Malaysian Communications and Multimedia Commission

Review of Access List

Public Inquiry Report

17 November 2021

This Public Inquiry Report was prepared in fulfilment of sections 55(2), 55(4), 61 and 65 of the Communications and Multimedia Act 1998.

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ABBREVIATIONS AND GLOSSARY

A2P	Application-to-Person
ACCC	Australian Competition and Consumer Commission
AGCOM	Autorita per le Garanzie nelle Cominicazioni (Authority for Communications Guarantees)
API	Application Programming Interface
AR	Augmented Reality
ARCEP	Autorité de Régulation des Communications Électroniques et des Postes (France's Regulatory Authority for Electronic Communications, Postal and Print Media Distribution)
ASP	Applications Service Provider
ATM	Asynchronous Transfer Mode
AUSF	Authentication Server Function
B2B	Business-to-Business
BBU	Baseband Unit
BEREC	Body of European Regulators for Electronic Communications
BFD	Bidirectional Forwarding Detection
BTS	Base Transceiver Station
CAGR	Compound Annual Growth Rate
CAPEX	Capital Expenditure
CAS	Common Antenna System
CAT-M1	Category M1
CDR	Call Detail Record
CIMS	Communication Infrastructure Management System
CMA	Communications and Multimedia Act 1998
CMP	Content Management Platform
CoS	Classes of Service
CRM	Commercial Radio Malaysia
CSMF	Communication Service Management Function
CSFB	Circuit-Switched Call Fallback
DAS	Distributed Antenna System
DEL	Direct Exchanged Line
DNB	Digital Nasional Berhad
DSL	Digital Subscriber Line
DSS	Dynamic Spectrum Sharing
DTBMS	Digital Terrestrial Broadcasting Multiplexing Service
DTT	Digital Terrestrial Television

DVB-T2	Digital Video Broadcasting-Second Generation Terrestrial
DWDM	Dense Wavelength Division Multiplexing
EC	European Commission
EEO	End-to-End Orchestrator
ELAN	Ethernet Local Area Network
E-LINE	Ethernet Line Services – Point to Point Services
EIR	Equipment Identifier Register
EN-DC	E-UTRA New Radio Dual Connectivity
eMBB	Enhanced Mobile Broadband
EPC	Evolved Packet Core
EU	European Union
EVS	Enhanced Voice Services
FE	Fast Ethernet
FCC	Federal Communications Commission
FNP	Fixed Number Portability
FTA	Free to Air
FTTH	Fibre to the Home
FTTP	Fibre to the Premise
FTTx	Fibre to the x
FWA	Fixed Wireless Access
GE	Gigabit Ethernet
GGSN	Gateway GPRS Support Node
GPON	Gigabit Passive Optical Network
GPP-I-2020	Garis Panduan Perancangan Infrastruktur Komunikasi 2020
GPS	Global Positioning System
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
GSMA	GSM Association
HDM	High Definition Maps
HLD	High Level Design
HSBB	High Speed Broadband Network
HSS	Home Subscriber Server
IBC	In-Building Coverage
ICMP	Internet Control Message Protocol
IMDA	Info-Communications Media Development Authority
IMT	International Mobile Telecommunications
IoT	Internet of Things
IP	Internet Protocol

IPTV	Internet Protocol Television
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
IX	Internet Exchange
IXP	Internet Exchange Point
JENDELA	Jalinan Digital Negara
Kbps	Kilo Bit Per Second
KLIA	Kuala Lumpur International Airport
L3VPN	Layer 3 Virtual Private Network
LACP	Link Aggregation Control Protocol
LAN	Local Area Network
LIG	Lawful Intercept Gateways
LRT	Light Rail Transit
LTBE	Long-Term Benefit of the End User
LTE	Long-Term Evolution
LTIE	Long-Term Interest to End User
M2M	Machine to Machine
Mbps	Mega Bit Per Second
MCMC	Malaysian Communications and Multimedia Commission
MDF	Main Distribution Frame
MEC	Multi Edge Computing
MEF 3.0	Metro Ethernet Forum 3.0
Metro-E	Metro Ethernet
MMTA	Malaysia Mobile Technology Association
MMS	Multimedia Messaging Service
mMTC	Massive Machine Type Communications
MNKT	Majlis Mesyuarat Negara Bagi Kerajaan Tempatan
MNO	Mobile Network Operator
MOCN	Multi-Operator Core Network
MORAN	Multi Operator Radio Access Network
MPFN	Majlis Perancangan Fizikal Negara
MRT	Mass Rapid Transit
MSA	Mandatory Standard on Access
MSAP	Mandatory Standard on Access Pricing
MSISDN	Mobile Station International Subscriber Directory Number
MSMCS	Mandatory Standards for the Provision of Mobile Content Services, Determination No. 4 of 2009
MTTR	Mean Time to Repair

MTU	Maximum Transmission Unit
MVNO	Mobile Virtual Network Operator
MyIX	Malaysia Internet Exchange
NB-IoT	Narrowband Internet of Things
NEF	Network Exposure Function
NFV	Network Function Virtualisation
NG-RAN	New Generation Radio Access Network
NGTN	Next Generation Transport Network
NIEL	National Interconnection Eco-System Lab
NKOM	Nasjonal Kommunikasjonsmyndighet (Norwegian Communications Authority)
NR	New Radio Network Architecture
NSA	Non Standalone Architecture
NSMF	Network Slice Management Function
NSSMEF	Network Slice Subnet Management Function
NSSF	Network Slice Selection Function
NTU	Network Termination Unit
Ofcom	Office of Communications (United Kingdom)
OSS	Operations Support System
OTT	Over-the-Top
P2P	Person-to-Person
PBX	Private Branch Exchange
PDM	Poles, Ducts and Manholes
POA	Point of Access
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
RCS	Rich Communication Services
ROI	Return on Investment
RRU	Remote Radio Unit
RTT	Return Trip Time
SA	Standalone Architecture
SAO	Standard Access Obligation
SBC	State-Backed Company
SEAF	Security Anchor Function

SEPP	Security Edge Protection Proxy
SIGTRAN	Signalling Transport Working Group
SIM	Subscriber Identity Module
SIP	Session Initiation Protocol
SKR1M	Sistem Kabel Rakyat 1Malaysia
SLA	Service Level Agreement
SMPP	Short Message Peer-to-Peer
SMS	Short Messaging Services
SON	Self-Organising Network
SPV	Special Purpose Vehicle
SS7	Signalling System Number 7
TDM	Time Division Multiplexing
TGA	Talian Gerak Alih Sdn Bhd
TM	Telekom Malaysia
TRAI	Telecom Regulatory Authority of India
UDM	Unified Data Management
UDR	Unified Data Repository
UK	United Kingdom of Great Britain and Northern Ireland
URLLC	Ultra-Reliable Low Latency Communications
USP	Universal Service Provider
VAS	Value-Added-Service
VDSL	Very High Bit Rate Digital Subscriber Line
VLAN	Virtual Local Area Network
VNS	Virtualised Network Services
VoIP	Voice over Internet Protocol
VoLTE	Voice-over-LTE (Long-Term Evolution)
VoNR	Voice-over-New Radio
VPN	Virtual Private Network
VR	Virtual Reality
VoWiFi	Voice over WiFi
WAN	Wide Area Network
WiMAX	Worldwide Interoperability for Microwave Access
WLLC	Wholesale Local Leased Circuit
3G	Third Generation
3GPP	Third Generation Partnership Project
4G	Fourth Generation
5G	Fifth Generation
5GC	5G Core Network

Part A   Background

1   Introduction

1.1   Public Inquiry Process

In its Public Inquiry Paper on the Access List Review (**PI Paper**) released on 20 August 2021, the MCMC detailed the approach and methodology it proposed to adopt in this Public Inquiry.

The purpose of this Public Inquiry has been to solicit views from industry participants, other interested parties and members of the public to assist the MCMC to determine whether:

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

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

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

The PI Paper set out the MCMC's preliminary views on these matters and invited comments on the MCMC's preliminary views and specifically sought comment on the questions listed in Annexure 1 of the PI Paper.

The PI Paper explained:

(d)   the legislative context and purpose of conducting the Public Inquiry;

(e)   the scope of the Public Inquiry;

(f)   the proposed outputs of the Public Inquiry;

(g)   the MCMC's preliminary views on potential changes to the Access List; and

(h)   the process of the Public Inquiry.

1.2   Consultation process

The MCMC has consulted widely and openly with all interested stakeholders during this Public Inquiry, including:

(a)   the circulation of informal questionnaires and presentations to industry about the proposed Public Inquiry;

(b)   the consideration by the MCMC of submissions received from the industry in response to the informal questionnaires;

(c)   the publication of the PI Paper on 20 August 2021; and

(d)   the consideration of all submissions received by 12 noon, 18 October 2021 in response to the PI Paper.

1.3 **Submissions received**

At the close of the Public Inquiry period at 12 noon, 18 October 2021, the MCMC had received written submissions from the following parties.

No.	Submitting party	Referred to in this PI Report as
1	Allo Technology Sdn Bhd	Allo
2	Altel Communications Sdn Bhd (on behalf of itself, Net2One Sdn Bhd and MYTV Broadcasting Sdn Bhd)	Altel, Net2One, MYTV
3	Measat Broadcast Network Systems Sdn Bhd	Astro
4	Celcom Axiata Berhad	Celcom
5	Celcom Timur (Sabah) Sdn Bhd	Celcom Timur (Sabah)
6	Digi Telecommunications Sdn Bhd	Digi
7	Digital Nasional Bhd	DNB
8	edotco Group Sdn Bhd and edotco Malaysia Sdn Bhd	edotco
9	Fiberail Sdn Bhd	Fiberail
10	Fibrecomm Network (M) Sdn Bhd	Fibrecomm
11	GTP Network Sdn Bhd	GTP
12	Maxis Broadband Sdn Bhd	Maxis
13	Malaysia Mobile Technology Association	MMTA
14	Persatuan Pengendali Internet Malaysia	MyIX
15	Ohana Communications Sdn Bhd	Ohana
16	REDtone Engineering & Network Services Sdn Bhd	REDtone
17	Sacofa Sdn Bhd	SACOFA
18	TT dotCom dotCom Bhd	TT dotCom
19	Telekom Malaysia Bhd	TM
20	U Mobile Sdn Bhd	U Mobile

No.	Submitting party	Referred to in this PI Report as
21	WorldDAB	WorldDAB
22	XOX Bhd	XOX
23	YTL Communications Sdn Bhd	YTLC

Figure 1 - Submissions received on PI Paper

There was another submission after the deadline which is not accepted by the MCMC.

Having thoroughly reviewed and assessed the submissions received on the PI Paper against its own preliminary views, the MCMC now presents this PI Report within the 30-day requirement of the closing date of submissions, as stipulated under section 65 of the Communications and Multimedia Act 1998 (**CMA**).

1.4   **Structure of this PI Report**

This PI Report begins with:

(a)   the general introduction in this Part A; and

(b)   an overview of the current Access List in 0.

Part C then considers each of the facilities and services included or proposed to be included in the Access List. For each facility and service, the PI Report sets out:

(c)   an introduction to the issues discussed in the PI Paper in relation to the facility or service;

(d)   a summary of the comments received;

(e)   a discussion of any changes to the MCMC's preliminary views regarding the facility or service, or the MCMC's rationale for maintaining its preliminary views (as applicable); and

(f)   the MCMC's final view on the retention, change or removal of the facility or service.

As with the PI Paper, the facilities and services considered in Part C are organised in the context of the family of facilities and services to which they belong.

Where the MCMC has proposed changes to an existing facility or service, the changes relative to the existing description are shown as follows:

▪   the MCMC proposes to add words that appear in <u>underlined red text</u>; and

▪   the MCMC proposes to delete words that appear in ~~strikethrough text~~.

The MCMC notes that it has not yet decided the precise form of variations to, or replacement of, the Access List Determination at this time. Therefore, the numbering and formatting of amendments described in this PI Report may vary in the final Access List Determination or Variation. The amendments described in this PI Report are shown as variations to the current Access List Determination for convenience.

1.5 Legislative Context

The MCMC has set out the legislative context for the present review of the Access List, including the national policy objectives in the CMA, in the PI Paper in some detail. That background is not repeated here, but interested parties are invited to review section 2 of the PI Paper for further details.

1.6 Key Concepts and Methodology

As discussed in sections 3 of the PI Paper, the MCMC has identified and applied the Long-Term Benefit of End Users (**LTBE**) and Bottleneck Facilities as the key concepts which are of most direct relevance to the ex-ante regulation of wholesale access to telecommunications facilities and services which is the purpose of the Access List.

However, as noted in the PI Paper, the MCMC has also considered other national policy objectives that are relevant to access regulation, including national development, equitable provision of services over ubiquitous national infrastructure, and the promotion of a civil society either as inherent in the LTBE concept or explicitly where necessary to consider such factors separately.

The MCMC's approach in this regard continues the approach adopted in the 2015 Access List Review.

1.7 Focus areas

In the PI Paper, the MCMC nominated five focus areas for the present Public Inquiry:

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

(b) **enhancement of High Speed Broadband (HSBB) network regulation:** the MCMC has strengthened regulation of Layer 2 HSBB Network Service with QoS and Layer 3 HSBB Network Service to address

issues faced by Access Seekers and to take into account technological developments;

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

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

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

The industry has generally supported these key focus areas in their submissions and the results of the Public Inquiry process demonstrate the importance of these focus areas.

1.8 Matters addressed comprehensively in the PI Paper

Each of the following matters is comprehensively addressed in the PI Paper for each existing or potential Access List facility and service:

(a) the description of the facility and service;

(b) competition/LTBE analysis related to the supply and acquisition of the facility or service; and

(c) details of any proposed changes to the facility or service.

The MCMC has not repeated each of these matters in this PI Report, but instead focused on submissions on those matters and any consequential changes to the MCMC's preliminary views in the PI Paper. The MCMC recommends that interested parties read the PI Paper and this PI Report together for a complete understanding of the conclusions in this PI Report.

1.9 Other issues

Operators also commented on a number of other matters which are addressed in section 16 of the PI Paper (Other submissions), including:

(a) circumstances in which commercial arrangements are preferred over access agreements;

(b) the MCMC's approach to regulation; and

(c)   acquiring services from unlicensed entities.

The MCMC's views in respect of these matters remain consistent with those set out in the PI Paper and are not repeated in this PI Report.

Further, to the extent that operators' submissions relate to matters outside the scope of the Public Inquiry (e.g. broader changes to the CMA, matters governed by the MSA or MSAP, or enforcement and monitoring), the MCMC acknowledges that regulation must be considered on a holistic basis, thanks operators for their continued engagement and looks forward to further engagement on these issues through upcoming Public Inquiries and other forums.

1.10   Summary of changes

The following table summarises the MCMC's proposed changes arising from the Public Inquiry.

Quick guide to amendments	
✔	Add new service to the Access List.
=	Retain service on Access List without any modification.
▲	Retain service on Access List with modifications.
✖	Remove service from Access List.

Existing Access List service	Amendments		Page reference
Fixed Network Termination Service	=	Retain the service without modification.	18
Fixed Network Origination Service	▲	Retain the service with minor amendments to remove SMS/MMS messaging.	21
Wholesale Line Rental Service	✖	Remove the service from the Access List.	23
Mobile Network Termination Service	▲	Retain the service with minor amendments to clarify that 5G is included in the scope of these services.	26
Mobile Network Origination Service	▲	Retain the service with minor amendments to underscore that 5G technology is included in the scope of these services and to remove SMS/MMS messaging.	28
MVNO Access Service	▲	Retain the service with minor amendments to underscore that 5G technology is included in the scope of these services and to correct typographical errors in the description.	31
Infrastructure Sharing Service	▲	Retain the service with modifications to expand the scope of the services to cover access to poles, rooftops and street furniture.	106
Duct and Manhole Access	▲	Retain the service with modifications to broaden the scope of duct infrastructure included within the listed service and to clarify the obligation of access providers to provide access to the land upon which such infrastructure is located.	115

Existing Access List service		Amendments	Page reference
Interconnect Link Service	🔺	Retain the service with modifications to include IP-based interconnection and included bandwidth for IP-based interconnection.	122
Network Co-Location Service	🔺	Retain the service with modifications to clarify the premises at which co-location must be supplied.	124
Digital Terrestrial Broadcasting Multiplexing Service	🔺	Retain the service with modifications to the definition of "Transport Stream" to reflect that this service is capable of being supplied as an audio-visual or audio-only service and to clarify that any method of delivery of the Transport Stream is covered by the service.	132
End-to-End Transmission Service	🔺	Retain the service with modifications to include certain technical parameters and to clarify the scope of the service.	142
Wholesale Local Leased Circuit Service	🔺	Retain the service with modifications to clarify that the service includes the provision of a Trunk Transmission Service (where required for the provision of the service) and the service may be incorporated into a Metro-Ethernet network.	149
Trunk Transmission Service	🔺	Retain the service with minor modifications to clarify that the service may be incorporated into a Metro-Ethernet network.	153
Domestic Connectivity to International Service (connectivity only)	🟰	Retain the service without modification.	155
Layer 2 HSBB Network Service with QoS	🔺	Retain the service with modifications to reflect the availability of higher speed tiers for the service, and to broaden the scope of the service to cover any technical parameters with which the service is supplied.	163
Layer 3 HSBB Network Service	🔺	Retain the service with modifications to reflect the availability of higher speed tiers for the service, and to broaden the scope of the service to cover any technical parameters with which the service is supplied.	163
Full Access Service	❌	Remove the service from the Access List.	171
Line Sharing Service	❌	Remove the service from the Access List.	171
Sub-Loop Service	❌	Remove the service from the Access List.	171
Bitstream with Network Service	❌	Remove the service from the Access List.	171
Bitstream without Network Service	❌	Remove the service from the Access List.	171
Digital Subscriber Line Resale Service	❌	Remove the service from the Access List.	171
Domestic Inter-Operator Roaming Service	✅	Add the service to the Access List.	64
5G Standalone Access	✅	Add the service to the Access List.	96
4G EPC with 5G RAN Access	✅	Add the service to the Access List.	96
IP Transit Service	✅	Add the service to the Access List.	130

1.11 **New facilities and services not to be regulated**

Finally, the MCMC has decided not to regulate to the following new services, on which operators were invited to provide submissions as part of the Public Inquiry:

(a)   A2P messaging termination services;

(b)   End-to-end A2P messaging services;

(c)   MOCN and RAN sharing arrangements;

(d)   Mobile fronthaul services;

(e)   5G broadcasting services; and

(f)   Dark fibre services.

1.12 **Promotion of competition, protection of consumers and quality of service**

In reaching the positions and decisions expressed in this PI Report, and as has been its historic practice, the MCMC has focused on its overarching CMA mandates to promote competition in the supply of access to telecommunications facilities and services, to protect the interests of consumers and to create and maintain regulatory settings which will improve the quality of services and ultimately uplift the digital capabilities of Malaysia as a whole. The MCMC regards the promotion of competition to be paramount over the promotion of particular competitors or the views about how their interests should be advanced.

Part B   Overview of current Access List

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

(a)   Fixed line services

(i)   Fixed Network Termination Service

(ii)   Fixed Network Origination Service

(iii)   Wholesale Line Rental Service

(b)   Mobile services

(i)   Mobile Network Termination Service

(ii)   Mobile Network Origination Service

(iii)   MVNO Access

(c)   Facilities access services

(i)   Infrastructure Sharing

(ii)   Duct and Manhole Access

(d) Interconnection services

    (i)   Interconnect Link Service

    (ii)   Network Co-location Service

(e) Broadcasting services (except transmission services)

    (i)   Digital Terrestrial Broadcasting Multiplexing Service

(f) Transmission services

    (i)   End-to-End Transmission Service

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

    (iii)   Trunk Transmission Service

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

(g) HSBB Services

    (i)   Layer 2 HSBB Network Service with QoS

    (ii)   Layer 3 HSBB Network Service

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

    (i)   Full Access Service

    (ii)   Line Sharing Service

    (iii)   Sub-Loop Service

    (iv)   Bitstream Service

    (v)   Digital Subscriber Line Resale Service

Part C   Review of Access List Services

1   Fixed line services

Fixed Network Termination Service

Introduction

1.1   In the PI Paper, the MCMC noted that the Fixed Network Termination Service remains a bottleneck and that there have not been any material changes since the 2015 Access List Review that would justify removing this service from the Access List.

Submissions Received

1.2   Altel, Net2One and MYTV agreed that the service should be retained in the Access List. All three stated that Fixed Network Operators should be required to offer IP-based interconnection to carry the service.

1.3   Celcom agreed that the service should remain in the Access List as fixed network operators continue to have exclusive control over access to end users, hence only they can originate and terminate voice calls on their networks. Celcom agreed that the service is a bottleneck service.

1.4   Digi agreed that the service should remain in the Access List, and stated the service is still relevant for mobile customers to communicate with fixed line numbers and vice versa while achieving any-to-any connectivity.

1.5   Maxis agreed that the service should remain in the Access List as it is a bottleneck service that is not substitutable, serving a large base of end users through PSTN. Maxis is of the view that the service should cover all services using fixed telephone number, whether it is IP voice, PSTN voice, etc.

1.6   REDtone agreed that the service should remain in the Access List to ensure a referable regulated benchmark of services and prices.

1.7   TM supported the retention of the service with minimal modification to the service description. TM proposed that domestic and international calls for this service be distinguished under the interconnection regime in the Access List. TM reasoned these services have different originating operators and would be in line with other best practice as in Singapore and the UK.

1.8   TM also proposed to allow short codes to be used for inbound and outbound calls under this service, and Access Providers be able to set commercial rates for incoming international-to-fixed network calls and incoming international-to-mobile network calls. TM reasoned that this is due to the low inbound international interconnection rates that benefit only the international operators. TM also proposed that Access Providers be allowed to set commercial rates to retain the value of the service and local network operators be able to generate higher income to improve network coverage and quality.

1.9   TT dotCom noted the MCMC's view to retain the service in the Access List as each operator has full control over termination of calls to its network and to ensure any-to-any connectivity.

1.10   However, TT dotCom proposed removing both origination and termination services from the Access List, as both services are not constantly acquired by Access Seekers. The services are only acquired once when the infrastructure is set up, and they are unlikely to be cancelled or terminated. Further, in TT dotCom's view, the termination service is no longer a necessity, especially for voice calls as it only forms a small percentage of operators' total revenue, with customers moving towards data-centric rather than voice-centric services. With 4G coverage exceeding 70% by the end of 2018, mobile subscribers began using mobile broadband to undertake activities, including making calls through OTT applications. It is questionable whether the service that was included at a time when voice was a primary service and network asymmetry was present is still relevant.

1.11   Additionally, TT dotCom stated that removal of this service may decrease the compliance burden and costs of having to publish something that no one new applies for, to amend existing agreements every time a new MSA or MSAP is

issued and more generally does not reflect the current telecommunications environment.

1.12   U Mobile agreed that the service should be retained in the Access List. U Mobile proposed allowing interconnection at agreed POIs instead of the legacy non-IP network design which requires far-end POI handover. This will result in lowering costs and providing better reliability, as current AAs specify threshold levels of 85% or 90% before an upgrade can be triggered resulting in insufficient capacity during single POI link outage.

1.13   U Mobile suggested a new definition of interconnect POI based on IP without requiring a far end handover and higher capacity, as IP network allows consolidation of POIs to 2 or 3 and capacity can be allocated to allow for N+1 link failure without congestion.

1.14   YTLC agreed that the service should remain in the Access List, noting that the service is technology neutral and includes IP based interconnection.

Discussion

1.15   All operators other than TT dotCom agreed that the Fixed Network Termination Service should remain on the Access List.

1.16   In relation to operator submissions regarding the technologies with which the service is supplied, the MCMC notes that the service is already drafted in a technology-neutral manner and already expressly refers to IP-based networks, so the MCMC does not consider that further amendments are required in this respect.

1.17   The MCMC rejects submissions by TT dotCom to exclude the Fixed Network Termination Service and Fixed Network Origination Service from the Access list. These are key bottleneck services, and in the absence of any evidence that the costs of regulation outweigh the benefits, the MCMC maintains its preliminary view as expressed in the PI Paper that it would be in the LTBE for these services to continue being regulated on the Access List.

1.18   The MCMC does not agree with the TM's views that domestic and international calls for this service should be distinguished, for the reasons set out in paragraph 7.43 of the PI Paper. Further, the use of short codes is as set out under the Mandatory Standards for the Provision of Mobile Content Services, so the MCMC does not consider it appropriate to include short codes in the Access List.

MCMC Views

1.19   The MCMC confirms its preliminary views and proposes to retain the Fixed Network Termination Service on the Access List without modification.

Fixed Network Origination Service

Introduction

1.20   In the PI Paper, the MCMC considered that the rationale for including the Fixed Network Origination Service in the Access List remains valid and operators had not expressed any disagreement with the basic service description.

1.21   In the PI Paper, the MCMC expressed the preliminary view that the Fixed Network Origination Service should remain in the Access List, but queried whether the service description should be modified to remove references to SMS and MMS.

Submissions Received

1.22   Celcom repeated its comments in respect of the Fixed Network Termination Service in submitting that the Fixed Network Origination Service should also remain on the Access List.

1.23   Celcom stated that SMS and MMS messages are not applicable to the service because origination service is an input to allow calls from Access Provider's network for the provision of freephone and toll-free service by Access Seeker which is limited to voice calls only.

1.24   Digi agreed that the service should remain in the Access List to ensure any-to-any connectivity. Digi stated that SMS and MMS messages should be removed from the service description of Fixed Network Origination Service because, to Digi's knowledge, there is no receiving party pays model or charging principles for SMS and MMS service, unlike voice origination service. Additionally, due to the prevalence of OTT messaging services like WhatsApp and significant decline of MMS services, the service has been rendered obsolete. Digi suggested that MMS messages should be removed from the service description of Fixed and Mobile Network Termination and Origination as well.

1.25   Maxis agreed that the service should remain in the Access List, stating the service is a bottleneck service since the originating operator can provide the service in respect of each originating network. It is useful for establishing call connections among network service providers, especially for Freephone service, tollfree service and selected short code 15XXX numbers.

1.26   Maxis proposed SMS and MMS messages should not be removed from the service description and be retained for future use in case the services can be offered by the Access Provider in view of the bottleneck nature of Fixed Network Origination Services, either for voice, SMS or MMS. If the MCMC decided to remove the service, Maxis proposed that it also should be removed from Mobile Network Origination Service to ensure consistency.

1.27   REDtone submitted that the service should remain in the Access List to ensure referable regulated benchmark of services and prices, especially for Access Seekers.

1.28   TM supported the retention of the service in the Access List and proposed that SMS and MMS messaging should remain in the Access List, as it would cater to future business requirements or advancement of technology. TM also proposed to allow short codes to be used for inbound and outbound calls under this service to provide a single number solution for enterprise customers and government agencies. There are increasing requests from government agencies to use termination service for inbound calls to certain short codes for cost savings to manage their operations and minimize potential abuse. As short codes have been used by origination and termination service, it will be acceptable that it should be included in the service descriptions of both origination and termination services.

1.29   TM also proposed that Access Providers should be able to set commercial rates for incoming international-to-fixed network calls and incoming international-to-mobile network calls.

1.30   TT dotCom proposed removing both origination and termination services from the Access List, as both services are not constantly acquired by seekers. The services are only acquired once and when the infrastructure is set up, they are unlikely to be cancelled or terminated. Further, termination service is no longer a necessity, especially for voice calls as it only forms a small percentage of operators' total revenue, with the movement towards data-centric than voice-centric services. With 4G coverage exceeding 70% by end of 2018, mobile subscribers began using mobile broadband to undertake activities, including making calls through OTT applications. It is questionable whether the service that was included at a time when voice was a primary service and network asymmetry was present is still relevant.

1.31   TT dotCom added that removal of this service may decrease the compliance burden and costs of having to publish something that no one new applies for, to amend existing agreements every time a new MSA or MSAP is issued and does not reflect the current telecommunications environment.

