speeds above 256 Kbps.[21] The transmission (download and upload) speed is also referred to as "bandwidth".

Service Descriptions

20.4 The Layer 2 HSBB Network Service with QoS is currently described in the Access List as follows:[22]

(11) 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;

[21] OECD, 'Revised OECD Telecommunication Price Baskets' DSTI/CDEP/CISP (2017)4/FINAL, 19 December 2017, https://one.oecd.org/document/DSTI/CDEP/CISP(2017)4/FINAL/En/pdf].
[22] MCMC, Commission Determination on Access List, Determination No.6 of 2021.

(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.*
30 Mbps	*5 Mbps*	*Low-speed broadband services*
30 Mbps	*10 Mbps*	
30 Mbps	*30 Mbps*	
50 Mbps	*10 Mbps*	*High-speed residential, business broadband services, or enterprise grade business broadband services*
50 Mbps	*20 Mbps*	
50 Mbps	*50 Mbps*	
100 Mbps	*40 Mbps*	
100 Mbps	*50 Mbps*	

Bit rate		Note and example applications
Downstream	**Upstream**	
100 Mbps	*100 Mbps*	*High-speed residential, business broadband services, or enterprise grade business broadband services*
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 higher, lower or different 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*	*≤ 10^{-3}*	*Real-time, jitter sensitive, high interaction – Voice over IP ("VoIP")*
1	*≤ 200 ms*	*≤ 50 ms*	*≤ 10^{-3}*	*Real-time, jitter sensitive, interactive – IP television ("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*

(iii) any other technical parameters or standards specified, utilised or agreed by the Access Provider from time to time.

20.5 The scope of the Layer 2 HSBB Network Service is illustrated in the diagram below:

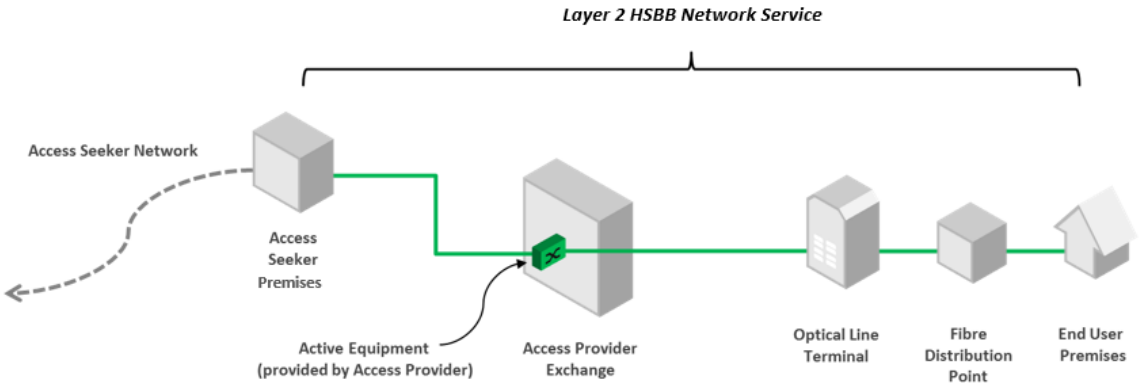


Figure 23 – Scope of Layer 2 HSBB Network Service

20.6 The Layer 3 HSBB Network Service is currently described in the Access List as follows:[23]

(14) 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

[23] MCMC, Commission Determination on Access List, Determination No.6 of 2021.

(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***
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 higher, lower or different 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, utilised or agreed by the Access Provider from time to time.

20.7 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:

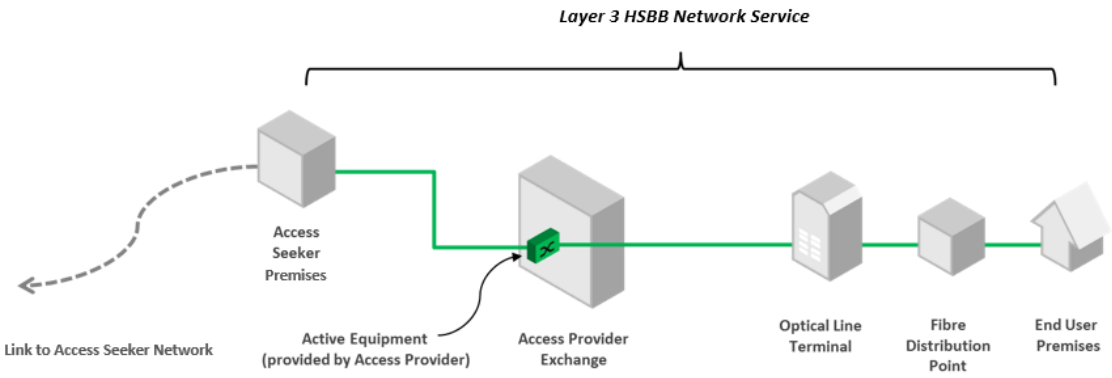


Figure 24 – Scope of Layer 3 HSBB Network Service

Submissions Received

Acquiring access to HSBB Services, usability and commercial arrangements

20.8 Astro, CelcomDigi, Maxis, Pr1ma, REDtone and U Mobile all stated that they acquire both HSBB Services and find them fully usable as an input to the services they supply to their customers.

20.9 Celcom Timur, TIME and TM do not acquire HSBB Services as they are Access Providers while another operator submitted that it does not require HSBB Services for MVNO operations.

20.10 Maxis, Pr1ma and U Mobile are the only operators which acquire either or all HSBB Services commercially. Maxis submitted that it acquires the Layer 3 HSBB Service from TM commercially. Maxis reported that this has introduced many impediments, for example in relation to churn/transfer requests. Pr1ma noted the benefits of acquiring these services commercially were flexibility in terms and conditions, faster implementation, cost efficiency and operational coordination.

Acquiring Layer 2 vs Layer 3 HSBB service

20.11 Allo only acquires the Layer 2 HSBB Service as a result of its business model and reported no impediments, whereas Pr1ma noted it maintains services on Layer 3 only and uses its built-in QoS capabilities.

20.12 Although CelcomDigi submitted that it acquires Layer 2 HSBB Services, it also stated that it "would consider acquiring" the Layer 2 HSBB Service as it provides greater control over traffic management and service differentiation for its customers. This submission implies that CelcomDigi is facing challenges acquiring the Layer 2 service (perhaps from some but not all Access Providers), despite also stating that it acquires such a service. CelcomDigi submitted that most Access Providers currently only offer the Layer 3 service in their RAO, which limits their ability to acquire the HSBB Layer 2 Service with QoS, limiting the level of service customisation CelcomDigi can provide. CelcomDigi observed that impediments to

accessing Layer 2 HSBB stemmed from the Access Provider's unwillingness to offer Layer 2 HSBB at MSAP rates.

20.13 Maxis submitted it acquires the Layer 2 HSBB Service from other Access Providers but not TM. It only acquires Layer 3 HSBB Service from TM since 2010 as TM does not offer Layer 2 HSBB Service in its RAO. Maxis further submitted that it would prefer to acquire the Layer 2 HSBB Service as it provides more flexibility and control to differentiate its retail fixed broadband offering to its customers. However, it has been unable to do so due to TM's refusal to offer the Layer 2 service, and the requirement for a major change to the current network setup.

Proposed changes to pre-defined bit rates

20.14 Pr1ma, TM and U Mobile submitted that the current range of bit rates for both HSBB Services are appropriate. Specifically, TM noted that other speeds are already covered under a "catch-all" provision.

20.15 Allo, Astro, Celcom Timur, CelcomDigi, Maxis, and REDtone noted that the pre-defined bit rates should be increased to include higher speeds, with specific suggestions as follows:

(a) **Allo:** simplify the pre-defined bit rate and introduce a new range for above-1 Gbps FTTH services.

(b) **Astro:** update bit-rate table to reflect market conditions including speeds of up to 2 Gbps.

(c) **Celcom Timur:** include speed options of 2 Gbps and above for constrained bit rate services, consistent with current mass-market offerings.

(d) **CelcomDigi**: continue the bit rates from 1 Gbps to 10 Gbps.

(e) **Maxis:** consumers are likely to expect higher speeds up to 5 to 10 Gbps in the next 3 to 5 years. Maxis proposed increasing the speeds to 10 Gbps with provision to allow any other speeds or bit rates as specified or utilised by the Access Providers from time to time. Maxis suggested the following amendment:

Bit Rates	
Downstream	Upstream
2000 Mbps	1000 Mbps
2500 Mbps	1000 Mbps
5000 Mbps	1000 Mbps
6000 Mbps	1000 Mbps
7000 Mbps	1000 Mbps
8000 Mbps	2000 Mbps
10000 Mbps	5000 Mbps

(f) **REDtone:** submitted that technology is able to cater to bit rates over 1000 Mbps.

Other proposed changes to the service description and scope of the service

20.16 Pr1ma, REDtone and TM proposed no amendments to the current description of HSBB Services but suggested monitoring marketplace conditions and technical evolution.

20.17 Allo, CelcomDigi, Celcom Timur, Maxis, TIME and U Mobile suggested the following amendments to the service descriptions for the HSBB Services:

(a) **Allo:** introduce differentiated port rates for bandwidth above 1 Gbps because higher capacities require upgrades of HSBB equipment infrastructure (such as optical line terminal and backhaul capacity).

(b) **CelcomDigi:** suggested that the Access List should adequately recognise the role of voice and related functionalities over HSBB, including support for FNP to reflect current service offerings and market demand.

(c) **Celcom Timur:** the current HSBB Service definitions are based on a GPON technology framework, and as the industry moves towards the next generation of GPON technology (XG-PON/XGS-PON), the Access List description should reflect this evolution. The amendments should distinguish between GPON and XG-PON frameworks as each has different technical capabilities and supports different speed tiers.

(d) **Maxis**:

(i) The existing service description for the Layer 3 HSBB Service does not include the QoS Class parameters which are specified for Layer 2 (latency, jitter and packet loss). Maxis suggested extending these QoS Class parameters from Layer 2 to Layer 3 for clarity and completeness.

(ii) The existing service description for Layer 3 HSBB Service does not specify the core network availability of the Access Provider. Access Providers use this reason to not comply with the regulated MSAP rates for the Service Gateway Internet Bandwidth, claiming that they are providing premium services by offering 99.992% core network availability. It is common for operators to have high core network availability due to multiple redundancy and routes. Therefore, Maxis proposed including core network availability of ≥99.99% in the service description of Layer-3 HSBB Service.

(e) **TIME:** recommended that a broad and inclusive service definition is adopted to capture all relevant services, minimise ambiguity, avoid regulatory gaps and ensure the Access List remains future-proof as technologies evolve.

(f) **U Mobile:** recommended introduction of multi-class, application-aware QoS capabilities to address parameters such as latency and jitter. It also proposed inclusion of the new PON technology such as XGS-PON.

20.18 In a follow-up submission, CelcomDigi submits that TR069 should be included in the service descriptions for both Layer 2 and Layer 3 HSBB Services, and notes that it is currently only implicitly listed under the Layer 3 HSBB Network Service with QoS under the class of service "Management, Business Internet".

Substitutability of HSBB Services

20.19 Celcom Timur noted that any substitution of services should undergo a feasibility study by MCMC, including assessments of QoS, cost models, and potential impacts on existing traditional communication and broadcasting.

20.20 TIME noted that HSBB Network services can potentially substitute traditional communications or broadcasting services. It provided the following examples of how HSBB can substitute various traditional communications and broadcasting services:

(a) consumers increasingly use HSBB for home voice services (e.g. VoIP) effectively replacing PSTN-based telephony;

(b) IPTV and other IP-based content delivery services substitute DTT and satellite-based television services;

(c) IP-VPN and other Layer 3-based corporate connectivity solutions can replace traditional leased line (transmission) services.

20.21 In terms of impediments to substitutability of traditional communications or broadcasting services by HSBB services, TIME submitted that there are:

(a) quality of service limitations, especially where HSBB does not provide guaranteed QoS comparable to dedicated leased lines or broadcast-grade quality;

(b) technical constraints such as bandwidth contention, reliance on shared infrastructure or limitations on multicast capability for broadcast-type services;

(c) commercial concerns where operators may be hesitant to transition fully from legacy services due to potential revenue cannibalisation, sunk costs or differing margin structures; and

(d) regulatory or operational barriers such as access constraints, interoperability issues or restrictions on using HSBB as an input service for certain wholesale products.

20.22 TM posited that, while IPTV, specifically via Unifi TV over the HSBB Network, provides content comparable to traditional broadcasting, it cannot be viewed as a definitive substitute. TM argues that IPTV remains a functional alternative primarily within urban, broadband-rich environments and has yet to achieve the status of a universal replacement. This is largely due to the inherent reliability of traditional broadcast signals, which remain unaffected by internet bandwidth, peak period congestion, or broadband outages. Furthermore, traditional broadcasting maintains bigger coverage in rural and underserved areas where services are accessible

without a subscription, and it continues to meet stringent regulatory standards for availability and emergency alerts that IPTV may not always satisfy.

20.23 TM also highlighted that IPTV is a platform sensitive to high latency, which presents challenges for real-time content like live sports, a limitation not shared by traditional broadcasting. This gap in performance and accessibility extends to voice services as well. TM noted that, while IP voice has to a certain degree replaced traditional voice, it is hindered by the same barriers and limitations identified with IPTV. TM maintains that IP-based voice services cannot yet fully become the substitute for traditional voice communication.

20.24 U Mobile submitted that HSBB has managed to substitute traditional fixed voice service to VOIP and broadcast television via IPTV or OTT.

Acquiring alternative forms of broadband services

20.25 Allo, CelcomDigi, Maxis, Pr1ma, REDtone, TM, U Mobile and another operator all submitted that they do not acquire any alternative forms of broadband services which are not currently listed on the Access List. Specifically, U Mobile noted that there is no permanent substitute for HSBB Services.

20.26 TIME highlighted the need to monitor satellite-based broadband as an alternative to HSBB Services, particularly Low Earth Orbit (**LEO**) satellite systems, noting historical adoption of satellite TV as a substitute for RTM or TV3 services in Malaysia as an example of consumer behaviour when terrestrial options are insufficient. TIME warned that unchecked LEO proliferation could affect competition, investment and long-term infrastructure development, recommending ongoing assessment to ensure it supports national objectives and a balanced competitive environment.

Sufficiency of Points of Interconnection

20.27 Allo, Astro Maxis, Pr1ma, REDtone and TM submitted that the current number and location of POIs are sufficient, noting that the existing POIs enable effective interconnection, routing and service delivery, and are strategically distributed nationwide across major regions.

