Suruhanjaya Komunikasi dan Multimedia Malaysia
Malaysian Communications and Multimedia Commission

GUIDELINES ON IMPLEMENTATION OF ACCESS TO NETWORK ELEMENTS

(MCMC/G/04/05)

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Malaysian Communications and Multimedia Commission
63000 CYBERJAYA
Selangor Darul Ehsan
Tel: +60 3-8688 8000
Fax: +60 3-8688 1000
Website: www.mcmc.gov.my

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1.0 INTRODUCTION

1.1 The Malaysian Communications and Multimedia Commission (MCMC) has determined a Commission Determination on Access List, Determination No.1 of 2005 (ALD) on 13 June 2005. In the ALD, the MCMC has included four forms of access to network elements (ANE), namely Full Access Service, Line Sharing Service, Bitstream Services and Sub-Loop Service to be implemented in phases.

1.2 The objective of these Guidelines is to provide guidance where access to any of the four forms of Access to Network Elements is implemented. Operators are encouraged to adopt the principles stated in these Guidelines for the purpose of implementing Access to Network Elements.

1.3 These guidelines should be read together with the Communications and Multimedia Act 1998 (CMA), the relevant subsidiary legislation and instrument issued under the CMA.

2.0 SCOPE OF GUIDELINES

These guidelines are set out in three parts:

2.1 generally applicable principles relevant to ANE services contained in Part A, covering the following issues:

1.1.1 points of interconnection and co-location;
1.1.2 quality of service;
1.1.3 activation;
1.1.4 churn; and
1.1.5 compatibility and interoperability.

2.2 specific guidelines applicable to specific forms of ANE services contained in Part B, including the specification of minimum parameters that must be used in the provision of forms of ANE services; and

2.3 resource and service management functions for all forms of ANE services.

PART A OF GUIDELINES – GENERALLY APPLICABLE PRINCIPLES TO ANE SERVICES

3.0 GENERALLY APPLICABLE PRINCIPLES

3.1 These Guidelines are to be implemented in such a way as to:

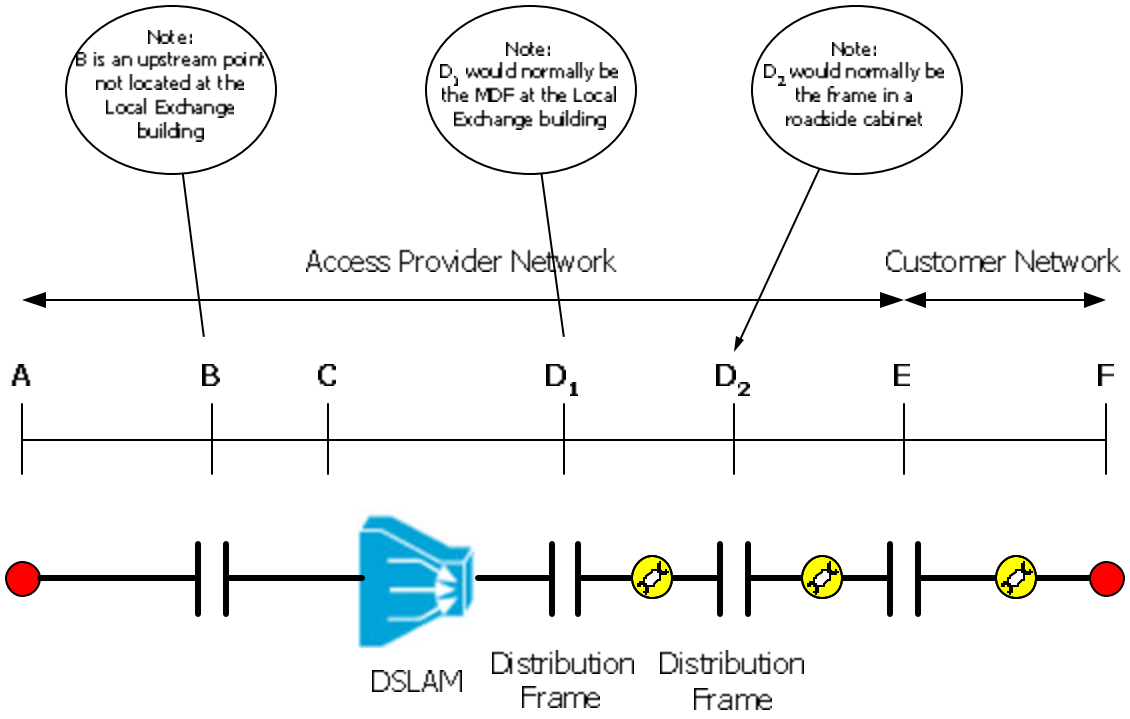
3.1.1 ensure that the provision of ANE services does not adversely affect other users and is otherwise provided in a non-discriminatory manner; and

3.1.2 ensure that the levels of service provided by Access Providers are adequate to stimulate competition from Access Seekers and to otherwise meet the National Policy Objectives in section 3(2) of the CMA.

4.0 ANE REFERENCE DIAGRAM

4.1 For the purposes of these guidelines, it is useful to set out a reference diagram which indicates the possible Points of Interconnection (POI) in the supply of ANE services. This reference diagram can then be applied in the description of individual ANE services. The reference diagram is set out in Figure 1:

Figure 1: Reference diagram for Points of Interconnection



4.2 It is usual for the DSLAM to be located in a Customer Access Module. A Customer Access Module is a device that provides ring tone and ring current to customer equipment. Examples are Remote Subscriber Stages, Remote Subscriber Units, Integrated Remote Integrated Multiplexers, Non-integrated Remote Integrated Multiplexers and the customer line module of a local switch.

4.3 There may be potential points of interconnection upstream from the digital subscriber line access multiplex (DSLAM) but not co-located with it and this is indicated as point B in the reference diagram.

4.4 The reference diagram also shows twisted pair as part of the network. This pair is known as a communications wire which is a copper or aluminium based wire forming part of a public switched telephone network (PSTN). In some cases, optical fibre may be used instead of communications wire. This fibre may be located at any point between B and D2.

4.5 The interface between the Access Provider Network and the Customer Network is the network boundary and is a point ascertained in accordance with section 128 of the CMA.

5.0 POTENTIAL POINTS OF INTERCONNECTION AND CO-LOCATION

An Access Provider will provide for the following points of interconnection and co-location at these points ofinterconnection for the purposes of acquiring ANE:

Table 1: Potential Points of Interconnection in the Reference diagram

Reference	Function	Possible POI?
A	Point on Access Provider's network at Access Seeker's POP	Yes
A – B	Backhaul from Access Provider's network to Access Seeker's POP	No
B	Point on Access Provider's upstream network not located at the Local Exchange building	Yes
C	Point on Access Provider's network at DSLAM in Customer Access Module	Yes
D_1	Point on Access Provider's network at Distribution Frame in Customer Access Module (includes MDF in Local Switch)	Yes
D_2	Point on Access Provider's network at Distribution Frame in sub-loop associated with Customer Access Module (includes Distribution Frame in roadside cabinet)	Yes
E	Network Boundary between Access Provider Network and Customer Network	No
F	Point in Customer Network where equipment is connected	No

6.0 CO-LOCATION

6.1 In relation to network co-location service, Access Providers and Access Seekers may agree to terms on its operations, maintenance, technical and implementation.

6.2 In relation to the provision of network co-location related services, the following principles may be applied:

6.2.1 **Security / Access** – Due to the likelihood of multiple Access Seekers at a co-location space, the Access Provider will put in place correct authorisation procedures to ensure adequate levels of security access to servers.

6.2.2 **Cross Connection** – Cross-connection co-location, involves the physical co-location of customer servers with one host, with the internet connection provided by another host. For cross connection co-location, the relevant provisions in the MSA on access, security, integrity and space should be applied.

6.2.3 **Uptime Guarantees** – Access Providers will ensure that they can provide guarantees to their customers in regard to the performance of the network connections provided.

6.2.4 **Leased Lines and Backhaul in Virtual Co-Location Arrangements** – In the instance of virtual co-location, leased lines or other links will be provided from the premises where the copper cable ends, and to provide backhaul component of bitstream services in some form through the network to a central location.