1.32   U Mobile agreed that the service should be retained in the Access List.

1.33   YTLC agreed that the services should remain in the Access List, noting that the service is technology neutral and includes IP based interconnection. YTLC agreed on the removal of messaging services from the service as it does not see use cases of sending SMS or MMS to any free phone or toll free number (1800/1300) so far.

Discussion

1.34   All operators except TT dotCom agreed with the MCMC's proposal to retain the Fixed Network Origination Service in the Access List. Some operators' submissions were equivalent to their submissions in respect of the Fixed Network Termination Service, and the MCMC has not addressed those submissions again in the context of this service.

1.35   While operators expressed varying views regarding whether SMS and MMS services should be removed from the Access List, the MCMC considers that the balance of submissions weighs in favour of removing these elements from the service description for the Fixed Network Origination Service.

1.36   In the 2015 Access List Review, the MCMC elected to retain SMS and MMS services in the service description as part of the MCMC's forward-looking approach to access regulation. However, the MCMC is not aware of any developments since that time which support the ongoing regulation of these services, and accordingly, and the MCMC considers it would be more desirable to exercise regulatory forbearance rather than continue imposing regulation.

1.37   The MCMC acknowledges Maxis's submission that if SMS and MMS services are to be removed from the Fixed Network Origination Service, they should be removed from the Mobile Network Origination Service. The MCMC agrees that, although these services are supplied in different markets with different conditions of

competition, SMS and MMS messages cannot currently be sent as part of either origination service. The MCMC addresses this issue in paragraph 1.36.

MCMC Views

1.38   The MCMC confirms its preliminary view that it would be in the LTBE to retain the Fixed Network Origination Service in the Access List, subject to clarifications that the service does not include SMS and MMS services, as follows:

4(1)   Fixed Network Origination Service

(a)   *A Fixed Network Origination Service is an Interconnection Service provided by means of a Fixed Network for the carriage of Call Communications (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).

Wholesale Line Rental Service

Introduction

1.39   In the PI Paper, the MCMC took the preliminary view that it would promote competition and the efficient use of existing communications infrastructure to continue listing the Wholesale Line Rental Service on the Access List.

1.40   However, given the Wholesale Line Rental Service is not currently being acquired by Access Seekers, the MCMC queried whether the ongoing regulation of this service would still be in the LTBE.

Submissions Received

1.41   Celcom has not attempted to seek access for the service, hence is unaware of relevant changes in the wholesale fixed telephony market that justify its removal. However, Celcom agreed that the service should be retained in the Access List as it believed that the service can potentially increase retail competition in fixed market.

1.42   Digi is not acquiring the service and does not foresee any impediments from removing the service from the Access List. New technology like cloud PBX will enable end users to make outgoing and receive incoming IP calls. The launch of

Fixed Number Portability will also be an added value to Cloud PBX services in the future, making the Wholesale Line Rental Service irrelevant.

1.43   Maxis stated that there have not been any relevant changes in the supply of the service that would justify the removal of the service from the Access List. Maxis submitted that the service should be retained in the Access List to facilitate FNP in locations where the Access Seeker does not have physical infrastructure. Alternative competitive options to end users can be provided when the Access Seeker does not have their own infrastructure, by subscribing to the Wholesale Line Rental Service from the Access Provider to provide FNP services.

1.44   Ohana agreed that the service should be retained in the Access List without any modification.

1.45   TM does not agree with MCMC's preliminary view and proposed to remove Wholesale Line Rental Service from the Access List. The implementation of FNP regulation has enabled fixed numbers to be introduced over multiple networks, such as the HSBB network. This will increase competition in fixed telephony services in Malaysia without the need for the Wholesale Line Rental Service. Further, there is currently no demand for this service and in line with government's target to decommission the copper network by 2025, this service should be removed from the Access List.

1.46   TM noted that there have been relevant changes in the supply of wholesale fixed telephony that justify the removal of the service, as the total number of residential and business DEL subscriptions has been declining at 11% CAGR from 2015 to 2020. The declining demand of the service is unlikely to justify retaining the service in the Access List. The recent implementation of FNP enable fixed numbers to be introduced across multiple networks, including HSBB network, will increase the competition in fixed services without the need of the service. The retention of the service in the Access List will hinder TM's plans to decommission the copper network by 2025.

1.47   TT dotCom opined that the service should not be regulated, taking into consideration FNP portability, under which end users have the option to port out their PSTN numbers to other service providers.

1.48   YTLC stated that allowing the service to remain in the Access List would be in the LTBE as it provides a choice for potential services to be provided by interested operators.

Discussion

1.49   There was a balance of views from operators regarding the need for ongoing regulation of the Wholesale Line Rental Service. While some operators submitted that the service is still a useful choice for Access Seekers even if it is not being acquired, TM and TT dotCom each referred to the recent implementation of FNP as a key development justifying removal of the service.

1.50   The MCMC considers that there are three key factors which justify removal of the service:

(a) the pro-competitive effects of the recent implementation of FNP in Malaysia, which significantly decreases the cost to customers of switching fixed line providers and provides further incentives for service providers to invest in improved services and price offerings to compete for switching users;

(b) the service is not presently being acquired by any Access Seekers, with no Access Seekers actually expressing any plans to acquire the service; and

(c) TM's plans to decommission the copper network by 2025, meaning it is unlikely that Access Seekers would seek to use Wholesale Line Rental as a wholesale input to voice services to build scale.

1.51 Given the above factors, and taking into account the MCMC's forward-looking approach to access regulation, the MCMC no longer considers that there is any justification to continue regulating the service, although as is the MCMC's practice in cases where it exercises regulatory forbearance, the MCMC will continue to monitor the market and consider any remedies needed in the event that Access Seekers who do wish to acquire this service experience any difficulties in acquiring it commercially.

MCMC Views

1.52 The MCMC proposes to remove the Wholesale Line Rental Service from the Access List.

2 Mobile services (other than 5G New Radio Services)

Mobile Network Termination Service

Introduction

2.1 In the PI Paper, the MCMC noted that the Mobile Network Termination Service remains a key bottleneck service and there has not been any material change in the level of competition that would justify removing this service from the Access List.

2.2 While the MCMC did not consider there to be any justification for fundamental changes to the service description for the Mobile Network Termination Service, the MCMC proposed minor amendments to:

(a) clarify that the service includes wholesale A2P termination services;

(b) underscore that 5G technology is included in the scope of the service; and

(c) to remove 3G technology from the scope of the service, given 3G sunset at the end of 2021.

2.3 The MCMC also queried whether WiMAX technology should continue to be included in the scope of the service.

Submissions Received

2.4 Celcom did not agree with the proposed amendments to the service description to include A2P messaging and on the definition of Interconnection Service. MNOs

have established a Content Management Platform (**CMP**) for A2P messages to implement spam filtering measures. To allow A2P messaging through POI or Access Seeker's POP would result in inefficient investment and duplication of infrastructure by the MNOs, as there is a need to set-up a new spam filtering system at the POI/POP. Celcom concluded that unnecessary additional costs by the MNOs would not be in the LTBE.

2.5   Digi agreed to the proposed amendments to the service description, including the removal of 3G technology and the inclusion of 5G technology. Digi accepted the proposed inclusion of a description of connection from an Access Provider's network to Access Seeker's POP. Digi noted that the definition of 'Interconnection Service' is technology neutral. Digi would like to seek confirmation from MCMC that the definition includes IP SIP technology as well as TDM. On the inclusion of A2P messaging, Digi is of the view that regulation of this service is redundant. Digi agreed with MCMC's position to retain WiMAX technology in the scope of the service description.

2.6   Maxis agreed to the MCMC's proposed amendments to the service description on the replacement of 3G technology with 5G technology and the inclusion of Access Seeker's POP under the definition of "Interconnection Service". However, Maxis disagreed on the inclusion of A2P Messaging in the definition of the service. Maxis believed that the inclusion would not be in the LTBE because;

(a)   Emergence of OTT platforms has created a viable competitive constraint for MNOs and thus mitigates monopoly power;

(b)   International precedent suggests non-regulation in markets where OTT has emerged as a viable competitive constraint;

(c)   Increase in consumer risk through potential spam content being transmitted over the service;

(d)   Regulation will not result in any benefit to end users and is not aligned with the LTBE.

2.7   Maxis agreed with the MCMC's proposed amendments to include 5G technology in the service description. However, Maxis disagreed with the proposed removal of 3G technology regardless of the planned sunsetting of 3G services. There may be delays and other exceptions may make it beneficial to have 3G technology listed in the service description until 3G technology has been totally removed from the industry. Maxis agreed that WiMAX should continue in the service description to support any-to-any communications and the principle of technology neutral.

2.8   Net2One agreed that the service should remain in the Access List and on the proposed amendments of the service description. Net2One opined that WiMAX should be removed from the scope of the service description because the service is no longer offered in Malaysia and the spectrum holders of the 2300MHz frequency band have started using 2300MHz band for LTE services.

2.9   REDtone has no objection and agreed to the proposed amendments to the service description.

2.10   U Mobile is of the view that the MCMC should maintain section 4(4)(a) of the service description for the Mobile Network Termination Service without changes. U Mobile agreed with the MCMC's proposal to add '5G New Radio' in 4(4)(d)(v), and the removal of 4(4)(d)(ii) IMT 2000 or 3G to be aligned with the government initiative to sunset 3G. Further, U Mobile stated that it has no issues with the removal of WiMAX as the technology is no longer deployed by any of the operators.

2.11   TM proposed to revise the service description on A2P Messaging, and submitted that the 'Interconnection Service' should be from a POI or Access Provider's POP to a 'B' party, rather than from a POI or Access Seeker's POP to a 'B' party as proposed by the MCMC. TM explained that as the Access Provider is the one providing the terminating service, the POP should belong to the Access Provider instead of the Access Seeker.

2.12   TM proposed that short codes can be supported in both Mobile Termination and Origination Service as discussed in Question 2 above.

2.13   TM stated that as an Access Seeker for this service, it considers that WiMAX should continue to be included if there are active mobile numbers utilising the technology to ensure Call Communications can be delivered.

Discussion

2.14   All operators agreed that the Mobile Network Termination Service should be retained on the Access List. Moreover, no operators objected to the proposed addition of 5G technology to the service description.

2.15   While Maxis submitted that 3G sunset is not yet complete and accordingly that the reference to 3G services should be retained, the MCMC considers that, adopting a forward-looking view of regulation and noting the imminence of 3G sunset at the end of 2021, there is no longer any need to expressly mention 3G technology in this service description.

2.16   Further, the MCMC notes that removal of 3G technology from the service description is not intended to negate the technology-neutral nature of the service description. As operators are aware, some parts of the Access List, including the Mobile Network Termination Service, set out examples of technologies used in the supply of a facility of service. Unless expressly specified, these examples are not intended to be exhaustive.

2.17   Accordingly, the MCMC reminds Access Providers that they must supply access to facilities and services on request by Access Seekers if they fall within the scope of a facility or service as described on the Access List, even if the specific technology is not referenced in the service description, as will be the case with 3G technology and the Mobile Network Termination Service going forward.

2.18   The MCMC also refers to its query in the PI Paper as to whether the reference to WiMAX can be retained. While there does not appear to be any evidence that WiMAX is being acquired by any operators, the MCMC notes that most operators were comfortable with retaining the service in the Access List, and accordingly the MCMC proposes to retain the reference to WiMAX in the service description.

2.19   Several operators also noted their objections to the MCMC's proposal to include A2P messaging termination services in the Mobile Network Termination Service. The MCMC's views regarding A2P messaging generally are set out in paragraphs 2.90 to 2.100 below.

MCMC Views

2.20   The MCMC confirms its preliminary view to retain the Mobile Network Termination Service should remain on the Access List with amendments to underscore that 5G is included in the scope of these services and to remove the reference to 3G technology from the service description. However, for the reasons described in paragraphs 2.90 to 2.100 below, the MCMC no longer proposes to include A2P messaging services within this service, as follows:

> ### *4(4)   Mobile Network Termination Service*
>
> *(a)   A Mobile Network Termination Service is an Interconnection Service for the carriage of Call Communications from a POI to a 'B' party.*
>
> *(b)   The Mobile Network Termination Service supports Mobile Network-to-Mobile Network, Fixed Network-to-Mobile Network, incoming international-to-Mobile Network calls and messages which require Any-to-Any Connectivity.*
>
> *(c)   The functionalities of the Mobile Network Termination Service include:*
>
> > *(i)   transmission and switching, whether packet or circuit; and*
> >
> > *(ii)   the signalling required to support the Interconnection Service.*
>
> *(d)   Examples of technologies used in the Mobile Network Termination Service would be:*
>
> > *(i)   Global System for Mobile Communications ("GSM");*
> >
> > *(ii)   International Mobile Telecommunications 2000 ("IMT-2000" or "3G");*
> >
> > *(iii)   Worldwide Interoperability for Microwave Access ("WiMAX");*
> >
> > *(iv/iii)   Long-Term Evolution ("LTE");*
> >
> > *(iv)   International Mobile Telecommunications – Advanced ("IMT-Advanced" or "LTE-Advanced"); and*
> >
> > *(v)   5G New Radio ("5G"); and*
> >
> > *(vi)   any other mobile technology which is currently available or which may be developed in future that involves the carriage of Call Communications.*

Mobile Network Origination Service

Introduction

2.21   In the PI Paper, the MCMC noted that the Mobile Network Origination Service remains a bottleneck and there has not been any material change that would justify removing this service from the Access List.

2.22   The MCMC proposed minor amendments to the service description to clarify that 5G technology is included in the scope of the service and to remove 3G technology

from the scope of the service. Again, the MCMC also queried whether WiMAX technology should be retained in the scope of the service.

Submissions Received

2.23   Celcom agreed that it would be in the LTBE for the Mobile Network Origination Service to remain in the Access List. Celcom also considers it acceptable to amend the service description to include 5G technology and to remove 3G technology from the scope of service. Celcom stated that WiMAX should continue to be included in the scope of the service description as long as the WiMAX licenses are still valid.

2.24   However, Celcom proposed that SMS and MMS messages do not appear to be applicable to Mobile Network Origination Service because the service is an input to allow calls from Access Provider's network for the provision of freephone 1800 service and toll-free 1300 service by Access Seeker. Currently, the provision of freephone 1800 service and toll-free 1300 service are limited to voice calls only.

2.25   Digi agreed to the proposed amendments to the service description for the Mobile Network Origination Service, including retaining WiMAX in the scope of the service.

2.26   Maxis agreed with MCMC's proposed amendment to the service description to include 5G technology. However, Maxis disagreed with the proposed removal of 3G technology. While Maxis acknowledged the planned sunsetting of 3G services, it noted that there may be delays and other exceptions whereby it would still be beneficial to have 3G technology listed in the service description until such time that the 3G technology has totally been removed from the industry. Similarly, Maxis agreed that WiMAX should continue to be included in the scope of the service description for Mobile Network Origination Service to support any-to-any communications and the principle of technology neutrality.

2.27   Net2One agreed with the MCMC's preliminary view for the Mobile Network Termination Service to remain on the Access List. Net2One also agreed with the proposed amendments to the service description for the Mobile Network Termination Service. However, Net2One submitted that WiMAX should be removed from the scope of the service description because the service is no longer offered in Malaysia and the spectrum holders of the 2300MHz frequency band have started using the 2300MHz band for LTE services.

2.28   REDtone has no objection to the proposed service description.

2.29   TM stated that as an Access Seeker for Mobile Network Termination Service, WiMAX should continue to be included if there are active mobile numbers utilising the technology to ensure Call Communications can be delivered. TM also proposed that short codes be supported in both the Mobile Network Termination Service and Mobile Network Origination Service services.

2.30   U Mobile agreed to the proposed amendments to the service description for the Mobile Network Origination Service.

2.31   YTLC does not have any comments on the proposed amendments to the service description for the MNOS, as YTLC does not provide any services using WiMAX.

Discussion

2.32   Operators expressed similar views regarding the amendments proposed to the Mobile Network Origination Service as they had expressed in respect of the Mobile Network Termination Service, namely that they were generally supportive of the MCMC's proposal to include a reference to 5G technology and remove references to 3G technology from the service description. The MCMC's discussion of those responses is as summarised in paragraphs 2.14 to 2.19 above, and is not repeated in respect of this service.

2.33   Additionally, the MCMC refers to its discussion in paragraphs 1.35 to 1.38 above regarding the proposal to remove SMS and MMS services from the Fixed Network Origination Service. The MCMC confirms that it considers the same arguments apply to the Mobile Network Origination Service, as raised by Celcom, and accordingly, the MCMC also proposes to remove those services from the Mobile Network Origination Service.

MCMC Views

2.34   The MCMC confirms its preliminary view that it would be in the LTBE to retain the Mobile Network Origination Service in the Access List with minor amendments to remove references to 3G technology, to underscore 5G technology is included in the scope of these services, and to remove SMS and MMS messages from the scope of the service description.

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

4(3) Mobile Network Origination Service

(a)   *A Mobile Network Origination Service is an Interconnection Service for the carriage of Call Communications (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)   ~~*International Mobile Telecommunications 2000 ("IMT-2000" or "3G");*~~

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

    (iv~~ii~~)   *Long-Term Evolution ("LTE");*

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

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

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

MVNO Access Service

Introduction

2.36   In the PI Paper, the MCMC took the preliminary view that retaining MVNO Access on the Access List would encourage the economically efficient use by MNOs of communications infrastructure and promote competition in the supply of retail mobile services to consumers.

2.37   The MCMC proposed to make minor amendments to the MVNO Access service description to reinforce the inclusion of 5G technology and the removal of 3G technology, as well as to correct typographical errors in the existing description.

Submissions Received

2.38   Celcom reiterated that MVNO Access service should be removed from the Access List. The current MVNO wholesale market has very low barriers to entry and expansion and there are multiple Access Providers. MNOs' presence ensures effective competition, both at retail and wholesale levels, that contributed to the LTBE. The classic case of U Mobile showed that MVNOs have sufficient bargaining power to get the best deal due to multiple competitive offers by the MNOs, proving regulation of the service is unjustified.

2.39   Celcom noted that MVNOs have captured 14.2% of the market share of total mobile subscriptions in 2020. The market also showed a steady increase of market share since 2012. Celcom quoted the MCMC Industry Performance Report 2020 that "One of the main benefits of MVNOs is that they provide competition, resulting in lower prices for consumers", to show that regulating the service is unjustified.

2.40   Maxis emphasized that the service should not be included in the Access List, as the existing mobile retail market is well-functioning and highly competitive. The barriers to entry for MVNOs are sufficiently low and arrangements should be based on commercial negotiations, allowing MVNOs to enter into flexible arrangements that suit their operating model and varied requirements.

2.41   Maxis disagreed that the lack of supply of P2P messaging service by MVNOs is evidence for the lack of workable competition and hence requiring MVNO access regulation. SMS services are effectively substituted by OTT messaging services from providers such as WhatsApp, Facebook, Skype, Yahoo Messenger, WeChat, LINE, etc., causing a rapid decline in P2P SMS traffic, resulting in inactive MVNOs in the area.

2.42   Maxis added that the MVNO arrangements via commercial negotiations have been successful in enabling competitive access for MVNOs. Based on Maxis's

experience, the Access Seekers prefer to negotiate on a commercial basis, having different requirements in terms of services, QoS, volume and network integration level. Operators like TuneTalk and XOX have managed to successfully establish themselves as leading MVNOs in the market. Based on international practice, like in Australia, New Zealand, UK and Spain, MVNO access is typically unregulated. The exception is in situations where there is a lack of workable competitiveness or where the incumbent has significant market power, such as in Norway.

2.43   If the MCMC chose to retain the service in the Access List, Maxis proposed that the service description should specify for combined 2G, 3G, 4G and 5G service to be provisioned from a single Access Provider at a centralised location.

2.44   Net2One agreed that the service should remain in the Access List with the removal of 3G technology and inclusion of 5G technology. Net2One suggested that the MCMC regulate MVNO Access in its entirety to prevent non-transparent terms in the supply of the service by MNOs resulting in complex business arrangements. Net2One stated that an indirect bottleneck may be created out of the complex and confidential business arrangements between incumbent MVNOs and an MNO against a potential new entrant.

2.45   REDtone agreed to the MCMC's minor proposed modifications to the service description.

2.46   U Mobile proposed that the service be removed from the Access List as there is no evidence of the market failure to warrant regulation. MVNOs are able to gain access without restrictions, as shown by 9 MVNOs currently acquiring access through commercial negotiations with MNOs. U Mobile submitted that competition in the mobile market has been intense, with a sharp price decrease over the years, which has benefited customers. MVNOs end up competing against MNOs, as they do not sufficiently differentiate their services, which does not contribute to the LTBE. U Mobile cited that in the US, the FCC found that the mobile market is effectively competitive and that there was accordingly no justification for regulatory intervention. Also, in EU member states where MVNOs are established, there is a general tendency toward forbearance from mandatory open-access requirement.

2.47   XOX is neutral on the inclusion of 5G New Radio in the service and stated that no further amendments are required to the service as described.

2.48   YTLC agreed with the retention of the service in the Access List and the inclusion of 5G technology. YTLC proposed differentiation between thin and thick MVNOs, and reasoned that thick MVNOs are enjoying unfair advantage over MNOs, as they do not contribute or share the costs of certain services such as Mobile Number Portability Clearing House. The differentiation of these services will allow them to be regulated differently. Being subject to the cost of MNP will allow thick MVNOs to build a substantial subscriber base.

Discussion

2.49   Maxis, U Mobile and Celcom submitted that MVNO Access should be removed from the Access List, citing a successful MVNO market and ease of commercial negotiations. However, other operators supported the ongoing regulation of the

MVNO Access service, with no operator objecting to the MCMC's proposed updates to reflect that 5G technology is included in the scope of the service and to remove the reference to 3G technology from the service description.

2.50   The MCMC does not consider that there is any justification to remove MVNO Access from the Access List, for the reasons stated in the PI Paper. In particular, the fact that MVNOs are competing against the existing MNOs – as noted by U Mobile – is prime facie evidence that regulation of the MVNO Access service is promoting competition in this market.

2.51   Further, the MCMC understands that there are only five "thick" MVNOs in the market, and four of these are hosted by one operator (Celcom). This demonstrates that MVNOs may be struggling to acquire MVNO Access on commercially reasonable terms, with high barriers to entry for new MVNOs who wish to control more elements of the service that they provide to their end customers.

2.52   There is also a further benefit of ongoing regulation of the MVNO Access service in that it incentivises and assists negotiations in access to MVNO Access even under commercial terms. If the MCMC were to remove the regulated service, there would be no "backstop" against which Access Seekers could negotiate. Ultimately, this means that new and emerging MVNOs may potentially face difficulties in concluding negotiations for access to MVNO Access on commercial terms (noting that MVNO Access already involves more complex commercial arrangements than many other services).

2.53   In relation to Net2One's comments that commercial arrangements should be prohibited, the MCMC notes that all operators are encouraged to enter into registered access agreements for services listed on the Access List, to ensure that the agreements enforcement. If operators are still preferring to enter into commercial arrangements, the MCMC requires further information and submissions to understand what elements of the MVNO Access service as listed are not available under an access agreement. However, the MCMC has not been provided with sufficient information to determine whether any adjustments are needed to the service description to ensure the regulated service reflects industry practice.

MCMC Views

2.54   The MCMC confirms its preliminary view to make minor modifications to the service description to underscore that 5G technology is included in the scope of this service, to remove 3G technology from the scope and to correct typographical errors in the existing description, as follows:

4(23) MVNO Access

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

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

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

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

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

(i)   radio network;

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

(iii)   Home Location Register;

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

(v)   SIM provisioning and configuration;

(vi)   customer billing; and

(vii)   customer relationship management.

A2P messaging

Introduction

2.55   In the PI Paper, the MCMC took the preliminary view that there is little or no competitive constraint on operators who currently supply A2P messaging services on a commercial basis and therefore it would likely promote competition in accordance with the LTBE to include these services in the Access List.

Submissions Received

2.56   The MCMC received extensive submissions from operators regarding the MCMC's preliminary view to regulate A2P messaging services on the Access List.

2.57   The majority of operators disagreed with the MCMC's preliminary view. Mainly, operators cited, amongst other issues:

(a)   security issues;

(b)   the adequacy of the existing regulatory framework;

(c)   the potentially catastrophic impacts on the A2P aggregator market; and

(d)   the increasing impact of OTT providers in the provision of A2P messages.

2.58   Only three operators - TM, XOX and YTLC - agreed with the MCMC's proposal to regulate A2P messaging services in the Access List in any form. A summary of operator submissions is below.

2.59   Celcom submitted that MNOs have already established a CMP for A2P messages, which has been working well with spam filtering measures for consumer protection. It supports national policy objective on promoting a high level of

consumer confidence in service delivery from the industry. Hence, Celcom submits that regulatory intervention is not justified.

2.60   Celcom also notes that one particular operator has been delaying establishing connectivity to CMP and has been pumping A2P messages via the interconnection platform under Model A (A2P Messaging Services). This breaches a condition in the Access Agreement whereby only P2P messages are allowed to pass through the SMSC. Celcom has been receiving customer complaints on the said A2P messages via the interconnection platform, which bypasses the spam filtering systems.

2.61   Based on the arguments above, Celcom considers that both models on A2P messaging services do not warrant regulatory intervention. Regulatory best practice does not recommend regulating SMS services, e.g. BEREC which only recommends wholesale voice termination regulation. Celcom supports the MCMC's principle that 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.

2.62   In this case, Celcom submits that the MCMC should take into account the costs of regulation whereby MNOs would need to establish duplicate infrastructure (spam filtering systems) at the interconnection platform.

2.63   Finally, Celcom notes that OTT alternatives of A2P messages are rapidly proliferating and that this trend will only increase going forward. These for example, include in-app authentication and messaging used by the financial institutions, OTT messaging platforms (WhatsApp etc.), email, and social media platforms. With easily available alternatives, and due to competition from OTT services in retail messaging, Celcom submits that MNOs will be constrained from refusing A2P termination or setting unreasonably high termination charges and accordingly it is unnecessary to include A2P services to the Access List.

2.64   Digi noted its understanding that the proposed description of A2P messaging service does not mandate interconnection between operators, with both model A and B as described in the PI Paper depicting only on-net transmission of A2P messages, with no hand-off from one operator's network to another.

2.65   Despite the above, Digi submitted that the proposal to include A2P messaging services in the Access List is unwarranted because alternative channels are available. An MNO's network is not the only viable option for aggregators to reach end users – for instance, connectivity between POIs can be via private leased line or via public internet through secure VPN connectivity. The internet-based OTT platform provides A2P aggregators and retailers with cheaper alternatives to deliver A2P messages, for example via email and WhatsApp. Furthermore, the growth of OTT services and the increase in smartphone penetration have resulted in the reduction of SMS traffic over time.

2.66   Digi considers that retailers and banks are moving away from SMS onto OTT channels to engage with their customers. As an example, Maybank has recently announced that they will no longer be generating SMS TAC to approve selected online transactions on Maybank2u and will be switching to Secure2u as the preferred authorisation method.

2.67   In light of the above, in Digi's view that there is no necessity to add A2P messaging service to the Access List. Further, as the proposed A2P messaging service does not involve any interconnection arrangements, Digi considers that it would not be appropriate for A2P messaging services to be part of the Mobile Network Termination Service.

2.68   Digi also cautioned that listing A2P messaging alongside P2P messaging service in the description of the Mobile Network Termination Service may have a counter effect on the network security and controls of mobile content services via SMS that is being governed by the Commission Determination on the Mandatory Standards for the Provision of Mobile Content Services (MS MCS).

2.69   Digi noted that A2P messages are typically used by organisations, such as financial institutions, government agencies, social media and transport providers, to communicate with their customers. More specifically, A2P messaging are used by retailers and banks to issue One Time Passwords (OTP) and Transaction Authorisation Codes (TAC) to the end user, which each acting as an additional layer of identity authentication before an end user is allowed to complete online transactions or tasks.