20.28 Astro further recommended that the Access Seeker should have the flexibility to establish additional POIs with equivalent functionality where necessary, particularly for redundancy and resiliency. It further suggested that neutral third-party facilities should also be permissible as POI locations. Many operators already maintain Points of Presence at data centres or Internet Exchanges, which offer suitable and cost-efficient options for POI deployment. This approach promotes operational efficiency and enhances service delivery to end-users.

20.29 CelcomDigi, Celcom Timur and U Mobile submitted that the current number of POIs is insufficient, for the following reasons:

(a) **CelcomDigi:** recommended having at least one active and one standby link for redundancy, service availability and operational resiliency. CelcomDigi also proposed a study of the number and location of additional POIs, taking into account the current HSBB coverage and traffic distribution. It added that POIs should be geographically diverse.

(b) **Celcom Timur:** as an Access Seeker, current POIs are insufficient for remote areas with sparse populations.

(c) **U Mobile:** availability and coverage of the POI vary between Access Providers and generally, POI coverage does not fully extend to new data centre areas, including KVDC.

MCMC Assessment

Competition/LTBE Analysis

20.30 MCMC considers that it remains in the LTBE to list Layer 2 and Layer 3 HSBB Services on the Access List.

20.31 Wholesale HSBB Services are an essential input into the supply of retail broadband services and are critical to ensuring there is a workable level of competition in relation to retail broadband services.

20.32 At the wholesale level, HSBB Services do not have sufficient substitutes. A degree of substitutability exists at the retail level between HSBB Services and mobile broadband services, especially in relation to lower-speed services (e.g. below 100 Mbps). However, this does not translate to a meaningful level of substitutability at the wholesale level. This is because acquirers of wholesale HSBB Services cannot readily switch to acquiring wholesale broadband services, in the event of a small but significant non-transitory increase in price (**SSNIP**). Wholesale mobile broadband is acquired using a very different structure to HSBB Services (i.e. through MVNO Access or through wholesale services that require significant investments from the Access Seeker, such as MOCN or MORAN arrangements).

20.33 Similarly, in response to TIME's submission about LEO satellite services, MCMC considers that, while LEO satellite services have become increasingly prevalent in Malaysia since the 2021 Access List review, these do not have the bandwidth and reach required to substitute HSBB Services on a national basis. This is for the following reasons:

(a) as mentioned in a range of stakeholder submissions on LEO satellite services at paragraphs 23.8 to 23.10, LEO satellite services have lower maximum speeds than HSBB Services and are unable to fully replace fibre in urban or suburban areas, due to their technical characteristics, capacity, price and quality. LEO satellite services instead tend to be focused predominantly on regional and rural areas; and

(b) LEO services also have a different supply structure and substantially different technical requirements (e.g. in relation to the type of end-user equipment required), meaning that an Access Seeker could not readily switch to acquiring wholesale LEO satellite services, and use it to supply substitutable retail services, in response to a SSNIP for HSBB Services.

20.34 These factors limit the ability of LEO satellite services to competitive constrain HSBB Services at the wholesale level. LEO satellite services instead operate largely as a complement to HSBB Services, at the edges of the market.

20.35 Some stakeholders (e.g. TIME) have also referred to substitution between HSBB Services and transmission services and PSTN-based telephony services. However, TIME acknowledged that there are impediments to full substitutability between these services and HSBB Services. MCMC agrees with this characterisation. While transmission services may impose a limited competitive constraint on HSBB Services, these have different technical characteristics and require Access Seekers to bring different types of wholesale inputs than for HSBB Services (in order to produce a usable retail broadband service that Access Seekers can supply to end-users).

20.36 Moreover, within the last-mile access network, the underlying passive fibre infrastructure used for HSBB and transmission services is often owned by the same Access Providers over the same network footprint. Accordingly, MCMC does not consider that transmission services are able to provide an independent competitive constraint to the supply of HSBB Services, as Access Seekers switching to acquiring transmission services would still need to do so from the same Access Provider over the same network infrastructure.

20.37 TM also refers to a degree of substitutability between HSBB Services (when used as an input into IPTV services) and broadcasting services. MCMC considers that this does not result in HSBB Services being competitively constrained by other services. There is a degree of one-way substitution between traditional broadcasting services and HSBB Services used for IPTV (which may impose some competitive constraints on the supply of traditional broadcasting services). However, because HSBB Services are used for a considerably larger range of use-cases beyond IPTV, traditional broadcasting services are unable to competitively constrain the supply of wholesale HSBB Services.

20.38 The same analysis applies in relation to the substitution between HSBB Services (for VoIP functionality) and traditional fixed voice telephony services, as referred to by TIME and U Mobile. This substitution is one-way (with HSBB Services potentially constraining traditional fixed voice telephony services, but not vice versa). Traditional fixed voice telephony services cannot act as a sufficient substitute for HSBB Services due to the much broader range of use-cases for HSBB Services (e.g. Internet access, content streaming, videoconferencing, etc).

20.39 MCMC also does not consider that there have been significant changes to the state of competition regarding the supply of HSBB Services since the 2021 Access List review. TM continues to play a very significant role as an Access Provider of HSBB Services, with most submissions from Access Seekers referring to TM as the Access Provider and mentioning challenges with acquiring certain services from TM (e.g. Layer 2 HSBB Service). MCMC also considers that there are two very significant barriers to other licensees competing effectively with 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.

20.40 Accordingly, the economic incentives for any new operator to enter the market and commence supplying HSBB Services (at least on a nationwide basis) are low.

20.41 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.

20.42 However, MCMC considers that competition in retail markets is improved when wholesale access is obtained via the Layer 2 HSBB Service, as compared to Layer 3 HSBB Service. This is because Layer 2 HSBB Service provide a greater level of control to Access Seekers, in turn allowing for competitive differentiation over a greater portion of the value chain.

20.43 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, MCMC considers that there would be a stronger basis for removing regulation at Layer 3.

20.44 However, until those impediments are removed, MCMC's view is that it remains in the LTBE to continue regulating access to both the Layer 3 HSBB Network Service together with the Layer 2 HSBB Network Service with QoS, given the lack of substitutability by other (non-HSBB) services as an input into the supply of retail broadband services and the concentrated nature of the supply side of the market for wholesale HSBB Services, which ultimately renders HSBB Services a bottleneck service to which access is required to safeguard competition in relation to retail broadband services.

Adjustments to bit rates

20.45 MCMC agrees with submissions from Allo, Astro, Celcom Timur, CelcomDigi, Maxis and REDtone that the pre-defined bit rates for HSBB Services should be updated to reflect that Access Providers are now able to offer higher speeds than those currently mandated in the Access List.

20.46 MCMC proposes to list an additional bandwidth profile of 2,000 Mbps downstream/500 Mbps upstream in respect of both HSBB Services.

20.47 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 new Layer 2 "Home Hyperfast" product is supplied with a bandwidth profile of up to 2,000 Mbps downstream;

(b) in the United Kingdom, Openreach's Fibre to the Premises option offers speeds up to 1,600 Mbps;

(c) in New Zealand, Chorus's Hyperfibre Business service is offered with symmetrical speeds of 2,000 Mbps, 4,000 Mbps and 8,000 Mbps; and

(d) in Singapore, Singtel offers a bundled fibre broadband plan with a bandwidth profile of 10 Gbps.

20.48 MCMC also proposes to delete bandwidth profiles with downstream bit rates below 100 Mbps (i.e. 30 Mbps and 50 Mbps) from the service description. MCMC understands that these low-speed bandwidth profiles are no longer being widely acquired by Access Seekers or supplied in retail markets. TM's Unifi HSBB services also commence at 100 Mbps downstream and above, with plans having 30 Mbps and 50 Mbps downstream speeds no longer being offered.[24]

20.49 Accordingly, as bandwidth demands and speeds have evolved since the previous review of the Access List, MCMC considers that there is no longer a sufficient regulatory basis to mandate access to HSBB services with bandwidth profiles below 100 Mbps downstream. MCMC notes that the service description would continue to require Access Providers to provide any bit rates that they utilise from time to time (e.g. for their own downstream operations), including any bit rates below 100 Mbps.

Other adjustments to service description

20.50 In relation to Maxis' submission about specifying network availability in the service description, MCMC is interested to receive further stakeholder submissions. MCMC's preliminary view is that it would be beneficial to specify at paragraph (d)(iii) of the Layer 3 HSBB Network Service description that this service includes any network availability parameters specified, utilised or agreed by the Access Provider from time to time. This would clarify that, even where the Access Provider supplies Layer 3 HSBB Service with "premium" or very high network availability (e.g. 99.992%), such services would fall within the scope of the regulated Layer 3 HSBB Network Service and the Access Provider would need to comply with the terms of the MSA and MSAP in relation to those services. To the extent these high network availability services require different pricing under the MSAP, this is a matter for the MSAP, not the Access List.

20.51 MCMC considers that this change should be made to the description of both Layer 2 HSBB and Layer 3 HSBB Services. While network availability metrics have a different technical scope for Layer 2 HSBB and Layer 3 HSBB Services, the intent of the proposed amendments is simply to clarify that, whatever network availability parameters are offered, these fall within the scope of the service description (i.e. an Access Provider cannot argue that its service falls outside the scope of the service description because it offers premium network availability commitments). This clarification is relevant to both Layer 2 HSBB and Layer 3 HSBB Services.

20.52 MCMC has a similar perspective regarding the inclusion of TR069 within the service description. MCMC's view is that the supply of ancillary functionality such as TR069 (which is used to remotely manage customer premises equipment) falls within the scope of the regulated Layer 2 HSBB and Layer 3 HSBB Services and should be supplied by Access Providers if they are themselves using such functionality. In MCMC's view, this is already caught under the general reference to "*any other technical parameters or standards … specified, utilised or agreed by the Access Provider from time to time*" in paragraph (d)(iii) of both Layer 2 and Layer 3 HSBB

[24] Unifi, Fibre Broadband, https://unifi.com.my/fibre-broadband, accessed on 10 March 2026.

Network Services. MCMC's preliminary view is that referring more explicitly to TR069 risks making the service description too rigid and specific, especially if there are evolutions to this functionality in the future. For example, MCMC understands that TR069 is already being upgraded to TR369.

20.53 However, MCMC is interested to receive any submissions from stakeholders regarding whether and how TR069 and other similar functionality should be reflected in the descriptions of the HSBB Services, and will consider if further changes are required based on these submissions. MCMC also reiterates that the pricing for TR069 functionality (including the question of whether an additional charge should apply) is a matter for the MSAP, not the Access List.

20.54 With respect to Allo's suggestion regarding differentiated pricing for bandwidth above 1 Gbps (due to the need for equipment upgrades), MCMC clarifies that the pricing of Access List services is a MSAP issue which must be raised during the MSAP review.

20.55 Regarding CelcomDigi's suggestion that the Access List should include support for FNP, MCMC reiterates that FNP is not an Access List issue and therefore not within the scope of this inquiry.

20.56 With respect to Celcom Timur and U Mobile's recommendations that the service descriptions should be updated to include the next generation of GPON technology (XG-PON and XGS-PON), MCMC clarifies that the current service descriptions of both HSBB Services are technology-neutral. They do not limit the provision of HSBB services to a certain technology only.

20.57 Finally, in response to Maxis' suggestion that the Layer 2 QoS parameters such as latency, jitter and packet loss, be extended to Layer 3 HSBB Service, MCMC clarifies that such measures are not usually provided for in the wholesale supply of Layer 3 HSBB Service. International regulatory models that define QoS requirements are usually for Layer 2 access, similar to the Layer 2 HSBB Network Service with QoS.

Other submissions

20.58 MCMC is concerned that Access Seekers are having difficulties obtaining access to Layer 2 HSBB Network Service from Access Providers, including TM, who do not offer the Layer 2 HSBB Network Service in their RAO. MCMC reminds Access Providers that section 149 of the CMA mandates all Access Providers to provide access to their network facilities or network services listed in the Access List. Additionally, section 5.3.3 of the MSA requires each Access Provider to prepare and maintain a RAO for each Facility and/or Service listed in the Access List which such Access Provider provides to itself or third parties. based on these requirements of the CMA and the MSA, if TM and other Access Providers provide Layer 2 HSBB Network Service to itself or any third party, they must prepare and maintain a RAO for Layer 2 HSBB Network Service. MCMC encourages Access Seekers to lodge a complaint with MCMC under section 69 of the CMA.

20.59 MCMC acknowledges the submissions on sufficiency of Points of Interconnection. Obligations relating to points of interconnection are contained in the MSA so MCMC will consider these submissions during the parallel review of the MSA.

Transmission from Access Seeker POI

20.60 Based on MCMC's discussions with stakeholders, there appears to be a degree of ambiguity among stakeholders regarding whether transmission is included within the scope of HSBB Network Services or must be separately acquired (e.g. under the regulated Trunk Transmission Service or End-to-End Transmission Service).

20.61 MCMC proposes to amend the service description of each of the HSBB Network Services to clarify that, where the service is acquired from an Access Seeker POI, the Access Seeker will need to separately acquire transmission from the Access Seeker POI to the Access Provider POI (from which point transmission will be included within the HSBB Network Service, until the end-user premises). This reflects the fact that the Access Provider does not have control of the location of the Access Seeker's POI and it would therefore be unreasonable for the Access Provider to be required to provide transmission from this location as part of the HSBB Network Services.

20.62 However, MCMC considers it reasonable for transmission from the Access Provider's POI to the end-user premises to fall within the scope of the HSBB Network Services, which are described as "*an access and transmission Facility and/or Service*".

Renaming of Layer 2 HSBB Network Service with QoS

20.63 Lastly, MCMC proposes to amend the name of Layer 2 HSBB Network Service with Quality of Service ("QoS") to "Layer 2 HSBB Network Service" given it is the only Layer 2 HSBB Network Service in the Access List now. This amendment is not intended to have any impact on the substance of Layer 2 HSBB Network Service.

MCMC Preliminary View

20.64 MCMC's preliminary view is that the service descriptions of Layer 2 HSBB Network Service with Quality of Service ("QoS") and Layer 3 HSBB Network Service are amended as follows:

(a) **Layer 2 HSBB Network Service with Quality of Service ("QoS")**:

(i) all references to "*with Quality of Service ("QoS")*" or "*with QoS*" are deleted from the name and the description of the service; and

(ii) bandwidth profiles below 100 Mbps downstream are deleted from the pre-defined bit rates table;

(iii) a new bandwidth profile of 2,000 Mbps downstream and 500 Mbps upstream is added to the pre-defined bit rates table; and

(iv) clarification is added that the service description captures all "*network availability parameters*" specified, utilised or agreed by the Access Provider from time to time; and

(v) clarification is added that the service does not include transmission from an Access Seeker's POI (and such transmission will need to be separately acquired).