7.0 QUALITY OF SERVICE

7.1 In relation to Quality of Service (QOS) offered in respect of ANE, the following principles may be applied:

7.1.1 **Defining and Guaranteeing the Quality of Access Networks** – Access Providers and Access Seekers will mutually agree on this definition of quality subject to the Access Provider's commercial terms. This will be documented in a service level agreement (SLA). The quality of networks should be defined in any SLA including details of key quality parameters. Appropriate systems should also be installed to measure key parameters.

7.1.2 **QOS Parameters and Indicators for Publication and Adherence** – The Access Provider will determine reasonable QOS parameters, the most important being network availability.

7.1.3 **Publication of standards** – The Access Provider will publish its standards for each of the technologies that it offers and adhere to them in their Access Agreements.

7.1.4 **Technical compatibility issues** – In its published standards, the Access Provider will address the following technical compatibility issues that may arise in using copper:

(i) Implementation of reverse asymmetrical digital subscriber lines (ADSL) to support internet service providers, whereby high bandwidth is in the direction of user to network – potentially causing service disruption to other users in the same cable.

(ii) Cross talk significant enough to cause bit error.

(iii) Special features from PSTN switches using particular frequency potentially interfering with the ADSL.

(iv) Use screen cable for proper grounding at customer end and also at the riser in order to minimise interference issues.

7.1.5 **The Maintenance of QOS** – An Access Provider will guarantee a given level of maintenance of quality of service through specifications of conditions.

7.2 Detailed QOS principles applicable to particular forms of ANE are outlined in Part B of these guidelines.

8.0 ACTIVATION

8.1 Activation timeframes are set out in Part B of these guidelines. An Access Provider may only unilaterally de-activate ANE services in accordance with the suspension and termination provisions in subsection 5.17 of the MSA.

9.0 CHURN PRINCIPLES

9.1 In relation to churn arrangements, the following principles may be applied:

9.1.1 **A robust and user friendly churn process**

(i) The Access Provider should establish churn arrangements in accordance with the MSA.

(ii) The churn arrangement should address slamming issues, where possible. Slamming involves the transfer of a customer from one operator to another without the knowledge or consent of the customer.

9.1.2 **Mechanisms for addressing invalid churn**

(i) All relevant parties are required to take immediate action to rectify invalid churn in accordance with the customer's wishes so that the customer is not disadvantaged.

(ii) In rectifying the invalid churn, the relevant parties should ensure that a customer is able to acquire services as enjoyed prior to the invalid churn.

10.0 COMPATIBILITY AND INTEROPERABILITY

10.1 In relation to compatibility and interoperability in respect of ANE, the following principles may be applied:

10.1.1 The Access Provider will provide ANE over its access network in a manner that reflects best practice safety and integrity. The manner in which this should be achieved includes, in part, through the provision of power spectral masks by the Access Provider.

10.1.2 Usage of new technologies on the access network will not be prevented by the Access Provider. The Access Provider will ensure that when using power spectral masks that they are not unduly restrictive.

10.1.3 The Access Provider will undertake tests aimed at the technical viability of service provision on local loops.

10.1.4 Interference between services and technology

(i) Where equipment is installed by the Access Seekers in the Access Providers' premises, such equipment put into operation should be electromagnetically compatible with existing equipment. Interference should be prevented through the adoption of measures published by the Access Provider.

(ii) The Access Provider will publish procedures in relation to disconnection due to interference. Such procedures should be consistent with a "last on - first off" policy. This means that the most recent equipment put into operation (including the Access Provider itself) is the first to be disconnected if interference occurs in respect of the usage of ANE services.

PART B OF GUIDELINES – PROVISIONS APPLICABLE TO SPECIFIC FORMS OF ANE SERVICES

11.0 APPLICATION OF GUIDELINES TO FULL ACCESS, SUB-LOOP AND LINE SHARING SERVICES

11.1 Scope of Part B

11.1.1 Specific principles are common to the Full Access Service, the Sub-loop Service and the Line Sharing Service. These principles are applicable to the types of DSL services being run over the Full Access Service, the Sub-loop Service and the Line Sharing Service. These ANE services, together with certain ancillary principles, are described in more detail in section 11.2.

11.1.2 Separate principles are applicable to the Bitstreaming Service (with or without Network Service) due to the different technical nature of that service as described in section 12 and 13.

11.1.3 Access Providers and Access Seekers should comply with the following principles and procedures in section 11 regarding the Full Access Service, the Sub-loop Service and the Line Sharing Service.

Activation timeframes	Refer section 11.4
Cross talk specifications	Refer section 11.5
Total average power measurement	Refer section 11.6.1
Power spectral density measurement	Refer section 11.6.2
Longitudinal balance measurement Longitudinal output voltage	Refer section 11.6.3 Refer section 11.6.4
Test criteria	Refer section 11.7

11.2 Relationship with reference diagram

11.2.1 The Full Access Service is an access service between points D1 and E. To the extent that the Access Provider has control over the Customer Network, the access service may extend to point F on Figure 1.

11.2.2 The Sub-loop Service is an access service between points D2 and E. To the extent that the Access Provider has control over the Customer Network, the access service may extend to point F on Figure 1.

11.2.3 The Line Sharing Service is an access service between points D1 (or D2) and E. To the extent that the Access Provider has control over the Customer Network, the access service may extend to point F on Figure 1.