2.70   To ensure security of the OTP and TAC functions, Digi submitted that the A2P messaging channels must be secure and clear of fraud. In addition to this, security of A2P messaging channels is crucial for retailers and banks to gain end-user's trust and protect its brand reputation. As the network provider, it is critical for Digi to protect the credibility of SMS as a communications channel. In 2018, the global A2P messaging market was reported to be worth USD14.75 billion and will increase to USD16.58 billion or significantly higher by 2023. Digi considers that it is more vital than ever to protect subscribers from unwanted messages (SMS spam) given the likelihood of A2P messaging service overtaking P2P messaging service.

2.71   Maxis disagreed with the proposal to include a new End-to-End A2P Messaging Service in the Access List, and noted that both Model A and Model B as currently illustrated in the Access List Public Inquiry have significant flaws that result in them being unworkable in the current Malaysian A2P service model.

(a)   in respect of **Model A**, Maxis noted that this model is illustrated with a single Aggregator POP providing end-to-end A2P messaging service to recipients. However, this illustration is incorrect as the current A2P service model includes two interconnected bulk messaging gateways, one with the Aggregator and one with the MNO. Based on Maxis's understanding, the MNOs' end users are not directly connected to the Aggregator, hence it is not possible for Aggregators to send A2P SMS directly to the end users of the MNOs without going through the MNOs' network. If the MCMC considers Model A as on-net A2P SMS, then in Maxis's view this is not within the ambit of the Access List, as the Access List has never regulated on-net Facilities and/or Services of the operators.

(b)   Maxis's view is that Model B is incomplete and does not cover all the types of A2P messaging flow that currently exist. In particular, Maxis submitted that Model B illustrates an A2P termination service that correctly depicts

the two separate bulk messaging gateways, but the illustration is highly limited in that it only covers a single type of service, while there are currently 3 types of A2P messaging flows, as depicted in the diagram below:

(i)   **Type 1**: A2P message from Aggregator to the end user, via the MNO (A2P message flow).

(ii)   **Type 2**: Customer response to Aggregator's Type 1 message (P2A message flow). This allows a customer to respond to an A2P message, for example to activate a credit card, submit survey responses, or unsubscribe to promotional messages.

(iii) **Type 3**: A2P message from MNO A's enterprise user to an end user with MNO B, via the Aggregator (case where there are 2 terminating operators or Access Providers i.e. the Aggregator and the other MNOs). This illustrates the challenge of defining the Access Provider.
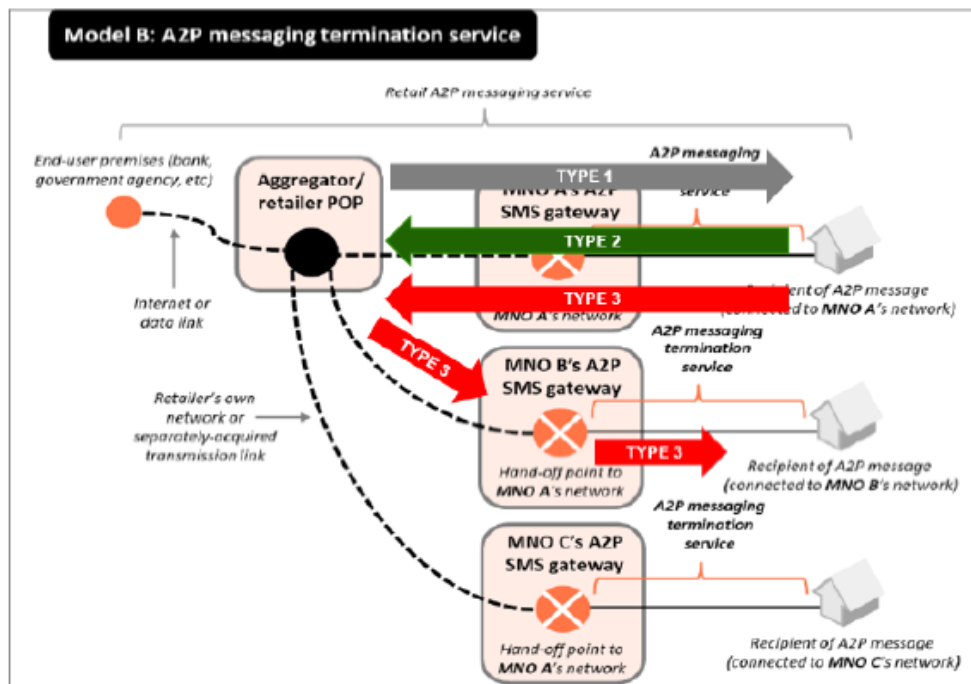
Figure 2 − Maxis's illustration of A2P messaging flows

2.72   Maxis reiterated that it does not foresee any significant benefit to end users with the intention of MCMC to regulate the A2P SMS either via Model A or Model B. While Maxis considers Model A does not exist, Model B (which Maxis considers incomplete) has been in use within the industry successfully without any issues since the early-mid 1990s. It has developed as a win-win situation across Aggregators, MNOs and significantly end users, who are protected from unwanted SMS such as scam, fraud, gambling, etc.

2.73   Maxis concluded that, if the MCMC's intention is to allow for specific treatment to the Government related A2P SMS such Talian Kasih/Talian Nur, Covid-19 SMS, etc., this can be done on a case-by-case basis based on the specific request/letter

by the MCMC. For example, the mobile industry is already providing free SMS service for the MySejahtera service after discussions with the government.

2.74   Malaysian Mobile Technology Association (MMTA) objected to the proposal to include A2P messaging services and the new End-to-End A2P Messaging Service in the Access List and its service description.

2.75   MMTA noted that its members are connected to all the MNOs and MVNOs to deliver the A2P messages to end users. MMTA also noted that to date there are no issues faced by any of MMTA's members through the general A2P connection which has been in place for the last 22 years.

2.76   Members of MMTA who have ASP (C) Licenses have been connected to all Celcos and MVNOs as early as 1999. As members of MMTA carry 95% of the A2P messaging services traffic in Malaysia, none of the members of MMTA have faced any challenges in commercially negotiating issues with any of the Celcos or MVNOs. Therefore, MMTA is of the opinion that the Access List should not change current arrangements because one party is facing challenges in commercially negotiating access to A2P messaging services with its counterpart.

2.77   From MMTA's observation, the impact on End Users (mobile subscribers) regarding mobile networks such as 2G, 3G, 4G and 5G are towards existing subscriber with "legacy handsets". Therefore, End Users are not able to "hook onto" the network and this does not have any relevance to A2P messaging services to be included in the Access List. Even if A2P messaging is listed on the Access List, "legacy handsets" held by End Users will still be affected each time the Celcos decommission a network coverage spectrum.

2.78   On this basis, MMTA submitted that it is not relevant or accurate to say that A2P message delivery will be affected if the 3G network is decommissioned, because if the End User is using a legacy 3G handset, then it will not only affect the A2P SMS delivery, but there will be "no network" for the user and all other services will be affected, including the P2P SMS, Voice, Data & etc.

2.79   MMTA also provided the following detailed comments regarding its opposition to the proposal to list A2P services on the Access List:

(a)   SMS (both P2P & A2P) is merely a text-based value-added-service (**VAS**) which has been around since 1992 and will not induce any further infrastructure enhancements or investments from any other parties. If A2P messaging is added to the Access List, MCMC will be disrupting an industry which has all this while worked effectively and efficiently for the last 29 years. The disruptions would include security issues, price wars, killing the content provider industry, causing job losses, detrimental to the LTBE and impacted by OTT.

(b)   MMTA also cited trends in Europe, Australia and Thailand:

(i)   Europe

(A)   In 2014 and 2019, Body of European Regulators for Electronic Communications (**BEREC**) declared that

regulators should regulate only voice in the termination market, not SMS. BEREC believes that the market can provide access, transparency and non-discrimination services to ensure effective competition and is outside the definition of markets susceptible to ex-ante regulation.

      (B)   OFCOM considers the termination of SMS and other data services to be outside the definition of the market in the EC's recommendation on markets susceptible to ex ante regulation.

    (ii)   Australia

      (A)   SMS regulation was removed in 2020 whereby SMS was regulated in Australia from 1997 to 2019. Effective 1 Jan 2020, SMS is excluded from being regulated.

      (B)   The ACCC notes that SMS termination services is no longer a bottleneck due to the emergence and take up of OTT messaging services which have become effective substitutes for P2P SMS in the retail market and the limited incentives for MNOs to refuse to provide SMS termination on reasonable terms.[1]

    (iii)   **Thailand** is known as the only country that allows "direct inter-connect" between Celcos and MVNOs. In so doing, there is a price war for End-to-End A2P messaging services, with local Celcos willing to sell "below" the published SMS price offered to SMS aggregators, because SMS is merely a value-added service and Celcos and MVNOs are ultimately trying to cross-sell their core product & services. As a result, the overall A2P SMS revenue had dropped significantly.[2]

(c)   If the MCMC decides to include A2P messaging into the Access List, it is unclear to MMTA how the MCMC would control international OTT players offering OTT messaging services in the retail mobile service market. In particular, MMTA queried whether the inclusion of A2P messaging services in the Access List would restrict domestic Celcos, MVNOs and A2P aggregators whereas MCMC would have no control over the market of international OTT players like WhatsApp, Line, Skype, etc. who are providing P2P messaging services, and are now also offering A2P messaging.

(d)   In Malaysia, there is an existing "eco-system" for the A2P Messaging industry including the Commission Determination on The Mandatory Standards for the Provisions of Mobile Content Services Determination of No. 4, 2009 (MSMCS) and External Content Provider Agreements (CPA)

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[1] https://www.accc.gov.au/media-release/regulation-of-wholesale-mobile-voiceterminating-services-to-continue
[2] https://dtac.listedcompany.com/misc/one_report/20210224-dtac-one-report-2020-en.pdf (DTAC declining B2B SMS from 2018 to 2020, page 32.

between all Celcos and A2P aggregators. This eco-system has been growing successfully and healthily since inception.

(e) Based on MMTA's estimation, there are around 250 million A2P SMS being delivered in Malaysia on monthly basis, generating revenue around RM15 million monthly and approximately RM180 million annually. If A2P Messaging is included within the Access List, it will have a profound impact on SMS Aggregators (i.e. Content Providers), all of whom are ASP (C) Licensees. Based on a recent survey conducted by MMTA, if A2P SMS is added to the Access List, the following negative impacts are expected, including job losses because some of the companies are pure A2P Messaging providers:

Name of Company	Number of Employee Impacted by SMS Messaging Services being added to Access List	Projected Revenue Affected if SMS Messaging Services being added to Access List (RM)
Genusis Consultancy Sdn Bhd	20	RM18M
Infobip Asia Pacific Sdn Bhd	80+	Millions
Sinch Malaysia Sdn Bhd	14	RM60M
Sphinx Fusion Sdn Bhd	5	RM500K
Micro Ocean Technologies Sdn Bhd	50	Millions
Macro Kiosk Bhd	240	RM180M
Elite Mobile Global Sdn Bhd	35	RM5M
Jaringan Iktiah Sdn Bhd	25	RM4M
Fire Mobile Sdn Bhd	6	RM30M
Cookiss Mobile Sdn Bhd	20	RM15M
MNC Wireless Bhd	30	RM20M
Mobiweb Sdn Bhd	16	RM6M
Hikaru Technology Sdn Bhd	25	RM6M
TOTAL	566+	RM345M+

Figure 3 – MMTA survey on impact of proposed regulation of A2P messaging

(i) As A2P messaging is highly price sensitive, and if Celcos can deliver to all End Users (mobile subscribers) on their own (without using A2P Aggregator/ SMS Providers/ Content Providers), Celcos will be able to approach the Banks, Corporates and Enterprises directly and could offer much lower pricing compared to A2P Aggregators, SMS Providers or Content Providers. Ultimately, because of the price reduction, the overall revenue of operators will be greatly reduced and as a result, there will be less contribution to the USP funds and tax revenue.

(ii) Based on TM's 2020 Group Financial Report, MMTA noted that TM's Group Revenue is RM 10.84 billion and comparing against the overall potential A2P revenue, it appears to MMTA members that TM is attempting to encroach on a market that is already crowded

and mature, without due consideration towards the existing industry stakeholders.[3]

(iii) If MCMC is intending to introduce End to End A2P Messaging Service to the Access List, MCMC could be jeopardising the whole A2P industry as a whole to fulfil only TM's needs but failing to consider the contribution of the A2P industry of about RM345 million to the economy and jobs of at least 566 persons and their families (based on those participated in MMTA's survey) who are in the A2P Content Provider industry.

(f) Increase in Spam and Scams

(i) One of the ongoing key concerns are security issue and scams through A2P Messaging spam. MMTA, Celcos and MVNOs are currently in discussion with the MCMC in managing scams through such spam.

(ii) Currently there is only one (1) eco-system to manage A2P messaging, which is through 6XXXX series short-code via the respective Celco's CPA system to perform real-time filtering.

(iii) There is also P2P messaging (using SIM Cards or better known in the industry as SIM farm) which is very challenging for all parties including MCMC. Celcos are currently blocking MSISDN which is found to be sending the spam messages. However, it is challenging and difficult to continuously filter and block P2P messages on a real time basis.

(iv) If A2P SMS is included on the Access List, this will definitely increase Spam / Scam messages whereby the culprits will see this as an opportunity to use P2P connectivity to send spam messages and it will be a nightmare for telcos to manage 2 separate systems for the A2P SMS. There will be a lot more resources required because for each spam message, it is more difficult to pinpoint the source. Therefore, for each spam message, all Celcos will need to be involved in the messaging process. On top of the current workload, Celcos would need to have a Spam investigation team.

(v) In Thailand, because of the "direct interconnect" between Celcos, Spam & Scam cases have increased drastically.[4]

(g) Regulatory Concerns

(i) All A2P Aggregators who provide A2P messaging services are currently regulated by the CMA and the MSMCS. All A2P Aggregators are ASP (C) Licensees.

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[3] https://www.tm.com.my/annualreport/#/home

[4] https://thethaiger.com/news/national/thai-banks-warn-of-cyber-scams-aftersurge-in-fraud,
https://www.thephuketnews.com/e-banking-scams-take-new-guise-78385.php,
https://thairesidents.com/money/sms-phishing-with-over-20-victims-damagesexceed-2m/,
https://www.bangkokpost.com/business/2038143/e-banking-scams-take-newguise

(ii)   If End to End A2P Messaging Services were to be added to the Access List, it is unclear to the MMTA how the Celcos and MVNOs would be regulated, e.g. whether Celcos and MVNOs would be regulated by the MSMCS, whether Celcos and MVNOs are required to be an ASP (C) Licensee, etc. The regulatory conditions for Celcos and MVNOs must be the same as all other A2P Aggregators and no preference should be given with all parties on a level playing field.

(iii)   In addition, if Celcos and MVNOs are also sending A2P messages via "direct interconnect", MMTA queried who will be the "enforcer/ gate keeper". Currently, Celcos and MVNOs are the enforcers against the A2P Aggregator in the event of a complaint. If Celcos, MVNOs and A2P Aggregators are all in the same level, MMTA queried whether the MCMC will now be the monitoring body and the gate keeper, and the manner in which the MCMC could ensure that Celcos and MVNOs are not breaching regulations given Celcos and MVNOs are actually the A2P platform providers.

(h)   Security Concerns

(i)   MMTA also raised security concerns with the MCMC's proposal, including whether Celcos would be willing to actually open their gateway to be used by their competitors to target their existing customers, and whether there will be a major price war causing instability to the A2P messaging industry.

(ii)   Additionally, MMTA noted that the existing P2P SMS Gateways within Celcos and MVNOs are not built towards mitigating security concerns unlike the A2P SMS systems. A2P messaging volume has fallen drastically in recent years with the introduction of OTT apps, therefore by the implementation of End-to-End A2P messaging services into the Access List, Celcos and MVNOs may be forced to invest in a sunset business, instead of using the investment for new technology to take Malaysia to another stage of mobile technology growth.

(iii)   SMS Aggregators will never be able to compete with telcos in price and technology if A2P SMS services are included in the Access List. This would cause unfair competition between small A2P Aggregators against Celcos and MVNOs, thus, not achieving fair competition in accordance with the objects and national policy objectives of the CMA.

(i)   Based on an MMTA survey:

(i)   there are no concerns experienced by industry players in gaining or acquiring A2P messaging access from all Celcos and MVNOs, evidencing fair supply terms; and

(ii)   if A2P messaging services are included on the Access List, MMTA considers that there will not be any changes to the state of technology and thus there would be no increase in infrastructure

investment, given SMS is merely a VAS that has been available for 30 years.

(j)   Finally, MMTA noted that P2P Messaging globally is being impacted by OTT providers offering free P2P SMS e.g., WhatsApp, LINE, etc., and the OTTs are beginning to also offer A2P Communications. Accordingly, a similar (delayed) impact is occurring. Hence, there is no benefit to regulate A2P at this current juncture.

2.80   TM proposed that the new End-to-End A2P Messaging Service should be excluded from the Access List. TM considers that the inclusion of A2P messaging services in the Mobile Network Termination Service is sufficient to address the key bottleneck faced in gaining access to the A2P service. Further, in TM's view the End-to-End A2P Messaging Service is competitive with multiple aggregators providing the service in the market. With the inclusion of A2P messaging service under the Mobile Network Termination Service, it would not be necessary for the MCMC to further regulate the End-to-End A2P Messaging Service.

2.81   TM proposed two amendments to the wholesale A2P messaging service insofar as the Mobile Network Termination Service is concerned:

(a)   **Fixed numbers used as sender ID for MNTS (A2P Messaging).** TM proposes that fixed numbers used as the sender ID for A2P messaging be included as part of the MNTS (A2P Messaging). This allows the POI normally used for P2P messaging service to also be utilised for A2P messaging services in the Access List. The following factors support TM's proposal:

(i)   High demand from government agencies and the industry.

(A)   Since 2017, around 400 government agencies have been using fixed numbers as the sender ID for their SMS termination service via TM's infoblast service. Infoblast service is an online messaging service available via fixed line number and offered to existing Telekom Malaysia fixed line users such as enterprises and government entities.

(B)   Government entities, specifically defence or security related agencies, have been requesting for fixed number messaging service due to its dedicated nature and closed user group criteria. While commercial A2P messaging service has become available with most commercial infoblast customers migrated to the commercial A2P platform, the use of a dedicated fixed number as sender ID remains highly relevant for these government agencies.

(ii)   Challenges in commercial acquisition of the service.

(A)   Fixed numbers have also been used for commercial purposes in other best practice markets. Examples

include Singapore, UK, Hong Kong, Brazil and United States. However, while there is a significant demand for the use of fixed number as the sender ID for SMS messaging, TM is facing challenges due to existing MNOs blocking the service (e.g. Celcom).

(B)   On October 2018, Celcom blocked the TM infoblast service on the pretext that it was adhering to anti-spam filtering guidelines provided by the MCMC.

(C)   As TM was unable to resolve this during commercial negotiations with Celcom, TM reached out to the MCMC. On 15 November 2018, the MCMC concluded that anti-spam filtering is not applicable to fixed SMS services and that there is no provision to block legitimate messages.

(D)   Despite the MCMC's clear instructions, the issue remained unresolved until January 2019.

(E)   As the infoblast service supports numerous government agencies, there was a significant impact on end users during the above-mentioned dispute resolution process. While Celcom has confirmed that it will no longer block TM's infoblast service, TM is still receiving regular requests from Celcom, asking it to use/support short codes instead of long codes for its infoblast service. In order to prevent potential disruption to the government services, TM would strongly recommend that the MCMC specify that fixed numbers can be used as the sender ID for the Mobile Network Termination Service (A2P Messaging) in the Access List.

(iii)   consistency with the CMA. Finally, TM submitted that the inclusion of fixed numbers to be used as the sender ID for the Mobile Network Termination Service (A2P Messaging) is also in line with the CMA, which provides that messaging communications should be technology neutral and service neutral. As such, the Mobile Network Termination Service (A2P Messaging) should allow for fixed numbers to be used as the sender ID.

(b)   **Standardisation of MNTS (A2P messaging)**

(i)   TM proposed that A2P messaging rates and features be standardised across international and domestic brands to reduce barriers in the acquisition of the A2P messaging service under the Mobile Network Termination Service.

(ii)   Currently, A2P messaging services are differentiated based on domestic and international brands. However, there is no industry standard for the categorisation of domestic and international

brands. For instance, while a particular company may be considered as a domestic brand by one operator, it can be considered as an international company by another operator.

(iii) In addition, TM noted that some MNOs are currently differentiating and charging different rates for domestic brands and international brands while others are charging the same rate for both domestic brands and international brands. Even for the same brand, different MNOs are charging different rates for the same A2P messaging service. This has led to confusion over the rates charged to Access Seekers.

(iv) TM also noted that MNOs have different terms and conditions which makes it challenging for Access Providers to manage the expectation of end-users and the associated costs.

(v) Finally, TM complained that existing MNOs do not provide minimum guaranteed Service Level Agreements (SLA) for Access Seekers. With the slow progress in agreeing on rates and terms and condition for A2P messaging under commercial negotiation, TM proposes that the MCMC standardise the service offerings in the Access List and the upcoming MSA and MSAP.

(c) **Additional requirement for connectivity for Mobile Network Termination Service**. For connectivity with MVNOs, TM requests that the MCMC:

(i) mandate MNOs to cover termination for all types of call communications and messaging including A2P messaging service to 'thin' mobile virtual network operators (MVNOs) regardless of number assignments; and

(ii) mandate the direct connectivity or interconnection to operators for all types of call communication and messaging including A2P messaging service for 'thick' MVNOs who have their own core mobile network. All routing information of the 'thick' MVNOs should be reflected in the Mobile Number Portability (MNP) database, which is managed by the MNP clearing house and shared with all operators.

(iii) Currently, in order to terminate calls and messaging service on a MVNO's network, TM must pay additional fees to TGA which is an unnecessary cost burden. As such, TM submitted that it should be allowed to terminate all types of calls and messaging services on an MVNO network without having to pass through and pay additional fees to TGA for additional MNP database.

2.82 U Mobile opposes the regulation of A2P messaging services. U Mobile considers that there is currently no barrier for A2P customers (businesses, financial institutions, government agencies and aggregators) to gain access to A2P messaging services from MNOs.

2.83   U Mobile noted that global regulatory bodies generally do not regulate the way A2P messages are terminated or to ensure interconnectivity – but are more concerned about addressing customer issues related to the security provided by enterprises and MNOs in the A2P messaging space. This includes restrictions placed on enterprises, SMS aggregators, and MNOs relating to sending messages to the customer in terms of the limited number of messages per day, particular time slot, and do-not-disturb activation by user. The FCC for instance focuses on the MNOs' code of conduct involving terms of service and privacy policy, etc., while the Telecom Regulatory Authority of India (TRAI) emphasises the prevention of spam and fraudulent messages purporting to originate from banks, financial institutions, or other trusted sources and on matters relating to consent of the customers.

2.84   U Mobile made a number of detailed submissions regarding perceived issues with the MCMC's proposal to regulate A2P messaging services, which can be summarised as follows:

(a)   A2P Messaging is a product solution to businesses, enterprises, retailers and aggregators. MNOs offer services to these entities to assist them to reach out to the MNO's subscribers. The MNO has obligations to protect its own subscriber base, therefore it makes no sense to have A2P interconnect to allow the information to traverse through infrastructure that do not belong to the MNO (i.e. other MNOs) for various reasons and concerns. As it is a product solution by MNOs to these entities, the service and pricing should not be regulated and should be determined by the MNOs themselves as the solution can be enhanced with more added features and values depending on the creativity of the MNOs;

(b)   A2P messaging contains sensitive information of the subscribers of the MNO hence, it should not traverse through other MNOs (as interconnect) as this will only expose the product to higher security risks and frauds. It should take the shortest and most direct routes from the "Service Provider" or those entities above to the MNO and direct to the MNO's subscribers;

(c)   A2P messaging should not be treated as an interconnect service as this will result in service degradation from A2P messaging delivery to customer support, troubleshooting and investigation. This imposes bigger risks and impacts to customers' data privacy, service SLA, customer support SLA and problem resolution to subscribers, resulting in unnecessary overheads, turnaround time and low customer satisfaction levels;

(d)   there are no challenges in gaining access to A2P messaging services to the entities above, however there are only attempts made by a certain party to monopolise the A2P messaging market by requesting A2P messaging service and rates to be regulated. This will result in detrimental effects and impacts to the Content Providers or Aggregators ecosystems that have been set up and operating smoothly for years. It will create an unlevel playing field as such change will render the said party a clear advantage against all the incumbents who already have their A2P messaging services set up with all MNOs (which again do not have any existing access challenges or issues). This party in this scenario should compete in all

fairness, as listing A2P messaging in the Access List will destroy the existing A2P messaging market;

(e) A2P messaging should not be equated to P2P messaging. A2P is an application to person messaging service which can be one-way or as an interactive two-way service, depending on the service provider. As it is a service provided by specific business entities, the MNO has the right to grant access or not to the business entities, as they are accessing the MNO's subscribers. This is more the reason A2P messaging should not be perceived, treated or taken as merely an interconnect service. By doing so, the MNOs would lose its governance and control against the business entities who render such services to the MNO's subscribers. It will also require unnecessary and redundant architectural setup which eventually boils down to cost, time and resource wastage. Therefore, the existing set-up and ecosystems of A2P messaging are already sufficient and mature enough to address these concerns.

(f) finally, as A2P messaging is already governed under the MSMCS, there are existing rules and guidelines on A2P messaging and the industry has a longstanding understanding on the policies, commercial arrangements, and operational procedures. Furthermore, the MSMCS is matured and is consistently being reviewed, enhanced and tightened to ensure that the MNOs continue to render a good solution to the customers.

2.85 XOX submitted that it is neutral regarding the proposal to include a new End-to-End A2P messaging service in the Access List. However, XOX is inclined for both models of the A2P messaging services to be included within the service description of the Mobile Network Termination Service. XOX considers that this regulation is fundamental to promote healthy competition in supply at a retail level, helping to achieve any-to-any connectivity and driving the efficient investments necessary to support the ongoing emergence and growth of these services.

2.86 YTLC agreed to the proposed inclusion of the End-to-End A2P Messaging Service in the Access List. YTLC noted this is its current way of connecting with existing Content Providers in Malaysia market.

2.87 YTLC recommended that the MCMC mandate all the Aggregators/Content Providers who hold ASP license/short code to interconnect with all Malaysian MNOs to ensure any-to-any connectively for ensuring that all Malaysians are able to receive intended A2P services. Current arrangements have often caused failure in the delivery of A2P services to YTLC's customers, resulting in customer complaints. YTLC submitted that the inclusion of A2P Messaging would certainly be in the LTBE.

2.88 YTLC noted that connectivity of A2P SMS is typically set up via public IP (e.g. HTTP API, SMPP), and is different from the P2P SMS in the Mobile Network Termination Service, which is connected via SS7/SIGTRAN. As a result, YTLC prefers not to include A2P SMS into the Mobile Network Termination Service.

2.89 As A2P SMS relies on different infrastructure, YTLC suggested that A2P Messaging Services be defined as a separate new service in the Access List. Model A and Model B can be put under this new service. YTLC believes that this will help the

Operators to have different control for A2P SMS and better manage both P2P and A2P SMS traffic in the network (e.g. different rules & filtering, short code/long number, keywords & etc.). YTLC submitted A2P services should also be included in any-to-any connectivity and this service is widely used in banking and day-to-day transactions.

Discussion

2.90   The MCMC welcomes the extensive submissions it has received from stakeholders in relation to listing an End-to-End A2P Messaging Services on the Access List and expanding the Mobile Network Termination Service to specifically include A2P messaging.

2.91   Based on the information contained in stakeholder submissions, the MCMC has revised its preliminary view and considers that, on balance, there is not a sufficient regulatory basis to list A2P messaging services on the Access List at present.