(b) **Layer 3 HSBB Network Service**:

(i) bandwidth profiles below 100 Mbps downstream are deleted from the pre-defined bit rates table;

(ii) a new bandwidth profile of 2,000 Mbps downstream and 500 Mbps upstream is added to the pre-defined bit rates table; and

(iii) clarification is added that the service description captures all "*network availability parameters*" specified, utilised or agreed by the Access Provider from time to time; and

(iv) clarification is added that the service does not include transmission from an Access Seeker's POI (and such transmission will need to be separately acquired.

20.65 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:

(13~~1~~) 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.

Where the Access Seeker is acquiring the Layer 2 HSBB Network Service from a POI at the Access Seeker's premises, the Layer 2 HSBB Network Service will not cover transmission from the Access Seeker's POI and will only cover the other elements of this service from that location. The Access Seeker will need to separately acquire a transmission service (which could be a Trunk Transmission Service, Wholesale Local Leased Circuit Service or End-to-End Transmission Service) from the Access Seeker's POI to a POI at the Access Provider's premises.

(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.*
~~30 Mbps~~	*~~5 Mbps~~*	*~~Low-speed broadband services~~*
~~30 Mbps~~	*~~10 Mbps~~*	
~~30 Mbps~~	*~~30 Mbps~~*	
~~50 Mbps~~	*~~10 Mbps~~*	*High-speed residential, business broadband services, or 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*	
250 Mbps	*100 Mbps*	
500 Mbps	*100 Mbps*	
600 Mbps	*100 Mbps*	
700 Mbps	*100 Mbps*	
800 Mbps	*200 Mbps*	
1000 Mbps	*500 Mbps*	

Bit rate		Note and example applications
Downstream	Upstream	
2000 Mbps	500 Mbps	
Any other higher, lower or different 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	≤ 10^{-3}	Real-time, jitter sensitive, high interaction – Voice over IP ("VoIP")
1	≤ 200 ms	≤ 50 ms	≤ 10^{-3}	Real-time, jitter sensitive, interactive – IP television ("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

(iii) any other technical parameters or standards (including network availability paramaters) specified, utilised or agreed by the Access Provider from time to time.

(14) 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").

Where the Access Seeker is acquiring the Layer 3 HSBB Network Service from a POI at the Access Seeker's premises, the Layer 3 HSBB Network Service will not cover transmission from the Access Seeker's POI and will only cover the other elements of this service from that location. The Access Seeker will need to separately acquire a transmission service (which could be a Trunk Transmission Service, Wholesale Local Leased Circuit Service or End-to-End Transmission Service) from the Access Seeker's POI to a POI at the Access Provider's premises.

(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***
~~*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*
2000 Mbps	*500 Mbps*
Any other higher, lower or different 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 (including network availability paramaters) specified, utilised or agreed by the Access Provider from time to time.

Questions

Question 39: Do you agree with the proposed new bandwidth profile of 2,000 Mbps downstream and 500 Mbps upstream in respect of both Layer 2 HSBB Network Service and Layer 3 HSBB Network Service? If not, please provide reasons, including your proposed changes to the bandwidth profiles.

Question 40: Should the low-speed bandwidth profiles of 30 Mbps and 50 Mbps downstream be removed from the Access List? If not, please provide reasons for retaining them on the Access List?

Question 41: Do you agree that the service description for both Layer 2 HSBB Network Services and Layer 3 HSBB Network Services should specifically capture any network availability parameters specified, utilised or agreed by the Access Provider from time to time?

Question 42: Do you consider that any further changes need to be made to the descriptions of the HSBB Services to capture the TR069 protocol and any evolutions to it (such as TR369)?

21 MVNO Access

Service Description

21.1 MVNO Access is currently described in the Access List as follows:

(16) 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, 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.

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

(i) radio network;

(ii) Serving GPRS Support Node (SGSN) and Gateway GPRS Support Node (GGSN);

(iii) Home Location Register (HLR);

(iv) value-added service platforms (such as its Short Message Service Centre (SMSC), Multimedia Service Centre (MSC) and voicemail server);

(v) Subscriber Identity Module (SIM) provisioning and configuration;

(vi) customer billing; and

(vii) customer relationship management.

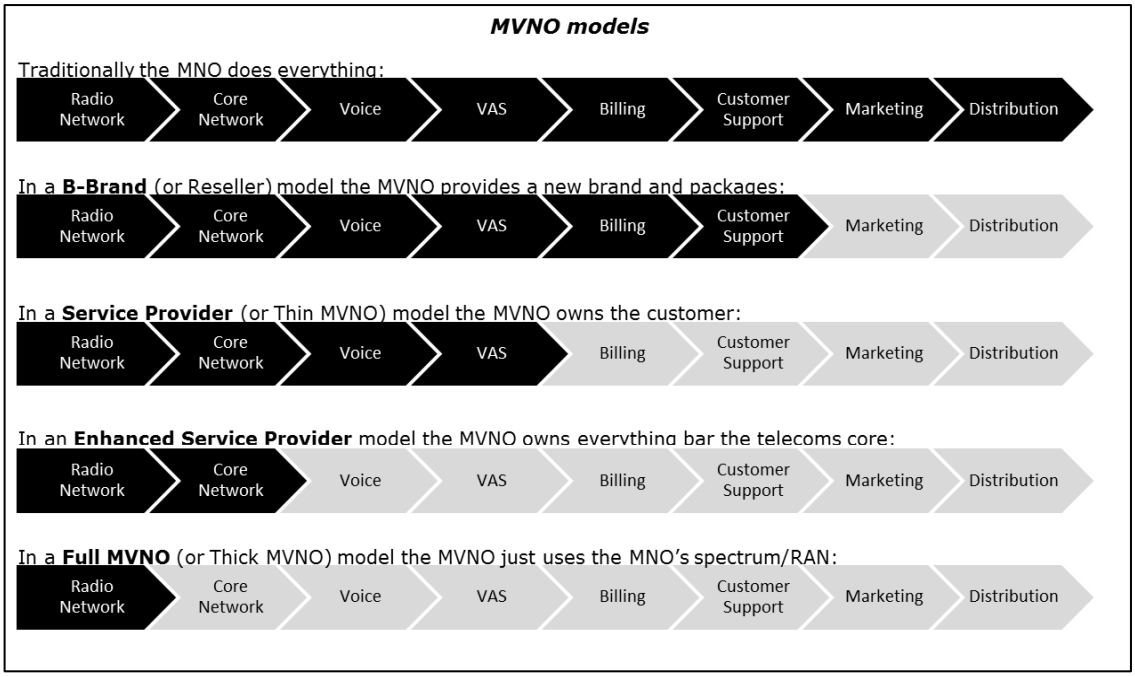


Figure 25 – Models for MVNO arrangements

Overview

21.2 The wholesale dimension of mobile broadband services consists of mobile virtual network operator (**MVNO**) access, domestic roaming and active network sharing arrangements (MOCN and MORAN).

21.3 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.

21.4 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).

21.5 Unlike fixed broadband services, there is no direct one-to-one correspondence between MVNO access services and retail mobile broadband services. MCMC understands that MVNOs acquire an "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.

Submissions Received

Acquisition of MVNO Access service

21.6 REDtone and another operator acquire the MVNO Access service. CelcomDigi, Celcom Timur, Fibrecomm Network, Maxis, Radio Kita, TIME, TM and another operator do not acquire this service.

Proposed amendments to service description

21.7 TM submits that the service description should be expanded on automatic inclusion of future technologies such as IoT or specific slices, and VoNR. It also wants IoT MVNO's flexibility to choose static vs dynamic IP, private vs public APN, inbound roaming, NB-IoT/Cat-M1 access and eSIM.

21.8 TM suggests further amendments to the service description as follows:

(a) **clarify MVNO model:** the descriptions should more clearly distinguish between full, light, and thin MVNO models, specifying which core network elements (Home Location Register, Home Subscriber Server, billing, etc) are required. TM recommends clarifying which elements are mandated minimums in those models to help Access Seekers understand the available MVNO set up options. This would make the requirements clearer and foster more MVNO take-up.

(b) **technical interface specifications:** the Access List should provide more detailed technical requirements for interconnection, including signaling protocols (e.g., Diameter, SIP) and data exchange standards, to avoid ambiguity.

(c) **5G access inclusion:** the current service description is largely in the context of 3G/4G. TM suggests inclusion of latest 2G4G technology and 5G NSA/SA capabilities as MVNOs demand features like slicing, QoS tiers and 5G standalone core features. TM suggests that, given the rollout of DNB's 5G single wholesale network, the MVNO Access service should be updated to include 5G access rights, not just legacy 2G/4G services.

(d) **data privacy and security standards:** TM suggests that data privacy and security standards should be enhanced to ensure compliance with Malaysia's Personal Data Protection Act and secure handling of subscriber data exchanged between MNOs and MVNOs.

21.9 An operator submitted that the current service description does not sufficiently address access to new technologies, QoS parity, or transparency on technical dependencies. The operator's view is that amendments are required to keep the service description current.

21.10 Another operator seeks MCMC's clarification on the scope of MVNO Access for 5G. It submits that the current definition of 5G Services primarily refers to the integration of Access Seeker's 4G or 5G Core with Access Provider's 5G RAN but the examples of services under 5G Services also includes access to the Access Provider's 5G Core. It queries whether the provision of 5G Services by the Access Provider using its own 4G or 5G Core and RAN falls under the definition of 5G

Services or MVNO Access. The operator recommends that this issue is addressed and to ensure clarity and clear demarcation of regulatory obligations between 5G Services and MVNO Access. The operator suggests as follows:

(a) access to Access Provider's 5G RAN integrated with Access Seeker's Core (4G/5G) to fall within the scope of 5G Services;

(b) access to Access Provider's 5G Core and 5G RAN to fall within the scope of MVNO Access.

Removal of MVNO Access from Access List

21.11 Maxis suggests removing MVNO Access from the Access List in view of the different requirements for MVNO Access sought by Access Seekers. Maxis explains that MVNO Access should be negotiated commercially by Access Seekers to meet their different requirements in terms of services (thin vs thick MVNO), quality of service, service level availability, volume, retail target market and network integration level.

21.12 According to Maxis, in most cases, mobile Access Providers compete to provide the best wholesale offer to meet the requirements of the Access Seekers. The Access Seekers have bargaining power to get the best deal from the Access Providers due to multiple competitive offers available in the MVNO Access market.

21.13 Maxis also explains that sufficient competition and regulatory safeguards are already in place to ensure a healthy MVNO access to the market. For example, CelcomDigi's undertaking required CelcomDigi to maintain separation of its wholesale business from its retail mobile business to establish a separate and independent MVNO department for managing wholesale operations for the past 3 years (refer to section 2.7.2 of the CelcomDigi undertaking dated 28 June 2025).

21.14 Maxis further submits MVNOs make up approximately 15% (~6m subscribers) of the total mobile market share, indicating that there is a competitive market for wholesale MVNO Access, hence MVNO Access can be considered for removal from the Access List.

21.15 Lastly, Maxis argues that many countries do not regulate MVNO Access. Based on its findings, the UK, Australia, Singapore, Portugal and Finland do not regulate MVNO Access whereas Malaysia, Thailand and Norway do.

21.16 Another operator, on the other hand, argues that MVNO Access must remain regulated because MNOs retain bottleneck control over essential inputs, the imbalance in negotiation power is significant and the absence of regulatory oversight has historically delayed MVNO Access especially for new technologies (VoLTE and 5G).

Other submissions

21.17 U Mobile noted that Access Providers are currently restricted from providing MSISDNs to Access Seekers without a NSP licence. U Mobile recommends that MCMC allow Access Seekers without an NSP licence to be assigned a dedicated range of MSISDNs under the Access Provider.

MCMC Assessment

LTBE overview

21.18 MCMC considers that significant barriers to entry remain in the establishment of mobile network infrastructure and the supply of wholesale mobile broadband. These include the high capital intensity of network rollouts and the scarcity of spectrum, which remain under the control of a limited number of MNOs.

21.19 MCMC does not consider that there is a workable level of competition in the wholesale market. The only licensees who are technically capable of providing MVNO Access are the MNOs (Maxis, CelcomDigi, U Mobile and potentially YTLC and TM) and DNB (who MCMC understands is not providing MVNO Access in practice). YTLC and TM are small players in the market so the only viable options for providing MVNO Access at scale are Maxis, CelcomDigi and U Mobile. Consolidation at the MNO level (e.g. the merger between Digi and Celcom in December 2022) has reduced over time the number of licensees who are able to supply MVNO Access. This means that the market for MVNO Access is more consolidated on the supply side now than when MCMC previously reviewed the Access List in 2021 (and decided to maintain regulation of MVNO Access).

21.20 Moreover, competition is affected by the fact that vertically integrated MNOs have an inherent incentive to favour their own retail arms over wholesale rivals, which disincentivises the provision of MVNO Access on efficient terms.

21.21 MCMC notes that the number of active MVNOs in Malaysia has grown from 8 in 2019[25] to 20 in 2024.[26] This trend demonstrates that the 2021 Access List Review has had a positive, pro-competitive impact. However, given that this growth is relatively recent and still stabilising, MCMC believes that removing regulation now would be premature and could reverse these gains.

21.22 Furthermore, MCMC observes that, even when MVNO services are negotiated commercially, the regulatory backstop of the Access List provides essential certainty. The non-price terms and conditions set out in the MSA establish standard operating processes that ensure transparency and prevent the constructive denial of access.

21.23 MCMC also emphasises that continued regulation is critical for the transition to 5G. Without mandated access, there is a risk that MNOs may delay or restrict the supply of high-capacity 5G inputs to MVNOs to preserve their own retail dominance in the emerging 5G and IoT enterprise markets.

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

(a) it prevents vertical foreclosure in a market where competition is not yet workable; and

[25] MCMC, Industry Performance Report 2019, p. 62, https://www.mcmc.gov.my/skmmgovmy/media/General/pdf/ENG-MCMC_IPR_2019.pdf.
[26] MCMC, Industry Performance Report 2024, p.56, https://laravel.fortiddns.com/ipr/assets/pdfs/MCMC%20IPR%202024_V.031125.pdf#page=6.

(b) it provides the regulatory certainty required to encourage efficient investment by thick or full MVNOs. By knowing their access rights are protected, these operators are more likely to invest in their own core infrastructure, billing systems and specialised support platforms, as already observed in the Malaysian market.