11.2.4 The Full Access, Sub-loop and Line Sharing Services are shown in Figure 2, Figure 3 and Figure 4.

Figure 2: Full Access Service

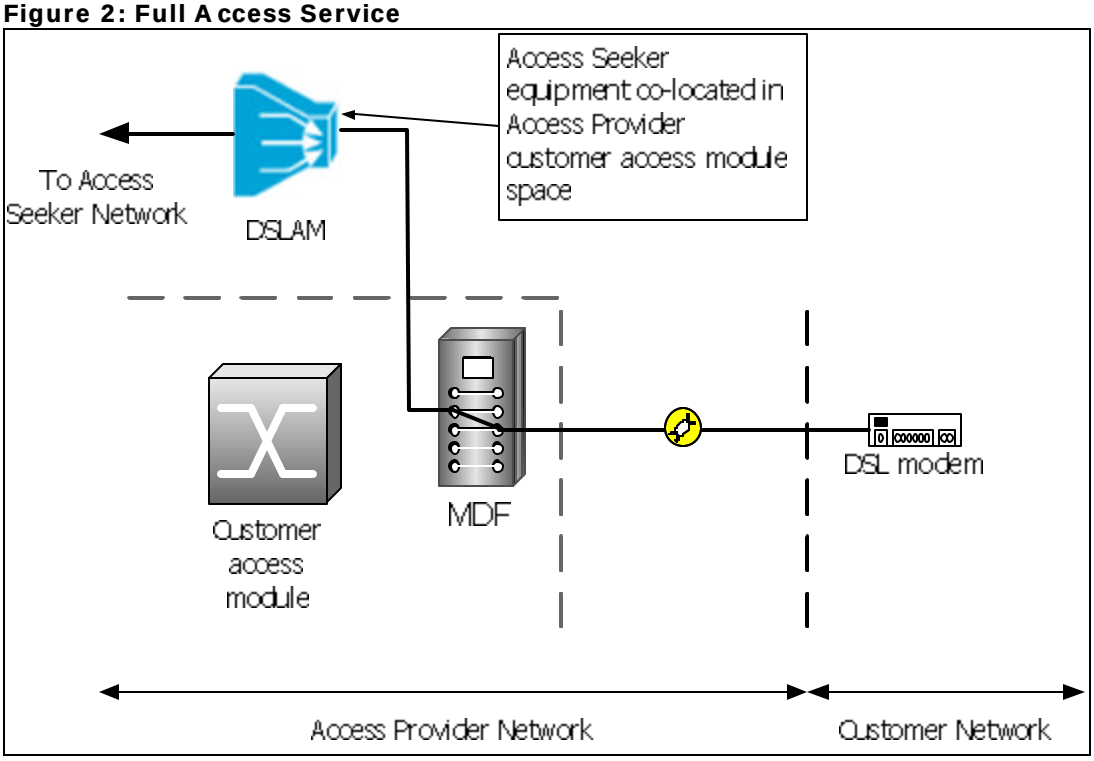


Figure 3: Sub-loop Service

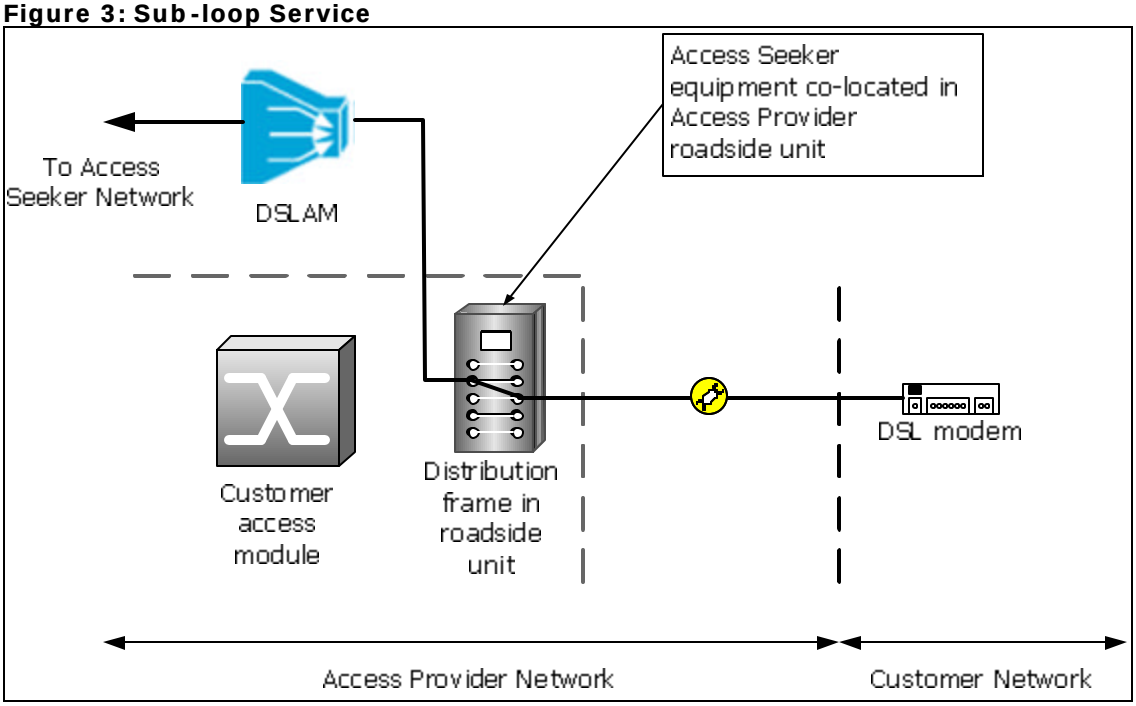
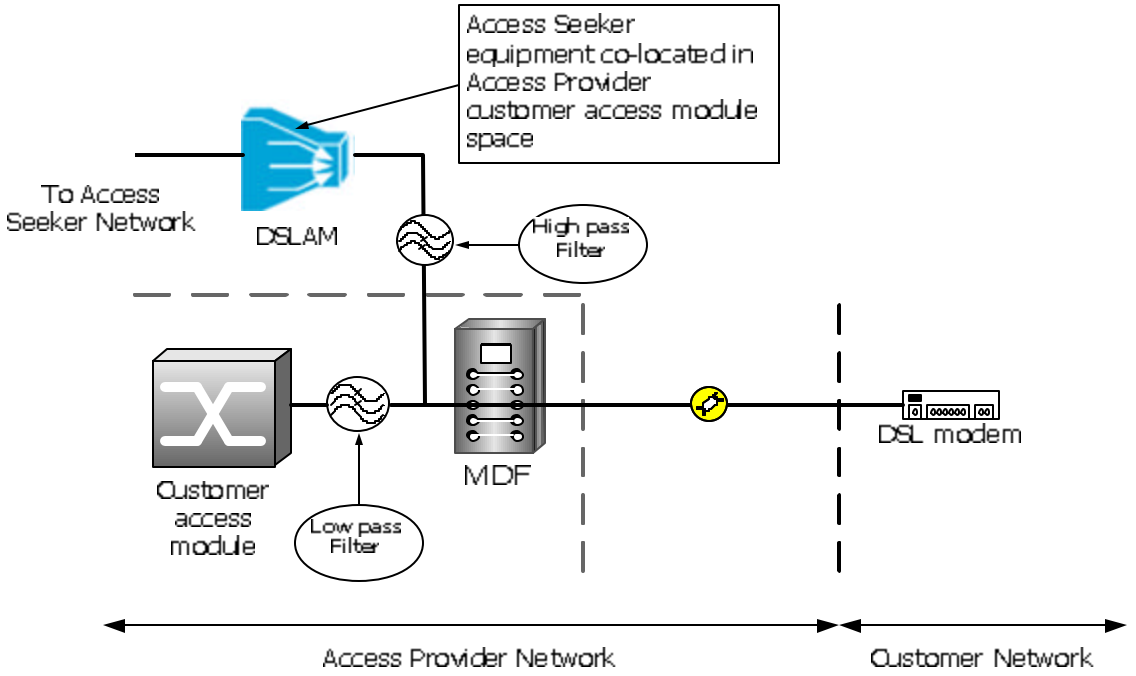


Figure 4: Line Sharing Service



11.3 Ancillary Services

11.3.1 The ancillary services set out in this section should be available from the Access Provider for each of the Full Access Service, Sub-loop Service and Line Sharing Service.

11.3.2 **Tie cables**

(i) The Access Provider should provide tie cables between the relevant distribution frame (whether the main distribution frame in the local exchange building or a distribution frame in a roadside cabinet) and the distribution frame installed by the Access Seeker (hand-over distribution frame (HDF)). An HDF will be needed to terminate the tie cables which extend the local loop from the MDF or equivalent distribution point closer to the customer premises to the Access Seeker co-location space. The Access Seeker should be given the possibility to choose either to self provide the HDF or to request the Access Provider to supply it.

(ii) When the Access Seeker is physically co-located with the Access Provider, the tie cable will remain inside the Access Provider's building (internal). On the other hand, when the Access Seeker is employing in-span co-location, the tie cables will need to connect the MDF site and the Access Seeker premises. In this case the Access Seeker will need a tie cable which runs inside the Access Provider's building (internal) and a tie cable that runs outside the Access Provider's building (external).

(iii) The Access Provider should provision the following:

(a) internal tie cable provision, including testing, termination and maintenance of a twisted copper pair between the MDF and the HDF (if the Access Seeker is physically co-locating) or between the MDF and the Access Provider's joint in cable chamber (if the Access Seeker is employing in-span co-location); and

(b) external tie cable provision, including testing, termination and maintenance of a twisted copper pair between the Access Provider's joint in cable chamber and the HDF in the Access Seeker's in-span co-location space (if the Access Seeker is

employing in-span co-location). The Access Seeker should have the option to self provide the external tie-cable.

(iv) Access Seekers which employ in-span co-location should have an option of self-providing the external tie cable. In this case the Access Provider should provide a cable pull through service from a defined roadside cabinet adjacent to the MDF site or equivalent distribution point closer to the customer premises. This will enable the Access Seeker's cable to be pulled into the MDF site or equivalent distribution point closer to the customer premises and subsequently connected to the MDF, either directly or by the use of internal extensions. This service must include co-operative end-to-end copper cable circuit testing and labeling.

11.3.3 **Splitters applicable to the Line Sharing Service**

(i) This section applies only to the Line Sharing Service.

(ii) The additional services required to provide the Line Sharing Service vary depending on how it is to be implemented. There are two possible technical configurations:

(a) the Access Provider separates the frequencies for voice telephony and those for higher-bandwidth services, and then leases to an Access Seeker the higher frequency portion of the loop (Option 1); or

(b) the Access Seeker separates the frequencies and hands back to the Access Provider the frequencies for voice telephony (Option 2).