2.92   The MCMC's initial rationale for proposing the listing of A2P services on the Access List was based on submissions from stakeholders that they were facing barriers acquiring wholesale A2P services from MNOs. In particular, the MCMC was concerned with ensuring that A2P aggregators (and other licensees) were able to effectively terminate A2P messages via the networks of MNOs and were not subject to unreasonable refusals of access in respect of such termination. The MCMC was also concerned with ensuring that A2P aggregators were not artificially disadvantaged in providing retail A2P messaging services because they do not have their own mobile network infrastructure.

2.93   The MCMC's preliminary view was strengthened by a consideration of the economic features of A2P messaging services which, like P2P messaging and voice calls, have natural monopoly characteristics (given that the only way to send an A2P SMS message to a B-party is via the MNO to which that B-party is connected). The MCMC considers that this remains the case, and is not persuaded that the availability of alternatives to A2P SMS messaging (such as OTT platforms or email) are at this time sufficiently developed or similar to exercise meaningful competitive constraints on A2P SMS messaging at the wholesale level.

2.94   However, the MCMC also considers that access regulation needs to be approached from a practical, evidence-based perspective, grounded in actual patterns of supply and barriers to access (or lack thereof) that may exist in the market. Based on operator submissions, including submissions from A2P aggregators (via MMTA), it appears that A2P aggregators do not face significant barriers in accessing wholesale A2P messaging termination on commercial terms. In fact, the views of most MNOs and A2P aggregators are that A2P messaging services should not be listed on the Access List and that regulation would not improve market outcomes (as compared to the current commercial approach).

2.95   The submissions of MNOs and A2P aggregators also suggest that the market for wholesale A2P messaging services is operating effectively, with A2P aggregators having effective access to termination of A2P messaging services without regulatory intervention. In other words, there does not appear to be a sufficient market failure such as to justify regulatory intervention via the Access List.

2.96   The MCMC notes TM's concerns about the TM Infoblast service and Celcom's blocking conduct. The MCMC accepts that some issues may still arise between A2P providers and the MNOs. However, isolated incidents such as the Infoblast issues are not sufficient to warrant regulation, particularly in circumstances where the MCMC assisted to resolve the issue notwithstanding some continued delay in the relevant MNO resolving the issue some months later as suggested by TM.

2.97   The MCMC considers that there is not currently a strong basis for listing A2P messaging services on the Access List, either in the form of the End-to-End A2P Messaging Services or the Mobile Network Termination Service. The MCMC will continue to monitor the market and may amend its views in the future if barriers to access (or other competition issues) emerge in respect of wholesale A2P messaging services.

2.98   The MCMC emphasises that its decision to not list A2P messaging services on the Access List is narrowly based on current patterns of supply in the market. The MCMC therefore wishes to address two themes of the stakeholder submissions that it does not consider relevant to the question of whether a service should be listed on the Access List.

(a)   First, some stakeholders have suggested that listing A2P messaging services on the Access List would harm the revenues of the A2P aggregator sector and would lead to certain licensees "undercutting" A2P operators. The MCMC reiterates that the purpose of the Access List is to promote the LTBE, including by encouraging competition. It is not the MCMC's role to protect existing business models, to protect the revenue of existing market participants, or to shield them from competition from new market entrants. Indeed, this would run counter to the very objectives of the Access List. As stated above, the MCMC will continue to monitor this market and will intervene if it considers that new market entrants are prevented from accessing wholesale A2P messaging services on a reasonable commercial basis.

(b)   Second, the MCMC strongly disagrees with the submissions of Maxis and Digi that the Access List cannot regulate "on-net" services that don't involve interconnection between MNOs. The Access List does not only regulate interconnection services, but also a range of end-to-end services that have bottleneck characteristics. For example, the End-to-End Transmission Service, MVNO Access, Duct and Manhole Access, Digital Broadcasting Multiplexing Service and Layer 3 HSBB Network Service are all examples of services where the access seeker is not interconnecting its own network with that of the access provider on an equal basis, but is instead acquiring access to an "end-to-end" input which it requires to supply a downstream service.

2.99   The MCMC therefore emphasises that, while it is not persuaded that there is a sufficient regulatory basis to list A2P messaging services on the Access List at present, A2P messaging services are (by virtue of their economic characteristics) susceptible of being regulated via the Access List in the future if there is evidence that current commercial arrangements are not delivering efficient and competitive outcomes.

2.100   The MCMC proposes not to include any A2P messaging services in the Access List, but will continue to monitor industry developments and intervene as required. The MCMC accordingly encourages operators to continue reporting to the MCMC any issues in acquiring these services so that the MCMC can take any appropriate steps to rectify those issues.

Domestic roaming / RAN sharing

Introduction

2.101   In the PI Paper, the MCMC's preliminary view was that the arguments for and against including domestic roaming in the Access List weighed in favour of regulation, on the basis that this may lead to the emergence of benefits to competition.

2.102   However, the MCMC took the preliminary view that it would not be in the LTBE for RAN sharing and MOCN arrangements (other than wholesale 5G arrangements) to be listed on the Access List.

Submissions Received

Domestic roaming services

2.103   Celcom submitted that a domestic roaming service should not be listed on the Access List. In particular, Celcom commented that:

(a)   there have been no impediments/bottlenecks that warrant regulatory intervention in current commercial arrangements. It is proven that competent operators who have implemented domestic roaming service or RAN sharing can grow and ultimately become a strong fourth player with their own network, such as U Mobile;

(b)   regulating domestic roaming service/RAN sharing will be complex as there are different requirements in terms of services, quality of service, volume, network integration level, etc. This already allows Access Providers to compete with each other to provide the best wholesale offer to meet the requirements of Access Seekers. Access seekers also have bargaining power to get the best deal from Access Providers due to multiple competitive offers available in the market;

(c)   there is evidence that RAN sharing can be achieved via commercial negotiations and without regulatory intervention. The activation of commercially agreed 3G RAN sharing between Maxis and U Mobile has accelerated U Mobile's network expansion 4 to 5-fold, essentially doubling its physical coverage area overnight. U Mobile is set to benefit in terms of considerable savings in operating expenditure and CAPEX, which is then passed onto customers in the form of more innovative and affordable packages and services;

(d)   Celcom does not see any impediments in gaining access to, or in supplying, any of the Domestic Roaming or RAN Sharing Services as these are being successfully implemented. Another example is the 2G Domestic Roaming

arrangements at T3 Phase 1 and 2 sites between Maxis, Celcom and Digi. Celcom has not experienced any discrimination or refusals to access domestic roaming, and does not agree with the complaints made by some operators in relation to supply of Domestic Roaming Service. Celcom suggests that parties discuss openly and highlight to the MCMC any issues they face; and

(e) over-regulation may distort ongoing efforts towards developing and establishing an efficient and competitive commercial framework for domestic roaming/RAN sharing operators and for the long-term benefit of end users. Regulatory intervention on domestic roaming is not supported by any benchmark from the Asia-Pacific region nor the European Union.

2.104   Celcom submitted that since there is no market failure in any of the Malaysian wholesale markets, it is unnecessary to overly regulate the mobile wholesale market (e.g. by including the Domestic Roaming and RAN Sharing Services in the Access List). In many cases, voluntary sharing in the form of commercial arrangement is the most prevalent form of access rather than mandated access through ex-ante regulation. Celcom supports the MCMC's assessment on RAN sharing whereby the service requires a high degree of joint co-ordination, planning and investment by participating mobile network operators. In this regard, the asymmetric relationship between Access Seekers and Access Providers is not suitable and this should remain under the commercial arrangements among operators.

2.105   Celcom reiterated that the Infrastructure Sharing arrangements that are in place among the mobile operators, and have worked very well to date, significantly reducing the need and economic justification for further regulation of domestic roaming.

2.106   Digi submitted that wholesale access to Domestic Roaming is typically provided to assist new entrants in an early phase of rollout to access to services nationally to enable selling of mobility services to end users before roll-out is complete. In most countries, wholesale access to Domestic Roaming is time-bound to encourage and incentivise such operators to complete rollout in a timely fashion. This was also the case in Malaysia with the phasing out of 3G and 2G national roaming in 2008 from the MCMC's Access List, since then commercial Domestic Roaming arrangements have been working well.

2.107   To the best of Digi's knowledge, there is no notable demand for wholesale Domestic Roaming for 4G services and it is not necessary nor appropriate to include Domestic Roaming in the Access List, especially Domestic Roaming on a national basis. Digi has also not experienced any discrimination or refusals to supply Domestic Roaming Services from existing MNOs.

2.108   Digi noted that in urban and sub-urban areas where capacity is sufficient, commercial negotiations for Domestic Roaming is more suitable for parties to reach a mutually beneficial arrangements based on the operator's business viability. Imposing an obligation to provide access to Domestic Roaming where capacity is at its optimum level, jeopardises the provider's ability to meet its quality-of-service commitment to end users.

2.109   Maxis has not experienced any form of discrimination of refusals to supply domestic roaming services from existing MNOs.

2.110   Maxis disagreed with the MCMC's proposition to regulate domestic roaming services, based on its following arguments:

(a)   Malaysia has a thriving, well-functioning mobile market which is driving the right outcomes.

(i)   Maxis considers that the Malaysian mobile market is highly competitive and driving the right outcomes in delivering competitive choice and low prices to end users.

(ii)   In addition to robust competition nationally and regionally, the major mobile operators also have broad population coverage across Malaysia with around 90% coverage across 3G and 4G networks. Maxis does not see the need for domestic roaming regulation as all the major mobile operators are already able to reach the majority of Malaysians currently per the diagram below.
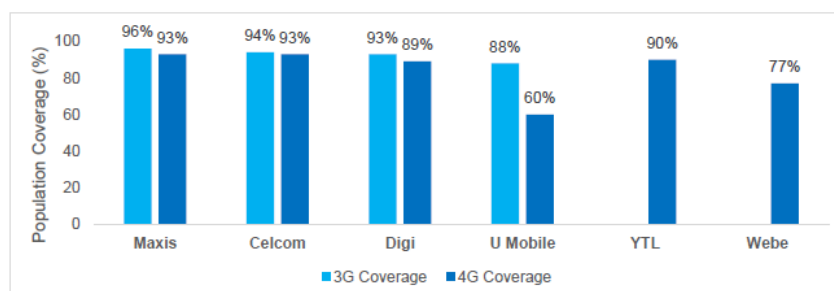
Figure 4 – Population coverage by mobile operators in Malaysia in 2019 (Frontier Economics)

(b)   Domestic roaming arrangements via commercial negotiations have achieved success without prior regulation.

(i)   Maxis refers to clear empirical evidence that domestic roaming via commercial negotiations have been successful between mobile service operators in the market, even without prior regulation. Access seekers have also successfully switched between domestic roaming providers in order to obtain favourable commercially negotiated terms. These demonstrate a competitive domestic roaming market in Malaysia, with Access Seekers able to choose and negotiate the best wholesale offering in the market and accordingly that there is no need for regulation to promote competition in the supply of these services.

(ii)   Under the JENDELA initiative, the MCMC has identified 1,661 locations nationwide in Malaysia for the deployment of new 2G and 4G telco towers / base stations to improve mobile coverage. Deployment of the new sites will be funded via the Universal Service Provision (USP) Fund, which is contributed annually by the major

MNOs.[5] Due to the large number of sites, no single MNO is able to deploy the entire targeted new sites and Maxis believes that an arrangement for RAN sharing and/or domestic roaming between Maxis, Celcom, Digi, and U Mobile would be implemented. This arrangement which is in a form of RAN sharing and/or domestic roaming (required by USP award conditions to the winner) will be entered into by the MNOs.

(iii) Maxis also cited other examples of domestic roaming being commercially negotiated in select areas:

    (A) Maxis provides 2G service via domestic roaming with Celcom and DiGi at certain T3 Phase 1 and 2 areas (667 sites) on a swapping basis to reach site parity, and a fallback rate if there is wide imbalance.

    (B) Maxis has arranged for DR services with other MNOs in case of natural disaster or occurrences of calamity.

(c) Non-regulation is the default position for global regulators except where a market situation (currently not evidenced in Malaysia) necessitates regulation for a temporary period.

(i) Maxis submitted that non-regulation of domestic roaming is in alignment with the international precedence set by most developed countries, citing the examples of Australia, UK, France, Italy and Norway to highlight their respective regulatory perspectives. Regulators have typically chosen not to regulate Domestic Roaming services given their assessment of well-functioning and competitive markets, allowing DR arrangements to be subjected to commercial arrangements between the operators.

(ii) Maxis noted that there are typically two scenarios where regulators have adopted domestic roaming regulations:

    (A) Temporary regulation to facilitate a new market entrant (e.g. Italy, Norway); and

    (B) To enable nationwide access in countries with regional spectrum licensing (e.g. US, Canada).

(iii) In **Australia**, Maxis noted that:

    (A) the ACCC has undertaken inquiries into whether domestic mobile roaming should be declared in 1998, 2004, and 2017. In each case it was determined that a declaration would not promote long term interest to end user (**LTIE**);

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[5] "MCMC identifies 1,661 new 4G sites nationwide – average 3MBps speeds" dated 20th November 2020: https://www.malaysianwireless.com/2020/11/mcmc-new-4g-sites-jendela-phase1

(B) the ACCC found that declaration would not promote competition in the retail mobile services market to a significant extent. MNOs compete across a range of factors, including the extent of network coverage, the quality (i.e. depth) of coverage in areas where they provide services, retail support, price, and service inclusions (e.g. data inclusions, free voice calls and SMS). The ACCC also found that overall geographic coverage is not the primary driver of competition, nor is it essential for MNOs to have equal geographic coverage to compete effectively in the market;[6] and

(C) the MNOs and MVNOs retail market in Australia is a highly competitive market, with three large MNOs. Retail market shares in Australia remain largely steady amongst the 3 major MNOs, with Telstra maintaining its share at 42%, Optus at 26%, VHA at 17%.

(iv) In the **United Kingdom**, Maxis noted that:

(A) The UK mobile market has been long established and competitive, with 4 main MNOs: Three, EE, Virgin Media/O2, and Vodafone. The UK also holds a large MVNO market, with the majority of the larger companies being hosted in isolation by EE.

(B) National roaming obligations have not been imposed in the UK as there are concerns this could discourage operators from rolling out infrastructure to rural areas.[7]

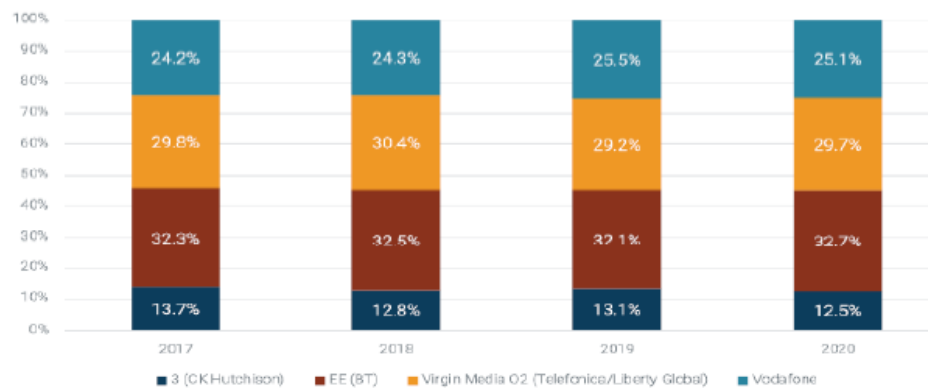*Figure 5 – 2017 – 2020 market shares of 4 Largest MNOs in UK by number of connections (DT Economics)*

(v) In **France**, Maxis noted that in January 2016, ARCEP began a consultation to gradually terminate national roaming agreements to encourage investment in 4G networks. Subsequently, the regulator

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[6] Omdia Country Regulation Overview: Australia
[7] Omdia Country Regulation Overview: UK

released an updated set of network-sharing guidelines in May 2016, which recommended termination of all roaming agreements in France. In line with this, Orange and Free Mobile signed a deal in June 2016 to gradually cease their 2011 roaming agreement (2G/3G) by 2020. In the same month, Bouygues Telecom and SFR also announced plans to terminate their roaming agreement (4G) by the end of 2018.[8]

(vi)   In **Italy**, Maxis noted that currently, Italy does not regulate domestic roaming, and non-regulation is the norm except when assisting new entrants with penetrating the market. This has happened three times in the country's history, with the launch of Wind (2000), Three (2003) and Iliad (2015). In such cases, AGCOM imposed temporary regulations as part of new licence or spectrum issue. These regulations expired after 30 months once the new player has gained sufficient scale. The situation is not applicable in Malaysia, where new entrants such as YTLC, U Mobile, and Webe already have significant scale.

(vii) In **Norway**, Maxis noted that national roaming regulations are imposed on Telenor in Norway in order to assist a new entrant, Ice.net and to help them build out their network capabilities. The incumbent must accept all reasonable requests for national roaming at a published price, regulated through a margin squeeze test. The regulator Nkom has set out that prices are expected to be higher for rural areas in order to encourage investment.[9]

(viii) In **North America**, Maxis noted that:

(A)   spectrum in the **United States** is auctioned on a region-by-region basis and is tradeable in the secondary market where operators can sub-divide and sell parts of the spectrum. As a result, spectrum holdings amongst operators are geographically fragmented and no single operator has complete spectrum holdings across the entire country. Operators refused to enter into commercial roaming agreements. National roaming regulation was introduced for voice in 2007 and data in 2011 because operators refused to enter into commercial roaming arrangements.

(B)   the spectrum licensing regime in **Canada** is also regional. The country is split into 14 different regions with spectrum allocated in each, and only the three largest mobile operators have access to national spectrum holdings. Without regulation, regional operators would not be able to effectively operate as without access to national roaming from the three large operators, their customers would not be able to

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[8] Omdia Country Regulation Overview: France
[9] Omdia Country Regulation Overview: Norway

use their mobile services outside their respective regions.

2.111 Maxis summarised international approaches using the following table:

Country	National Roaming Regulations
Australia	Not regulated
Singapore	Not regulated
South Korea	Not regulated
Japan	Not regulated
China	Not regulated
UK	Not regulated
France	Not regulated
Portugal	Not regulated
Netherlands	Not regulated
Germany	Not regulated
Italy	Not regulated

Figure 6 – Maxis's international benchmarks for national roaming regulation

2.112 Maxis believes that infrastructure sharing arrangements amongst the MNOs have worked well to date, eliminating the need and economic justification for regulation of domestic roaming. Maxis concluded that it would be unnecessary to over-regulate the mobile wholesale market by including domestic roaming and RAN sharing services in the Access List.[10]

2.113 Net2One agrees with the MCMC's preliminary view to list Domestic Roaming on the Access List on a national basis. Net2One believes this move will contribute to a better cellular coverage and network speed as envisioned under JENDELA.

2.114 Net2One has not experienced any discrimination or refusal to supply Domestic Roaming from existing MNOs when Net2One was considering to seek this service with a particular MNO. Net2One however discovered that the domestic roaming rates/fees were high and did not support a business case for Net2One to proceed with the arrangement.

2.115 Net2One also proposed that that the Domestic Roaming Service should remain to be listed on the Access List for at least 5 years, again consistent with JENDELA.

2.116 REDtone agreed that Domestic Roaming Service should be described and listed in the Access List to support the development of 5G and JENDELA

2.117 TT dotCom submitted that the MCMC should consider including Domestic Roaming Service in the Access List to promote competition of mobile services at the retail level. In TT dotCom's view, there should be more MVNOs which deploy innovative

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[10] ACCC International examples of national roaming and their relevance to the ACCC's inquiry in Australia report https://www.accc.gov.au/system/files/Optus%20submission%20Annex%201%20of%201_0.pdf

services to support future 5G applications and use cases such as M2M and, ultra-reliable and low-latency services.

2.118   TM agreed that the Domestic Inter-Operator Roaming Service should be included in the Access List, on a national basis. The inclusion of the Domestic Inter-Operator Roaming Service would support Circuit Switched Call Fallback (**CSFB**) and reduce infrastructure duplication.

2.119   TM has experienced various forms of discrimination and refusals in acquiring this service. While there have been instances of existing MNOs refusing to supply Domestic Roaming Services to TM, other examples from past commercial negotiations include price discrimination and refusal to provide minimum SLAs. Besides challenges in the acquisition of Domestic Roaming Services from existing MNOs, TM noted that current commercial arrangements for Domestic Roaming Services also do not allow third-party resale, which severely limits the business arrangements that Access Seekers can potentially secure with their business partners.

2.120   TM accordingly raised several arguments in support of the MCMC's proposed Domestic Inter-Operator Roaming Service:

(a)   Given the planned shutdown of the 3G network by December 2021, TM considers that the MCMC would need to ensure that all MNOs, including 4G/LTE-only MNOs, have access to the 2G network to support CSFB. Access to the Domestic Inter-Operator Roaming Service would provide the operators with access to the 2G network without the need to invest in legacy networks. This also reduces duplication of infrastructure as Access Seekers do not need to invest in existing coverage areas and can focus on achieving the coverage and speed targets set out in JENDELA.

(b)   The service would provide asset-light MNOs and MVNOs with a network in existing coverage areas, reducing the duplication of infrastructure, since the Access Seeker does not have to invest in existing coverage areas or in legacy network technologies such as 2G and 3G. Duplication of network infrastructure in areas where demand for traffic is low results in under-utilised investments. The resources and funds used for such investments could be better used for expansion into new coverage areas and/or addressing congestion in high-demand areas. This will help the industry stay on track to achieve the coverage (i.e. 100% 4G coverage in populated areas) and speed (i.e. >100Mbps mobile broadband) targets by 2025 as set out in JENDELA.

(c)   Given the potential merger between Celcom and Digi, TM suggested that the imposition of the Domestic Inter-Operator Roaming Service would also be in line with regulators in best-practice markets, where access to domestic roaming is imposed as part of MNO merger conditions. TM notes that this is done to ensure that the mobile market remains competitive after the merger, and cites the following examples:

(i) Merger of Telefonica and KPN in Germany where the merged entity is mandated to provide access to domestic roaming on 2G/3G/4G from 2014 to 2025 to a new mobile entrant;[11]

(ii) Merger of Hutch3G and Vimpelcom in Italy where the merged entity is mandated to provide national roaming on 2G and 3G/4G MOCN service to a new MNO entrant;[12] and

(iii) Merger of Hutch3G and Orange in Austria where the merged entity is mandated to provide national roaming for the new MNO for up to six years.[13]

(d) Legacy 2G and 3G networks remain essential to support CSFB for legacy voice services. While there is ongoing adoption of VoLTE, most operators globally are still relying on 2G/3G network for CSFB. The 2G/3G network thus remains useful as a low-power fallback and is essential to provide network coverage in rural areas. In the UK, the general consensus among MNOs is to phase out 3G first and retain 2G for CSFB in support of legacy voice services.[14]

(e) As an asset-light MNO, TM has been commercially negotiating access to domestic roaming with MNOs. However, TM has faced challenges in acquiring access to Domestic Roaming Services. Existing MNOs have a strong position in negotiations and also refused to provide enhancements or commit to standard industry SLAs and penalties. For instance, existing MNOs have rejected requests for enhancements such as correctly configured billing CDRs.

(f) MNOs also often require large minimum commitments in connection with network sharing services, which smaller operators may not be able to fulfil. Even if Access Seekers can meet the large minimum commitments, there are generally long lead times (i.e. 2–3 months) before a site is activated, even in cases where there is no physical activity required on site. Access seekers also have no recourse to late delivery of activations as there are no associated penalties for delivery time. Furthermore, existing MNOs will charge activation and usage fees for access to 4G MOCN services. Based on current industry practice, the first Access Seeker on a site will have to bear the full cost of activation. However, once the site is activated for the provision of 4G MOCN services, the Access Providers can further monetise the availability of 4G MOCN services to other parties. The fact that the first Access Seeker bears the full cost of activation in effect provides a subsidy to the Access Provider in terms of its costs and provides an unfair advantage to other Access Seekers. In addition to the activation charge, Access Providers also charge for data usage, which further adds to the cost of acquiring 4G MOCN services.

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[11] https://ec.europa.eu/competition/mergers/cases/decisions/m7018_6053_3.pdf
[12] https://ec.europa.eu/competition/mergers/cases/decisions/m7758_2937_3.pdf
[13] https://ec.europa.eu/competition/mergers/cases/decisions/m6497_20121212_20600_3210969_EN.pdf.
[14] https://www.ispreview.co.uk/index.php/2019/10/new-report-examines-the-uk-impact-of-switching-off-2g-mobile.html

(g)   The four MNOs claim that the market is competitive but act at times like a cartel, working with each other to share their network infrastructure while excluding other MNOs. This has reduced the level of competition in the mobile market where the four nationwide MNOs have maintained a high combined subscriber market share of >86% as of 2020. This type of behaviour, indicative of market failure, should cease and enable fair and favourable conditions for other operators.

2.121   TM proposed that Domestic Roaming Services remain on the Access List until the next review of the Access List, noting that the MCMC conducts detailed reviews of the facilities and services in the Access List every three to five years. The decision to add or remove facilities and services from the Access List should be undertaken in the next Access List review cycle. Moreover, in line with the MCMC's view, facilities-based competition in mobile services will only be sustained if there is sufficient spectrum available for all MNOs. Without resolving the spectrum imbalance between MNOs, TM considers that the MCMC will need to enable input services such as Domestic Roaming Services.

2.122   However, given the existing MNOs' strong negotiating position, TM requested that the MCMC include the following technical and operational parameters to ensure the reliability of the Domestic Inter-Operator Roaming Service:

(a)   standardisation of minimum key performance indicators (KPIs)/SLAs (e.g. restoration of service/mean time to repair (**MTTR**) and disaster recovery);

(b)   regular reporting of network and service KPIs including network performance at cell level, portal for site list and service coverage; and

(c)   equivalence of inputs and accessibility to all spectrum bands in the provision of the Domestic Roaming Service.

2.123   U Mobile disagreed with the MCMC's proposal to list the Domestic Inter-Operator Roaming Service in the Access List. U Mobile considers that Access Seekers have the bargaining power to get the best deal from mobile Access Provider, due to multiple competitive offers available in the market.

2.124   In commercial areas, U Mobile has managed to secure the supply of Domestic Roaming/RAN Sharing services commercially. However, in USP areas e.g. T3/T3E areas, U Mobile supports mandating RAN sharing arrangements among major USP Contributors to maximise effective coverage (from investments) to benefit customers.

2.125   XOX submitted that the MCMC should include the Domestic Inter-Operator Roaming Service in the Access List. XOX considers that it would allow MVNOs to compete with MNOs by differentiating their offerings and adapting their services to consumer preferences as well as to market conditions and necessities. Regulation will give flexibility to MVNOs to allow for increased competition and a strong market environment. MVNOs may have major challenges to upgrade network equipment to support the service and require huge capital investment for that.

2.126   XOX submitted that the Domestic Roaming listed in the Access List is subject to commercial negotiation between both parties (MNO and MVNO) because it involves special network management requirements of the relevant facilities or services.

2.127   YTLC submitted that it strongly supports the inclusion of domestic roaming in the Access List as it will facilitate access to the infrastructure of the Access Provider especially in areas where, due to certain limitations, it is not possible for the Access Seeker to install its own infrastructure. One such area is in-building coverage where the installation of a second in-building system is not feasible. It will also allow operators to increase coverage in rural and remote areas where population is sparse and building another network is costly. YTLC submitted that domestic roaming will increase efficiencies in the utilisation of existing infrastructure and capacity and at the same time promote competition and consumer choice.

2.128   YTLC agrees Domestic Roaming Service should be included in the Access List on a temporary basis subject to evaluation on whether it has achieved its objectives. YTLC submitted that domestic roaming should be on a national basis as pockets of non-coverage areas are distributed all over the country.

RAN sharing and MOCN arrangements

2.129   Some operators grouped their submissions in respect of domestic roaming services and RAN sharing / MOCN arrangements. However, as noted in the summaries of the operator submissions above, where an operator disagreed with domestic roaming, typically that operator also disagreed with the proposal to include RAN sharing or MOCN arrangements on the Access List.