Adjustments to service description

21.25 In response to the submissions from an operator and TM on the scope of MVNO Access for 5G, MCMC clarifies that 5G MNVO access is already encompassed within the existing definition of MVNO Access. It is not covered under 5G Standalone Access or 4G EPC with 5G RAN Access.

21.26 MCMC agrees with the above-mentioned operator's position that:

(a) where an Access Seeker brings its own 4G or 5G core network and seeks access to DNB or U Mobile's 5G RAN infrastructure, this access would occur under the 5G Standalone Access service or the 4G EPC with 5G RAN Access service; and

(b) where an Access Seeker seeks access to DNB or U Mobile's 5G RAN and core network, this would fall within the scope of the MVNO Access service.

21.27 MCMC's preliminary view is that the service descriptions for the 5G Standalone Access and 4G EPC with RAN Access do not capture access to the Access Provider's core, only to their 5G RAN. There are no references within these service descriptions to access to the Access Provider's 4G or 5G core network. Accordingly, MCMC does not consider further amendments to these descriptions are required, but invites submissions from stakeholders if they consider this needs to be clarified further.

21.28 MCMC also clarifies that the MVNO Access service is intended to be technology-neutral and therefore includes MVNO Access in respect of 5G networks. The technology-neutral nature of the service also addresses TM's suggestion for automatic inclusion of future technologies in the service description and an operator's concern that the description does not sufficiently address access to new technologies.

21.29 More specifically, paragraph (b)(ii) of the description specifically includes a catch-all phrase covering "*any other mobile networks which are currently available or which may be developed in future*". Consequently, MCMC is of the view that no further amendments are required to the service description in this regard.

21.30 Other technical suggestions by TM are more appropriately addressed during the parallel review of the MSA.

21.31 MCMC also proposes a minor amendment to paragraph (c) of the service description (based on its meetings with various licensees) to clarify that the facilities and services an Access Seeker may request from an Access Provider include those owned or operated by the Access Provider. This amendment is intended to clarify that if an Access Provider operates or leases the facilities and is able to provide access, they are required to do so under the Access List, regardless of the underlying ownership.

Removal of MVNO Access from Access List

21.32 In response to Maxis' submission that MVNO Access should be removed from the Access List, MCMC notes that no other stakeholders have made this submission. MCMC acknowledges Maxis' point that the MVNO market has grown, now serving approximately 15% of the total mobile subscribers. However, MCMC disagrees that this commercial success justifies the removal of regulated access. While competitive wholesale offers may exist in the current market, they are underpinned by the regulatory backstop provided by the Access List, which ensures that Access Seekers have a legal right to non-discriminatory access and recourse to MCMC in the event of a dispute.

21.33 MCMC aligns with the view expressed by an operator that MNOs continue to retain absolute control over the underlying RAN and spectrum, which are essential inputs that cannot be duplicated by MVNOs. Since the 2021 Access List Review, the MNO sector has also experienced consolidation, including through the merger of Digi and Celcom, which makes it less likely that competitive forces will be sufficient to ensure that MVNO Access can be provided commercially on efficient terms.

21.34 While Maxis cited countries like the UK and Australia as examples of unregulated MVNO markets, MCMC notes that these markets often have different competition dynamics or alternative pro-competitive tools (such as specific spectrum licence conditions) that may not be directly applicable to the Malaysian context.

21.35 MCMC therefore considers that maintaining MVNO Access on the Access List is in the LTBE and MCMC proposes to retain the service in the Access List for now.

Other submissions

21.36 In response to U Mobile's recommendation that MCMC allow Access Seekers without an NSP licence to be assigned a dedicated range of MSISDNs under the Access Provider, MCMC considers this to be a non-Access List issue, which is beyond the scope of this inquiry.

MCMC Preliminary View

21.37 MCMC's preliminary view is to retain MVNO Access in the Access List with minor amendments to clarify that the Facilities and Services to which the Access Seeker can request access include those that are "owned or operated" by the Access Provider. 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 MVNO Access is as follows:

(16) 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, 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.*

(c) *Examples of Facilities and Services to which the Access Seeker may request access includes but is not limited to the following that are owned and/or operated by the Access Provider~~'s~~:*

(i) *radio network;*

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

(iii) *Home Location Register (HLR);*

(iv) *value-added service platforms (such as its Short Message Service Centre (SMSC), Multimedia Service Centre (MSC) and voicemail server);*

(v) *Subscriber Identity Module (SIM) provisioning and configuration;*

(vi) *customer billing; and*

(vii) *customer relationship management.*

Questions

Question 43:	Do you agree with MCMC's proposal to keep MVNO Access on the Access List? If you disagree, please provide reasons.
Question 44:	Is the market now competitive enough to operate without regulation of MVNO Access? Provide evidence on whether current market dynamics are sufficient to ensure long-term competition.
Question 45:	Do you consider that further amendments are required to the service descriptions of 5G Standalone Access and 4G EPC with RAN Access to clarify that these two services do not include access to the Access Provider's core network? If an Access Seeker needs to acquire access to the Access Provider's core network, do you agree that it will fall under MVNO Access instead of 5G Standalone Access and 4G EPC with RAN Access?
Question 46:	Do you have any comments on the proposed minor amendments to the description of MVNO Access to clarify that the facilities and services sought by Access Seekers are those owned and/or operated by the Access Provider? If not, please provide reasons.

22 Domestic Inter-Operator Roaming Service

Overview and Service Description

22.1 Domestic roaming, also known as "national roaming", refers to an MNO using the RAN of another MNO to supply retail mobile telephony services (or services of a particular type) in locations where the first MNO 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, rural or where an operator only has a small subscriber base.

22.2 The Domestic Inter-Operator Roaming Service is currently described in the Access List as follows:[27]

> ***(17) Domestic Inter-Operator Roaming Service***
>
> *(a) The Domestic Inter-Operator Roaming Service is a Service that enables an End User of an Operator or an MVNO 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.*

Submissions Received

Acquisition and supply of service

22.3 CelcomDigi, Maxis, TM, Tune Talk and U Mobile all acquire Domestic Inter-Operator Roaming Service as an Access Seeker, finding it usable as an input to the downstream services they provide to their customers.

22.4 TM further submitted that Domestic Inter-Operator Roaming Service remains a critical input for ensuring nationwide coverage, especially in areas where TM has limited mobile footprint. It explains that while the service provides basic roaming capability, it falls short of what is needed in a dual-network 5G environment. It argues that the current service description focuses narrowly on enabling roaming, not guaranteeing seamless mobility, consistent user experience or continuity for advanced services. Consequently, the service is usable at a foundational level but is insufficient for delivering the quality and consistency expected by consumers and enterprises.

[27] MCMC, Commission Determination on Access List, Determination No.6 of 2021.

22.5 U Mobile submitted that this service is critical for providing legacy 2G services, such as voice and 2G Machine-to-Machine for Access Seekers that do not have their own 2G infrastructure.

22.6 Celcom Timur, Fibrecomm Network, Radio Kita, REDtone, TIME and another operator do not acquire the service.

Functionality and functional limitations

22.7 CelcomDigi, Maxis, and Tune Talk (which acquires the service via CelcomDigi) report that the service provides the required functionality with no significant limitations.

22.8 TM submitted that:

(a) voice continuity is not explicitly covered resulting in call drops during movement between networks;

(b) data session continuity is not assured resulting in applications such as video conferencing, real-time navigation, online gaming and IoT telemetry potentially freezing or disconnecting when roaming between networks;

(c) advanced 5G services are not covered, for example, SA-to-SA or SA-to-NSA scenarios and continuity for MEC-dependent or slice-based services are not taken into account in the service description; and

(d) there is a lack of KPIs and service standards. There are no obligations for roaming attach success, inter-PLMB handover success, latency variance or session reliability.

Impediments in gaining access or supplying the service

22.9 CelcomDigi and Maxis reported no impediments in gaining access to or supplying the service; TIME had no comments and another operator's primary impediment was a lack of clarity on MVNO eligibility and service parity under domestic roaming arrangements.

22.10 TM faces several operational and structural impediments which limit its ability to fully utilise domestic roaming services. These are:

(a) **unclear cross-network mobility and interworking rules:** no mandated procedures for dual network roaming in a 5G environment, leaving Access Seekers dependent on Access Provider's internal configurations and timelines;

(b) **limited transparency on coverage, readiness and performance:** Access Providers are not obliged to publish detailed coverage maps, roaming supported cells, activation timelines or roaming capability status (SA, NSA, VoLTE);

(c) **slow or inconsistent integration and testing processes:** lengthy testing cycles, unclear documentation or delayed acceptance of roaming configurations;

(d) **no obligation to support advanced features:** current description does not mandate support for 5G-specific mobility, service continuity or QoS preservation; and

(e) **asymmetric power dynamics due to retail participation by Access Providers:** they have incentives to delay or constrain domestic roaming service improvements.

22.11 TM submits that continued regulation will preserve nationwide coverage, protect MVNO viability, safeguard competition and ensure affordable services for all Malaysians. TM suggests that there should be seamless roaming and network handover requirements, explicit voice continuity obligations, mandatory service quality KPIs, continuity for advanced enterprise services and greater transparency required from Access Providers.

Proposed amendments to service description

22.12 CelcomDigi, Maxis and TIME do not require any amendments to the service description.

22.13 An operator submits that the service description should clarify whether and how MVNOs may access domestic roaming services and the conditions under which such access applies.

22.14 TM submits that amendments to the service description are necessary to align it with Malaysia's dual-network objectives and global best practices. It suggested the updated service description should:

(a) require seamless roaming and inter-network handover, not just basic roaming activation;

(b) include explicit voice continuity obligations, covering VoNR, IMS interworking and fallback to VoLTE/LTE where needed;

(c) mandate service quality KPIs including roaming attach success, inter-PLMN handover success, call continuity, latency and jitter thresholds and data session reliability;

(d) support continuity for advanced enterprise services, including IoT, mission critical connectivity, MEC based applications, and future slice-based mobility; and

(e) require transparency from Access Providers including roaming coverage disclosure, readiness timelines, API/Open Source Software exposure and monthly performance reporting.

22.15 TM further submits that these improvements would ensure that roaming becomes a robust mechanism for seamless national mobility, not merely a fallback solution. They would also protect consumer experience, support enterprise adoption and uphold Malaysia's commitment to a fair, competitive and resilient dual network 5G ecosystem.

Retention of service despite regulation of MOCN and MORAN arrangements

22.16 CelcomDigi, REDtone, TIME, TM, Tune Talk, U Mobile and another operator all support the continued regulation of Domestic Inter-Operator Roaming Service, even if MOCN/MORAN arrangements are regulated. The operators' reasons are set out below:

(a) **CelcomDigi:** domestic roaming remains an important input for Access Seekers, particularly for providing coverage in rural and USP areas where direct infrastructure deployment may be limited. However, the necessity and scope of continued regulation should ideally be informed by a detailed market assessment, evaluating factors such as extent of active network sharing, competitiveness of wholesale access and the potential impact on service availability and pricing;

(b) **REDtone:** all base stations cannot support a MOCN arrangement;

(c) **TIME:** even if a MOCN/MORAN arrangement is available, there will be circumstances where it cannot be sufficiently implemented or utilised and this is why the service must continue being regulated;

(d) **TM:** justifications for retaining domestic roaming service on the Access List are:

(i) domestic roaming is the foundation fallback mechansim for national coverage. MOCN/MORAN enable deeper network integration but they require extensive technical alignment, site-level enablement and core RAN integration. Conversely, domestic roaming provides immediate, technology agnostic coverage;

(ii) domestic roaming remains critical for MVNO participation and industry diversity. The growing number of MVNOs in Malaysia, serving niche segments including youth, gig works, migrant communities and B40 households, do not deploy their own RAN infrastructure and rely heavily on the domestic roaming service to provide nationwide services;

(iii) domestic roaming ensures no operator can weaponise coverage as a competitive barrier;

(iv) domestic roaming ensures continuity during transition to 5G and dual network operations – acts as a necessary bridging mechansim; and

(v) both domestic roaming and MOCN/MORAN are complementary, not substitutes;

(e) **Tune Talk:** the service and MOCN/MORAN arrangements serve different market purposes. Domestic roaming is essential for maintaining coverage continuity;

(f) **U Mobile:** it is essential for legacy technology access such as 2G voice and SMS services. Removal of the service from the Access List would create gaps where 2G rollout is not commercially viable, such as for MVNOs who lack 2G spectrum; and

(g) Another operator submitted that the regulation of domestic roaming remains relevant as the services address different use cases and competitive scenarios.

MCMC Assessment

Retention of service on the Access List

22.17 MCMC concurs with the overwhelming industry consensus that Domestic Inter-Operator Roaming Service should remain a regulated service on the Access List, even if 4G MOCN is regulated as separately proposed by MCMC in section 8. While MCMC has considered whether the regulation of 4G MOCN/MORAN arrangements could serve as a substitute, MCMC's assessment, bolstered by operator submissions, confirms that these services are complementary rather than interchangeable.

22.18 MCMC's position is based on the following key considerations:

(a) **National coverage**: unlike MOCN or MORAN arrangements, domestic roaming allows the Access Seeker to obtain national coverage (in all areas where the Access Seeker does not have its own coverage) under a single arrangement, rather than on a site-by-site basis.

(b) **Universal technical accessibility:** as noted by REDtone, not all existing base stations can support the technical complexity of MOCN. Domestic roaming remains the only technology-agnostic "fallback" that provides immediate national coverage without the extensive site-level core integration required by active network sharing.

(c) **Protection of small MNOs and MVNOs:** TM correctly highlighted that domestic roaming remains critical for MVNO participation and industry diversity. For smaller operators and MVNOs who lack their own RAN (or specific legacy spectrum like 2G), this service ensures they can provide nationwide "any-to-any" connectivity.

(d) **Legacy service continuity:** domestic roaming is essential for maintaining 2G voice and SMS services in areas where 4G/5G rollout is not yet commercially viable. Removing this service would create significant "blind spots" for users reliant on legacy devices, particularly in rural and USP areas.

(e) **Bridging the 5G transition:** during the transition to a dual 5G Network model, domestic roaming acts as a vital bridging mechanism to ensure service continuity as networks are reconfigured and integrated.

22.19 MCMC's preliminary view is that the service remains a critical bottleneck input for competition. MOCN and MORAN arrangements provide for deeper integration and efficiency (including by allowing access on a site-by-site basis), but they do not

replace the fundamental role of domestic roaming as a universal safety net for national coverage and industry diversity.