(iii) Under Option 1, the Access Provider will provide splitter at the relevant exchange site and the Access Seeker will provision and maintain a splitter at the customer's premises matching the one the Access Provider uses to separate the frequencies at the exchange site.

(iv) Under Option 2, the Access Provider will provide the internal tie-cable, including testing, termination and maintenance of a metallic twisted pair between the Access Seeker's HDF and the MDF, necessary to represent the streamed-off PSTN calls.

(v) The Access Provider should publish standards applicable to its own and the Access Seeker's splitters. Such standards are to be consistent with international standards (where possible).

11.4 Activatio n Guidelines

11.4.1 The time for the activation of a Full Access, Sub-Loop or Line Sharing Service is two (2) Business Days from receipt of a request from an Access Seeker by the Access Provider provided that the Access Seeker has entered into a Network Co-location Services agreement with the Access Provider.

11.5 Minimum specifications

11.5.1 There are a number of specifications that should be met by an Access Seeker as well as the Access Provider in providing the Full Access Service, the Sub-loop Service and the Line Sharing Service in order to avoid the following issues:

(i) near-end cross talk (NEXT); and

(ii) far-end cross talk (FEXT).

11.5.2 The first approach to minimise cross-talk is to specify the following parameters for a number of different possible services:

(i) total a verage power;

(ii) power spectral density (PSD);

(iii) longitudinal balance; and

(iv) longitudinal output voltage.

11.5.3 The requirements for the parameters to be met by Access Providers in relation to the provision of the Full Access Service, the Sub-loop Service and the Line Sharing Service are specified in Table 2.

Table 2: Requirements

Parameter	Requirement
Total average power	The total average power transmitted by the relevant equipment shall not exceed the total average power limited over the specified frequency range, measured when the relevant equipment is transmitting maximum power, excluding any transient start up or initialisation phases.
Power Spectral Density (PSD)	The PSD transmitted shall not exceed the PSD mask, at any frequency, measured when the relevant equipment is transmitting maximum power, excluding any transient start up or initialisation phases.
Longitudinal balance	The longitudinal of the relevant equipment shall be greater than or equal to the longitudinal balance limit over the specified frequency range, when the longitudinal termination is ¼ of the termination impedance for the Class. Longitudinal balance is defined as: Longitudinal balance (dB) = $20 \times \log_{10}\left(\frac{V_l}{V_m}\right)$ where: V_l is the longitudinal or common mode voltage V_m is the metallic or differential voltage
Longitudinal output voltage	The longitudinal output voltage shall not exceed the longitudinal output voltage limit over the specified frequency range, when measured across a load (consisting of 100Ω in series with 0.15µF) when the relevant equipment is transmitting maximum power. Any transient start up or initialisation phases should be excluded.

11.5.4.1 These requirements will vary depending on the type of service supplied by the Access Seeker using the services. The types of service fall into six groupings or classes as specified in Table 3.

Table 3: Classes of service

Reference	Class	Service	Variants
1	ISDN	ISDN basic rate 2B1Q	
2	ADSL	ADSL	
3	ADSL Lite	ADSL Lite	
4	SDSL	Symmetric Digital Subscriber Line	SDSL 272 kbit/s SDSL 528 kbit/s SDSL 784 kbit/s SDSL 1168 kbit/s SDSL 1552 kbit/s SDSL 2064 kbit/s SDSL 2320 kbit/s
5	HDSL	High bit rate Digital Subscriber Line	HDSL 784 kbit/s HDSL 1168 kbit/s HDSL 2320 kbit/s
6	SHDSL	Single-pair High Speed Digital Subscriber Line	SHDSL 584 kbit/s SHDSL 784 kbit/s SHDSL 1168 kbit/s SHDSL 1552 kbit/s SHDSL 2064 kbit/s SHDSL 2320 kbit/s

11.5.5 For each of the classes of service set out in Table 3, the requirements set out in Table 2 should be specified by an Access Provider. This will be done by specifying the measurement methodology and then setting out the relevant test criteria, as discussed in sections 11.6 and 11.7.

11.5.6 The Access Provider should meet international best practice standards in relation to the distances over which each of the classes of services set out in Table 3 are provided.

11.5.7 In the event that a new class of service is required and where there are no internationally agreed standards for the parameters, then the Access Seeker and the Access Provider should agree the values to be applied for that class of service. For example, in respect of VDSL, the parameters may be based on draft standards where applicable, including the draft standard published by the Telecommunication Industry Association, TIE1.4/98-043R3.

11.6 Measurements

11.6.1 Total average power

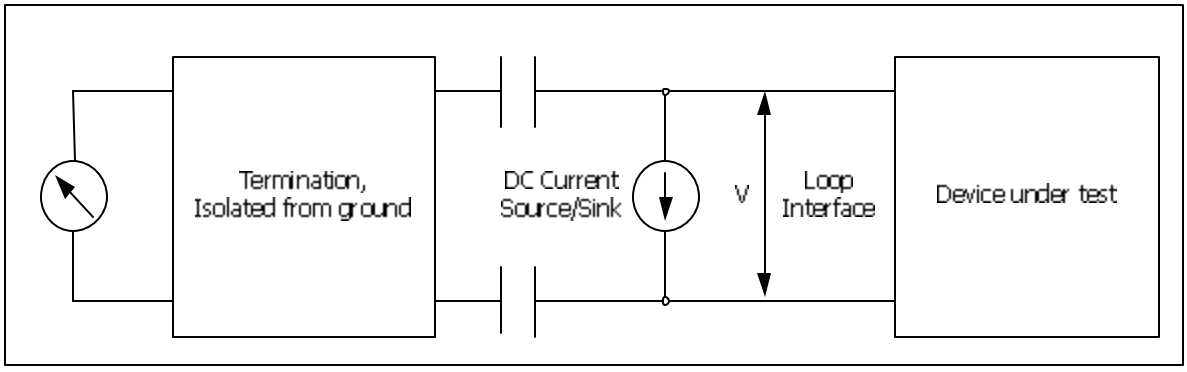
(i) Total average power will be measured by an Access Provider using the test circuit in Figure 5. The DC source/sink and blocking components are not required where the power feed or wetting current is not supported.

(ii) The total average power will be measured by the Access Provider with the device under test terminated in the termination impedance.

(iii) The Access Provider will measure the total average power over the averaging time. The measurement equipment should be measured over the averaging time specified. The measurement equipment should not be synchronous with device.

(iv) The data input to the device under test will be pseudo-random sequence, and the device should provide all processes used in normal operation (e.g. scrambling, coding). Pseudo-random sequences will be those specified in ITU-T Recommendations O.151, O.152 or O.153 for the appropriate data rate.

Figure 5: Average power and PSD test configuration



11.6.2 Power Spectral Density

(i) The Access Provider will measure the PSD using the configuration in Figure 5. The data input to the device under test should be a pseudo-random sequence, and the device should provide all processes used in normal operation (e.g. scrambling and coding). Pseudo-random sequences should be those specified in the ITU-T Recommendations O.151, O.152 or O.153 for the appropriate data rate.

(ii) The PSD should be measured using the resolution bandwidths and frequency ranges where specified. Measurements should be made at discrete frequencies, with spacing equal to the resolution bandwidth, covering the specified range. The measurement at each frequency should be averaged over time, taking into account the settling time for the resolution bandwidth. For a measurement bandwidth of 10 kHz at least 2 seconds is required.

(iii) To obtain the dynamic range required, it may be necessary to use passive filters before the spectrum analyser or selective level meter when measuring the out of band spectrum. If filters are used it is necessary to assure the nominal termination impedance is maintained across the whole signal band.

11.6.3 Longitudinal balance

(i) The Access Provider will test longitudinal balance using the test circuit in Figure 6.

(ii) The transmitter of the device under test should be placed in a quiet mode and the termination of the line by the device under test should be maintained.

(iii) The DC source/sink and blocking components are not required where the power feed or wetting current is not supported.

(iv) The device under test should be earthed as under normal operating conditions.

(v) The residual balance of the test circuit should be at least 20 dB over the limit when a resistor of the termination impedance is submitted for the device under test.