2.130   Digi concluded that apart from the RAN sharing or MOCN arrangements for 5G services, Digi is agreeable to the MCMC's preliminary view that it is not suitable to list RAN sharing and MOCN arrangements in the Access List. Digi has not experienced any impediments in acquiring these services. As such, there is no need for regulatory intervention for RAN sharing or MOCN arrangements.

2.131   edotco agreed with the MCMC's preliminary views that RAN sharing would not be in the LTBE with the exception of 5G wholesale services which will be supplied under a single wholesale network model. The MCMC has distinguished the future competitive and economic conditions related to 5G, compared with services supplied over other mobile technologies, which are subject to competitive market constraints.

2.132   edotco also submitted that there are two other significant reasons which support the MCMC's position. First, RAN sharing may have an adverse impact on network resilience and secondly, with the migration to a 5G wholesale monopoly, edotco considers that the MCMC should actively encourage competitive rivalry in those other telecommunications market segments which are open to competition.

2.133   edotco also agreed with the MCMC's views that MOCN arrangements should not be regulated through the Access List. If they were to be approved, edotco believes there could be a potential adverse impact on infrastructure providers and the investment in digital infrastructure in the country necessary to meet the JENDELA

targets. Furthermore, edotco considers it critical that there is absolute transparency and scrutiny by the MCMC in relation to any such utilisation.

2.134   Nevertheless, edotco is of the view that MOCN arrangement may have an undesirable impact, if not properly managed, as capacity from the spectrum will be shared and split between the spectrum owner and other MNOs at the site. The shared resources will lead to lower throughput and eventually the quality of services to end-user. This will impact the JENDELA target of 35Mbps that is being championed by the MCMC. edotco concluded that it is important that proper planning is done at MOCN sites to ensure that any potential low throughput and quality of service can be mitigated early.

2.135   For public interest, edotco suggested that any MNOs who intend to undertake MOCN arrangement should perform the following:

(a)   identify MOCN site in the MCMC CIMS. The identification will help the MCMC to be better informed of a site status and the potential issues. In the future, for example, if complaints arise from the public due to network quality of service at a particular site because of spectrum capacity constraint due to MOCN, the MCMC will be well informed of the issue and can suggest necessary action for MNO to undertake site upgrade to cater to the capacity improvement; and

(b)   notify structure owners of MOCN arrangements at site. Notifying the structure owner is pertinent as it helps both the MNOs' MOCN arrangement and the structure owner to have better visibility of the site for current and future planning. Any failure of MNOs to inform may lead the structure owner to overlook expansion planning or make available adequate space for other MNOs to locate at the site. Future unplanned expansion will have material financial impact to both MNO and the structure owner.

2.136   Net2One also agreed with the MCMC's preliminary view that RAN sharing or MOCN arrangements should not be listed on the Access List, on the basis that parties wishing to enter into these arrangements should be given full flexibility to negotiate with each other on the commercial and technical terms.

2.137   REDtone proposed that RAN Sharing and MOCN arrangements should be listed in the Access List to support the development of 5G and JENDELA.

2.138   TM commented that there should not be a one-size-fits-all approach for the wholesale mobile services given differences in requirements for asset-heavy MNOs (i.e. Maxis, Celcom, Digi and U Mobile), asset-light MNOs (i.e. unifi Mobile, YTLC, REDtone and Altel) and MVNOs. According to TM, the differences in requirements are as follows:

(a)   asset-heavy MNOs (i.e. nationwide 4G deployment) would prefer network sharing in the form of MOCN which allows them to leverage existing spectrum and infrastructure assets;

(b)   asset-light MNOs (i.e. limited 4G deployment) will require a combination of MOCN for 4G/5G technologies and domestic roaming for legacy network to support CSFB; and

(c)   MVNOs will require domestic roaming access across all technologies.

2.139   In furtherance of the above, TM proposed that 4G MOCN arrangements be listed on the Access List, noting the challenges that TM faced in commercial negotiations with existing MNOs for the acquisition of 4G MOCN services.

2.140   TM commented that 4G MOCN services allow operators to pool their respective spectrum allocation and share operations and planning costs, resulting in improved efficiency, enabling MNOs to leverage existing networks instead of investing and rolling out new network infrastructure in existing coverage areas. JENDELA has set aggressive targets for the mobile network (i.e. 100% 4G coverage in populated areas by 2025). It is therefore vital for the MCMC to stimulate investments in extending 4G coverage areas.

2.141   In TM's view, the addition of 4G MOCN services to the Access List would allow existing mobile networks to monetise excess space capacity and allow future investments to be directed to new coverage areas. As such, TM requested that the MCMC to include 4G MOCN services in the Access List, specifying:

(a)   transparency (e.g. evidence would be required to support the rejection of a request for 4G MOCN service provision);

(b)   equivalence of inputs; and

(c)   standardised delivery times with associated penalties to protect Access Seekers.

2.142   XOX submitted that RAN sharing and MOCN arrangements should not be included on the Access List other than in respect of 5G wholesale services. RAN sharing and MOCN arrangements are typically bilateral or multilateral commercial arrangements that involve two or more operators using each other's network infrastructure or establishing a joint venture in respect of shared network infrastructure. Such arrangements, therefore, do not typically involve one operator merely supplying another operator with access to a service or facility, which is the focus of the Access List.

2.143   YTLC submitted that RAN sharing and MOCN should also be listed in the Access List as it avoids duplication of infrastructure, promotes better utilisation of capacity and promote competition. YTLC concluded it will reduce facilities-based competition while promoting services-based competition.

Discussion

2.144   The MCMC thanks operators for their detailed and considered submissions on the MCMC's proposal to regulate the Domestic Inter-Operator Roaming Service.

2.145   Arguments from operators in respect of this service were once again balanced. As expected, while MNOs were generally against the proposal to include the service on the Access List, other operators considered that listing the service would promote competition. At the same time, industry submissions generally agreed with the MCMC's proposal not to regulate RAN sharing and MOCN arrangements (other than wholesale 5G arrangements).

Domestic roaming services

2.146   In relation to comments by Celcom, Digi and Maxis that commercial domestic roaming arrangements have been successful in Malaysia and that the mobile market is competitive, the MCMC once again acknowledges, as set out in the PI Paper, that there does not appear to be strong evidence in Malaysia of discrimination in domestic roaming arrangements on a commercial basis, or any refusal by Malaysian MNOs to enter into such arrangements. As noted by Maxis and also by the MCMC in the PI Paper, these issues are experienced in other jurisdictions where domestic roaming services are regulated, including France, Canada and the United States.

2.147   However, the absence of these barriers at present does not in itself mean that regulation is unwarranted. As operators are aware, the MCMC is not concerned merely with regulation to prevent or end anti-competitive conduct, but regulation that would provide benefits to competition that would be in the LTBE. This includes supporting new market entrants, facilitating investment in new technologies, and utilising excess capacity on existing infrastructure in regional areas to promote efficient use of, and investment in, infrastructure.

2.148   The MCMC must also take into account Malaysia's unique environment, which cannot be easily compared to other jurisdictions. This includes:

(a)   the ambitious JENDELA targets of 100% 4G coverage in certain areas and >100Mbps mobile broadband speed targets by 2025, as cited by TM;

(b)   the Government's MyDigital Plan, which aims to utilise regulatory measures to expand infrastructure coverage and facilitate increased market entry for new businesses, highlighting the pro-active role that must be played by the MCMC in promoting competition, including from new market entrants; and

(c)   the single wholesale 5G network deployment model in Malaysia, and the transformative impacts of 5G in general. In this context, ensuring all operators are able to access and use 5G networks using existing infrastructure would encourage the efficient use of infrastructure consistent with the LTBE.

2.149   While the MCMC recognises the additional burden on operators of mandated domestic roaming, the MCMC maintains that there are efficient investment incentives created by such an approach which justify regulation. This view was supported by the majority of operators, and the MCMC agrees with views expressed by operators, including Net2One, TM, XOX and YTLC, that domestic roaming would (variously):

(a)   facilitate efficient use of existing infrastructure and capacity, particularly as legacy 2G and 3G infrastructure (and ultimately 4G infrastructure) is phased out and as the industry transitions towards 5G;

(b)   promote greater competition between MVNOs and MNOs by promoting services-based competition; and

(c)   ultimately, lead to better coverage and choice for end users.

2.150   The MCMC also believes that the regulation of domestic roaming services potentially addresses and lowers barriers to entry as the mobile market transitions towards 5G. Without domestic roaming, the post-5G industry structure where barriers to entry are high will continue, due to, for example, high customer acquisition costs. Regulation of domestic roaming over existing mobile networks has the potential to reduce barriers to entry and allow all participants in the mobile sector to compete on a level playing field. This form of competition is more likely to replicate the form of competition that will exist in the post-5G mobile market. Once 5G services are more mature, there should be a reduced need for domestic roaming to be regulated over non-5G networks as the field of competition moves across to 5G networks.

2.151   The MCMC also agrees with YTLC's comments regarding the positive impact of domestic roaming in areas where the Access Seeker is unable to install its own infrastructure, such as in-building coverage where there are physical capacity constraints. The MCMC notes in this regard its comment in the PI Paper that the owner or operator of a common in-building mobile system likely has a monopoly in respect of that system within that building or site, and accordingly domestic roaming would promote competition in the supply of these systems.

2.152   Additionally, the MCMC considers that the increasing degree of convergence between fixed broadband and mobile broadband is a critical industry change that must be taken into account in the context of domestic roaming regulation. In particular, as end users become increasingly reliant on mobile broadband as a substitute for fixed broadband, they will also in turn rely to a significant extent on the quality and scope of in-building coverage, in respect of which the various incumbent operators enjoy monopolies as outlined above.

2.153   In those circumstances, the MCMC is concerned that, in the absence of mandated domestic roaming, MNOs will be incentivised to deny or refuse access to domestic roaming to MVNOs and other Access Seekers under commercial arrangements, which could lead to poorer end user experience, inefficient duplication of infrastructure and potentially reduce the ability of MVNOs to compete with MNOs (and fixed broadband operators) in the supply of mobile broadband services. While these failures may not be present in the market today, the MCMC considers it important to put in place regulatory settings which prevent these market failures from arising in future.

2.154   From a regulation perspective, as the MCMC has previously regulated domestic roaming services and there are numerous examples of domestic roaming regulation internationally (including in the jurisdictions noted in the PI Paper), the MCMC does not consider that the complexity of regulation, as cited by Celcom, is a sufficient counter-point to the MCMC's proposal to regulate domestic roaming.

2.155   Finally, the MCMC notes TM's submissions regarding the need for domestic roaming regulation in light of the proposed merger between Celcom and Digi, which is currently the subject of the MCMC assessment. The MCMC does not consider it appropriate for access regulation to pre-empt the outcome of that assessment.

RAN sharing and MOCN arrangements

2.156   As noted above, most operators agreed with the MCMC's preliminary view not to regulate RAN sharing and MOCN services.

2.157   The MCMC does not consider that there is sufficient justification for 4G MOCN services to be listed on the Access List as proposed by TM. While the MCMC considers there are significant LTBE benefits for domestic roaming arrangements - and the MCMC has experience in regulating these arrangements in the past - the approach to regulatory pricing and regulatory oversight for 4G MOCN services is likely to be significantly more complex, and at this time the MCMC considers that the costs of regulation would continue to outweigh the benefits.

2.158   The MCMC notes the comments made by TM about the challenges faced by TM in commercial negotiations with existing MNOs for the acquisition of 4G MOCN services. The MCMC agrees that the MNOs should have commercial incentives to monetise excess spare capacity and allow future investments to be directed in new coverage areas. However, the MCMC believes the challenges associated with regulatory oversight of 4G MOCN services and the implementation issues associated with 4G MOCN services, are too complex particularly given the likely short-term benefits of 4G MOCN as a regulatory remedy in the lead up to 5G networks being rolled out in Malaysia.

2.159   Nonetheless, the MCMC has been prepared to include domestic roaming services on the Access List and will continue to review MNOs' incentives to commercially negotiate 4G MOCN arrangements. The MCMC considers that TM and other smaller MNOs can rely on these domestic roaming services to compete with larger MNOs using the networks of those MNOs and create more vibrant competition in the supply of mobile services. If the MCMC believes that the MNOs are not acting in alignment with these incentives, the MCMC will reconsider listing the 4G MOCN services on the Access List.

2.160   The MCMC also reminds operators that the most critical MOCN arrangements - being 5G MOCN arrangements - are covered under the proposed 5G service descriptions set out in paragraph 3.125 below.

Timeframe for regulation domestic roaming arrangements

2.161   Operators who supported the introduction of the domestic roaming service generally agreed that the service should be regulated on a temporary basis, however the MCMC received only a small number of submissions suggesting a particular timeframe. In particular:

(a)   Net2One proposed regulation for 5 years, consistent with JENDELA;

(b)   TM proposed that regulation until the next review of the Access List, which TM expects within the next three to five years;

(c)   YTLC proposed regulation on a temporary basis until the service has achieved its objectives.

2.162   The MCMC does not have sufficient information to determine a specific timeframe over which the service should be regulated. However, the MCMC agrees generally with TM's view that, given the MCMC's regular reviews of the Access List - and the MCMC's intention to closely focus on the mobile market over the next regulatory period as 5G services are rolled out - it would be appropriate to regulate the Domestic Inter-Operator Roaming Service until the next Access List review, at which point the MCMC will review the regulatory settings and consider any scope for de-regulation.

Service description for domestic roaming services

2.163   Operators provided limited views on the proposed service description for the Domestic Inter-Operator Roaming Service, indicating that those who supported the introduction of this service on the Access List were generally satisfied with the description.

2.164   While TM proposed certain service levels and reporting requirements be included within the scope of the service description, the MCMC considers that these are more relevant to the MSA, which will be the subject of a later the MCMC inquiry.

MCMC Views

2.165   The MCMC confirms its preliminary view that it would be in the LTBE to include the Domestic Inter-Operator Roaming Service as a new domestic roaming service in the Access List, as follows:

Domestic Inter-Operator Roaming Service

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

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

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

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

2.166   The MCMC also confirms its preliminary view not to include MOCN or RAN sharing arrangements in the Access List, other than for 5G services as described in paragraph 3.125 below.

Mobile fronthaul

Introduction

2.167   In the PI Paper, the MCMC noted that it did not have sufficient data regarding the extent to which mobile fronthaul services are supplied, and the underpinning competitive dynamics, but took the preliminary view that it would not be in the LTBE for mobile fronthaul services to be included in the Access List.

Submissions Received

2.168   Celcom does not acquire nor supply mobile fronthaul service. At this stage, Celcom is of the view that there is no requirement to include this service on the Access List, unless there is evidence of limiting access to the service which would not be in the LTBE.

2.169   Digi acquires mobile fronthaul service and does not face any impediments in acquiring the service. Digi agreed not to include mobile fronthaul service on the Access List, as there are alternative arrangements for sharing of network infrastructures. Digi explained that acquisition of mobile fronthaul service involves commercial arrangements between operators in sharing of core or radio networks, which is similar to MOCN, MORAN and RAN sharing.

2.170   edotco does not acquire nor supply mobile fronthaul service. edotco explained that mobile fronthaul works in tandem with a relatively new type of RAN architecture that consists of centralised baseband controllers and remote radio units (**RRUs**) installed at macro cell sites located either some distance away or adjacent to one another. edotco considered that the connectivity link forms an integral part of the BTS Hotel Service, and as such cannot be separated and unbundled. There are considerable technical difficulties if there was an attempt by the MCMC via the Access List to separate and unbundle this service.

2.171   edotco also highlighted that there are significant market and technical innovations happening in the infrastructure space which are designed to reduce the MNOs' CAPEX and OPEX, and hence the retail prices. This mobile fronthaul service is certainly not a "well established" bottleneck service and premature inclusion of some form of regulation or regulated access has the potential to harm innovations in the Malaysian market. It may result in costing implications for the DNB deployment in key zones. edotco is also unable to find any global precedent for regulating mobile fronthaul service.

2.172   In edotco's perspective, there should not be a separate mobile fronthaul service on the Access List. Mobile fronthaul is not part of transmission services generally or within the applicable Access List definitions. It is just a fibre connection (of say 1 to 2KM distance) between BBU and RRU where BTS Hotel is deployed (in a master-slave configuration). In a normal deployment (e.g. macro site), the two components referred to (BBU & RRU) reside at the same location. A separation is preferred for a number of reasons including but not limited to costs, reducing power consumption (so it is an environmentally friendly deployment), space limitation and/or aesthetic reasons. Because of the importance of the link – the RRU cannot operate independently of the BBU – then often there is redundancy buildout depending on the client needs (e.g. if a macro cell may provide coverage and this RRU only provides additional cell capacity, then the MNO may not have need for such redundancy).

2.173   Fiberail does not acquire nor supply mobile fronthaul service and is of the view that this service should not be included on the Access List.

2.174   Maxis does not acquire nor supply mobile fronthaul service and agreed that this service should not be listed on the Access List. Maxis is of the view that mobile fronthaul service can be acquired under the existing Transmission Services in the

Access List. Maxis clarified that mobile fronthaul service can be covered by End-to-end Transmission Service (e.g. between two Access Seeker Points of Presence).

2.175   Net2One currently does not acquire nor supply a mobile fronthaul service and agreed not to include this service on the Access List.

2.176   Ohana, REDtone, SACOFA, TM and TT dotCom do not acquire nor supply mobile fronthaul service.

2.177   U Mobile does not acquire nor supply mobile fronthaul service. U Mobile is of the view that mobile fronthaul service can be considered on the Access List for the benefit of 5G and beyond deployment as this architecture is the most prevalent. U Mobile explained that currently mobile fronthaul service cannot be acquired under the existing Transmission Services in the Access List. U Mobile also suggested to include the following to the Transmission Services:

(a)   Minimum QoS requirements;

(b)   Dark fibre access; and

(c)   Fibre core/wavelength-division multiplexing.

2.178   YTLC repeated its earlier comments supporting the introduction of mobile fronthaul on the Access List.

Discussion

2.179   Only U Mobile and YTLC supported the introduction of mobile fronthaul on the Access List, with all other operators either not acquiring this service or supporting the MCMC's preliminary view not to include this service on the Access List.

2.180   The MCMC's views on this service have not changed since the PI Paper. Although U Mobile commented that the mobile fronthaul service cannot currently be acquired under the Access List, Digi agreed with the MCMC's preliminary view that these services are similar to MORAN / MOCN arrangements, which the MCMC does not propose to separately regulate (other than in respect of 5G wholesale services) for the reasons described in the PI Paper and as set out in paragraphs 2.156 to 2.160 above.

2.181   In those circumstances, the MCMC does not propose to list these services on the Access List, but will monitor 5G developments to determine the extent to which this service may require regulation in future.

MCMC Views

2.182   The MCMC confirms its preliminary view that it would not be in the LTBE for mobile fronthaul services to be included in the Access List.

3   5G New Radio Services

Introduction

3.1   In the PI Paper, the MCMC expressed the preliminary view that it would be in the LTBE for 5G New Radio services to be added as new services to the Access List, rather than as an amendment to the existing MVNO Access service.

3.2   Accordingly, the MCMC proposed to include two new services in the Access List: a 5G Standalone Access service and a 4G EPC with 5G RAN Access service.

Submissions Received

5G access regulation principles

3.3   Altel and Net2One each agreed with the MCMC's regulatory principles for 5G access regulation, both for 5G Standalone Access and 4G EPC with 5G RAN Access. Altel and Net2One suggested that current policy be reviewed to allow other spectrum holders of the IMT bands to use the spectrum to provide 5G services, especially to serve enterprise and government customers.

3.4   Astro agrees with the MCMC's regulatory principles for 5G access regulation. Astro submitted that it is critical that DNB's activities are limited by a legal instrument to solely being a wholesale Access Provider. All legal instruments including DNB's licenses should ensure that DNB's activities are restricted to wholesale bandwidth and would not extend to the retail sector to avoid any conflict of interest.

3.5   Astro shares the MCMC's view that it is in the LTBE to regulate access to 5G wholesale services. Being the monopoly provider of 5G services, DNB's incentives to innovate and improve services that a competitive marketplace would engender is not present. Additionally, DNB would face "no competitive constraints and could accordingly increase prices or change terms of access largely at will", as noted by the MCMC. Astro therefore support the MCMC's efforts to impose Access standards and regulated pricing to ensure that rate remain fair and transparent to all Access Seekers.

3.6   Celcom submitted that the following the MCMC principles for 5G access must be scrutinised for clarity:

    (a)   **Different forms of access.** Another form of access to be specified is 5G core network owned and provided by the MNOs. Celcom's existing 4G network has been upgraded and extended to become MNOs' 5G core network. This network is ready to access to 5G RAN provided by DNB. Access to MNO 5G core will naturally be opened to other licensees including our MVNOs.

    (b)   **Access to any licensee**.

        (i)   As far as DNB's network is concerned, Celcom's understanding is that it is accessible by MNOs and MVNOs (Access Seekers) who have appropriate network capabilities to provide retail services to both end-users and enterprise business users. These Access Seekers should be qualified NFP and NSP licensees. The MCMC may qualify

the eligible NFP and NSP licensees. Nevertheless, Celcom strongly believe that MVNOs should continue to access the networks of mobile operators, because MVNOs may not be able to ensure service continuity and seamless customer experience without incurring complex and expensive integration of two separate networks.

(ii) Further, Celcom submitted that ASP licensees should not be allowed to connect to DNB directly as DNB would not have network service capabilities. This is in line with DNB's scope of licence which is limited to wholesale services only in the upstream market and not the downstream market.

3.7 Digi submitted that the following regulatory principles should apply to the regulation to 5G services:

(a) **Regulatory oversight**

(i) As Malaysia's single 5G wholesale network provider, DNB must adhere to stringent regulation when providing wholesale 5G services and access to its 5G network. It is critical that access to 5G be regulated in a manner that:

(A) does not prohibit certain supply models;

(B) maintains build versus buy signals; and

(C) ensures access is fair, reasonable and non-discriminatory.

(ii) In terms of access to services provided by DNB, all Access Seekers should be subjected to the same technical standards, testing, and minimum capacity commitments and terms offered. As a general principle, access by any seeker should be fair, reasonable and non-discriminatory.

(iii) An inconsistent application of the aforementioned principles risks disrupting market signals and incentives, which may reduce benefits to consumers and ultimately disadvantage the nation's economy.

(iv) How 5G is regulated will also impact the commercial viability in maintaining or increasing investment in MNOs' existing networks including 4G.

(v) Despite the move towards 5G, 4G is likely to continue playing a key role in the near term in improving accessibility and quality of Internet in Malaysia. It is imperative that appropriate investment incentives be applied to both 4G and 5G. To advocate for a deeper infrastructure-based competition for 5G, licensees must retain the flexibility to invest and deploy assets (be it 4G or 5G) in areas where it is economically viable.

(b) **Catering to different forms of access to 5G**

(i) Digi submitted that owning a 5GC when providing 5G SA services using DNB's RAN will be a crucial enabler of MNO innovation, differentiation and customisation of network architecture. Owning a 5GC will allow each operator to provide a full range of 5G products and services tailored to their customers' needs. Similarly, Digi is of the view that having its own core is important to allow Digi to customise future services for its customers and most importantly, retain control of its customer-relationship management.

(ii) Digi, like all operators worldwide, is constantly upgrading its core for higher capacities and to support the latest 3GPP features and customer use cases. As such, Digi's virtualised core has already evolved to support 5G NSA with upgrades for supporting 5G SA features already underway.

(iii) Each operator providing its own 5G SA core does not create any inefficiencies. Prohibiting it would be wasteful to existing investments and reduce operators' willingness to invest in the future.

(iv) In addition to owning their own 5G cores, permitting MNOs to provide 5G services (using the existing spectrum holdings or other partnership models between MNOs and DNB) would enable MNOs to retain the flexibility to deploy assets in areas that can commercially support it. As recommended by GSMA to Malaysia in its recent analysis of Malaysia's Single National 5G Network Study, allowing MNOs to use their current spectrum to provide 5G creates alternative delivery options and can expedite roll-out of 5G networks and services.

(v) Promoting network competition in areas where it is economically viable will improve the quality of services to users and create market pressure for cost-efficient 5G deployments by all parties. MNOs can leverage existing spectrum on currently deployed hardware by using dynamic spectrum sharing (DSS), and would be incentivised to invest in more advanced equipment (e.g. Massive-MIMO antennas) that would provide speed/capacity boosts to both 4G and 5G users.

(c) **Expediting deployment and future-proofing 5G access service**

(i) Building a comprehensive nationwide 5G infrastructure takes time and there will likely be a capacity limit as DNB's network is being built. Further, a MOCN set-up may also mean technical limitations on the number of interconnecting operators. As such, there may be a natural limit to the number of Access Seekers DNB's network can efficiently support.

(ii) MNOs are well positioned to work with the MVNOs and will continue to enable MVNOs to enjoy a fair share of 5G access and grow their

base from 2G, 3G, 4G and eventually 5G. Sharing of MNOs' networks to support MVNOs in delivering specific services enabled by 4G and 5G will also optimise the extensive 4G network that has been built by the MNOs. In addition to minimising network duplication, access to the 5G services through MNOs will ensure continuous coverage, customisation, and better customer experience.

(iii) As noted in the PI Paper, the commercial launch of 5G services will precede the determination of the MSA and MSAP. Digi is keen to work together with DNB, the MCMC and the industry to ensure alignment on the key aspects of the regulatory framework for DNB as well as DNB's RAO, that are important in delivering 5G services to end users.

(iv) The national single wholesale network model creates a unique situation where the scale of DNB's 5G rollout may range between two extreme scenarios – a pure supply-driven rollout based on national coverage obligations, vs. a pure demand-driven rollout based on customer needs and readiness of 5G use cases, device availability/ affordability and customers' preferences. A scenario where DNB retains absolute discretion on the scale of 5G rollout would incentivise over-supply far exceeding customer demand, with the burden of this inefficient spend transferred to Access Seekers and potentially to end customers. Thus, it is essential to ensure a consultative process across DNB and industry MNOs with robust governance to ensure optimal scale of 5G network - balancing responsible infrastructure investment with the right incentives to ensure win-win outcomes for the end customer and all stakeholders.

3.8 DNB noted that it supports the MCMC's regulatory principles for 5G access regulation, with the following comments:

(a) DNB accepts that it needs to be regulated, but noted that it is only one part of the value chain for delivering 5G services to end users. Demand for 5G services will depend upon the price and quality of service which is offered to end-users. End-user prices will depend upon the wholesale prices charged by DNB.

(b) DNB has already set these at a cost-oriented level in its RAO through use of its capacity-based charging model. DNB expects that competition between Access Seekers (both mobile operators and MVNOs) in supplying these services at the retail level will mean that the mark-up by Access Seekers on DNB's wholesale prices will be set at a level which recovers the Access Seekers additional costs plus a reasonable return on capital employed. DNB urges the MCMC to establish monitoring mechanisms to ensure that this is the case so that end-user prices are as low as a sustainable supply chain can support.

(c)   DNB agrees that different Access Seekers may want different 5G capabilities from DNB so as to maximise demand from their customer base for 5G services. DNB intends, in time, to provide Access Seekers with a wide range of 5G services in stand-alone mode to enable them to achieve this competitive differentiation.

(d)   If DNB is to achieve its corporate objectives, DNB will need to implement all the main services standardised through the 3GPP process and delivered to DNB through its contractor, Ericsson. A problem could arise however if the MCMC were to specify in the Access List services for which there was little demand, but which significantly raised DNB's costs. Such a situation would lead to a loss rather than increase in LTBE.

(e)   DNB therefore requested that the MCMC give DNB flexibility in determining which 5G SA services it provides, at least over the next three years until such time as the current high levels of market uncertainty disappear. DNB is naturally incentivised to be responsive in meeting its Access Seeker end-user's demands for innovative services, as they are the only route to market and DNB will be competing with other communications technologies such as fibre broadband to meet their end-user's needs.