Adjustments to service description

22.20 In response to an operator's request for clarification on how MVNOs may access the service, including the specific conditions of access, MCMC clarifies that subsection 6.14 of the MSA already prescribes the applicable terms. These include, but are not limited to: service fulfilment timelines; provision of the service on a modular and unbundled basis; ensuring the Access Provider provides the same service quality and mobile technologies to Access Seekers as it does to itself.

22.21 Regarding TM's submission that advanced 5G services are not covered in the service description, MCMC refers to subsection 6.14.12 of the MSA. This section mandates that Access Providers must offer access to all mobile technologies, including 5G New Radio. The service description in the Access List is designed to be technology-neutral, and the MSA further reaffirms that all mobile technologies, including 5G, fall within its scope.

22.22 The additional improvements suggested by TM are more appropriately addressed within the MSA framework rather than the Access List service description. Consequently, MCMC will evaluate these suggestions during its parallel review of the MSA to ensure operational consistency.

MCMC Preliminary View

22.23 MCMC's preliminary view is that Domestic Inter-Operator Roaming Service should remain on the Access List without any modification.

Questions

Question 47:	Do you have any comments on MCMC's proposal to retain the Domestic Inter-Operator Roaming Service on the Access List without any changes to the service description?
Question 48:	Do you agree that the Domestic Inter-Operator Roaming Service should remain on the Access List even though MCMC is proposing listing 4G MOCN Access on the Access List?

23 Other Services and Facilities

Introduction

23.1 In addition to submissions about specific services that are currently on the Access List or that MCMC specifically asked questions about adding to the Access List, MCMC received general submissions from stakeholders in relation to the access regime and MCMC's functions more generally. Those submissions, and MCMC's preliminary discussion and response to those submissions, are set out in this section.

LEO Satellite Services

Overview

23.2 Low Earth Orbit (**LEO**) satellite services represent a transformative shift in satellite communications, characterised by constellations of satellites operating at altitudes typically between 500 km and 2,000 km above the Earth's surface. Unlike traditional Geostationary (**GEO**) satellites, which remain fixed relative to the Earth's orbit and are at approximately 36,000 km above the Earth's surface, LEO satellites are in constant motion relative to the Earth, requiring a constellation of hundreds or thousands of units to ensure continuous, overlapping coverage. This proximity to Earth significantly reduces round-trip latency, often achieving delays as low as 25ms to 50ms, compared to the 600ms+ common with GEO systems, enabling high-performance applications such as real-time video conferencing, cloud computing and online gaming that were previously impractical over satellite links.

23.3 LEO technology is a critical tool for bridging the "last mile" connectivity gap in Malaysia's underserved and remote regions where terrestrial fibre or microwave backhaul is commercially or geographically unfeasible. The deployment of LEO services allows for rapid infrastructure rollout, as it bypasses the need for extensive ground-based civil works. As the industry transitions toward a more integrated telecommunications ecosystem, LEO satellites also play an increasingly vital role in supporting direct-to-device communication and providing resilient backhaul for 5G mobile networks.

Submissions Received

Role of services provided over LEO satellite networks

23.4 Altel, CelcomDigi, Pr1ma and TIME noted that the LEO satellite services market in Malaysia is developing.

23.5 MEASAT noted that LEO satellite services are expected to grow rapidly over the next five years, driven by partnership models between NFP/NSP licensees and LEO operators, while the current wholesale model requires procuring a leased circuit to Starlink's nearest POP in Singapore, adding cost. MEASAT also highlighted that direct-to-device services are expected to mature, expanding from emergency texts to voice and data.

23.6 TM noted that LEO satellite services can help close coverage gaps by extending broadband to rural and hard-to-reach areas, supporting backhaul for mobile and fixed networks, strengthening resilience for disaster recovery and critical operations, enabling private networks for industries and facilitating new applications such as IoT and sensor-based applications that require wide coverage.

23.7 SACOFA noted that the limitations of LEO satellite services as compared to terrestrial networks are not foreseen to improve in the next five years.

Impact of LEO satellite services on the supply of HSBB network services and other fixed broadband services

23.8 Altel, Astro, Celcom Timur, CelcomDigi, Edotco, Maxis, MEASAT, Pr1ma, REDtone, SACOFA, Starlink, TM, U Mobile, YTLC and another operator submitted that LEO

satellite services will primarily complement existing networks, particularly for rural, and remote reach areas where fibre-based broadband is limited, for the following reasons:

(a) **Astro:** LEO customer premises equipment remains costly for the average Malaysian household, with higher latency and typical speeds of around 200 Mbps, well below the 2 Gbps available on HSBB networks.

(b) **CelcomDigi:** in densely populated regions, fibre-based HSBB and other fixed broadband options are expected to remain more cost-effective and scalable.

(c) **Edotco:** there is still uncertainty about long-term pricing sustainability for end-users as the market develops.

(d) **Maxis:** LEO satellite services are expected to reshape competition in rural and enterprise segments but are unlikely to fully replace mobile or fixed operators due to capacity and speed limitations. For mobile networks, LEO satellite retail broadband services can reduce reliance on MNOs for terrestrial expansion, while direct-to-device services may bypass traditional coverage or operate through partnerships. LEO satellite backhaul solutions also offer enterprises and smaller operators an alternative to MNO-provided backhaul. In the fixed broadband segment, LEO provides a credible option in areas without fibre and complements HSBB, though it cannot replace fibre in urban or suburban markets, or USP-funded areas due to capacity and speed limitations.

(e) **Starlink:** considers that land-based network services will continue to serve as the backbone of broadband access in Malaysia over the next five years, particularly in densely populated areas. LEO satellite services excel in geographical areas which are "uneconomical" for other broadband services as evidenced by fastest customer uptake of Starlink in the states of Sarawak and Sabah. Starlink further explained that fibre and other terrestrial broadband services can achieve cost efficiency once the optimal density and distribution of users is achieved, whereas the cost of deploying LEO satellite services does not vary across urban and rural areas. Starlink contended that given that LEO satellite services in Malaysia are in their infancy, encouraging parallel growth among different providers (as opposed to inclusion within the Access List) will maximise efficiency and benefit consumers in the longer term.

(f) **TIME:** LEO satellite systems will increasingly support broadband delivery in Malaysia, including backhaul, fixed satellite broadband for rural premises and direct to device mobile services.

(g) **U Mobile:** described LEO satellite services as a substitute for End-to-end Transmission Services in remote areas but noted they will not fully replace fixed broadband in Malaysia due to capacity, price and policy or quality constraints.

23.9 According to MEASAT and REDtone, LEO satellite services will have a limited impact on the supply of fixed broadband services in Malaysia. However, MEASAT submitted

that LEO services will play a significant role in areas where FTTH and HSBB rollout is limited or economically unviable.

23.10 Maxis, U Mobile and YTLC also noted that LEO satellite services will not fully displace HSBB services and other broadband services in Malaysia due to capacity, price and policy/quality considerations.

23.11 Edotco, Fibrecomm Network, Maxis and TM highlighted security and sovereignty concerns where LEO satellite service providers use gateways outside of Malaysia. TM and Maxis noted concerns with Malaysian user data being processed outside national borders, creating risks related to cybersecurity, foreign dependency for connectivity, and regulatory compliance.

Proposed changes to Access List

23.12 Starlink, currently the sole provider of LEO satellite services in Malaysia at the infrastructure level, submitted that LEO satellite services are typically deployed as integrated, end-to-end broadband platforms rather than modular wholesale access services. They face capacity constraints due to significantly higher average deployment costs, making them unsuitable for mandatory access obligations when constellations already require continuous satellite launches to keep up with replacement cycles. LEO satellite services do not constitute essential or nonreplicable wholesale inputs. Starlink further noted that imposing access obligations at this early stage would undermine commercial viability. LEO satellite operators should be allowed to develop and compete on the strength of their own network, allowing consumers to benefit in the long run from the development of different LEO satellite services.

23.13 Starlink further submitted that the stability of LEO satellite services depends on tight coordination between satellites, gateway earth stations and user terminals. Open access entailing third-party connection or standardised access products will have the following impact:

(a) introduce operational dependencies that affect network performance;

(b) it is generally not technically feasible;

(c) increase exposure to cybersecurity threats;

(d) complicate management of control, encryption and network monitoring.

23.14 Starlink further submitted that LEO satellite services are an advanced, yet nascent, technology which should not be subjected to access regulations so that they can become an alternative to terrestrial networks in unserved and underserved areas in Malaysia.

23.15 Altel, Astro, CelcomDigi, MEASAT and Pr1ma also submitted that LEO satellite services should not be included on the Access List. Notable reasons include:

(a) **Altel:** noted that LEO satellite services remain proprietary and lack industry-wide standardisation in service quality, interoperability, and wholesale access models. Premature regulation could misalign with evolving global practices.

(b) **CelcomDigi:** advised that a comprehensive assessment is needed to fully understand the impact of LEO satellite services. Key factors such as performance, cost, coverage, and integration with existing networks should be carefully evaluated before making any final decisions for inclusion in the Access List.

(c) **MEASAT:** submitted that Starlink is the only provider of LEO satellite services in the Malaysian market. It argued that imposing mandatory standards will deter new players from competing with Starlink in Malaysia. It also said that LEO satellite services do not meet the purpose of listing services on the Access List, that is, avoiding duplication, reducing wastage and regulating a bottleneck service. MEASAT believes it would be premature for LEO and satellite backhaul services to be regulated at this stage.

23.16 Celcom Timur, Fibrecomm Network, Maxis, TIME, Tune Talk, TM, YTLC and another operator submitted that LEO satellite services should be added to the Access List. Notable reasons include:

(a) **Celcom Timur**: LEO satellite services may compete with HSBB and fixed broadband offerings but Access List inclusion should be limited to very remote areas.

(b) **Fibrecomm Network**: LEO satellite services' ability to serve similar broadband and mobile functions suggest that regulatory or access obligations may be needed to address competition issues and protect local infrastructure investment. Fibrecomm Network further suggested transparency obligations and clear regulatory treatment of LEO satellite services to ensure its growth does not undermine fair competition or long-term network development in Malaysia.

(c) **Maxis**: LEO satellite services should be included on the Access List.

(d) **TIME**: recommends inclusion on the Access List to ensure fair and non-discriminatory wholesale access and prevent market imbalance as LEO services become mature and more widely integrated. TIME noted that the market structure and licensing framework must be clarified before any access obligations are imposed. The offering of LEO services through resellers who are not licensed under the CMA create ambiguity around licensing requirements. TIME also requested clarity on whether wholesale LEO capacity and backhaul services should be supplied only by CMA-licensed entities.

(e) **TM**: reasoned that adding LEO satellite services to the Access List will provide regulatory certainty, encourage investment and support Malaysia's broader digital transformation. It also suggested the inclusion of following requirements: primary gateway or hub for LEO satellites operating in Malaysia should be located within Malaysia; specific regulations for gateways or hubs located outside Malaysia and geo-redundancy requirements for service resilience.

(f) **Tune Talk**: strongly recommended inclusion of LEO satellite services on the Access List, as this would be beneficial for future efforts to provide connectivity in rural areas.

(g) **YTLC**: listing on the Access List would facilitate competition, interoperability, and equitable access to satellite connectivity for end users.

(h) Another operator submitted that it supported the inclusion of LEO satellite services on the Access List given the high barrier of entry and to ensure fair and equitable access.

Other submissions

23.17 U Mobile suggested that the definition of Transmission Services, particularly Trunk Transmission Services or End-to-End Transmission Services, should remain technology-neutral or be explicitly updated to include satellite backhaul as a regulated input so that if an operator becomes dominant or holds exclusive gateway rights, Access Seekers can obtain regulated backhaul capacity on fair terms to extend mobile coverage.

MCMC Assessment

Listing of LEO satellite services

23.18 MCMC's preliminary view is that, at this stage, it would not be in the LTBE for LEO satellite services to be listed on the Access List. MCMC considers that the current market dynamics and technical characteristics do not yet satisfy the criteria for mandatory access regulation.

23.19 LEO satellite services comprise high-capacity, low-latency constellations that serve as a critical alternative for providing broadband connectivity in areas where terrestrial infrastructure is either absent or insufficient to support the connectivity needs of end-users. MCMC understands that LEO services are also increasingly being used as backhaul, effectively providing an alternative to fixed or microwave transmission links.

23.20 However, the structure of the market in relation to LEO satellite services remains in its infancy and is likely to change significantly in the coming years. While Starlink is currently the only major player at the infrastructure level, there is likely to be further entry into the market, as other global LEO satellite providers (e.g. Amazon's Project Leo and China's Guowang and Qianfan projects) are likely to launch their constellations and may commence services in Malaysia.

23.21 MCMC is concerned that listing wholesale LEO satellite services on the Access List may discourage further market entry, which would have the effect of diminishing rather than increasing competition in downstream markets (contrary to the LTBE).

23.22 MCMC's concern is augmented by the fact that, to MCMC's knowledge, LEO satellite services are not subject to wholesale access obligations in any jurisdiction. If these services were to be regulated under the Access List, it would result in Malaysia being the only country where such services are access-regulated, thereby requiring LEO satellite providers to develop wholesale products for Malaysia only. This is likely to disincentivise new market entry at this time, when the market is still in a nascent

state. This point is underscored by MEASAT, which noted that premature mandatory standards might deter new players from entering the Malaysian market to compete with the sole current provider.

23.23 MCMC acknowledges the counterarguments from stakeholders such as TM, Maxis and TIME, who suggest that adding LEO satellite services to the Access List would provide regulatory certainty and prevent a potential monopoly in remote areas.

23.24 However, given the dynamic nature of the market, MCMC considers that the market is likely to become more competitive over time, as new providers enter the market. Making regulatory decisions that will have an impact over the medium term, at a time when the market structure is rapidly changing, creates a high risk of regulatory error, especially a risk that regulatory intervention will hinder the LTBE, by discouraging competition.

23.25 MCMC will, however, continue to review this position as LEO technology matures and as the structure of the market becomes more stable.

Impact on HSBB Services

23.26 MCMC has taken into account the impact that LEO satellite services are having on high-speed broadband markets and the continued listing of HSBB Services on the Access List. MCMC has set out its preliminary view on this issue at paragraphs 20.33 and 20.34 above. In summary, MCMC does not consider that changes are required to the regulation of HSBB Services in response to LEO satellite services, as such services currently operate at the edge of the market and are not a sufficient competitive constraint on the supply of HSBB Services at present.