Figure 6: Longitudinal balance measurement

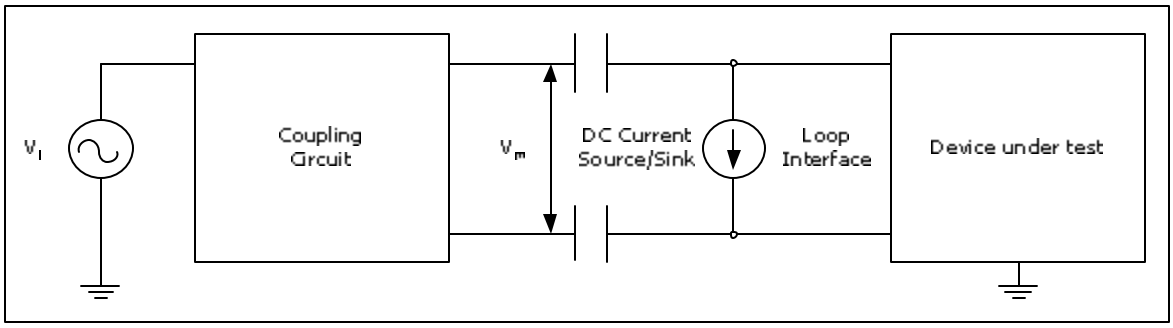
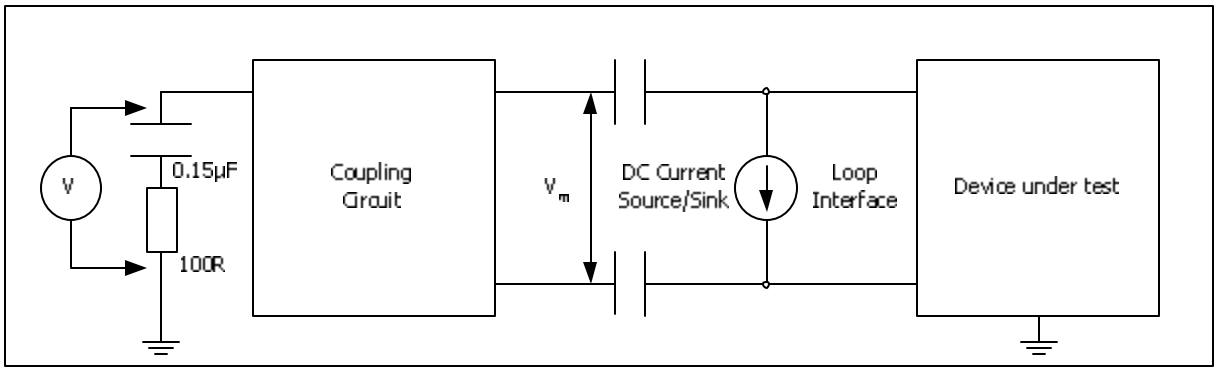


Figure 7: Longitudinal output voltage measurement



Note 1: The impedance of the metallic or differential termination of the coupling circuit is equal to the termination impedance.

Note 2: The longitudinal or common mode termination of the coupling circuit is equal to ¼ of the termination impedance.

11.7 Test Criteria

11.7.1 Introduction

(i) The test criteria and the relevant power spectral density mask for each class of service which can be provided over the unconditioned local loop or high frequency unconditioned local loop is set out in this section.

11.7.2 Test criteria for ISDN

(i) Reference impedance = 135 O

Table 4: Test criteria for ISDN

Parameter		Value
Total average power	Level	13.5 dBm
	Frequency range	0 Hz to 160 kHz
	Averaging time	= 10 s
PSD mask		See Table 5
Longitudinal Balance	Level	45.5 dB from 5 kHz to 40 kHz, with a slope of 5 dB/decade below 5 kHz and -5 dB/decade above 40 kHz
	Frequency range	500 Hz – 160 kHz
Longitudinal output voltage	Level	-50 dBV in any 4 kHz band
	Frequency range	As per longitudinal balance

Table 5: PSD mask for ISDN [1]

Frequency range f (kHz)	PSD (dBm/Hz)
0 < f = 50	-30
50 < f = 500	$-30 - 52.4 \times \log_{10}(f/50)$
500 < f = 1400	-80
1400 < f = 5000	$-80 - 72.3.5 \times \log_{10}(f/1400)$
5000 < f = 30000	-120

[1] Source: European Telecommunications Standards Institute TS 102 080 V1.4.1 (2003-07)

11.7.3 Test criteria for ADSL

(i) Reference impedance = 100 O

Table 6: Test criteria for ADSL

Parameter		Value
Total average power	Level	19.9 dBm
	Frequency range	25.875 kHz – 1104 kHz
	Averaging time	= 10 s
PSD mask		See Table 7
Longitudinal Balance	Level	40 dB
	Frequency range	30 kHz – 1104 kHz
Longitudinal output voltage	Level	-50 dBV in any 4 kHz band
	Frequency range	As per longitudinal balance

Table 7: PSD mask for ADSL[2]

Frequency range f (kHz)	PSD (dBm/Hz)
0 < f = 4	-97.5
4 < f = 80	$-96 + 4.63 \times \log_2(f/4)$
80 < f = 138	$-76 + 36 \times \log_2(f/80)$
138 < f = 1104	-40
1104 < f = 3093	$-40 - 36 \times \log_2(f/104)$
3093 < f = 4545	-93.5 peak
4545 < f = 11040	-93.5 peak
11040 < f = 12040	-93.5 peak

[2] Source: Australian Communications Industry Forum, ACIF C559 :2005 Part 3

11.7.4 Test criteria for ADSL Lite

(i) Reference impedance = 100 O

Table 8: Test criteria for ADSL Lite

Parameter		Value
Total average power	Level	16.2 dBm
	Frequency range	138 kHz – 552 kHz
	Averaging time	= 10 s
PSD mask		Table 9
Longitudinal Balance	Level	40 dB
	Frequency range	30 kHz – 1104 kHz
Longitudinal output voltage	Level	-50 dBV in any 4 kHz band
	Frequency range	As per longitudinal balance

Table 9: PSD mask for ADSL Lite[3]

Frequency range f (kHz)	PSD (dBm/Hz)
0 < f = 4	-97.5
4 < f = 80	$-96 + 4.63 \times \log_2(f/4)$
80 < f = 138	$-76 + 36 \times \log_2(f/80)$
138 < f = 552	–40
552 < f = 893	$-40 - 36 \times \log_2(f/552)/\log_2(2)$
893 < f = 1800	-65
1800 < f = 2368	$-65 - 72 \times \log_2(f/1800)/\log_2(2)$
2368 < f = 3093	-93.5
3093 < f = 4545	<-93.5 peak
4545 < f = 11040	<-93.5 peak
11040 < f = 12040	-93.5 peak