(f)   DNB strongly supports the principle that licensees such as MVNOs and licensed enterprises should have access to DNB's wholesale services. Such access should increase competition in the supply of end-user services, stimulate demand for 5G services, and hence increase LTBE.

(g)   DNB supports the MCMC's proposal for functional descriptions of services so as to give it freedom on how it acquires and implements services, however DNB requested flexibility to choose those services in a way which maximises LTBE. DNB considers that the proposed service descriptions included in the Access List are too specific and premature for such a nascent technology as 5G.

(h)   DNB agrees with the MCMC that, given that Access List reviews are carried out every 3 to 5 years, 5G service availability and QoS needs to change as new services are launched and the technology capability of the radio access network improves. DNB again reiterated the need for flexibility in determining which new services to add to its portfolio.

3.9   edotco submitted that it strongly supports the MCMC's preliminary view to incorporate 5G New Radio Services into Access List based on the five regulatory principles articulated in the PI Paper.

3.10   edotco also reiterated that it is highly supportive of the Government of Malaysia's new MyDigital economy blueprint, including the deployment of single wholesale 5G network, which seeks to build infrastructure, facilitate innovation and create an ecosystem to transform Malaysia's digital economy and contribute to higher standards of living for all Malaysians. edotco agrees that the PI Paper provides a workable approach to the Access List consistent with those policies.

3.11   Maxis's position on the MCMC's proposed 5G regulatory principles can be summarised as follows:

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

(i)   Maxis agrees with the inclusion of 5G wholesale services in the Access List, however Maxis disagrees with the MCMC's position that DNB should deploy both 5G RAN and 5GC with MNOs acquiring an MVNO-type service under a 5G SA architecture.

(ii)   Maxis proposes that mobile operators should be allowed to deploy their own 5G SA Core and integrate with DNB's 5G RAN via MOCN arrangement to be able to provide 5G SA service. This would be consistent with 4 key benefits that are aligned with the LTBE:

(A)   foster innovation and differentiation by mobile operators in alignment with the national agenda;

(B)   drive efficient infrastructure-based competition and promote the investment incentive of mobile operators;

(C)   accelerate timeline for realisation of full scope of 5G SA capabilities, and use cases; and

(D)   enhance network resilience and technical performance.

(iii)   If mobile operators are not allowed to have their own 5GC and instead provision MVNO-type service, Maxis submits that this will result in diminished incentive for mobile operators to make investments into the development of unique, differentiated use cases as anything developed with DNB would not be a sustainable, and defendable differentiation, particularly as DNB is mandated to offer non-discriminatory access to all licensees.

(iv)   Maxis submitted that the example of StarHub and M1's 5G deployment in Singapore is instructive of the importance of maintaining separate cores to drive innovation and service differentiation, noting that StarHub and M1 have deployed a shared 5G RAN but maintained separate 5GC due to the need for strategic differentiation, as shown in the figure below:

Figure 7 – Case study of M1 – StarHub 5G service differentiation

(v) Maxis also referenced international regulatory perspectives to highlight that having independent core networks is critical to drive service-based competition, including statements by BEREC and the International Telecommunications Society.

(vi) Maxis disagreed that 5GC sharing will drive any significant savings justifying the detrimental impact on the national agenda for innovation, citing that allowing MNOs to have their own 5G core would result in a more efficient level of infrastructure-based competition because:

    (A) the incremental cost for MNOs to deploy a 5GC is minimal, while bringing significant benefits of driving innovation and differentiation; and

    (B) allowing MNOs to invest in their own 5GC in fact drives greater incentives to invest even in legacy technology (i.e., 4G) as they can control their destiny and future product/use case roadmap.

(vii) Maxis noted that the dependency on DNB introduces a significant potential for increased new product development cycle time, especially when considering that DNB will have to orchestrate and work across all mobile operators. Challenges include queuing and scheduling for any development/testing work, required alignment for any changes during the process reducing flexibility, and all post-launch configurations and change requests having to go through DNB. Given these additional frictions, Maxis expects that it will take significantly longer (by 4 – 6 times) for mobile operators to launch new products and services to the market. Any delay in the rollout of 5G services will have substantial impact given that 5G will become a critical enabler to Malaysia's competitiveness in the future digital economy.

(viii) From a technical performance perspective, Maxis submitted that allowing MNOs to deploy their own 5GC will bring about significant benefits in terms of delivering enhanced network diversity and resilience, driving seamless integration and better efficiency at the N26 interface and subscriber databases across 5G and 4G network and enabling improved SLA management resulting in better end user experiences.

(b) **Open access approach to selecting 5G access.** Maxis agrees with the overall principle of open access approach, with 4G EPC with 5G RAN and 5G SA as two proposed regulated services. However, Maxis proposed that 5G SA service should be delivered via MNO's 5GC integrated with DNB 5G RAN.

(c) **Access to any licensees**. Maxis expressed reservation regarding MVNOs seeking direct access from DNB, noting that:

(i)   synergies between existing MNO 4G EPC and 5GC will enable 5G services to be deployed in a shorter timeframe, allowing MVNOs to offer 5G services to retail customers' sooner than if DNB were to provision a separate 5GC;

(ii)   the integration of 2G/4G and 5G subscriber bases (HSS/HLD & HDM) at MNOs will allow subscribers to use the same MSISDN/phone number to have access across technologies (2G/4G/5G). If an MVNO uses different host networks for 2G/4G and 5G services, the separation of the databases will mean that two separate phone numbers would be required to access 2G/4G and 5G service respectively, creating a poorer subscriber experience and hindering the successful uptake of 5G services;

(iii)   a critical requirement for driving competition and innovation in 5G SA services is for mobile operators to have their respective core networks integrated with DNB's 5G RAN. To ensure the LTBE, DNB should fully focus on ensuring the rapid deployment of a nationwide 5G RAN network, enabling the respective mobile operators to provision 5G services to retail and enterprise end users in an accelerated timeline. This will allow all major mobile operators in Malaysia to obtain 5G wholesale access and engage in infrastructure-based competition driven by differentiations delivered over their own core networks to offer relevant 5G products to the market; and

(iv)   Maxis considers the MCMC should limit Access Seekers for 5G Services to "NFP(I) and NSP(I) licensee with LTE spectrum" only. This is because 5G wholesale services provided on a competitive basis e.g. by MNOs to MVNOs, are separate to the 5G New Radio Services to be provided by DNB, and accordingly should not be regulated on the Access List.

(d)   **Functional service description**

(i)   Maxis agrees with the principle of taking a functional approach to service descriptions. Taking a functional approach to describing 5G access services will provide certainty to DNB and to Access Seekers about the type of service that is to be regulated, without being overly prescription of exactly how the service is to be delivered. However, for functional completeness, there is a need to include some additional details in the service description, as noted further below.

(ii)   The 5G access "menu" approach by DNB should take into consideration the requirements of the mobile operators as the operators are the parties with best understanding of the requirements and uses cases demanded by its end users or retail and enterprise customers.

(e)   **Future proofing**. Maxis agrees with the principle of having regulations that are sufficient future proof. As 5G technology will continue to change

and evolve over time, it is necessary for any regulations to be sufficiently forward looking to address this evolution. Maxis also agrees with the MCMC's view that DNB network and 5G access services should comply with the existing and future 3GPP standards and should also be able to meet the superior needs and other capabilities once it becomes available over time.

3.12   REDtone agrees with the MCMC's regulatory principles for 5G access regulations.

3.13   TT dotCom had no objection to the MCMC's regulatory principles for 5G access regulation as outlined in the PI paper. TT dotCom is also of the opinion that 5G coverage should be made available to Access Seekers as a back-up or interim solution.

3.14   TM agreed with the MCMC's regulatory principles for 5G access regulation. However, TM had the following comments arising from recent and potential upcoming market developments:

(a)   with the introduction of DNB as the 5G SPV and the potential merger of Celcom and Digi, asset-light MNOs including unifi Mobile may face challenges competing with the four nationwide MNOs (i.e. Celcom, Digi, Maxis and U mobile) which have extensive spectrum holdings and strong financial positions.

(b)   in order to provide clarity and certainty over wholesale access to 5G infrastructure, the MCMC should include access to 5G domestic roaming service in the Access List, with price regulation under the MSAP. This will provide MNOs with more certainty in planning for the provision of 5G services and will allow them to focus on expanding 4G services to achieve JENDELA's mobile targets; and

(c)   the combined Celcom/Digi entity is likely to have a dominant position in the mobile market, which may negatively affect competition. Furthermore, Celcom is currently the preferred host network for many of the MVNOs and is also the host network for domestic roaming for unifi Mobile. There will be concerns on the continuity of the domestic roaming arrangement post-merger.

3.15   XOX agreed with the MCMC's regulatory principles for 5G access regulation. In XOX's view, access regulation for 5G wholesale services should not be omitted and should lay down the requirements of end-users, given the importance of clarifying the regulatory obligations imposed upon DNB. XOX submitted that the MCMC has a duty to ensure that DNB, as the sole single wholesale network operator, is subjected to flexible regulation to avoid a total monopoly and to promote good execution, network resilience and effective pricing to protect all parties involved, especially the consumers.

3.16   U Mobile agrees with the MCMC's approach to promote competition in the supply of downstream services by MNOs as well as to encourage investment by DNB. U Mobile submitted that since DNB has no competitive constraints, it is vital that the access prices be mandated, and that supply be provided on a non-discriminatory basis to the MNOs.

3.17   YTLC agreed with the LTBE principle as applied throughout the PI Paper. LTBE is best served by promoting competition, as efficient allocation of resources can only be achieved through competition. Efficiencies, in turn, allow service providers to reduce prices. YTLC raised its concerns that with no competition, use of resources may not be optimum and may lead to increase in costs to MNO that will inevitably be passed on to users. For this reason, YTLC considers it is necessary for the MCMC to allow MNOs to use existing spectrum resources to provide 5G services.

5GC network deployment options

3.18   Astro urged the MCMC to apply its learnings from issues relating to access in relation to fixed networks to 5G services. To ensure open access, it will be essential for the MCMC to facilitate ease of entry to non-MNO players. This will require, at the very least, access similar to Layer 3 HSBB Network Services – i.e. a fully loaded service that would enable non-MNOs to enter the market. Astro submitted that only then will the MCMC's aspirations for a more competitive marketplace be realised. On this basis, it is imperative that 5G SA access is included in the Access List.

3.19   Celcom submitted that based on the current scope of a single network provider, MNOs will face some limitations in providing 5G retail and enterprise services to customers. If DNB is the only 5G core network operator, Celcom's concerns are as follows:

(a)   there will be only one common platform for provision of the services. This would dampen product innovation and service differentiation;

(b)   given the above scenario, MNOs would unnecessarily need additional investment to enable capability for service innovation;

(c)   there is one single point of failure. This is detrimental to the whole industry where service provision to consumers will be seriously affected;

(d)   this will involve complex and expensive integration for MVNO. MVNOs will not be able to ensure service continuity and seamless customer experience for existing MVNO subscriber without incurring complex and expensive integration of two separate networks;

(e)   a single core network will be a bottleneck delaying individual MNO customisation and service rollouts; and

(f)   Subscribers' data integrity and confidentiality, given the subscriber database will be outside the domain of MNOs.

3.20   To address the above concerns, Celcom will acquire 4G EPC with 5G RAN Access service, given service provision based on the current scope of a single network provider would have limitations and negative impact to consumers.

3.21   Digi noted that telecommunications companies have invested a total of RM116 million during the 5G Demonstration Project (**5GDP**) to run 32 5G sites across 6 states for 6 months, since which Digi has been upgrading its existing network in anticipation of 5G deployment. Upgrading Digi's existing virtualised core network which currently supports both 4G and 5G NSA, to support 5G SA is a natural

software (i.e. Virtualised Network Function) progression. It is needed as part of the software/ VNS upgrades as well as to support advanced 5G services. Integrating Digi's own 5G SA core into the Access Provider's RAN will be a critical part of future 5G network plans, resulting in a core network that over time supports 4G, 5G NSA and 5G SA.

3.22   Given 5G SA is an evolution of 5G NSA, Digi expects that both will coexist for many years to come and as such, both of these services will be needed to support different use cases (i.e. 5G NSA to support eMBB, FWA and 5G SA to support advanced 5G services like URLLC, mMTC etc.).

3.23   Digi will need to acquire both services starting from 4G EPC with 5G RAN and eventually 5G Standalone Access on Access Seeker's 5G core with 5G RAN to provide bespoke, evolving and innovative products and services to customers and their digitalisation needs.

3.24   Without Digi's own 5GC, this will not only restrict Digi's ability to innovate, differentiate and customise future advanced services, but to provide all 4G, 5G NSA and 5G SA services to Digi's customers via a different core network will further increase the complexity and deployment cost to the overall provisioning of services.

3.25   Given the importance of utilising its own 5G core, Digi's view is that the description of the proposed models of 5G service supply in the Access List should be amended as follows:

(a)   as the description for 4G EPC with 5G RAN access already refers to MOCN technology, Digi is of the view that this arrangement should be categorised generally as 5G Non-Standalone Access; and

(b)   5G Standalone Access should be updated to allow MNOs to deploy their own 5G SA core.

3.26   Alternatively, for clarity purposes, Digi recommended that a third service description be added for MNO 5GC + MOCN architecture under 5G Standalone as "A 5G Standalone Access service built with Access Seekers' 5GC based on a MOCN model, requiring integration between DNB's gNodeB and an Access Seekers 5GC."

3.27   In addition to this, Digi noted that network slicing is a 5G Core capability where the owner of that 5G Core enables these capabilities. In a SA MOCN scenario, this could also be delivered by the Access Seeker. As such, Digi suggests the following amendment to the definition of "5G Network Slice":

3.28   "5G Network Slice" means, in respect of a 5G New Radio core, a virtualised network or network partition used by the Access Seeker or Access Provider to support a particular type of service, use case, application, customer or other purpose, and includes the following:

(a)   Mobile broadband;

(b)   Massive IoT; and

(c)   Mission-critical.

3.29   DNB disagrees with the MCMC's proposal to prohibit Access Seekers from deploying their own 5GC networks, on the basis that:

(a)   (commercial) MNOs will initially use their own 4G cores to connect via NSA to the DNB 5G RAN. This will allow MNOs to provide seamless services for their subscribers and to retain tight control over the subscriber experience. MNOs can use their own policy control elements to align policy and business rules to their own strategy and business needs. They may decide that they prefer this to the MVNO-like arrangement inherent in the MCMC's proposed single 5GC operated by DNB, and hence stay with NSA operation rather than move to SA. This would then limit the 5G services that can be offered in Malaysia and may make a move by DNB to SA uneconomic. Conversely, by having their own 5G cores, MNOs are able to develop new innovative services and differentiate their 5G offering. This will lead to a more vibrant, competitive and innovative mobile service. In addition, DNB does not accept that there are significant benefits from a single core.

(b)   (technical) In cases where 5G SA coexists with 4G and 5G NSA, the implementation of a 5GC will be in a combined mode with 4G core networks. If the MNOs provide their 4G core but are reliant on DNB for a 5GC then there are two approaches:

(i)   Separate cores and integrate: Extensive integration requirements between DNB's single 5GC and multiple MNOs' 4G core networks. DNB submits that this is highly complex, unproven with different vendors and may not be possible if the 4G core networks are not co-located with the 5G core because bandwidth, latency or other transmission issues may prevent full integration.

(ii)   Separate cores and roam or operate as an MVNO. This would result in voice services being available only within DNB's coverage area, mobility performance degradation due to unavailability of 4G, complicated integration to existing MNOs' IT systems (e.g. CRM, customer bundling and provisioning, etc.) impacting MNOs' ability to serve customers, complicated lawful interception protocols and a requirement for domestic voice and international inter-connects by DNB.

3.30   DNB considers that neither of the above options promotes the LTBE, and DNB therefore strongly recommends that Access Seekers be allowed to own and deploy their own 5G core networks. This will drive early adoption of 5G SA with its associated advanced services, encourage innovation and enable differentiation across Access Seekers, and provide a better customer experience.

3.31   DNB clarified that it expects a three-staged approach to 5G deployment:

(a)   only 5G NSA is provided;

(b)   both 5G NSA and 5G SA are provided during a migratory period; and

(c)   only 5G SA is provided.

3.32   DNB expects to move through this migratory process and in due course, to only provide SA services where NSA is no longer necessary. This should be the case once all the mobile operators have implemented their 5G cores or move to DNB's 5G core, and handsets are widely SA-capable. Moving to SA-only brings advantages in reducing complexity, optimising the network and improving spectrum efficiency through reduced signalling traffic. It will also reduce DNB's costs as DNB will no longer need to maintain a wider range of options and capabilities within its network.

3.33   Since DNB's 5G network deployment is being done in phases, edotco considers that the two type of network and integration architectures will co-exist for a long period. edotco supports the MCMC's view of defining the new 5G services as follows:

(a)   5G SA Access; and

(b)   4G EPC with 5G RAN Access.

3.34   edotco noted that it is cautious about the restriction proposed by the MCMC regarding MNOs upgrading their EPC to 5G Core. Such a restriction arguably restricts their ability to differentiate retail offerings, especially for wireless broadband (i.e. eMBB) services which could run counter to one of the MCMC's key regulatory principles i.e. to promote LTBE.

3.35   U Mobile disagrees with the MCMC's preliminary views that MNOs deploying their own 5GC networks would inefficiently duplicate infrastructure. Without MNOs' own 5GC networks, 5G product innovation will be stifled, to the detriment of the LTBE. It is the MNO's natural technology evolution path to upgrade 4G EPC to 5GC with the combination of 4G EPC and 5GC. This type of deployment maximises the LTBE as full-fledged 5G services can be deployed without affecting any incumbent 4G services.

3.36   Allowing only DNB to deploy a 5GC network may also introduce complexity to Access Seekers seeking holistic 2G/4G/5G MVNO services with national coverage. These MVNOs can only acquire 2G/4G/5G NSA MVNO services from existing MNOs, but will need to make separate arrangements with DNB to complete their service offerings with DNB's 5G SA MVNO service. This added complexity may result in MVNOs having differentiated overall coverage experience between 5G SA and 5G NSA devices, even though the 5G SA coverage is from DNB alone.

3.37   Further, U Mobile noted that a single 5G core via DNB introduces a single point of failure and increases vulnerability of the 5G network from a security and reliability perspective e.g. EU/EC highlighted lack of 5G network/supplier diversity as a key risk for network security and resiliency. Accordingly, U Mobile considers that MNOs should be given the flexibility to determine the degree of investment into their 5GC networks based on planned service proposition (e.g. consumer and enterprise vs. consumer only) and price their retail services accordingly.

3.38   Finally, U Mobile noted that it needs a combined 4G EPC and 5G SA Access service to supply full-fledged 5G services to its 5G retail and enterprise services. While the former service can only be used to supply NSA services to its customers, a 5G Standalone Access service with U Mobile's own 5GC will allow U Mobile to supply

5G retail or enterprise services to its customers. Limiting this service to DNB's 5GC may be detrimental to U Mobile's offering of 5G services to its customers, especially in the enterprise sector which requires a lot of customisation, innovation and tailor-made QoS requirements that may not be implementable without U Mobile's own 5GC/EPC. This loss of innovative products will be detrimental to the LTBE.

3.39   YTLC also submitted that MNOs should have the option of having their own core based on price and service considerations. Encouraging MNOs to have their own 5GC promotes LTBE as the competition between MNO owned 5G services and 5GC will put pressure on DNB to achieve efficiencies and lower prices. In addition to the use of existing spectrum, YTLC submitted that MNOs should also be encouraged to build their own 5G core to enhance their own value chain and be in a position to provide innovative and differentiated services to end users. It should not be considered as duplication of infrastructure as it adds value and gives MNOs the capability of providing dual-mode EPC+ and 5GC supporting 5G NSA and 5G SA based on virtualised and/or cloud native platforms.

3.40   While YTLC noted the stated intention of the MCMC to protect the investments made by DNB, similar consideration ought to be given to the investments made by the MNOs as the MNOs are the market for 5G wholesale services. A thriving market will in turn spur the demand for 5G wholesale services. Further, DNB can concentrate on building the RAN while MNOs can deploy their own 5G core to have the flexibility for planning strategic innovations to MNO's respective customers.

3.41   YTLC has been planning and augmenting its architecture with the deployment of 4G EPC and 5GC common core platform, which is based on cloud native technology in anticipation of the launch of 5G services. Therefore, YTLC concluded DNB should allow MOCN between DNB's NR and MNO's 5GC. This will allow MNOs to innovate the service offerings to their customers and also optimise their investments.

Supply of 5G services to MVNOs

3.42   The views of operators in respect of the MCMC's proposal to allow DNB to supply services directly to 5G varied. While MNOs largely submitted that the MCMC should limit access to DNB's 5G services only to MNOs, other operators including MVNOs stated that access should be provided to any licensee.

3.43   Astro recommends that DNB offer all facilities and services related to MVNOs (i.e core network, voice, VAS, customer support, billing etc.), where such offerings will eliminate the need to go to various MNOs for the services. Astro suggests DNB provide under both a Thin MVNO and Reseller / B-Brand model as set out in the PI Paper.

3.44   REDtone noted that it plans to deploy 5G services and will look into DNB's 5G infrastructure for the deployment of 5G services and evolve through time.

3.45   REDtone submitted that 5G Standalone Access service and 4G EPC with 5G RAN Access service should be made available to all Access Seeker from the first day of launch of service to acquire end-to-end access directly from DNB. REDtone noted its interest in exploring the possibilities of accessing services directly from DNB.

REDtone submitted that 5G Standalone Access service and 4G EPC with 5G RAN Access would allow REDtone to supply 5G retail and enterprise.

3.46   XOX supports access being given to any licensees under the SAO as set out in section 149 of the CMA because it will allow fair and non-discriminatory access to the 5G network. Further, XOX submitted that the MSA should include the description of 5G access services in the Access List.

3.47   While YTLC agrees with the MCMC's regulatory principles for 5G access regulation, YTLC is of the view that access to DNB's 5G services should be confined to MNOs as MNOs have the necessary infrastructure to provide services to end users, either on their own or through their MVNOs. Allowing MVNOs to provide access to other licensees could open the way for DNB's involvement in providing services directly to end users in a way that conflicts with its stated objective of only being a wholesale service provider.

5G service descriptions

3.48   Altel and Net2One commented that the 4G EPC with 5G RAN Access service will allow and enable Altel and Net2One to offer 5G MVNO services as a retail service and also customised services that will suit business/use cases required by B2B, enterprise and industrial needs. Altel and Net2One are inclined to acquire both the 4G EPC with 5G RAN and 5G Standalone Access services as both would be suitable for Altel's and Net2One's current business priorities. This is also in line with Altel's intention to deploy its own 5G network to support its business requirement. Altel envisions to offer this service to customers by Q3 2022.

3.49   Celcom agreed that 5G services can be described by reference to the function of the service. In addition, Celcom considers that the service description should also allow MOCN technology to be implemented.

3.50   While edotco agreed with the proposition that Facilities and Services description should be defined according to its functions for added clarity, the functions have to be exhaustive and reasonably unbundled. The functions defined must be aligned with the current 3GPP Standards.

3.51   edotco and a range of other IT companies may provide similar services to enterprise customers or DNB itself and therefore might fall inadvertently within the scope of the Access List definitions. As such, edotco submitted that the MCMC should clarify, by making it clear in the Access List definitions, that the obligations arising from the provision of the two services and its related Facilities and Services functions apply only to DNB as the monopoly 5G Access Provider. It is critical that any other services which have similar characteristics e.g. mini data centres at sites / Edge Computing or Site-as-a-Services, provided by other licensees or third parties are excluded from the Access List as opposed to the bottleneck service which would warrant inclusion on the Access List.

3.52   Digi noted that the service descriptions in the PI Paper refers to "5G New Radio services" but presumes that this means 5G services in general, not RAN services in particular.

3.53   DNB provided the following comments in respect of the key elements of 5G services proposed to be regulated by the MCMC:

(a)   **Voice services**. DNB will not provide voice services in 5G NSA mode. This is because voice services are provided through the core network and in NSA the Access Seekers use their own 4G core networks. Hence, Access Seekers will deliver voice services themselves. DNB is unable to deliver voice in such an arrangement. In a 5G SA mode, DNB is willing to deliver voice services where the Access Seekers do not wish to do so themselves via their own 5G core networks.

(b)   **Data services**.

(i)   DNB is concerned about the QoS requirements proposed by the MCMC. For example, DNB believes that the peak requirements set out in the PI Paper cannot currently be met, could not be used by most terminals currently available, and would exceed any service delivery in the world that DNB is aware of.

(ii)   DNB proposes that, once set, the QoS levels are specified in a single document to avoid any conflict or confusion. DNB proposes that the RAO should be used for this purpose and recommends that the QoS requirements in the RAO apply to Access Seekers such that the 5G performance is not degraded by Access Seekers, for example due to low-quality core networks used by Access Seekers. Hence, data rate requirements should be directly passed through. Latency requirements should be divided into RAN and core latency, with Access Seekers required to deliver the core latency specified where they use their own core. Any QoS levels should not be imposed until the network is established, stable and optimised which is likely to be at least a year from launch.

(c)   **Access services**. This only applies to 5G SA, as the various elements are within the 5G core network. For 5G SA, DNB is willing to offer access to the elements listed by the MCMC, provided that MEC, NEF, and SEPP will not be available until 2023. DNB suggests that access need not be implemented until there is demand for it, to avoid expensive capabilities being added to the DNB 5G core network that transpire not to be needed. As such, DNB is of the view that these services need not be listed on the Access List at this juncture.

3.54   DNB commented in respect of the proposed requirement for it to support 3GPP Release 15 Options 3, 3a and 3x, including E-UTRA New Radio Dual Connectivity ("EN-DC") that DNB is only planning to offer option 3x in 5G NSA, due to its better performance and efficiency compared to options 3 and 3a. Option 3x also provides near zero interrupt time, LTE-5G mobility, and allows voice over LTE without using fallback to a 4G network. DNB will support Option 2 in 5G SA.

3.55   DNB believes that requirements should be imposed on Access Seekers to set relevant parameters in their networks in line with such recommendations as DNB may make on how this should occur. Such parameters might include idle mode network selection, handover parameters, handover lists and other matters that

impact the performance of the shared network. Without such requirements, there is a significant possibility that unnecessary congestion of the 5G network might occur in particular on the 700MHz bearers and on the signalling channels. It should be possible for DNB to refuse connection for Access Seekers that refuse to coordinate in such a manner.

3.56   DNB also commented on the proposed requirement for DNB to support advanced 5G services such as mMTC and URLLC. DNB agrees that advanced 5G services should be regulated, but believes that it is currently too early to set regulatory parameters for these services as 5G SA networks are only just being deployed. The performance that they can offer and the performance that users require are still far from certain. DNB does not expect to provide these services commercially until late 2022 or early 2023, at which point the appropriate parameters will perhaps be clearer. Hence, DNB proposes that requirements for these services be removed from the Access List and revisited when the Access List is next reviewed or left to be specified in the RAO only.

3.57   DNB also notes the following points for such time as any revision may occur:

(a)   as with QoS, it would be more appropriate to place requirements for advanced services in the RAO and incorporate them into the Access List by reference;

(b)   requirements for device density for mMTC are very difficult to define and to measure. Much depends on the devices and their connectivity requirements. mMTC may also be provided using NB-IoT and enhancements thereof, which may be delivered by MNOs using 4G-based networks and hence need not be part of DNB's solution. Also, IoT subscription rates are currently growing only slowly and are unlikely to reach high-density levels for many years. mMTC is still some years from being standardised. mMTC is not defined in 3GPP Releases 16 and 17. mMTC is a continuously evolving standard as per 3GPP and is not a candidate for Release 18. All this suggests that it is premature to regulate this area, that regulation may not be needed in the Access List, and that if there is regulation it will need careful and appropriate definition; and

(c)   requirements for URLLC are very difficult to define and to measure. In particular, "reliability" will need careful definition for the situations in which it applies and the manner in which it is measured. A user-plane latency of 1ms as suggested in the inquiry currently might in time be possible in specific situations but will be very difficult and costly to provide across an entire network. Setting QoS requirements in advance of actual user requirements risks over-specifying the network with resultant high costs.