MCMC Preliminary View

23.27 MCMC's preliminary view is that LEO satellite services should not be listed on the Access List during this review cycle for the reasons explained above.

Data Centres

Overview

23.28 As described in section 5, data centres function as essential digital infrastructure in Malaysia, supporting high-performance computing, cloud services, and the operational requirements of artificial intelligence. These facilities house the servers, storage systems and networking equipment required to process increasing volumes of domestic and international data traffic. Data centres are integrated into the national telecommunications ecosystem through a reliance on domestic fibre networks and international subsea cable landing stations. This integration is necessary to deliver the high-performance connectivity essential for modern digital services.

Submissions received

23.29 In the informal questionnaire, MCMC asked stakeholders whether they had faced any barriers in establishing data centres or in obtaining access to space or other facilities within data centres.

23.30 CelcomDigi, Pr1ma, REDtone, Tune Talk and YTLC reported not facing any barriers in relation to establishing data centres or obtaining access to space in data centres.

23.31 Altel & MYTV, Celcom Timur, Maxis, TIME and TM responded that there were still barriers in establishing data centres and obtaining access to facilities within data centres, noting as follows:

(a) **Altel & MYTV:** the main barriers were exclusivity practices and high pricing, which disadvantage smaller operators and service providers, distorting competition. Altel & MYTV argue for the introduction of price regulation and standardisation of data sovereignty requirements.

(b) **Celcom Timur:** the main barriers are insufficient water and power supply, challenges obtaining rights of way and limited international gateway capacity when establishing data centres in Sabah. Celcom Timur found that limited access to facilities within data centres drives up costs for existing facilities, making Sabah less attractive for hyperscalers.

(c) **Maxis:** identified three key barriers when accessing data centres. First, non-standard and high data centre rates make it difficult for Maxis to offer competitive rates to customers. Second, some data centre providers only offer one POE to data centres, as opposed to the typical 4, which limits the ability of operators to offer network redundancy. Third, Access Providers having exclusive arrangements which prohibit Access Seekers from using duct and manhole facilities to deploy their own fibre cable into data centres.

(d) **TIME:** reported that certain data centres have been designated *Sasaran Penting Negara*, which restricts external access for national security reasons. TIME noted that though access could theoretically be possible through Standard Operating Procedures, these have not been implemented consistently in reality, effectively leading to TIME being unable to obtain access to these data centres.

(e) **TM:** identified the barriers for establishing data centres as lengthy and inconsistent timeframes for approval from local authorities, shortages of critical utilities like water, electricity and concrete, and increased operational costs due to renewable energy tariffs being priced higher than standard electricity rates.

23.32 Astro reported that it does not have plans to establish its own data centre but leverages access to data centres through arrangements with local ISPs.

23.33 Fibrecomm Network noted it is not involved in data centre projects but its main challenge for connectivity is obtaining last mile access to data centres.

23.34 NTM responded that it does not establish data centres but leases dark fibre cores to data centre tenants.

MCMC Assessment

23.35 MCMC notes that a significant number of operators, including CelcomDigi, Tune Talk, and YTLC, reported no significant barriers to accessing data centre facilities.

Furthermore, other operators such as Astro, Fibrecomm Network and NTM, also submitted that they are not currently involved in data centre projects.

23.36 With respect to barriers identified by certain operators regarding utility access or lengthy timeframes for regulatory approvals, MCMC maintains that such issues do not justify the inclusion of data centres as a regulated facility and/or service on the Access List. These administrative and infrastructural challenges fall beyond the scope of Access List and are more appropriately resolved through alternative agencies or commercial methods.

23.37 In response to the challenges cited by Fibrecomm Network in securing last mile connectivity into data centres and by Maxis regarding the use of duct and manhole facilities and limited POE access, MCMC proposes to include access to dark fibre on the Access List, where dark fibre connects into a data centre and there are restrictions at the POE. This is intended to assist with the connectivity bottlenecks identified by stakeholders in relation to data centres. This is discussed further in section 7 (Access to Dark Fibre).

23.38 MCMC acknowledges the concerns raised by MYTV and Altel, Celcom Timur and Maxis regarding high rates for data centre services. MCMC notes that, in relation to connectivity into data centres, licensees have a number of regulated options, including acquiring transmission services (currently listed on the Access List) or dark fibre (proposed to be listed on the Access List where there are capacity or other constraints at a POE).

23.39 If the concern is about services *within* data centres, such as colocation, power or cooling, MCMC has limited powers to address these issues via the Access List. This is because MCMC understands that most data centres are not owned by licensees and are therefore not able to be regulated via the Access List. However, to the extent a data centre is owned or operated by a licensee, and access is associated with the provision of a facility or service on the Access List (e.g. a regulated Interconnect Link Service or Transmission Service), Access Seekers are able to obtain regulated access via the Network Co-Location Service. This service must be provided at any "*network facilities locations"* (which is broad enough to include data centres) that are "*associated with the provision of a Facility or Service in the Access List*". Please also see paragraph 18.22.

23.40 Accordingly, MCMC does not consider it necessary to separately list access to data centre space or other services at a data centre on the Access List.

MCMC Preliminary View

23.41 MCMC's preliminary view is that access to data centres should not be listed as a separate service on the Access List for the reasons explained above.

Other Services and Facilities

Submissions Received

23.42 The overall impressions of the stakeholders in relation to facilities and services listed on the Access List and the need for any other facilities and services were as follows:

(a) CelcomDigi, Fibrecomm Network, Maxis, Pr1ma and REDtone do not require any other services or facilities to be listed on the Access List whilst TIME proposed Market Definition Analysis to determine the potential services that ought to be captured under the Access List; and

(b) Celcom Timur, Fibrecomm Network, MYTV, TIME, TM and YTLC reported facing difficulties providing services to customers due to an inability to obtain inputs. Maxis and Pr1ma faced no such issues.

23.43 Astro responded that terrestrial broadcasters struggle with limited spectrum availability and radio coverage which restricts their ability to deliver and expand wholesale services.

23.44 Celcom Timur reported challenges as a backhaul provider, particularly in rural areas, due to infrastructure and environmental constraints such as poor road access, limited electricity and water, dependence on wholesale access to utility poles and HDD services and deployment near power line corridors. These issues have led to project and maintenance delays. Additionally, Celcom Timur submitted that the limited number of IP transit providers constrains price competitiveness for their IP transit services.

23.45 Fibrecomm Network indicated it faced challenges obtaining permit approvals at the infrastructure level.

23.46 A licensee responded that, while DTT broadcast pricing is regulated, the underlying infrastructure costs are not. The licensee reported that this allows certain infrastructure providers to charge costs for essential infrastructure which are significantly higher than the regulated CASPs prices which the licensee charges. The licensee assesses that these elevated costs are not economically sustainable in the long-term and will affect its ability to continue providing the DTT service.

23.47 TIME stated that its enterprise services in Johor and Selangor are affected by difficulties in obtaining sufficient fibre cores from local suppliers and delays or denials in securing right-of-way permits. TIME states that this situation is exacerbated when fibre cores are either unavailable or offered at prohibitively high prices. TIME reports that these constraints directly affect its ability serve existing enterprise customers, expand national coverage and ultimately its overall market competitiveness.

23.48 TM reports that Application-to-Person (**A2P**) SMS has become the backbone of automated communication and should be included on the Access List. TM notes that the absence of regulation has led to a fragmented and unclear pricing environment, the monetisation of firewalls rather than their use as technologically neutral safeguards, migration of enterprises to OTT channels outside Malaysia's sovereign control and increased costs for both government and SMEs. TM proposes expanding the description of the Mobile Network Termination Service, applying regulated pricing, enabling a regulated A2P interconnection platform over IP, and standardising national definitions for A2P SMS.

23.49 YTLC reported difficulties acquiring End to End Transmission Services for USP sites under the JENDELA project at *Kampung Orang Asli* Terhem, Bukit Rewe and Bukit Bungar. YTLC noted that, despite fibre cabling being deployed close to these sites,

the services were not made available at the regulated pricing, preventing the use of existing USP-funded network resources for downstream service delivery. YTLC asks for clarity regarding how existing USP-funded infrastructure may be used to support other projects when the specific USP-object has been accomplished. YTLC suggested that access to USP infrastructure and services, including MOCN, should be clearly specified in the Access List.

MCMC Assessment

23.50 MCMC's overarching view is that the proposed inclusion of a new Broadcasting Transmission Service, Access to Dark Fibre and 4G MOCN Access on the Access List will effectively address the majority of the issues identified by the operators above. These services are intended to optimise resource utilisation and foster more efficient network sharing across the industry.

23.51 In terms of issues which have not been addressed by MCMC previously in this Public Inquiry Paper, MCMC responds as follows:

(a) **A2P Messaging:** with respect to TM's suggestion to include A2P messaging on the Access List, MCMC notes that no other stakeholders have identified this as an area requiring intervention through the Access List. MCMC reaffirms its position from the 2021 Public Inquiry Report on Review of Access List, which concluded that there was insufficient regulatory basis for listing A2P messaging on the Access List.[28] As no new evidence has been submitted during the current review cycle to alter this assessment, MCMC invites other stakeholders to provide submissions if they believe new market conditions warrant a reconsideration of this position.

(b) **End-to-End Transmission Services for USP Sites:** regarding YTLC's submission concerning difficulties in securing End-to-End Transmission Services for USP sites under the JENDELA project, MCMC clarifies that the service description applies to all end-to-end transmission services without geographic or project-based exclusions. Therefore, access to end-to-end transmission services for USP sites already falls within the scope of the mandated service, and Access Providers are obliged to supply such access on a non-discriminatory basis.

MCMC Preliminary View

23.52 MCMC's preliminary view is that no further changes are required to the service descriptions in the Access List arising from the additional submissions made by the operators.

[28] Public Inquiry Report on Review of Access List 2021, pp.46-48.

Questions

Question 49:	Do you agree with MCMC's preliminary view that LEO satellite services should not be listed on the Access List during the current review cycle? If you disagree, please provide detailed reasons supported by market evidence to justify why regulation is necessary at this stage.
Question 50:	Do you agree with MCMC's preliminary view that A2P messaging should not be listed on the Access List during the current review cycle? If you disagree, please provide detailed reasons supported by market evidence to justify why regulation is necessary at this stage.

Annexure 1 Summary of Questions

Access to Dark Fibre

Question 1: Do you agree that Access to Dark Fibre should be listed on the Access List, within the scope set out in the proposed service description?

Question 2: Do you agree with MCMC's proposed approach to limiting the scope of the Access to Dark Fibre service to Exclusive Zones and Restricted Data Centre POEs?

Question 3: Do you suggest any amendments to the proposed service description, including the definitions of Exclusive Zones and Restricted Data Centre POEs?

Mobile Network Sharing Arrangements

Question 4: Do you agree with listing a new 4G MOCN Access service on the Access List? Please provide reasons.

Question 5: Do you have any proposed amendments to the proposed service description of 4G MOCN Access?

5G Services

Question 6: In light of the inherent technical differences between 5G Standalone Access (which allows for the native VoNR via the 5G core) and 4G EPC with 5G RAN Access (which relies on the Access Seeker's 4G core), stakeholders are invited to comment on: (a) whether the service descriptions for 5G Standalone Access and 4G EPC with 5G RAN Access should explicitly distinguish the responsibility for voice capability based on the network architecture used; and (b) the technical and operational feasibility of a "shared responsibility" model for voice services?

Question 7: Do you consider that the service descriptions of the 5G Services should be amended to reflect that voice service capability is a shared responsibility of the Access Provider and Access Seeker (rather than a responsibility of the Access Seeker only)?

Question 8: How should "Non-Public Network" functionality introduced in 3GPP Release 16 be captured in the service descriptions of the 5G Services?

Question 9: Do you consider that Reduced Capability and High-Performance Machine Type capabilities should be explicitly referred to in the service descriptions of the 5G Services? If you are an Access Provider, are you currently providing these capabilities?

Question 10: Do you agree with specifically referring to SEPP and N32 interface in the examples of Facilities and Services to which Access Seekers may request access under the 5G Standalone Access service?

Question 11: Do you consider that VoNR and EPS Fallback to LTE/VoLTE should be explicitly referred to within the service descriptions of the 5G Services?

Question 12: Do you agree that access to in-building 5G mobile systems (both passive and active elements) should be regulated under a new Access to In-Building Mobile Systems service and not under the 5G Services? Please provide reasons.

Question 13: Should 5G Standalone Access cover 5G MOCN arrangements between the two 5G network providers under the dual network model? If so, are any amendments required to the service description to enable this?

Question 14: Are there any other changes you consider should be made to the service descriptions of 5G Standalone Access and 4G EPC with 5G RAN Access? Please provide details.

Broadcasting Transmission Service

Question 15: Do you acquire broadcasting transmission services as an Access Seeker or supply broadcasting transmission services as an Access Provider? If so, do you currently acquire or supply these services commercially or using the broadcasting transmission component of the Trunk Transmission Service or End-to-End Transmission Service?

Question 16: Are you experiencing any difficulties in acquiring or supplying broadcasting transmission services?

Question 17: Do you agree that broadcasting transmission services should be listed under a new Broadcasting Transmission Service, rather than being a component of the Trunk Transmission Service and End-to-End Transmission Service? Please provide reasons.

Question 18: Do you have any comments on the proposed new service description for the Broadcasting Transmission Service, including the functionalities and technical parameters?

Infrastructure Sharing

Question 19: Do you agree that Access to In-Building Mobile Systems should be listed as a new service instead of expanding the scope of Infrastructure Sharing service to include the active components of in-building solutions? Please provide reasons.

Question 20: Do you have any comments on the proposed new service description for Access to In-Building Mobile Systems? Please provide your suggested amendments if you believe the service description should be amended.

Question 21: Do you agree with the new concept and definition of "Active In-Building Elements", which seeks to capture all active elements relating to mobile in-building solutions within the scope of Access to In-Building Mobile Systems? If not, please propose alternatives for MCMC's consideration.

Question 22: In relation to physical access to the central equipment room, are the proposed requirements for power, environmental services such as heating, ventilation and air-conditioning, and security sufficient to allow Access Seekers to access the service? If not, please provide suggestions on any ancillary services required.

Question 23: As an Access Provider, do you anticipate any challenges in providing the proposed service? Please provide details.

IP Transit Service

Question 24: Do you agree with MCMC's proposal to remove IP Transit Service from the Access List? Please provide evidence of any remaining bottleneck characteristics or market failures that would justify its retention.

Interconnect Link Service

Question 25: Do you agree with MCMC's proposal to remove SS7-based interconnection link from the Interconnect Link Service description? If not, please provide reasons.