11.7.5 Test criteria for SDSL

(i) Reference impedance = 135 O

[3] Source: Australian Communications Industry Forum, ACIF C559 :2003 Part 3

Table 10 – Test criteria for SDSL

Parameter		Value						
Max bit rate (kbit/s)		272	528	784	1168	1552	2064	2320
Total average power	Level	14dBm	14dBm	14dBm	14dBm	14dBm	14dBm	14dBm
	Frequency range	0 – 136 kHz	0 – 264 kHz	0 – 392 kHz	0 – 584 kHz	0 – 776 kHz	0 – 1032 kHz	0 – 1160 kHz
	Averaging time	= 10 s	= 10 s	= 10 s	= 10 s	= 10 s	= 10 s	= 10 s
PSD mask		See Table 11						
Longitudinal Balance	Level	40 dB from 20 kHz to 68 kHz, with a slope of 20 dB/decade below 20 kHz and -20 dB/decade above 68 kHz	40 dB from 20 kHz to 132 kHz, with a slope of 20 dB/decade below 20 kHz and -20 dB/decade above 132 kHz	40 dB from 20 kHz to 196 kHz, with a slope of 20 dB/decade below 20 kHz and -20 dB/decade above 196 kHz	40 dB from 20 kHz to 292 kHz, with a slope of 20 dB/decade below 20 kHz and -20 dB/decade above 292 kHz	40 dB from 20 kHz to 388 kHz, with a slope of 20 dB/decade below 20 kHz and -20 dB/decade above 388 kHz	40 dB from 20 kHz to 516 kHz, with a slope of 20 dB/decade below 20 kHz and -20 dB/decade above 516 kHz	40 dB from 20 kHz to 580 kHz, with a slope of 20 dB/decade below 20 kHz and -20 dB/decade above 580 kHz
	Frequency range	500 Hz – 272 kHz	500 Hz – 528 kHz	500 Hz – 784 kHz	500 Hz – 1168 kHz	500 Hz – 1552 kHz	500 Hz – 2064 kHz	500 Hz – 2320 kHz
Longitudinal output voltage	Level	-50 dBV in any 4 kHz band	-50 dBV in any 4 kHz band	-50 dBV in any 4 kHz band	-50 dBV in any 4 kHz band	-50 dBV in any 4 kHz band	-50 dBV in any 4 kHz band	-50 dBV in any 4 kHz band
	Frequency range	As per longitudinal balance	As per longitudinal balance	As per longitudinal balance	As per longitudinal balance	As per longitudinal balance	As per longitudinal balance	As per longitudinal balance

Table 11: PSD mask for SDSL[4]

Maximum bit rate													
272 kbit/s		528 kbit/s		784 kbit/s		1168 kbit/s		1552 kbit/s		2064 kbit/s		2320 kbit/s	
f (kHz)	**PSD (dBm/Hz)**	**f (kHz)**	**PSD (dBm/Hz)**	**f (kHz)**	**PSD (dBm/Hz)**	**f (kHz)**	**PSD (dBm/Hz)**	**f (kHz)**	**PSD (dBm/Hz)**	**f (kHz)**	**PSD (dBm/Hz)**	**f (kHz)**	**PSD (dBm/Hz)**
0	-32.4	0	-35.7	0	-37.0	0	-38.7	0	-40.0	0	-41.2	0	-41.7
17.3	-32.4	37	-35.7	50	-37.0	74	-38.7	99	-40.0	132	-41.2	148	-41.7
43.4	-33.4	93	-36.7	125	-38.0	186	-39.7	247	-41.0	329	-42.2	370	-42.7
72.9	-36.4	156	-39.7	210	-41.0	313	-42.7	416	-44.0	553	-45.2	621	-45.7
107.6	-52.4	230	-55.7	310	-57.0	462	-58.7	614	-60.0	816	-61.2	917	-61.7
128.4 190.8	-68.4 -70.4	275 408	-71.7 -73.7	370 550	-73.0 -75.0	551 819	-74.7 -76.7	732 1089	-76.0 -78.0	974 1448	-77.2 -79.2	1095 1628	-77.7 -79.7
232.4	-80.4	497	-83.7	670	-85.0	998	-86.7	1326	-88.0	1764	-89.2	1983	-89.7
260.2	-92.4	557	-95.7	750	-97.0	1117	-98.7	1485	-100.0	1974	-101.2	2219	-101.7
340.0	-93.4	728	-96.7	980	-98.0	1460	-99.7	1940	-101.0	2580	-102.2	2900	-102.7
351.5	-95.6	771	-100.7	1050	-102.75	1585	-105.5	2128	-107.4	2851	-109.3	3218	-110.1
351.5 < *f* = 12040	Note 1	771< *f* = 12040	Note 1	1050 < *f* = 12040	Note 1	1585 < *f* = 12040	Note 1	2128 < *f* = 12040	Note 1	2851 < *f* = 12040	Note 1	3218 < *f* = 12040	Note 1

[4] Source: Australian Communications Industry Forum, ACIF C559:2003 Part 3

Note 1: At maximum frequency range the PSD is -143 - $10 \times \log_{10}\left(\frac{\left(10^3 \times f\right)^{1.5}}{1.134 \times 10^{13}}\right)$ dBm/Hz

11.7.6 Test criteria for HDSL

(i) Reference impedance = 135 O

Table 12: Test criteria for HDSL

Parameter		Value		
Max bit rate (kbit/s)		768	1168	2320
Total average power	Level	14dBm	14dBm	14dBm
	Frequency range	0 – 392 kHz	0 – 584 kHz	0 – 1160 kHz
	Averaging time	= 10 s	= 10 s	= 10 s
PSD mask		See Table 13		
Longitudinal Balance	Level	40 dB from 20 kHz to 196 kHz, with a slope of 20 dB/decade below 20 kHz and -20 dB/decade above 196 kHz	40 dB from 20 kHz to 292 kHz, with a slope of 20 dB/decade below 20 kHz and -20 dB/decade above 292 kHz	40 dB from 20 kHz to 580 kHz, with a slope of 20 dB/decade below 20 kHz and -20 dB/decade above 580 kHz
	Frequency range	500 Hz – 784 kHz	500 Hz – 1168 kHz	500 Hz – 2320 kHz
Longitudinal output voltage	Level	-50 dBV in any 4 kHz band	-50 dBV in any 4 kHz band	-50 dBV in any 4 kHz band
	Frequency range	As per longitudinal balance	As per longitudinal balance	As per longitudinal balance

Table 13 – PSD mask for HDSL[5]

Maximum bit rate					
768 kbit/s		1168 kbit/s		2320 kbit/s	
f (kHz)	**PSD (dBm/Hz)**	**f (kHz)**	**PSD (dBm/Hz)**	**f (kHz)**	**PSD (dBm/Hz)**
0	-37.0	0	-38.7	0	-41.7
50	-37.0	74	-38.7	148	-41.7
125	-38.0	186	-39.7	370	-42.7
210	-41.0	313	-42.7	621	-45.7
310	-57.0	462	-58.7	917	-61.7
370	-73.0	551	-74.7	1095	-77.7
550	-75.0	819	-76.7	1628	-79.7
670	-85.0	998	-86.7	1983	-89.7
750	-97.0	1117	-98.7	2219	-101.7
980	-98.0	1460	-99.7	2900	-102.7
1050	-102.75	1585	-105.5	3218	-110.1
1050 < *f* = 12040	Note 1	1585 < *f* = 12040	Note 1	3218 < *f* = 12040	Note 1

Note 1: At maximum frequency range the PSD is $-143 - 10 \times \log_{10}\left(\frac{(10^3 \times f)^{1.5}}{1.134 \times 10^{13}}\right)$ dBm/Hz

[5] Source: ITU-T Recommendation G.991.1

11.7.7 Test criteria for SHDSL

Table 14: Test criteria for SHDSL

Parameter		Value					
Max bit rate (kbit/s)		584	784	1168	1552	2064	2320
Total average power	Level	14dBm	14dBm	14dBm	14dBm	14dBm	14dBm
	Frequency range	0 – 1500 kHz	0 – 1500 kHz	0 – 1500 kHz	0 – 1500 kHz	0 – 1500 kHz	0 – 1500 kHz
	Averaging time	= 10 s	= 10 s	= 10 s	= 10 s	= 10 s	= 10 s
PSD mask		See Equation 1 and Table 15					
Longitudinal Balance	Level	40 dB from 20 kHz to 95 kHz, with a slope of 20 dB/decade below 20 kHz and -20 dB/decade above 95 kHz	40 dB from 20 kHz to 131 kHz, with a slope of 20 dB/decade below 20 kHz and -20 dB/decade above 131 kHz	40 dB from 20 kHz to 194.7 kHz, with a slope of 20 dB/decade below 20 kHz and -20 dB/decade above 194.7 kHz	40 dB from 20 kHz to 258.7 kHz, with a slope of 20 dB/decade below 20 kHz and -20 dB/decade above 258.7 kHz	40 dB from 20 kHz to 344 kHz, with a slope of 20 dB/decade below 20 kHz and -20 dB/decade above 3446 kHz	40 dB from 20 kHz to 386.7 kHz, with a slope of 20 dB/decade below 20 kHz and -20 dB/decade above 386.7 kHz
	Frequency range	20 kHz – 2 MHz	20 kHz – 2 MHz	20 kHz – 2 MHz	20 kHz – 2 MHz	20 kHz – 2 MHz	20 kHz – 2 MHz
Longitudinal output voltage	Level	-50 dBV in any 4 kHz band	-50 dBV in any 4 kHz band	-50 dBV in any 4 kHz band	-50 dBV in any 4 kHz band	-50 dBV in any 4 kHz band	-50 dBV in any 4 kHz band
	Frequency range	200 – 450 kHz	200 – 450 kHz	200 – 450 kHz	200 – 450 kHz	200 – 450 kHz	200 – 450 kHz