3.58   Finally, DNB made a number of submissions regarding the relationship between QoS and the price for 5G wholesale services. Broadly, DNB commented that the MCMC should set minimum QoS at the wholesale level rather than the retail level, and to establish mechanisms:

(a)   for determining QoS levels which reflect what would be delivered in a competitive market, through a benchmarking exercise; and

(b) which allow the MCMC to explore the price consequences of raising and lowering minimum QoS levels in advance of setting them.

3.59 Maxis proposed a more detailed set of service descriptions for 5G New Radio services to ensure that Access Seekers are able to obtain adequate access given DNB's monopoly on 5G wholesale services, as set out in **Error! Reference source not found.**.

3.60 Maxis also proposed the inclusion of MORAN access in order to support private networks for large enterprise customers that require dedicated spectrum. This will be required to realise the full potential of 5G capabilities to meet the needs of large enterprises. While acknowledging that all 5G spectrum will be awarded to DNB, Maxis opined that DNB should be allowed to lease out portions of their spectrum for dedicated use by the MNOs on case-by-case basis depending on the use cases and customer requirements.

3.61 Net2One agreed with the proposed draft service descriptions for the 5G Standalone Access service and 4G EPC with 5G RAN Access service. Net2One agrees that the 4G EPC with 5G RAN Access should not refer specifically and only to MOCN technology and should also consider other technologies or network configurations.

3.62 TT dotCom submitted that 5G Standalone Access service should also include the scope for access transport services similar to Metro-E. The proposed description of the 5G Standalone Access service should be revised to include the following words underlined in red as follows:

> *5G Standalone Access*
>
> *(a) 5G Standalone Access is a Facility and/or Service for access to a 5G New Radio Mobile Network, for the purpose of the Access Seeker providing:*
>
> *(i) MVNO Access;*
>
> *(ii) services to enterprise or government Customers for access transport service (similar to metro-E);*
>
> *(iii) public cellular services to the public; or*
>
> *(iv) wireless or mobile broadband services to the public.*

3.63 TM plans to acquire both 5G Standalone Access and 4G EPC with 5G RAN Access Services for the provision of 5G services for retail and enterprise services.

3.64 TM proposed that the service description for 5G Standalone Access specify the network architecture, network topology, use cases, 5G RAN setup, 5G RAN Mobility and 5G RAN performance as provided in the diagrams below:
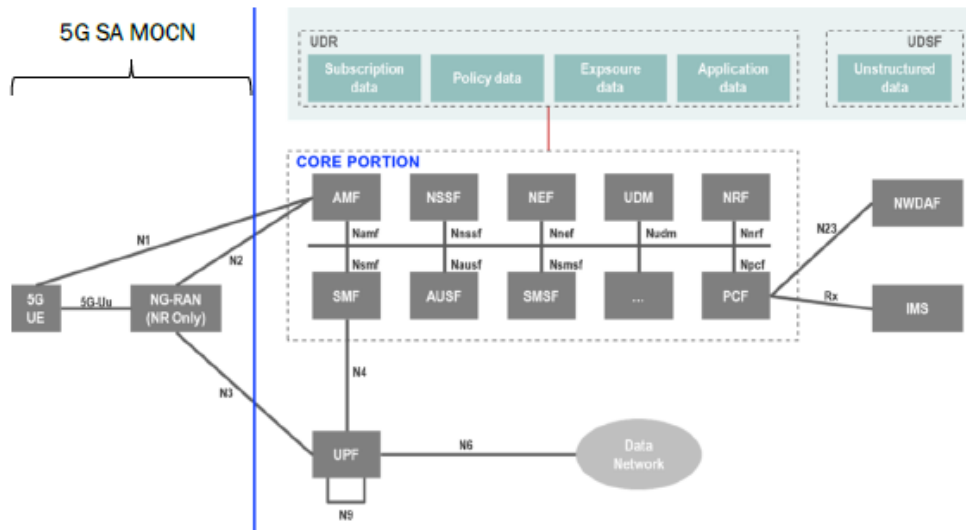
Figure 8 – 5G Standalone Access service network architecture (GSMA, 2020)
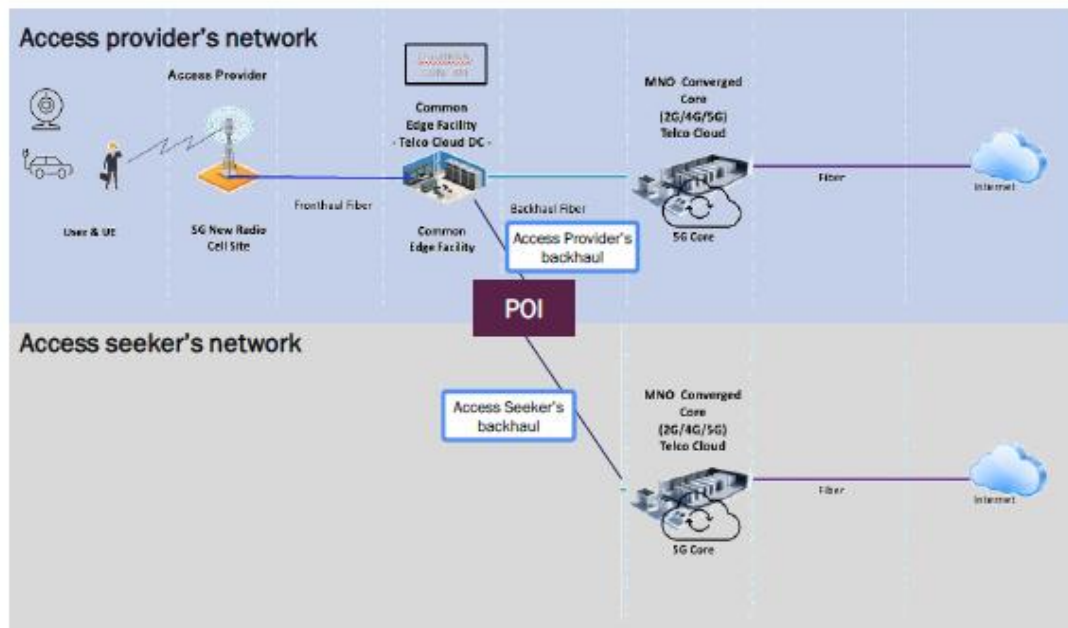
Figure 9 – TM proposed 5G Standalone Access service network topology

3.65   In addition, TM proposed that the 5G Standalone Access service should be available and enhanced for all use cases under the current 4G network. Other 5G use cases TM requests to be listed in the Access List include (but are not limited to):

(a)   enhanced Mobile Broadband that can support the 4K broadcasting services, Virtual Reality (VR), Augmented Reality (AR) and the online gaming services. The basis of these services is the shorter latency responses, sufficient bandwidth to guarantee the user experiences;

(b)   internet of things – mMTC;

(c)   uRLLC for use cases such as connected cars etc.;

(d)   new verticals to support niche industrial requirements, specific industrial sectors in parallel with the Industrial 4.0 readiness. This shall also include specific use cases e.g. in supporting an Emergency Services Network; and

(e)   Voice over New Radio (VoNR) to take the advantage of SA network availability.

3.66   These 5G use cases need to be supported with a 5G ecosystem which would include the following:

(a)   regulatory and law agencies requirement – MERS999, Lawful Intercept Gateways (**LIG**), Mobile Location Services, Equipment Identifier Register (**EIR**), Signalling Firewall;

(b)   5G security related readiness – in compliance with Malaysia's National Cyber Security Policy in addition to the global best practices;

(c)   5G service Orchestration and Management including the OSS functionality;

(d)   network analytics integration points (may include the analytics platform as well);

(e)   5G domain charging; and

(f)   Voice over New Radio (**VoNR**) capabilities and services – in addition to the IMS platform.

3.67   For the 5G RAN setup, TM requested that the MCMC specify that 5G RAN has capabilities including 5G NR key technologies such as new air interface, massive multi-input and multi-output (**MIMO**) and uplink enhancement. These capabilities would help to improve spectrum efficiency, enhance coverage and suppress interference.

3.68   Specifically, TM requested that 5G RAN should have the following features to support End-to-End 5G Standalone Access services:

(a)   network slicing;

(b)   VoNR including emergency services;

(c)   mMTC;

(d)   massive MIMO minimum 64T64R configuration;

(e)   local edge breakout;

(f)   interworking between the 4G and 5G; and

(g)   compatibility with the 5G SA user equipment or customer premise equipment.

3.69   TM proposed that Access Seekers should also be allowed to access all 5G spectrum designated for the 5G Standalone service. Sufficient bandwidth will need to be

provided by Access Providers to support the 5G SA use cases which requires low latency and high reliability.

3.70   For 5G RAN mobility, TM considers that 5G RAN should be able to support full mobility experience for the related use cases. The Access Provider should ensure interworking between 4G and 5G network domains are optimised. This may include the availability of Self Organizing Network (**SON**) platform to cater for the neighbour relations.

3.71   For 5G RAN performance, for MNOs to have access to 5G RAN quality and performance data when requested, TM requests that Access Providers should readily provide the necessary data including GPS georeferenced data correlated to the radio events reported (i.e. the concept from the current LTE arrangement can be used as a reference). The data provided should be useable for further analytical purpose with their Operational Support System (**OSS**). Examples of use cases for analysis include (not limited to):

(a)   radio signal levels;

(b)   radio quality;

(c)   radio path loss;

(d)   distance UE-Radio Site;

(e)   UE profiling;

(f)   traffic analysis; and

(g)   mobility analysis.

3.72   TM further considers that the Access Provider must be required to ensure data privacy such that only the respective Access Seekers have the right to retrieve their own data. TM proposed that details such as unique identifiers can be discussed in detail with the MNOs.

3.73   In relation to the 4G EPC with 5G RAN Access service, TM proposes that the service description of 4G EPC with 5G RAN Access service should specify that MNOs can have access to the 5G RAN quality and performance data when requested. This would be similar to the 5G Standalone Access service RAN performance specified above by TM.

3.74   Finally, TM proposed a new 5G Standalone (**SA**) MOCN service be included in the Access List to cater to the needs of 5G enterprise services to customers. The service description for such a service would, in TM's view, be similar to the service description specified under 5G Standalone Access service subject to TM's suggested amendments above. However, the network architecture for 5G SA MOCN service would allow Access Seekers to acquire access to NG-RAN.

3.75   TM noted that as different enterprises have different requirements, MNOs should provide access to 5G SA MOCN to cater to the specific needs of each enterprise. The inclusion of 5G SA MOCN is critical in improving service-level competition in the 5G enterprise market.

3.76   XOX fully supports the proposed draft service descriptions for the 5G Standalone Access Service and 4G EPC with 5G RAN Access Service to be included in the Access List.

3.77   XOX submitted that the 5G Standalone Access service and 4G EPC with 5G RAN Access service will allow XOX to supply 5G retail or enterprise services to XOX's customers. Hence, XOX agrees with the proposed services.

3.78   XOX also agrees that the service description for 4G EPC with 5G RAN Access should not be referred specifically to MOCN technology since technically 4G EPC with 5G RAN Access does not mean Cell Sharing per se. MOCN technology is covering both Cell Site Sharing and NodeB and eNodeB.

3.79   U Mobile considers that allowing DNB to select what is technically feasible for the purposes of the "menu" approach to 5G access services is very subjective based on DNB's point of view. The process of updating the service description and obligation in the MSA may involve a long duration, leading to long delays in the introduction of new 5G access services. Instead, U Mobile proposed that DNB should be fully transparent by presenting all planned services in its RAO from the outset, including all relevant details, descriptions and specifications as well as the proposed locations of its POIs to optimally link up with existing POIs operated by major MNOs.

3.80   U Mobile had the following comments on the service description for the 5G access services proposed by the MCMC:

(a)   that the 5G Standalone Access service should be described as based on a MOCN model, requiring integration between DNB's gNodeB and an Access Seeker's 5GC;

(b)   from a QoS perspective, the required minimum capabilities listed in the MCMC's proposed 5G service descriptions appear more like 5G targets or 5G capabilities, rather than minimum network requirements. U Mobile queried whether, for example, if DNB cannot meet the minimum user plane latency of 4ms or peak data rate of 10Gbps, it can still offer the Mobile Broadband slice to Access Seekers. U Mobile suggested that the Access List should set out minimum requirements for service delivery to give Access Seekers a minimum guaranteed service standard. U Mobile also proposed that minimum requirements for 5G network slice services should be governed through MSQoS determination;

(c)   For the 4G EPC with 5G RAN Access service, it would be clearer to follow the GSMA naming convention if this service is called 5G Non-Standalone (NSA) Option 3 Access service. The service descriptions as drafted allow not just MOCN sharing arrangements but also MORAN as well;

(d)   POIs should be neutrally located for all parties' equipment and fibre access.

3.81   YTLC agreed that 5G Standalone and 4G EPC with 5G RAN will allow the provision of 5G services to retail or enterprise customers, and both support MOCN technology in accordance to 3GPP and GSMA deployment options. However, in addition to the listed services and facilities in the proposed 5G service

descriptions, YTLC submitted Access Provider should provision the network slice related management functions in accordance to 3GPP TS.28.533, including but not limited to the following:

(a)   CSMF (Communication Service Management Function);

(b)   NSMF (Network Slice Management Function); and

(c)   NSSMEF (Network Slice Subnet Management Function).

3.82   YTLC noted that network slices could span across multiple parts of the network (RAN, CN and TN) depending on business requirements. YTLC submitted that Access Seekers should have an option to acquire and access the end-to-end orchestrator (**EEO**) provided by the Access Provider to facilitate and provision the network slice related requirement. YTLC proposed that the service description and functionalities be amended accordingly.

Other submissions

3.83   U Mobile commented on the need for price regulation given DNB will be the sole provider of 5G SA services and will have the incentive and ability to charge excessive wholesale prices for enterprise services, especially when the 5G coverage requirement is only needed by a sole enterprise customer. MNOs would need to pass these high wholesale prices onto their customers, causing further end-user harm. Failing to regulate reasonable 5G wholesale prices will cause excessive retail prices to the detriment of users and the Malaysian economy. U Mobile thus sought clarification on how the MCMC will ensure that DNB's pricing is reasonable before the MSAP review in 2022, to allow for 5G launch in 2021.

Discussion

3.84   The MCMC thanks operators for their detailed and considered submissions on the regulation of 5G services in the Access List, reflecting the importance of these services to Malaysia's telecommunications and digital industry.

3.85   Most operators agreed with the MCMC's proposed regulatory principles for 5G access regulation, and operators - including DNB - unanimously agreed that as the monopoly 5G Access Provider, DNB must be regulated in order to promote the LTBE.

3.86   However, MNOs, including Celcom, Digi and Maxis, as well as the 5G Access Provider, DNB, disagreed with the MCMC's application of certain elements of the proposed 5G regulatory principles. The MCMC addresses those concerns in this section, together with other comments raised by operators in respect of the MCMC's proposed approach to 5G access regulation, which can be grouped generally into three categories:

(a)   whether deployment of 5GC networks should be limited solely to DNB;

(b)   whether DNB should be permitted to supply directly to MVNOs;

(c)   whether the service description for 5G services should be amended to reflect other use cases, technologies or technical parameters; and

(d)   whether the MCMC's 5G access regulation should support a 5G MORAN model.

3.87   The MCMC deals with these issues in turn below. However, the MCMC has not commented further on operator submissions in respect of the availability of a 5G MORAN model, under which operators would theoretically control their own spectrum. The MCMC reiterates its view in the PI Paper that such a model would be inconsistent with government policy regarding the use to which 5G spectrum may be put.

Deployment of 5GC networks by operators

3.88   The MCMC acknowledges the almost unanimous submissions from operators - including from DNB, as the 5G Access Provider, as well as MNOs and other operators - that MNOs should be permitted to deploy their own 5GC networks for integration with DNB's 5G RAN.

3.89   While the MCMC affirms its preliminary view that multiple 5GC networks would risk a degree of inefficient duplication of infrastructure, the MCMC must have regard to the weight of operator submissions regarding the benefits of MNOs deploying their own 5GC networks alongside DNB, including:

(a)   each MNO will be reliant on the ability to control its own 5GC network in order to customise its services and facilitate the development of new and innovative products and 5G use cases, particularly to serve the enterprise segment, as 5G technology matures;

(b)   the greater integration costs and complexities associated with a single 5GC network model, whether integration between a single 5GC and the multiple 4G core networks of MNOs, or integration with IT systems in the context of only an MVNO-style 5G access service;

(c)   the complexity and potential coverage concerns associated with MNOs needing to enter into separate arrangements with MNOs (5G NSA) and DNB (5G SA) to complete their service offerings;

(d)   the need to incentivise MNOs to transition to access under the 5G SA access model, rather than continuing to take supply under 5G NSA whereby MNOs will continue to control core network elements;

(e)   the promotion of competition between DNB and MNOs in relation to the supply of 5G SA services to MVNOs; and

(f)   the security and resiliency concerns associated with a single 5GC network.

3.90   The MCMC also acknowledges that several operators have invested - and have plans to continue investing - in upgrading their 4G/LTE core networks to 5GC networks, as a natural evolution of their mobile technology and infrastructure. In particular, the MCMC refers to Digi's comment that telecommunications companies have already invested RM116 million in respect of the 5GDP alone. The MCMC expects that the actual amount invested by operators is likely to exceed this, with several operators having continued investing in their own virtualised (4G and 5G) core networks separate to the 5DGP.

3.91   Further, while 5GC network rollout costs are expected to be significant, the MCMC understands that the majority of 5G infrastructure costs will be incurred in deploying 5G RAN elements, which will be rolled out solely by DNB. This 5G RAN deployment model aligns generally with global trends observed by the MCMC of an increasing consolidation by MNOs of tower infrastructure, whether through RAN sharing arrangements or asset sell-down. Accordingly, the MCMC accepts that the scope for inefficiencies in the duplication of 5G infrastructure is limited, and such inefficiencies are likely - especially in the long-term - to be outweighed by the benefits highlighted in paragraph 3.89 above, all of which promote the LTBE.

3.92   The MCMC notes that it continues to hold concerns regarding the potential impact on DNB's efficient investment incentives of MNOs rolling out their own 5GC networks. As operators are aware, a key policy objective underpinning DNB's establishment as a single wholesale network operator is to provide state-of-the-art connectivity to Malaysian citizens, with DNB incentivised to roll out and transition its 5GC network over time in order to avail "true" 5G capabilities including uRLLC and mMTC services as described in the PI Paper.

3.93   If each MNO rolls out its own 5GC network, DNB may not be incentivised to deploy its own 5GC network on a national scale, and will likely not be incentivised to deploy its 5GC network with the rapidity and at the scale it would have had there been no viable 5GC alternative for Access Seekers. In particular, MNOs may focus their initial 5GC deployments in densely populated areas or enterprise applications where the 5G business case is more certain and revenues more capable of being front-loaded. This is especially relevant in the context of de-centralised 5G nodes whereby, unlike 4G/LTE core networks, the 5GC network will be co-located with applications in data centres across the country.

3.94   In that scenario, DNB would have less opportunity to earn a return on its significant investment, which in turn may affect DNB's ability to invest in its network in regional areas where MNOs may not have 5GC network infrastructure. Further, MNOs as incumbents enjoy the advantage of established systems, processes, infrastructure and personnel, meaning they would exercise a significant competitive constraint on DNB in the supply of 5G wholesale services in these highly populated areas.

3.95   No operators made any submissions regarding the impact of multiple 5GC networks on DNB's investment incentives. However, the MCMC accepts the counterfactual scenario posited by DNB that, if MNOs are prevented from deploying their own 5GC networks, they may elect to continue acquiring 5G NSA services from DNB to maintain control over core network elements, which would in any event harm DNB's efficient investment incentives to roll out its 5GC network and transition to a 5G SA model.

3.96   The MCMC considers that there are risks associated with either model, especially given the significant uncertainties in the 5G business case for Access Seekers and DNB alike. However, it is not the role of access regulation to anticipate or address every possible risk which may arise in relation to the supply of services or the potential future incentives of operators. Rather, the MCMC must focus on regulation that is the LTBE, and in this context, the MCMC considers the LTBE

would be best served under a model where MNOs can roll out their own 5GC networks.

3.97 Accordingly, on balance, taking into account the above considerations and the weight of operator submissions in favour of multiple 5GC networks, the MCMC has revised its preliminary view and considers that it would be in the LTBE for Access Seekers to be permitted to integrate their own 5GC networks with DNB's 5G RAN. This will give Access Seekers the *option* of deploying their own 5GC network, but not the *obligation* to do so.

3.98 The MCMC will accordingly amend the draft service description for the 5G Standalone Access service to facilitate this type of integration.

Supply of 5G services to MVNOs

3.99 Operators expressed a range of views regarding the MCMC's preliminary view to allow DNB to supply 5G services directly to MVNOs. Generally, MNOs expressed a desire to continue maintaining their relationships with MVNOs, while MVNOs and other operators expressed their preference for an open access model whereby any licensee can acquire 5G services directly from DNB.

3.100 The MCMC confirms its preliminary view expressed in the PI Paper that it will not limit the Access Seekers who can acquire services directly from DNB, including because the MCMC does not have the authority under the CMA to artificially limit access to any facilities or services listed on the Access List (including 5G services once listed) to particular types of licensees (e.g. MNOs).

3.101 In any event, the MCMC notes that permitting DNB to supply 5G access directly to MVNOs will not mean DNB will have a monopoly in supplying those services. Rather:

(a) in the short-medium term, as DNB's 5GC rollout progresses, MVNOs will continue to acquire MVNO Access from MNOs, as described in paragraphs 3.104 to 3.105 below; and

(b) over time, MVNOs will be able to acquire 5G services directly from DNB, but will retain the option of acquiring 5G services from MNOs in line with current practice. There will be a number of constraints on DNB's supply of 5G services to MVNOs, including:

(i) the ability for MNOs to deploy their own 5GC networks, allowing for the emergence of services-based competition between MNOs and incentivising DNB and MNOs to provide innovative wholesale services, including value-added services, to MVNOs;

(ii) each of the four large MNOs has a relatively high level of national coverage, which means that, from a technical perspective, they are capable of competing with DNB (and each other) as suppliers of MVNO access; and

(iii) compared to the acquisition of other wholesale services, MVNO arrangements tend to be relatively more complex and require a high level of commercial negotiation despite MVNO Access being listed

on the Access List. This means that DNB would need to overcome potentially significant customer acquisition hurdles to disrupt the existing relationships between the four large MNOs and MVNOs.

3.102   The MCMC also reminds operators that the MCMC will continue to adopt a dynamic and multi-faceted approach to 5G regulation, as is its approach to other telecommunications facilities and services. This includes the ability for the MCMC to regulate price and non-price matters under the MSAP and MSA.

3.103   As to the model of access, the MCMC acknowledges Astro's submissions regarding the type of MVNO access that must be supplied by DNB. The MCMC repeats its views in the PI Paper that the MCMC prefers a "menu" style of access, whereby - just like the existing MVNO Access service in the Access List - Access Seekers select those parts of DNB's available service offering which they desire, meaning MVNOs can continue to operate as "thick" or "thin" MVNOs as desired.

3.104   It is not clear to the MCMC how Access Seekers can acquire the 4G EPC with 5G RAN Access service, as noted by REDtone. The 4G EPC with 5G RAN Access service is limited to integration between DNB's gNodeB (i.e. DNB's 5G base station) and the Access Seeker's EPC. Accordingly, the MCMC expects that, until DNB rolls out its 5GC network, MVNOs will continue acquiring MVNO Access from MNOs under the existing MVNO Access service, whether in respect of 4G/LTE or, as MNOs expand their 5G capabilities (whether 5G SA using their 5GC networks, or 5G NSA using their 4G/EPC cores).

3.105   As DNB's 5GC network rollout progresses, MVNOs would then have the additional option of acquiring 5G services directly from DNB under the 5G SA service, which will permit - but not require - Access Seekers to integrate their own 5GC networks with DNB's 5G RAN.

5G service descriptions

3.106   Operators were generally supportive of the MCMC's functional approach to the proposed 5G service descriptions (subject to the submissions in respect of MNO 5GC integration and access to MVNOs as outlined above). Most operators agreed that the 4G EPC with 5G RAN and 5G Standalone Access service will allow them to supply dependent retail services.

3.107   A number of operators, including edotco, Maxis, TM, U Mobile and YTLC requested that additional clarifications and details be included across the 5G service descriptions.

3.108   The MCMC has considered these submissions, and notes as a general introductory comment that:

(a)   the role of the Access List is not to exhaustively and specifically define all possible elements of a particular facility or service, but to adopt a functional and broad approach to service description to ensure that, in adopting an exhaustive description, the scope of the service is not inadvertently narrowed;

(b)   it would be inappropriate for the Access List to set out detailed technical specifications for a particular service or facility. The MCMC has at its disposal other regulatory powers and instruments to address technical capabilities, including the MSA and MSQoS;

(c)   the draft 5G service descriptions proposed by the MCMC are drafted in a technology-neutral manner to the extent practicable, and would not limit many of the services and applications sought by operators in their submissions; and

(d)   finally, the MCMC considers that DNB will itself be naturally incentivised to make available as wide a range of services as technically feasible that might be sought by Access Seekers, in order to ensure that DNB earns a return on its investment in its 5G network and upholds its overarching objective of lifting the digital capability of Malaysians.

3.109   For the above reasons, the MCMC disagrees with edotco's submission that the functions for the 5G services should be "exhaustive". Further, the MCMC notes that the proposed service descriptions already reference that each 5G wholesale service must be provided in compliance with 3GPP Release 15 (and any updates to that standard), so the MCMC does not consider it necessary to replicate or otherwise draw on particular elements of that or other 3GPP standards in the Access List.

3.110   In relation to comments by edotco that it and other IT companies may inadvertently fall within the scope of the proposed Access List descriptions, the MCMC notes that the descriptions are already limited to access to a "5G New Radio" Mobile Network (for 5G Standalone Access) or radio network (for 4G EPC with 5G RAN). Under the access model proposed in the PI Paper, DNB would be the only provider with a 5G New Radio Mobile Network.

3.111   However, the MCMC notes that given its revised proposal to permit MNOs to supply their own 5GC, MNOs may be inadvertently captured by the 5G Standalone Access definition, which refers to a "Mobile Network". Accordingly, the MCMC proposes to clarify that the 5G Standalone Access Service is only limited to the supply of access to a 5G New Radio radio network, whether or not as part of a Mobile Network.

3.112   The MCMC accepts DNB's submissions that it will not provide voice services under the 4G EPC with 5G RAN Access, given voice services will be delivered by Access Seekers using their own 4G core networks in that context. The MCMC will amend the service description to reflect this distinction, and make corresponding adjustments in the 5G Standalone Access service to account for when an Access Seeker integrates its own 5GC with DNB's 5G RAN.

3.113   In relation to DNB's concerns regarding the proposed QoS requirements for 5G services, the MCMC notes that QoS is a critical element of 5G access and Access Seekers will be heavily (and solely) reliant on DNB to obtain services with a QoS which facilitate the supply of 5G retail services.

3.114   The MCMC acknowledges DNB's comments that the QoS requirements specified in the Access List may not be immediately available at launch and it may not be

possible for DNB to comply, as a technical and practical matter, with certain technical parameters proposed by the MCMC in respect of eMBB services in particular.

3.115   The MCMC proposes that for the period while DNB is unable to supply 5G services that comply with the 3GPP Release 15 and any updates to that standard, as specified in the service descriptions, DNB must provide the best available technical capabilities. This also addresses U Mobile's concerns regarding DNB's obligation to supply services where the specified technical capabilities may not yet be technically feasible for DNB to support.