Question 26: Are bandwidth increments of 100 Mbps and 100 Gbps feasible to be mandated under the scope of the Interconnect Link Service? If not, please provide details.

Question 27: What are your views on the inclusion of BoD as a feature of the Interconnect Link Service? As an Access Provider, would you face significant challenges in providing BoD if it is mandated under the Access List?

Origination and Termination Services

Question 28: Do you agree with MCMC's position that Fixed Network Origination Service, Fixed Network Termination Service, Mobile Network Origination Service and Mobile Network Termination Service should remain on the Access List without modification?

Transmission Services

Question 29: Should the Trunk Transmission Service be defined with the same technical parameters as those existing for the WLLC Service and End-to-End Transmission Service? If not, please provide details of any alternative parameters that should be included in the service description.

Question 30: Do you consider that these are specific routes for Trunk Transmission Service, End-to-End Transmission Service and WLLC Service that should be removed from the Access List? If so, please identify the specific routes and provide evidence regarding the levels of competition and supply characteristics for these routes.

Domestic Connectivity to International Services

Question 31: Are the current scope and definition of Domestic Connectivity to International Services adequate to support a competitive international gateway market in Malaysia? If not, what specific physical connection services or operational enhancements should be mandated to ensure an equitable and non-discriminatory environment for all players?

Duct and Manhole Access

Question 32: Do you have any comments on the proposed amendments to the description of Duct and Manhole Access?

Question 33: Do you have any comments on the proposed definition of Pole, including its scope? Please provide your suggested amendments if you believe the definition should be modified.

Network Co-Location Service

Question 34: Have you acquired or offered virtual co-location services in the last 24–36 months?

Question 35: If you have considered but ultimately decided against using virtual co-location, what were the primary deterrents? (e.g., pricing, lack of physical control over equipment, or better alternatives)

Question 36: If virtual co-location were removed from the Access List, would this create a barrier to entry for smaller licensees or new market entrants who lack the capital to invest in their own physical hardware?

Question 37: Do you have any comments on the proposed amendments to the description of Network Co-Location Service?

Digital Terrestrial Broadcasting Multiplexing Service

Question 38: Do you agree that Digital Terrestrial Broadcasting Multiplexing Service should remain on the Access List without any modification to the service description? If not, please provide reasons, including suggested amendments to the service description.

High-speed Broadband (HSBB) Service

Question 39: Do you agree with the proposed new bandwidth profile of 2,000 Mbps downstream and 500 Mbps upstream in respect of both Layer 2 HSBB Network Service and Layer 3 HSBB Network Service? If not, please provide reasons, including your proposed changes to the bandwidth profiles.

Question 40: Should the low-speed bandwidth profiles of 30 Mbps and 50 Mbps downstream be removed from the Access List? If not, please provide reasons for retaining them on the Access List?

Question 41: Do you agree that the service description for both Layer 2 HSBB Network Services and Layer 3 HSBB Network Services should specifically capture any

network availability parameters specified, utilised or agreed by the Access Provider from time to time?

Question 42: Do you consider that any further changes need to be made to the descriptions of the HSBB Services to capture the TR069 protocol and any evolutions to it (such as TR369)?

MVNO Access

Question 43: Do you agree with MCMC's proposal to keep MVNO Access on the Access List? If you disagree, please provide reasons.

Question 44: Is the market now competitive enough to operate without regulation of MVNO Access? Provide evidence on whether current market dynamics are sufficient to ensure long-term competition.

Question 45: Do you consider that further amendments are required to the service descriptions of 5G Standalone Access and 4G EPC with RAN Access to clarify that these two services do not include access to the Access Provider's core network? If an Access Seeker needs to acquire access to the Access Provider's core network, do you agree that it will fall under MVNO Access instead of 5G Standalone Access and 4G EPC with RAN Access?

Question 46: Do you have any comments on the proposed minor amendments to the description of MVNO Access to clarify that the facilities and services sought by Access Seekers are those owned and/or operated by the Access Provider? If not, please provide reasons.

Domestic Inter-Operator Roaming Service

Question 47: Do you have any comments on MCMC's proposal to retain the Domestic Inter-Operator Roaming Service on the Access List without any changes to the service description?

Question 48: Do you agree that the Domestic Inter-Operator Roaming Service should remain on the Access List even though MCMC is proposing listing 4G MOCN Access on the Access List?

Other Services and Facilities

Question 49: Do you agree with MCMC's preliminary view that LEO satellite services should not be listed on the Access List during the current review cycle? If you disagree, please provide detailed reasons supported by market evidence to justify why regulation is necessary at this stage.

Question 50: Do you agree with MCMC's preliminary view that A2P messaging should not be listed on the Access List during the current review cycle? If you disagree, please provide detailed reasons supported by market evidence to justify why regulation is necessary at this stage.

Annexure 2 Legislative Context

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

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

3. The relevant provisions of the CMA for the purposes of the Review of Access List are as follows:

   (a) section 55, which sets out the process for conducting an inquiry and making a determination;

   (b) section 56, which gives MCMC the power to modify, vary or revoke a determination in response to a written request or on its own initiative;

   (c) section 58, which provides MCMC may hold a public inquiry on any matter of a general nature which relates to the administration of the CMA, either in response to a written request from a person or on its own initiative if MCMC is satisfied that the matter is of significant interest to the public or to current or prospective licensees;

   (d) section 60, which provides MCMC may conduct an inquiry as an when it thinks fit and for the purposes of an inquiry, exercise any or all of its investigation and information gathering powers under Chapters 4 and 5 of Part V of the CMA;

   (e) section 61, which provides the inquiry held by MCMC shall be public and for the duration of a minimum of 45 days within which members of the public are invited to make submissions to MCMC;

   (f) sections 62 and 64, which allow MCMC to conduct an inquiry (or parts of an inquiry) in private in certain cases, and to provide a written instruction restricting the disclosure of confidential material presented at the inquiry or part of the inquiry;

   (g) section 65, which sets out the requirement to publish a report into any inquiry within 30 days of the conclusion of the inquiry, which may be extended by not more than 30 days by MCMC;

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

   (i) section 146, which gives MCMC power to determine the inclusion or removal of facilities and services from the Access List; and

   (j) section 147, which provides for the ability for an access forum to recommend the inclusion or removal of a network facility, a network service, or any other facilities and/or services which facilitate the provision of network services or

applications services, including content applications services from the Access List.

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

Objects and national policy objectives

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 MCMC; and

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

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.

Annexure 3 Draft Access List Determination

The Draft Access List Determination is attached as Annexure 3 to this PI Paper.

Changes are shown in markup relative to the current Access List (Commission Determination on Access List, Determination No. 6 of 2021).

The substantive amendments that MCMC proposes to make to the Access List are explained throughout this PI Paper, in the corresponding sections above.

MCMC proposes to rearrange the flow of certain services in the Access List to reflect similarities between such services (e.g. by ensuring that Transmission Services and HSBB Network Services flow sequentially after each other). The movement and reflow of sections are not shown in markup, to allow the substantive proposed changes to the service descriptions to be identified.

ANNEXURE 3

Suruhanjaya Komunikasi dan Multimedia Malaysia
Malaysian Communications and Multimedia Commission

COMMUNICATIONS AND MULTIMEDIA ACT 1998

COMMISSION DETERMINATION ON ACCESS LIST

DETERMINATION NO. ~~6~~[x] OF ~~2021~~2026

In exercise of the powers conferred by sections 55, 56 and 146 of the Communications and Multimedia Act 1998 *[Act 588]* ("Act"), the Commission hereby determines as follows:

Citation and commencement

1. This determination may be cited as the **Commission Determination on Access List, Determination No. ~~6~~[x] of ~~2021~~2026.**

2. This determination shall come into operation on ~~15 December 2021~~[x] 2026.

Definitions and Interpretations

3. For the purpose of this Determination, unless the context otherwise requires,

   (i) any term used in this Determination shall have the same meaning as in the Act or the regulations made under it;

   (ii) words in the singular include plural and vice versa; and

   (iii) the following terms used in this Determination shall have the stated meaning:

“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 Internet of Things (“IoT”); and

(c) mission-critical;

“Access Provider” means a network facilities provider who owns or provides Facilities and/or a network service provider who provides Services, listed in this Determination, and who is a licensee as defined in the Act;

“Access Seeker” means a network facilities provider, a network service provider, an applications service provider, or a content applications service provider who is a licensee as defined in the Act and who makes a written request for access to Facilities or Services, listed in this Determination;

“Active In-Building Elements” means powered hardware and associated software inside a building, including but not limited to a base transceiver station, active multi-band distributed antenna system, master units, remote units, bi-directional amplifiers and small cells, which amplify, filter and convert radio frequency signals for distribution through the Common Antenna System, and which are owned or operated by an Operator, including one or more Mobile Network Operators;

“Any-to-Any Connectivity” means a connection which is achieved when an End User is able to communicate with another End User, whether or not the End Users are connected to the same network;

“Associated Tower Sites” means land owned, leased or tenanted by an Operator surrounding or on which the tower is situated, including necessary right-of-way and permission to dig;

“ ‘A’ party” means, in the context of communications between End Users, the End User from whom the communication originates;

“ ‘B’ party” means, in the context of communications between End Users, the End User to whom the communication terminates;

~~“Border Gateway Protocol” means a standardised gateway protocol that enables the internet to exchange routing information between autonomous systems;~~

“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;

“Common Antenna System” means a system of Facilities comprising antennas and cabling to the antennas inside a building, which is owned or operated by an Operator, including one or more Mobile Network Operators, in association with in-building coverage;

~~“Contention Ratio” means the notional bit rate expressed as a proportion of the per user bit rate;~~

“Customer” means, in relation to an Operator, a person having a contractual relationship with that Operator for the provision of communications by means of that Operator’s Facilities and/or Services;

“Customer Access Module” means a device that provides a connection including ring tone and ring current to customer equipment. Examples include a customer line module of a local switch, remote terminals of a digital line carrier system, a digital subscriber line access multiplexer, a node in a fibre to the node network and an optical line terminating equipment in a fibre to the premises network;

“End User” means a consumer and final recipient of the service, and includes an ultimate retail Customer of an Operator;

“Facilities” means network facilities and/or other facilities which facilitate the provision of network services or applications services, including content applications services;

“Fixed Network” means network facilities and/or network services comprising the Public Switched Telephone Network and/or networks based on Internet Protocols for the provision of communications by guided electromagnetic energy or by point-to-point unguided electromagnetic energy;

“HSBB Network” or “High-Speed Broadband Network” means an IP-based network capable of providing services of at least 10 Mbps. For the avoidance of doubt, “HSBB Network” or “High-Speed Broadband Network” which includes but not limited to:

(a) the High-Speed Broadband Network, Phase 1;

(b) the High-Speed Broadband Network, Phase 2; and

(c) the Suburban Broadband Network;

“Interconnecting Networks” means interconnection of the network of an Access Provider and the network of an Access Seeker;

“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:

(a) a Point of Interconnection; or

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

“Inter-exchange Duct” means each duct or series of ducts that connects (whether directly or indirectly) between two Access Provider locations, including exchange buildings;

“IP” or “Internet Protocols” means network-layer which is Layer 2 protocol, as defined by the Internet Engineering Task Force, that contains addressing information and some control information that enables packets to be routed;

“Jitter” means the difference between the actual Latency of a packet and a reference Latency for a packet population of interest. The reference Latency of a population of packets is the minimum Latency for the packets within the population of interest. Jitter is a statistical sample, measured over a packet population of interest;

“Latency” means the one-way time interval between the moment the first bit of a IP packet crosses an entry point of a network and the moment the last bit of the same packet crosses an exit point of the network dimensioned in time;

“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;

“Mainline Duct” means each duct or series of ducts, which extend(s) from one or more Lead-In Duct(s) to the closest exchange building associated with the duct(s);

“Message Communications” means communications that provide only text with or without associated images, audio clips and video clips. Examples of Message Communications include 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;

“Mobile Network” means network facilities and/or network services comprising the public cellular mobile network and/or the public mobile radio network, for the provision of communications;

“MyIX” means the Malaysia Internet Exchange;

“MVNO” or “Mobile Virtual Network Operator” means an Operator that is not a holder of a relevant spectrum assignment or an apparatus assignment under Chapter 1 of Part VII of the Act, but is capable of providing public cellular services to End Users;

~~“Network Boundary” has the meaning given to it in section 128 of the Act;~~

"Operator" means:

(a) a network facilities provider;

(b) a network service provider;

(c) an applications service provider; or

(d) a content applications service provider,

who is, an Access Provider or an Access Seeker;

"Packet Loss" means the ratio of total lost IP packets to total transmitted packets in a population of interest. Total lost packets include any delivered with errors or Latency greater than 3 seconds;

"POI" or "Point of Interconnection" means any technically feasible point which demarcates the Interconnecting Networks, and is the point at which communication is transferred between the Interconnecting Networks, such as MyIX;

"Pole" means any pole, including a utility pole or traffic pole, that supports, or has the capability to support, the installation of fixed network equipment;

"POP" or "Point of Presence" means a point at which an Access Seeker has established itself for the purpose of obtaining access to Facilities and/or Services;

"PSTN" or "Public Switched Telephone Network" means a telephone network accessible by the public providing circuit switching and transmission facilities utilising analogue and/or digital technologies;

"QoS Class" or "Quality of Service Class" means a set of quality of service parameters as defined above as Latency, Jitter and Packet Loss, that are associated with Layer 2 connectivity;

"Services" means network services and/or other services which facilitate the provision of network services or applications services, including content applications services; and

"Transport Stream" means a packet based method of multiplexing one or more digital audio-visual or audio streams having one or more independent time bases into a single stream.

~~**Implementation of service under paragraph 5(13)**~~

4. ~~Paragraph 5(13) will come into force upon the commencement of the Mandatory Standard on Access which contains security measures referred to in subparagraph 5(13)(b)(iii).~~ Not Used.

Access List

5. (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 (excluding Short Message Service and Multimedia Message Service Message 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 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 (excluding Short Message Service and Multimedia Message Service Message Communications).

(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, 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.

(3) Mobile Network Origination Service

(a) A Mobile Network Origination Service is an Interconnection Service for the carriage of Call Communications (excluding Short Message Service and Multimedia Message Service Message 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) 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 Call Communications (excluding Short Message Service and Multimedia Message Service Message Communications).

(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.

(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) GSM;

(ii) WiMAX;

(iii) LTE;

(iv) IMT-Advanced or LTE-Advanced;

(v) 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.