(i) Reference impedance = 135 O

$$psdmask(f) = 10 \times \log_{10}\left(\frac{K}{135} \times \frac{\left[\sin\left(\frac{pf}{Nf_{sym}} \right) \right]^2}{\left(\frac{pf}{Nf_{sym}} \right)^2} \times \frac{1}{1 + \left(\frac{f}{f_{3dB}} \right)^{2 \times order}} \times 10^{\frac{MaskOffsetdB(f)}{10}} \right)$$ for $f < f_{int}$

$$psdmask(f) = 10 \times \log_{10}\left(1.7971 \times 10^{-6} \times f^{-1.5} \right)$$ for $f_{int} = f = 1500$ kHz

psdmask(f) = -90 peak (Max power in the [f, f + 1 MHz] window of -50 dBm for 1500 kHz < f = 11040 kHz

psdmask(f) = -90 peak for 11040 kHz < f = 12040 kHz

Equation 1 – PSD mask for SHDSL

where:

$$MaskOffsetdB(f) = 1 + 0.4 \times \frac{f_{3dB} - f}{f_{3dB}}$$ $f < f_{3dB}$

$$MaskOffsetdB(f) = 1$$ $f > f_{3dB}$

f_{int} is the frequency where the two equations governing psd mask(f) intersect in kHz

(ii) For each data rate at which the relevant equipment can operate, it shall not exceed the psd mask generated by choosing a value of f_{sym} within the range shown in Table 15.

Table 15: PSD mask parameters for SHDSL[6]

SHDSL Bit rate	f_{sym} (kbaud)	K	Order	N	f_{3dB} (kHz)
584 kbit/s	66.6 – 194.7	7.86	6	1	1 x f_{sym}/2
784 kbit/s	66.6 – 261.4	7.86	6	1	1 x f_{sym}/2
1168 kbit/s	66.6 – 389.4	7.86	6	1	1 x f_{sym}/2
1552 kbit/s	66.6 – 517.4	7.86	6	1	1 x f_{sym}/2
2064 kbit/s	66.6 – 685.3	7.86	6	1	1 x f_{sym}/2
	685.3 – 688	9.9	6	1	1 x f_{sym}/2
2320 kbit/s	66.6 – 685.3	7.86	6	1	1 x f_{sym}/2

[6] Source: Source: Australian Communications Industry Forum, C559:2005

	685.3 – 773.4	9.9	6	1	1 x f_{sym}/2

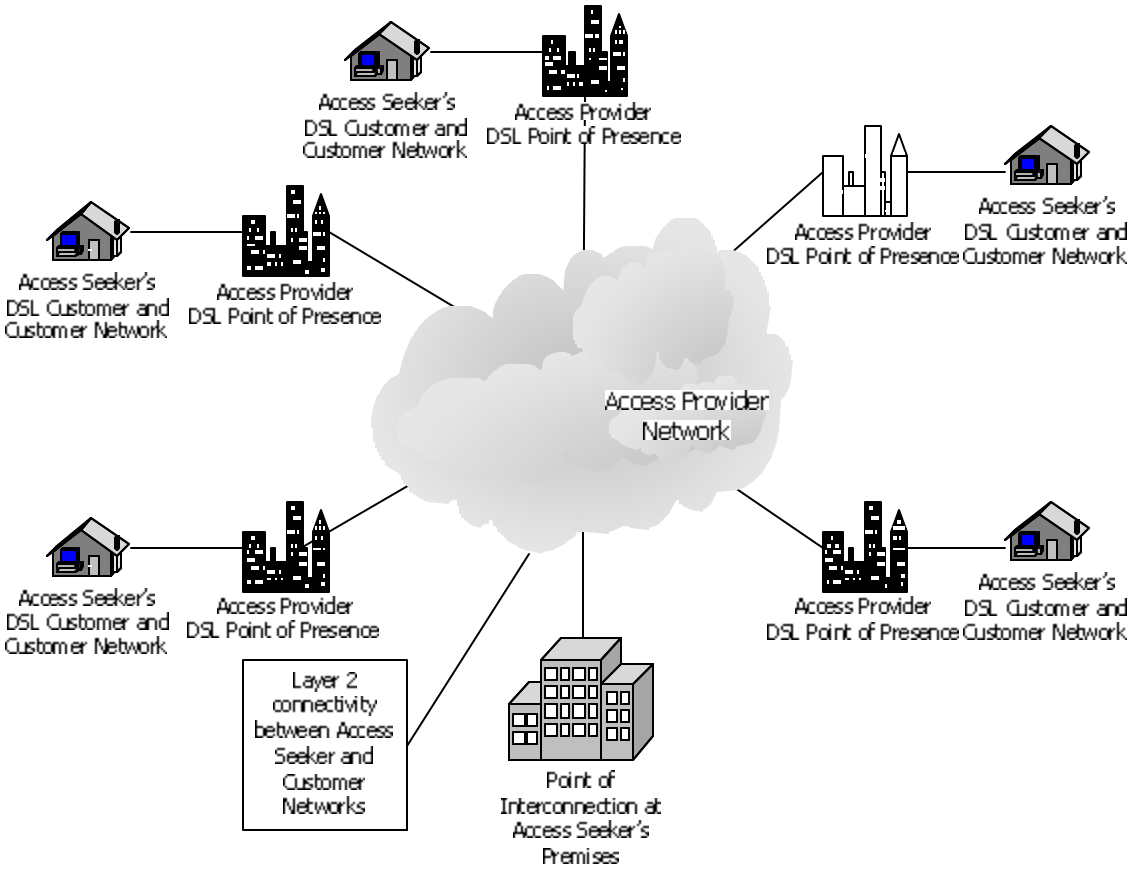
12.0 BITSTREAM WITH NETWORK SERVICE

12.1 Relationship with reference diagram

12.1.1 The Bitstream with Network Service is a service for the delivery of traffic from point A to point E as set out in Figure 1. To the extent that the Access Provider has control over the Customer Network, the access service may extend to point F in Figure 1.

12.1.2 The service is shown diagrammatically in Figure 8.

Figure 8: Bitstream with Network Service



12.2 Service levels

12.2.1 There are a number of service levels and specifications associated with this service and these are set out in Table 16.

Table 16: Service requirements for Bitstream with Network Service

Parameter	Requirement
Network availability	99.9%
Network element availability (any DSLAM)	99.95%
Latency	30 millisecond maximum
Jitter	10 millisecond maximum
Packet loss	<0.1%
Contention ratio (DSLAM to core)	no worse than 1:20
Interleaving	Prohibited
Service level for confirmation of new service requests and transferral requests	No more than 2 Business Days from the receipt of a valid service request
Service level for implementation of new service requests and transferral requests	No more than 5 Business Days from the receipt of a valid service request
Service level for confirmation of fault notifications	Fault acknowledgement within 2 hours of the fault notification by Access Seeker
Service level for fault repairs	Fault response (i.e. work on repairing must commence) within 12 hours of the fault notification by Access Seeker
Service level for notification of fault clearance	Service must be restored within 24 hours of the fault notification by Access Seeker

13.0 BITSTREAM WITHOUT NETWORK SERVICE

13.1 Relationship with reference diagram

13.1.1 The Bitstream without Network Service is a service for the delivery of traffic from point C to point E as set out in Figure 1. To the extent that the Access Provider has control over the Customer Network, the access service may extend to point F in Figure 1.