(5) Interconnect Link Service

(a) An Interconnect Link Service is a Facility and/or Service which enables the connection between the network of an Access Provider and the network of an Access Seeker for the purpose of providing an Interconnection Service, including ~~but not limited to~~:

~~(i)~~ the interconnection of the IP-based network of an Access Provider to the IP-based network of an Access Seeker.~~; 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.~~

(b) Interconnection of~~ the kind described in subparagraph (5)(a)(i) above~~ an IP-based network includes the provision of bandwidth at the following increments:

(i) 100 Mbps;

~~(i)~~(ii) 1 Gbps;

~~(ii)~~(iii) 10 Gbps; ~~and~~

(iv) 100 Gbps; and

~~(iii)~~(v) any other amount or increment of bandwidth agreed between the Access Provider and the Access Seeker.

(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 an Access Provider's premises and an End User location or an Access Seeker's premises, available only at one end of a private 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, 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 ISDN, Metro Ethernet ("Metro-E"), IP based networks and Ethernet interfaces.

(c) Without limiting subparagraph 6(a) above, 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.

(d) The Wholesale Local Leased Circuit Service includes any Wholesale Local Leased Circuit 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 <1 ms and~~ <40 ms;

(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 subparagraphs (i) to (iii) above.

(7) ~~(12)~~ 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's premises, 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 and Metro-E.

(c) The functionalities of the Trunk Transmission Service include:

(i) transmission and any type of routing or switching, whether packet, 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) 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)~~(e) An Access Seeker for the Trunk 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 Trunk Transmission Service in order to connect its limited network facilities or network services.

(8)~~(15)~~ 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; or

(iii) between one End User location and one Access Seeker's premises,

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, 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 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)~~(e) Technologies used to supply End-to-End Transmission Service, such as Metro-E, or any other applicable technology which is currently available or which may be developed in future, may be requested by Access Seekers and the Access Provider must supply End-to-End Transmission Service using these technologies on request.

~~(g)~~(f) 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)~~(g) 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 <1 ms and~~ <40 ms;

(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 subparagraphs (i) to (iii) above.

(9)~~(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 (including rooftop 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 in, along, or in close proximity to:

(A) a street;

(B) a road;

(C) a path;

(D) a railway corridor;

(E) a park; or

(F) such other outdoor area that may be accessed by members of the public,

including but not limited to street furniture (such as billboards, public transit shelters, poles, and traffic light poles), bridges, and road gantries.

(c) Physical access includes power (including right-of-way for power installation by the Access Seeker), 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.

(e) Facilities and/or Services that fall within the scope of Access to In-Building Mobile Systems are excluded from the scope of Infrastructure Sharing.

(f) Poles, ducts and manholes that fall within the scope of Pole, Duct and Manhole Access are excluded from the scope of Infrastructure Sharing.

(10)~~(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.

(11)~~(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~~ a premises owned and/or operated by the 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~~ a premises owned and/or operated by the 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~~ the network facilities owned and/or operated by an Access Provider 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, any location where a main distribution frame is housed and such other network facilities locations associated with the provision of a Facility or Service in the Access List.

(12)~~(10)~~ 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 and regardless of the system used to deliver that Transport Stream to receivers.

(13)~~(11)~~ 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.

Where the Access Seeker is acquiring the Layer 2 HSBB Network Service from a POI at the Access Seeker's premises, the Layer 2 HSBB Network Service will not cover transmission from the Access Seeker's POI and will only cover the other elements of this service from that location. The Access Seeker will need to separately acquire a transmission service (which could be a Trunk Transmission Service, Wholesale Local Leased Circuit Service or End-to-End Transmission Service) from the Access Seeker's POI to a POI at the Access Provider's premises.

(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.
~~30 Mbps~~	~~5 Mbps~~	~~Low-speed broadband services~~
~~30 Mbps~~	~~10 Mbps~~	
~~30 Mbps~~	~~30 Mbps~~	
~~50 Mbps~~	~~10 Mbps~~	
~~50 Mbps~~	~~20 Mbps~~	
~~50 Mbps~~	~~50 Mbps~~	
100 Mbps	40 Mbps	
100 Mbps	50 Mbps	

Bit rate		Note and example applications
Downstream	Upstream	
100 Mbps	100 Mbps	High-speed residential, business broadband services, or enterprise grade business broadband services
250 Mbps	100 Mbps	
500 Mbps	100 Mbps	
600 Mbps	100 Mbps	
700 Mbps	100 Mbps	
800 Mbps	200 Mbps	
1000 Mbps	500 Mbps	
2000 Mbps	500 Mbps	
Any other higher, lower or different 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	≤ 10^{-3}	Real-time, jitter sensitive, high interaction – Voice over IP ("VoIP")
1	≤ 200 ms	≤ 50 ms	≤ 10^{-3}	Real-time, jitter sensitive, interactive – IP television ("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

(iii) any other technical parameters or standards (including network availability parameters) specified, utilised or agreed by the Access Provider from time to time.

(14) 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").

Where the Access Seeker is acquiring the Layer 3 HSBB Network Service from a POI at the Access Seeker's premises, the Layer 3 HSBB Network Service will not cover transmission from the Access Seeker's POI and will only cover the other elements of this service from that location. The Access Seeker will need to separately acquire a transmission service (which could be a Trunk Transmission Service, Wholesale Local Leased Circuit Service or End-to-End Transmission Service) from the Access Seeker's POI to a POI at the Access Provider's premises.

(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**
~~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
2000 Mbps	500 Mbps
Any other higher, lower or different 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 (including network availability parameters) specified, utilised or agreed by the Access Provider from time to time.

(15)~~(13)~~ Pole, Duct and Manhole Access

(a) Pole, 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) Poles;

(ii) ducts, including any or all of the following;

~~(i)~~(A) Lead-in Ducts;

~~(ii)~~(B) Mainline Ducts; and

~~(iii)~~(C) Inter-exchange Ducts;

~~(iv)~~(iii) manholes, including any manholes associated with a duct ~~Lead-in Ducts, Mainline Ducts or Inter-exchange Ducts~~; and

~~(v)~~(iv) 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.~~; and~~

~~(iii)~~(c) ~~p~~Provision of physical access in subparagraphs (b)(i) ~~to~~and (b)(ii) above will be subject to the security measures to be included in the Mandatory Standard on Access to mitigate security risk of Access Provider.

(16) 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, 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.

(c) Examples of Facilities and Services to which the Access Seeker may request access includes but is not limited to the following that are owned and/or operated by the Access Provider~~'s~~:

(i) radio network;

(ii) Serving GPRS Support Node (SGSN) and Gateway GPRS Support Node (GGSN);

(iii) Home Location Register (HLR);

(iv) value-added service platforms (such as its Short Message Service Centre (SMSC), Multimedia Service Centre (MSC) and voicemail server);

(v) Subscriber Identity Module (SIM) provisioning and configuration;

(vi) customer billing; and

(vii) customer relationship management.

(17) Domestic Inter-Operator Roaming Service

(a) The Domestic Inter-Operator Roaming Service is a Service that enables an End User of an Operator or an MVNO 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.

(18) 5G Standalone Access

(a) 5G Standalone Access is a Facility and/or Service for access to a 5G New Radio radio network, whether or not as part of a 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, provided that where the Access Seeker has integrated its 5G core with the Access Provider's gNodeB, the Access Seeker is solely responsible for any voice service capability (and for the avoidance of doubt any such voice services may be delivered using the Access Provider's radio network).

(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) integration between the Access Provider's gNodeB and the Access Seeker's 5G core (5GC);

(iii) Network Slice Selection Function (NSSF and 5G Network Slices as selected by the Access Seeker);

(iv) Unified Data Management (UDM);

(v) Unified Data Repository (UDR);

(vi) Network Exposure Function or (NEF);

(vii) Mobile Edge Computing (MEC);

(viii) Network Function Virtualisation (NFV);

(ix) security-related functions, such as Security Anchor Function (SEAF), ~~and~~ Authentication Server Function (AUSF), Security Edge Protection Proxy (SEPP) and N32 interface;

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

(xi) customer billing; and

(xii) customer relationship management.

(d) The 5G Standalone Service shall be supplied to the Access Seeker in compliance with 3rd Generation Partnership Project ("3GPP") Release 15 and any updates to that standard (including new releases) 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 (or similar services), as selected by the Access Seeker:

(i) mobile broadband services;

(ii) massive IoT services; and

(iii) mission-critical services.

(e) Despite anything to the contrary in paragraphs (a) to (d), 5G Standalone Access does not include any Facilities or Services within the scope of Access to In-Building Mobile Systems.

(19) 4G Evolved Packet Core ("EPC") with 5G Radio Access Network ("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, provided that the Access Seeker is solely responsible for any voice service capability (and for

the avoidance of doubt any such voice services may be delivered using the Access Provider's radio network).

(c) The functionalities of 4G EPC with 5G RAN Access include:

(i) integration between the Access Provider's gNodeB and the Access Seeker's 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 (including new releases) from time to time, and with all technical capabilities as may be required to enable the Access Seeker to provide mobile broadband and similar services.

(e) Despite anything to the contrary in paragraphs (a) to (d), 4G EPC with 5G RAN Access does not include any Facilities or Services within the scope of Access to In-Building Mobile Systems.

~~(20) 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.~~

(20) Access to Dark Fibre

(a) Access to Dark Fibre is a Facility and/or Service for the provision of access to optical fibre cables between a POI at an Access Provider's premises and another location on the Access Provider's network, where at least one of these locations is:

(i) within an Exclusive Zone and there are fewer than three independent providers of optical fibre cables providing connectivity between the two locations to which the Access Seeker is requesting access; or

(ii) a Restricted Data Centre POE.

(b) An "**Exclusive Zone**" means any area, including a state, a federal territory, a district, a development area or other location where, at the time of the access request, a prevailing law, regulation, policy, requirement, contract,

arrangement, understanding or practice prohibits or materially hinders the deployment of new fibre infrastructure by a licensee.

(c) A "**Restricted Data Centre POE**" means a point of entry into a data centre to which the Access Seeker is:

(i) unable to deploy its own fibre infrastructure because of space or capacity constraints in the relevant ducts or manholes at that point of entry; or

(ii) prohibited from deploying its own fibre infrastructure because of contracts, arrangements, understandings or practices between the Access Provider and any person.

(d) Access to optical fibre cables under paragraph (a) includes the Access Seeker's right to install equipment to enable the carriage of communications over the relevant fibre cables and to use the fibre cables for such carriage of communications.

(21) 4G Multi-Operator Core Network ("MOCN") Access

(a) 4G MOCN Access is a Service for access to a 4G radio network, whether or not as part of a Mobile Network, for the purpose of the Access Seeker providing:

(i) MVNO Access or another Service and/or Facility on the Access List that uses access to a 4G radio network as an input;

(ii) services to enterprise and/or government Customers;

(iii) public cellular services to the public; or

(iv) wireless or mobile broadband services to the public.

(b) 4G MOCN Access may include access to Facilities and/or Services used by the Access Seeker to provide one or more of voice, data and application services, as selected by the Access Seeker, provided that the Access Seeker has integrated its 4G core with the Access Provider's eNodeB.

(c) The functionalities of 4G MOCN Access include:

(i) integration between the Access Provider's eNodeB and the Access Seeker's 4G core network; and

(ii) support for 3GPP Release 15 and any updates to that standard from time to time.

(d) 4G MOCN Access must be made available by the Access Provider on a site-by-site basis at any site where the Access Provider has installed components of its 4G radio network.

(22) Broadcasting Transmission Service

(a) The Broadcasting Transmission Service is a Facility and/or Service for the carriage of communications, which comprise a content applications service, between any two technically feasible network transmission points 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, synchronous digital hierarchy ("SDH"), or any other applicable technology which is currently available, or which may be developed in future.

(c) The functionalities of the Broadcasting Transmission Service include:

(i) transmission and any type of routing or switching, whether packet, circuit, multi-layer or otherwise;

(ii) the signalling and synchronisation required to support the technology or to provide a service;

(iii) termination at either end by a port, router, network termination unit, switch or earth station; and

(iv) a digital protocol including Internet Protocols and MPEG-TS.

(d) The Broadcasting Transmission Service includes any Broadcasting 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 <20ms;

(iii) any jitter of <10ms;

(iv) zero or more routes of redundancy; and

(v) any other technical parameters specified or utilised by the Access Provider from time to time, including parameters of a type referred to in subparagraphs (i) to (iv) above.

(e) An Access Seeker requesting access to the Broadcasting Transmission Service may, at its discretion, also request the Access Provider to provide any one or all of the following ancillary services, which the Access Provider shall provide:

(i) broadcasting network operations centre services;

(ii) operation and maintenance services (including repair and replacement) in respect of Access Seeker equipment used in connection with the service described in paragraph (a); and

(iii) any other service ancillary to the service described in paragraph (a), as may be agreed between the Access Provider and the Access Seeker.

(23) Access to In-Building Mobile Systems

(a) Access to In-Building Mobile Systems is a Facility and/or Service which comprises:

(i) the provision of access to in-building Common Antenna Systems and Active In-Building Elements; and

(ii) the provision of physical access to the central equipment room of a building.

(b) Physical access includes power (including right-of-way for power installation by the Access Seeker), environmental services (such as heat, light, ventilation and air-conditioning), security, site maintenance and access for the personnel of the Access Seeker.

Revocation

5. The Commission Determination on Access List, Determination No. ~~2~~6 of ~~2015~~2021 shall be revoked with effect from ~~15 December 2021~~[x] 2026.

Transitional and Savings

6. Access agreements that have been registered and/or lodged with the Commission under the Commission Determination on Access List, Determination No. 1 of 2005, the Variation to Commission Determination on Access List (Determination No. 1 of 2005), Determination 1 of 2009, ~~and~~ the Commission Determination on Access List, Determination No. 2 of 2015 and the Commission Determination Access List, Determination No. 6 of 2021, shall continue to be in full force and effect ~~as if the same are registered under this Determination~~.

7. In so far as the Commission Determination on Access List, Determination No. ~~2~~6 of ~~2015~~2021 is being referred to in the following Commission Determinations, on or after ~~15 December 2021~~[x] 2026, this Determination shall be applicable as if this Determination was referred to in the following Commission Determinations:

(a) the Commission Determination on the Mandatory Standard on Access Pricing, Determination No. 1 of ~~2017~~2023; and

(b) the Commission Determination on the Mandatory Standard on Access, Determination No. ~~3~~1 of ~~2016~~2022.

Made:

Chairman
Malaysian Communications and Multimedia Commission