13.1.2 The service is shown diagrammatically in Figure 9.

Figure 9: Bitstream without Network Service

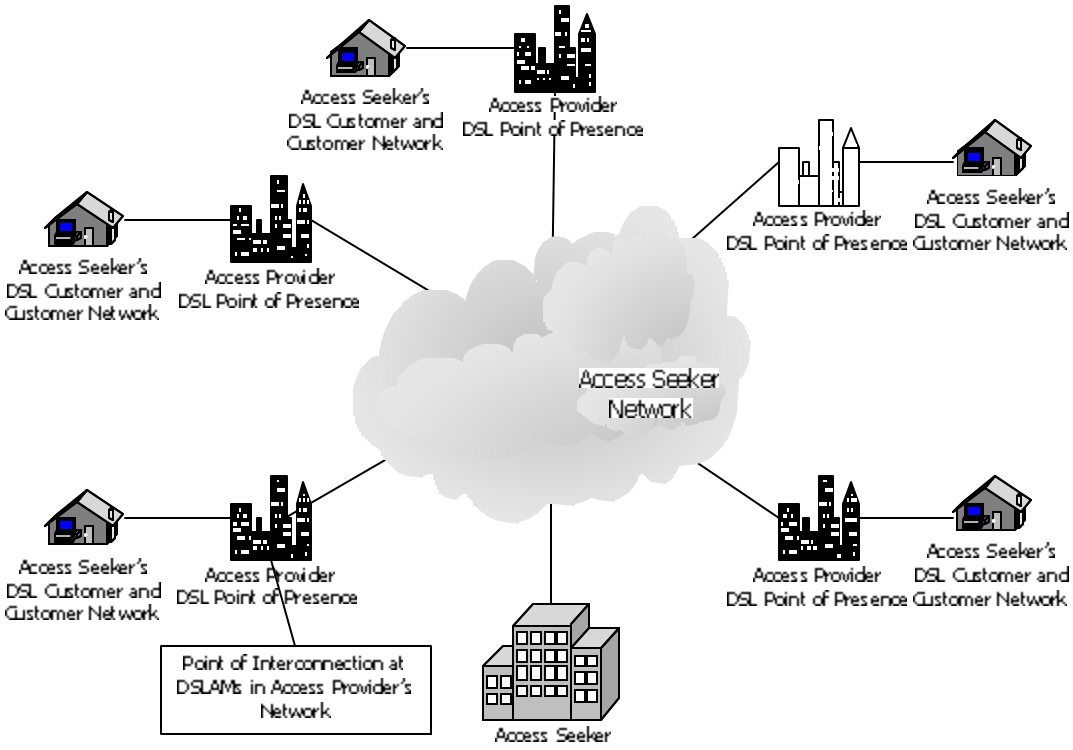


Table 17: Service requirements for Bitstream without Network Service

Parameter	Requirement
Network element availability (any DSLAM)	99.95%
Interleaving	Prohibited
Service level for confirmation of new service requests and transferral requests	No more than 2 Business Days from the receipt of a valid service request
Service level for implementation of new service requests and transferral requests	No more than 5 Business Days from the receipt of a valid service request
Service level for confirmation of fault notifications	Fault acknowledgement within 2 hours of the fault notification by Access Seeker
Service level for fault repairs	Fault response (i.e. work on repairing must commence) within 12 hours of the fault notification by Access Seeker
Service level for notification of fault clearance	Service must be restored within 24 hours of the fault notification by Access Seeker

PART C OF GUIDELINES – RESOURCE AND SERVICE MANAGEMENT FUNCTIONS FOR ALL FORMS OF ANE SERVICES

14.0 RESOURCE AND SERVICE MANAGEMENT FUNCTIONS

14.1 When an access agreement is in place (along with its associated service level agreement), the provisioning interactions are either resource management as set out in Table 18 or service management as set out in Table 19. Resource management allows an access seeker to use the resources of the Access Provider to establish a service. Service management refers to the management of service in operation including maintenance and decommissioning.

14.2 The resource and service management functions apply to User Port Functions (UPF) and Service Port Functions (SPF). The management of UPF and SPF which provides User Network Interface and Service Node Interface functionality respectively are also considered in ITU-T Recommendation G.902.

14.3 The UPF adapts the specific User Network Interface requirements for the core and management functions. The SPF adapts the requirements defined for a specific interface between the Access Seeker and the Access Provider to the common bearers for handling the core function. In addition, the SPF selects the relevant information for treatment in the Access Network system management function. The core, transport and management functions are responsible for Access Network operations.

Table 18 – Resource management

Management Function	Summary
1. Request a Resource	The Access Seeker requests a UPF or SPF resource. The resource is identified by the transport bearer service domain it can cover and by its type.
2. Configure Resource parameters	The management function enables the Access Seeker to configure resources-specific parameters. It covers UPF/SPF and management resources.
3. View Resource Setup	Provides a view of the current resource-configuration.
4. Release a Resource	The Access Seeker requests the release of resources. The released resources can be re-allocated to other Access Seekers.
5. Connect SPF to POI	The Access Seeker requests for the connection between SPF and POI. The result of this service gives the SPF the capability of transferring information from SPF and the service node and vice versa.
6. Disconnect SPF-resource from POI	The Access Seeker requests for the disconnection of a SPF from a POI.
7. Connect UPF to POI	The Access Seeker requests that a UPF is connected to an end user location and routed through a specified POI.
8. Disconnect UPF from POI	The Access Seeker requests that UPF is disconnected from an end user location.
9. Request change of resource capabilities	The Access Seeker requests the addition or removal of resource capabilities, e.g. upgrade/downgrade or migration, to conform with new requirements.

Table 19 – Service management

Management Function	Summary
Request a Bearer-Transport Service	The Access Seeker requests that a service, specified through the service description, is made available at a certain access point location to a SPF. Connection between UPF and SPF is performed automatically. The Service may be requested with following restrictions: • use of specific UPF instead of one automatically assigned by the Access Provider • use of specific service node instead of SPF.
Delete a Bearer-Transport Service	The Access Seeker requests the termination of a service. The resources become re-allocatable to other services but are assigned to the Access Seeker. The resources are released completely if their assignment has occurred automatically through the Access Provider.
Identify service capabilities	The service returns the set of capabilities a bearer-transport service has.
Add service capability to a Bearer-Transport Service	A service capability is added to an existing bearer transport service instance.
Remove service capability from a Bearer-Transport Service	A service capability is removed from an existing bearer-transport service instance.
Block/unblock a bearer transport service	During maintenance work such as the upgrade of equipment in the Access Network, the Access Provider must be able to temporarily block the service in the Access Network. The Access Provider may request permission to block from the Access Seeker.

15.0 EFFECTIVE DATE AND REVISION

15.1 These guidelines shall come into effect on 28 September 2005 and shall continue to be effective until modified, varied or revoked by the Commission.

15.2 These guidelines are intended to be used as a guide only and do not prevail over any legislative provisions contained in the law.

16.0 MCMC CONTACT

For any queries and further information, please contact:

General Manager
Industry Development Division
Malaysian Communications and Multimedia Commission
63000 CYBERJAYA
Selangor Darul Ehsan
Tel No : +60 3-8688 8000
Fax No : +60 3-8688 1000

16. GLOSSARY

The following terms have the same meaning as in the MSA and the Access List.

ADSL means Asymmetric Digital Subscriber Line.

ANE means Access to Network Elements.

Customer Access Module means a device that provides ring tone and ring current to customer equipment.

Communications Wire means a copper or aluminium based wire forming part of a PSTN.

DSL means digital subscriber line.

DSLAM means digital subscriber line access multiplex.

FEXT means far-end cross talk.

HDF means hand-over distribution frame.

HDSL means High bit rate Digital Subscriber Line.

MDF means main distribution frame.

MSA means the Mandatory Standard on Access, Determination No. 2 of 2005.

NEXT means near-end cross talk.

POI means point of interconnection.

POP means point of presence.

PSD means power spectral density.

PSTN means public switched telephone network.

SDSL means Symmetric Digital Subscriber Line.

SHDSL means Single-pair High Speed Digital Subscriber Line.

SOF means Statement of Requirement.

SPF means Service Port Function.

UPF means User Port Function.

VDSL means Very High Speed Digital Subscriber Line.