3.116   For clarity, the MCMC expects that once DNB is capable of meeting the specific parameters that comply with the 3GPP Release 15 and any updates to that standard as set out in the service descriptions, DNB must make those parameters available to Access Seekers on request. The MCMC will closely monitor DNB's service offerings to ensure that, once those technical parameters are more widespread, that DNB supplies these in accordance with its SAOs.

3.117   The MCMC will also continue to actively consider further QoS requirements, including in DNB's RAO, in the upcoming MSA inquiry and in any future MSQoS determination, to ensure that DNB's services are of a sufficient quality to meet Access Seeker and retail and enterprise requirements or whether any adjustments are needed to promote the LTBE. This includes any adjustments or improvements that the MCMC considers are appropriate to make to the Access List to reflect any changes in DNB's capabilities e.g. as a result of additional spectrum being allocated to DNB.

3.118   DNB proposed limiting the references in the draft service descriptions to "3GPP Release 15" to 3GPP Option 3x (in 5G NSA) and Option 2 (in 5G SA). The MCMC acknowledges DNB's comments, but notes that it does not have sufficient information to assess whether this is appropriate. For example, this could have unanticipated consequences as 5G services mature, e.g. if further configurations become possible in future that are as yet unknown, or if issues are identified with the configuration chosen by DNB. In any event, given the benefits cited by DNB of its chosen options over other 3GPP options, the MCMC expects that Access Seekers would request access to DNB's selected options, but that it would be inappropriate for the MCMC to foreclose other options at this nascent stage.

3.119   The MCMC does not agree to remove access to elements such as MEC, NEF and SEPP from the 5G Standalone Access service description. The MCMC adopts a forward-looking view of regulation such that the MCMC considers what services are likely to be required by the industry in the next 4 – 5 years. As noted in the PI Paper, Access Providers are not required to build new facilities or services under the SAOs, and accordingly the Access List only operates to require Access Providers to supply access to existing facilities and services. Accordingly, given DNB's confirmation that it expects to provide these services by 2023, the MCMC does not consider there to be any need to remove these services (or any advanced 5G services such as uRLLC and mMTC) from the proposed service descriptions.

3.120   TT dotCom requested that the 5G Standalone Access service should permit Access Seekers to provide access transport services similar to Metro-E. The MCMC does

not have sufficient information to determine the potential impacts of TT dotCom's proposed changes, and prefers to retain the broad functional description currently specified in paragraph (a)(ii) of the proposed 5G Standalone Access service description. This requires DNB to support the provision of services by an Access Seeker to enterprise or government customers generally and does not prevent the service being used as an input for access transport services similar to Metro-Ethernet.

3.121   Most of the use cases proposed by TM to be included in the Access List are already reflected in the service descriptions for the proposed 5G services. Moreover, the MCMC has adopted a broad approach to regulation such that it would be both impractical and unnecessary to list all potential 5G use cases, technologies or applications. The MCMC notes in this regard that most operators submitted that the draft service descriptions proposed by the MCMC already support MOCN and other technologies e.g. MORAN, so the MCMC considers that there is no need to separately specify a 5G MOCN service.

3.122   Finally, the MCMC notes again that price and non-price terms and conditions for access to 5G and other services will be considered separately by the MCMC in later inquiries on the MSAP and MSA, and the MCMC has not responded individually to submissions made by operators in respect of matters which are more appropriately the subject of those inquiries, for example provision of data and information, privacy, OSS functionality, Access Seeker obligations and pricing.

3.123   Similarly, the MCMC has not addressed any matters which are beyond the scope of this Access List inquiry but may be addressed by other MCMC functions, such as spectrum management and compliance. Operators should raise any such concerns or questions separately with the relevant the MCMC divisions.

MCMC Views

3.124   The MCMC confirms its preliminary view to regulate two 5G services to reflect the different network architectures with which 5G services can be supplied, subject to the following clarifications:

(a)   updating 5G Standalone Access to permit integration between DNB's gNodeB and any Access Seeker 5GC; and

(b)   clarifying that voice services are not included under either service where an Access Seeker is integrating its own core network with DNB;

3.125   The MCMC's proposed service descriptions for the 5G Standalone Access and 4G EPC with 5G RAN Access services are set out below. Words that appear in underlined red text below have been added relative to the proposed description in the PI Paper, while words that appear in strikethrough text are proposed to be deleted:

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");

(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 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.*

5G Network slice (as selected by Access Seeker)	Required minimum technical capabilities	Supported service types
Mobile Broadband	User plane latency: 4 ms one-way (downlink and uplink) Control plane latency: 10 ms Peak data rate: 20Gbps (downlink) and 10Gbps (uplink) Support user data rates of 100Mbps (downlink) and 50Mbps (uplink) Such superior or other technical capabilities specified by the Access Provider for Mobile Broadband services from time to time	Enhanced mobile broadband, fixed wireless access, telehealth, VR/AR content, tele-learning platforms and systems and other 5G New Radio services supplied or to be supplied by the Access Seeker
Massive IoT	Connection density: support for 1,000,000 devices per km² Such superior or other technical capabilities specified by the Access Provider for Massive IoT services from time to time	Machine-to-machine communications, connected energy, smart cities, manufacturing and retail and other 5G New Radio services supplied or to be supplied by the Access Seeker
Mission-critical	User plane latency: <1 ms one-way (downlink and uplink) Control plane latency: <10 ms Reliability: 99.999% success rate Such superior or other technical capabilities specified by the Access Provider for Mission-critical services from time to time	Ultra-reliable low latency services, remote surgery, autonomous vehicles and other 5G New Radio services supplied or to be supplied by the Access Seeker

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 Evolved Packet Core ("EPC"), whether using anchor technology or otherwise; and

(ii) support for 3GPP Release 15 Options 3, 3a and 3x, including E-UTRA New Radio Dual Connectivity ("EN-DC") and any updates to that standard from time to time.

(d) 4G EPC with 5G RAN Access shall be supplied to the Access Seeker in compliance with 3GPP Release 15 and any updates to that standard from time to time, and with all technical capabilities as may be required to enable the Access Seeker to provide ~~the following types of services, as selected by the Access~~ Seeker *mobile broadband and similar services:*

Minimum technical capabilities	*Supported service types*
~~User plane latency: 4 ms one-way (downlink and uplink)~~ ~~Control plane latency: 20 ms~~	
~~Peak data rate: 20Gbps (downlink) and 10Gbps (uplink)~~ ~~Support user data rates of 100Mbps (downlink) and 50Mbps (uplink)~~	~~Enhanced mobile broadband, fixed wireless access, telehealth, VR/AR content, tele-learning platforms and systems and other services supplied or to be supplied by the Access Seeker~~
~~Such superior or other technical capabilities specified by the Access Provider from time to time~~	

4 Facilities access services

Infrastructure Sharing

Introduction

4.1 In the PI Paper, the MCMC took the preliminary view that it would be in the LTBE to continue regulating access to Infrastructure Sharing, given the importance of the underlying facilities in enabling any-to-any connectivity and facilitating competition in downstream markets, and the high barriers to entry to the market for tower and rooftop space access.

4.2 The MCMC accordingly proposed to maintain regulation of the Infrastructure Sharing service in the Access List, with modifications to expand the scope of the service to cover access to poles and street furniture.

Submissions Received

4.3 Altel and Net2One submitted that Infrastructure Sharing service should be expanded to cover poles and other street furniture including all types of structures that can be used to install the antennas as this will ease the network roll out in dense areas.

4.4 Altel and Net2One also agreed with the proposed amendments to the Infrastructure Sharing Service to cover poles and street furniture.

4.5 Astro, Fiberail, Ohana, U Mobile and YTLC are agreeable that the description of the Infrastructure Sharing is expanded to cover poles and other street furniture.

4.6   Celcom agreed that the service description is expanded to include special structures such as poles, Rapid Assembly Pole (Rapole) and other street furniture. Celcom made reference to the National 5G Task Force Report (Malaysia) which stated that the special structures are part of requirements for 5G deployment apart from ground-based tower and rooftop. Celcom accepts the inclusion of the terms "close proximity".

4.7   Celcom specifically highlighted that the operators who will be designated by local councils to install microcell infrastructure should strictly follow the MCMC guidelines including but not limited to the relevant technical codes developed by Malaysian Technical Standards Forum Berhad. Celcom stressed that it is very important that the structure design for street furniture for 5G provides the best technical solution.

4.8   CT Sabah does not agree that the Infrastructure Sharing service should be expanded to cover poles and street furniture as their pole design is not suitable for sharing.

4.9   Digi is agreeable to the MCMC's position to expand the description of the Infrastructure Sharing Service to cover poles and other street furniture as these are essential infrastructure to support network equipment to deliver coverage over a smaller area.

4.10   Digi utilises poles and street furniture for coverage in blind spot areas, road junctions or dense areas which are surrounded by building structures. Digi is of the view that poles and street furniture are not substitutable with tower and rooftop space access in high density areas. To date, Digi is able to leverage on the existing lamp pole and street furniture structures to improve coverage.

4.11   DNB supports the expansion of the Infrastructure Sharing Service definition to include poles and other street furniture. Additionally, DNB pointed out that access to towers and rooftops can be limited in some cases, as only one Access Seeker is able to locate antenna on a tower or a rooftop site. DNB believes this will raise its cost as it rolls out its 5G RAN and will not generate LTBE and thus, requests that the MCMC investigate these restrictions.

4.12   DNB agrees with the MCMC's assessment and supports its preliminary view for the proposed amendments to the Infrastructure Sharing Service to cover poles and street furniture as this will be crucial to DNB's rollout of 5G wireless services across Malaysia. The proposed amendments by the MCMC will ensure comprehensive coverage of the new services and facilitate quicker and cheaper acquisition of the services.

4.13   However, DNB is of the view that the MCMC's proposal to limit access to those facilities that are proximate to certain public outdoor areas will ultimately lead to the detriment of the LTBE. DNB stated that it has strong incentives to follow the proximity rule so as to minimise the cost of densifying its 5G network while maximising its RAN capacity in dense urban areas. DNB has incentives to both minimise its use of street furniture and to use only street furniture located where public activity is greatest, thus, removing the proximity condition will not lead to an undue burden on street furniture Access Providers. In fact, DNB feels this could lead to delays i.e. Access Providers could cite the need to ensure compliance with

the proximity rule as a season for denying or delaying DNB's access to street furniture.

4.14   DNB also commented that it is ambiguous and could lead to costly disputes since the MCMC has not defined a maximum distance for proximity nor has the MCMC defined all types of outdoor area that could satisfy the condition. DNB went on to state that this could lead to varied interpretations amongst operators and that it is also not practical for the MCMC to define the distance parameters as there could be many interpretations on the appropriate proximity levels. DNB therefore suggests that the MCMC removes the proximity condition from its proposed service description.

4.15   DNB supports the MCMC's proposal to include in the Access List street furniture where local councils have granted exclusive access to one or more designated operators but would like to seek clarity from the MCMC on how such access will be enforced.

4.16   edotco is very supportive of the proposal to expand the description of Infrastructure Sharing Service to cover poles and other street furniture as this is logical to facilitate the deployment of 5G networks and services in Malaysia. edotco feels that the inclusion should help Malaysia to "catch up" with its regional peers like Singapore and Thailand.

4.17   edotco generally concurs with the proposed amendment to Access List paragraph 4(7)(b) but considers that ferry terminal, pontoon or similar should be included given the use of ferries in Malaysia e.g. Penang to Butterworth, Langkawi and in Sarawak, etc. Additionally, edotco considers that overhead pedestrian walkways should be included within the definition.

4.18   Maxis agrees with the MCMC's view that it would be in the LTBE for the Infrastructure Sharing Service to remain listed on the Access List as it promotes downstream competition and encourages and facilitates the efficient use of the existing infrastructure. Maxis further commented that the description should be improved by being expanded to cover poles and street furniture and for completeness to also include rooftops and buildings.

4.19   Maxis proposed that poles for fixed telecommunications infrastructure to be included under the Poles, Ducts and Manhole section to avoid potential dispute between operators on the obligation to provide access to the fixed telecommunications poles if it is included under the Infrastructure Sharing Services which has always been linked to the mobile / cellular telecommunications infrastructure.

4.20   Maxis noted that the state of competition in the supply of Infrastructure Sharing services has weakened since 2015 where there are limited or no substitutable services, hence Maxis is of the view that all types of Infrastructure Sharing Services including poles, rooftop and street furniture should be regulated in the Access List. Maxis adds that this will assist with JENDELA targets through enabling any-to-any connectivity and facilitating competition in downstream markets.

4.21   Maxis proposes to follow the definitions as per the GPP-I-2020 document by the MCMC with regard to proximity of such furniture or equipment to public outdoor areas.

4.22   With regards to the scope of IBC, Maxis proposes that DAS and radiating/ leaky cable be included as part of IBC to facilitate the efficient use of existing infrastructure i.e. LRT tunnel, MRT tunnel, etc. Additionally, Maxis propose the regulation of IBC to be applicable only for IBC services within the public areas, namely, malls, airport, hospital etc.

4.23   Ohana is of the view that the Infrastructure Sharing service is an important facility to increase 4G capacity and 5G rollout. Ohana added that the SBC's "exclusivity" or monopolizing the capability to build and own the telecommunications infrastructure should not be allowed as this is an obstacle to the development of telecommunications infrastructure i.e. delay to the 4G/ 5G rollout. Ohana also stated that there should be dynamic competition in supplying these services.

4.24   REDtone agreed that the description of the Infrastructure Sharing service is expanded to cover poles and other street furniture to support the development of JENDELA and especially 5G. Poles and street furniture are important for placement of network equipment. REDtone also added that it helps to provide line-of-sight connections and large-scale area coverage for 5G.

4.25   SACOFA agreed that the description of the Infrastructure Sharing service should be expanded to cover poles and other street furniture as the structures will be utilised when 5G is rolled out and micro cells are to be affixed thereto.

4.26   TM agreed that the description of Infrastructure Sharing Service should be expanded to cover poles and other street furniture but proposes to limit the scope to non-telecommunications poles and for the mobile use case only i.e. 5G / Fixed Wireless Access. TM stated that its poles are not designed to support additional network equipment and are mostly loaded to full capacity. In addition, TM's poles do not fulfil the technical specifications provided under the MTFSB standards i.e. access to street furniture to be at least 10-18m in height.

4.27   TM pointed out that access to poles in comparable markets such as Thailand have also focused on utility poles as they are structurally sturdier compared to telecommunications poles and could bear additional loading.

4.28   In terms of location, TM stated that its poles are mostly deployed in non-urban or rural areas. Given that the use case for access to poles and street furniture is related to 5G deployment at urban settings, it is unlikely that TM's poles would be used for the deployment of 5G networks.

4.29   TM observed that the MCMC has not conducted a detailed assessment and does not have sufficient evidence on the inclusion of "bottleneck" facilities and services in the Access List or the LTBE. Thus, the MCMC is not in a position to conclude inclusion of access to pole and street furniture in the context of fixed network services.

4.30   TM suggested that the service description for Infrastructure Sharing should specify the exclusion of telecommunications poles and that the use of poles and

other street furniture should be limited to mobile use case only. TM also provided its opinion with regard to rooftop tower sites, in-building right-of-way, MDF room and cable gantry. TM proposes that the MCMC includes rooftop tower sites and in-building access as currently right-of-way is not applicable to towers located on rooftops of commercial buildings i.e. rooftop tower sites.

4.31   TM proposes the MCMC includes in-building access to rooftop towers sites as TM faces impediments in gaining access to these infrastructures as Access Providers have been charging high prices for access to these infrastructures. The high cost of access is due to the right-of-way charges that are also charged for buildings that do not belong to the Access Providers. TM would like the MCMC to clarify that rooftop towers and in-building access for Access Seeker's fibre similar to right-of-way on land are included in Infrastructure Sharing Service.

4.32   TM recommends that the MCMC consider including access to MDF rooms and cable gantries in buildings where it is exclusively controlled by a single licensee including Data Centres to be part of Infrastructure Sharing. Further, TM also urged to review the access prices to MDF room and cable gantry. TM commented that the high prices create a barrier to access and impedes network deployment.

4.33   TT dotCom is of the opinion that including network facilities into the Access List disregards the application of sections 228 to 230 of the CMA. This will allow licensees to access all forms of network facilities and posts (whether owned by network facility providers or public utility) and ensure efficient use of the infrastructure for communications.

4.34   TT dotCom believes determination of network facilities as an access service causes the access regime to be applicable instead of relying on sections 228 to 230 of the CMA. This in turn raises questions of its suitability and effectiveness in enabling access to seekers wanting to use such network facilities in a timely manner. TT dotCom went on to add that the key benefit of regulating under sections 228 to 230 is to allow the MCMC to regulate rates and terms for access and to empower the Minister to make regulations applicable to specific facilities by specific providers or public utilities. The MCMC would also be empowered to undertake an asymmetric regulatory approach, which is an effective and efficient form of regulation.

4.35   TT dotCom concluded that it is best not to include these facilities in the Access List and instead be treated under sections 228 to 230 of the CMA.

4.36   U Mobile submitted that the proposed amendments to the Infrastructure Sharing service to cover poles and street furniture should not be limited to 5G services but to all services that contribute to LTBE. All service providers should be provided equal access and regulating this service would ensure all local councils or owners of poles and street furniture to grant approvals or permits. U Mobile added that service providers should be granted approvals to build poles in areas that do not have poles.

4.37   YTLC suggested street furniture to be included in the ambit of the licencing regime as street furniture is used to provide network facilities which are licensable under the CMA. In addition, YTLC proposed that the description of physical access in 4(7)(c) is expanded to include right of way for installation of power and fibre optic

cables. YTLC stated that this should not be treated as additional access with separate rates and charges as the proposed inclusion in the service description would facilitate the provisioning of power and fiber to the sites.

Discussion

4.38   Nearly all operators agreed to the MCMC's proposal to expand the scope of the Infrastructure Sharing Service to include poles and street furniture, although Celcom Timur (Sabah) disagreed, citing that its pole design is not suitable for sharing, while TT dotCom stated that the Access List is not the appropriate vehicle for regulation of these facilities.

4.39   The MCMC does not agree with the submissions of Celcom Timur (Sabah) or TT dotCom. In particular:

(a)   in relation to Celcom Timur (Sabah), the MCMC refers to its comments in paragraphs 4.43 to 4.46 below regarding the role of the Access List versus other instruments and codes which govern physical constraints and technical specifications associated with the supply of access to facilities and services; and

(b)   in relation to TT dotCom's submission that there are greater benefits of regulation of street furniture facilities under sections 228 to 230 – i.e. enabling the MCMC to regulate rates and terms for access – the MCMC notes that these powers are in any event available to the MCMC under the MSA and MSAP once the relevant facilities are listed on the Access List. The MCMC has reiterated on many occasions that on balance access to bottleneck facilities should be symmetric and imposed on any operator holding these facilities.

4.40   A number of operators commented that the scope of street furniture should be expanded to cover specific types of street furniture, such as ferry terminals, pontoons and overhead pedestrian walkways (as submitted by edotco) and fixed telecommunications poles, rooftops and buildings (as submitted by Maxis). However, the MCMC notes that it has taken a broad and functional approach to service description such that even if a particular facility is not listed as an example in the draft service description, provided it falls within the scope of the service as described, it will be covered by the Access List and hence subject to SAOs. Accordingly, the MCMC does not consider it necessary to list each of these facilities in the service description.

4.41   The MCMC acknowledges the concerns cited by DNB regarding the potential for Access Providers to dispute the meaning of what street furniture is in "close proximity" to a street or other outdoor public area. However, the MCMC will maintain its preliminary view to limit the scope of the service description as proposed, because:

(a)   it would be inappropriate and impractical to regulate access to every single facility which can support the installation of telecommunications infrastructure. The MCMC must not only consider the regulatory burden on Access Providers, but also whether this could lead to unanticipated and unintended outcomes; and

(b) it is consistent with current global regulatory trends for the scope of access to be limited by reference to public areas.[15]

4.42 However, the MCMC has amended the proposed service description to include facilities which are inside (and not merely alongside or in close proximity to) parks and public outdoor areas, and the MCMC proposes to amend the service description to reflect this. The MCMC also proposes to expressly clarify that that access to rooftop space is included within the scope of this service, noting requests by TM and DNB that this be clarified. The MCMC has already noted in the PI Paper that there are issues in the supply of access to these facilities including high barriers to entry, and accordingly it would be in the LTBE to expressly list these facilities on the Access List.

4.43 A recurring theme within submissions is the concern raised by operators regarding the capability for street furniture to support the loads associated with micro-cell deployment, as noted by Celcom Timur (Sabah) and TM. The MCMC refers to its comments on these issues as noted in the PI Paper and reminds operators that it is not the role of the Access List to account for or anticipate potential capacity or physical constraint issues.

4.44 In this regard, the potential physical space constraints cited by operators in the context of access to street furniture are essentially no different to the constraints of which the MCMC is aware in other contexts, such as Duct and Manhole Access and Network Co-Location. These issues are to be brought to the MCMC's attention by Access Providers under the reporting obligations set out in the MSA, while Access Seekers should also report any issues they experience in accessing facilities and services on the Access List. However, this does not mean that the services should not be listed on the Access List.

4.45 Further, as noted in the PI Paper, the MCMC reminds operators that there are several registered technical codes developed by the Malaysian Technical Standards Forum Berhad that address issues such as wind resistance and weight load, which can be updated as required in future to support the increased load expected on poles and street furniture due to the deployment of 5G micro-cell and similar infrastructure on those facilities. However, this exercise is beyond the scope of this Access List inquiry.

4.46 Similarly, for these reasons, the MCMC does not agree to TM's proposal to limit the scope of the expansions to mobile use cases only, or to exclude fixed telecommunications poles from the service description because TM's telecommunications poles are not suitable for deployment of 5G networks. Whether a particular pole or other type of street furniture is technically capable of supporting micro-cells or other facilities is not a matter for the Access List, but will be assessed based on technical codes referred to above. Further, if any specific poles are for some reason not suitable for sharing, or there is insufficient space for installation of Access Seeker Equipment, the MSA already contains provisions setting out grounds on which access may be refused (e.g. where it is

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[15] For example, the TRAI in India is currently consulting on access to street furniture that comprises an object "in public space", while the UK government has launched a Digital Connectivity Infrastructure Accelerator program focusing on access to publicly owned buildings and curb-side infrastructure.

not technically feasible to provide the access requested).[16] The MCMC's expectation is that access to poles will be provided unless these grounds are satisfied.

4.47   Given the criticality of these facilities to 5G deployment in Malaysia, the MCMC does not consider it appropriate to pre-empt what DNB's requirements may be, and in this case proposes to adopt a balanced approach to access regulation which takes into account the burden on Access Providers and the significant LTBE considerations. Taken together, these considerations weigh in favour of a facility-neutral approach to access regulation.

4.48   The MCMC acknowledges TM's submission that data centre access should be included within the scope of this service description, but the MCMC still does not have sufficient information to determine whether this would be in the LTBE, and the MCMC will also need to consider its powers to do so within the existing regulatory framework. Accordingly, the MCMC does not propose to regulate access to data centres at this time, however this will be a key focus of the MCMC in future, in line with the role expected to be played by data centres to achieve the government's MyDigital vision.

4.49   The MCMC agrees with U Mobile's submission that access to poles and street furniture is not limited to 5G services, and refers to the draft service description which is facility and technology-neutral.

4.50   With regard to YTLC's submission that the description of physical access in paragraph 4(7)(c) should be expanded to include right-of-way for installation of power and fibre optic cables, the MCMC notes that the current service description is already drafted sufficiently broadly to cover this type of access, but the MCMC proposes to expressly clarify this to minimise scope for disputes. In particular, given Access Providers are required under the MSA to ensure the provision of all necessary utilities and ancillary services, including power and back-up power, the MCMC considers that it would be consistent with the objects of the regulatory framework to ensure that Access Seekers can install any power-related equipment as required.

4.51   Finally, the MCMC acknowledges comments from operators including DNB regarding facilities owned or operated by SBCs or local councils, etc. The MCMC refers to its comments in the PI Paper regarding its ongoing efforts to engage with Senior State Officials of the relevant states to address these issues to the extent practicable.

MCMC Views

4.52   The MCMC confirms its preliminary view that it would be in the LTBE for the Infrastructure Sharing service to remain listed on the Access List with modifications to expand the scope of the services to cover access to pole and street furniture. The MCMC also proposes to make the following changes to the draft service description proposed in the PI Paper, to clarify that:

(a)   physical space includes access to rooftop space;

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[16] Commission Determination on the Mandatory Standard of Access, Determination No. 3 of 2016, section 5.4.11.

(b) access must be provided to facilities which are located in outdoor public spaces such as parks; and

(c) physical access includes right-of-way for installation of power.

4.53 The revised service description for the Infrastructure Sharing service is as follows:

4(7) Infrastructure Sharing

(a) Infrastructure Sharing is a Facility and/or Service which comprises the following:

(i) provision of physical access, which refers to the provision of space (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 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.

Duct and Manhole Access

Introduction

4.54 In the PI Paper, the MCMC took the preliminary view that it would be in the LTBE for Duct and Manhole Access to be retained in the Access List, given the broader bottlenecks observed by the MCMC in these facilities and services since the 2015

Access List Review, and the potential impacts on competition if Duct and Manhole Access were to be removed from the Access List.

4.55   The MCMC also proposed to expand the scope of the regulated service to lead-in ducts, mainline ducts, inter-exchange ducts and manholes on an unbundled basis, and to clarify the obligation of Access Providers to provide access to the land upon which such infrastructure is located.

Submissions Received

4.56   Altel, Celcom Timur (Sabah), Digi, Net2One, REDtone, U Mobile and YTLC agree that the MCMC should continue to regulate access to duct and manhole infrastructure.

4.57   Altel and Net2One agree that the scope of the duct and manhole infrastructure which the MCMC now proposes to regulate (lead-in ducts, mainline ducts, inter-exchange ducts, each on a nationwide basis) is the correct scope for access regulation since the changes proposed to the service description have given clarity on the Access Seeker's right and the obligation of Access Providers to provide access to the land where such infrastructure is located.

4.58   REDtone agree with the scope of the duct and manhole infrastructure that MCMC proposes to regulate.

4.59   Altel, Digi, DNB, Net2One and YTLC agree with the MCMC's proposed new definition for inter-exchange ducts.

4.60   Astro agrees that the MCMC should continue to regulate access to duct and manhole infrastructure to encourage competition as having it regulated will reduce the cost of deploying fiber for the ISPs which may be an alternative that could lower the barriers of entry for the ISPs.

4.61   Astro, Celcom Timur (Sabah), DNB and REDtone agree that the MCMC should regulate the lead-in ducts, mainline ducts and inter-exchange ducts, each, on a nationwide basis.

4.62   Celcom commented that it is important to regulate access to duct and manhole infrastructure especially in the brownfields where access to incumbent's network is essential to ensure competition in the retail market. Celcom pointed out that the infrastructure in brownfields is uneconomical to duplicate, especially the 'last mile' access network. Celcom stated that this network is particularly an important input to accelerate the realization of JENDELA targets. The duct and manhole infrastructure is a bottleneck facility and requires regulatory intervention. Any claims of impediments in supplying the service must therefore be thoroughly investigated to avoid inappropriate denial of supply.

4.63   Celcom accepts the scope of duct and manhole infrastructure and definition of interexchange duct as proposed by the MCMC.

4.64   Digi is agreeable to the MCMC's position to expand the scope of duct and manhole infrastructure to include lead-in ducts, inter-exchange ducts, each on a nationwide basis. In addition, Digi would like the scope of duct and manhole infrastructure to include telecommunication sites, tower, building, etc. Digi would like Access

Providers to allow Access Seeker, its nominated employees and/or operators to physically access the Access Provider's network facilities and the Access Seeker's Equipment to perform operation or maintenance activities.

4.65   DNB agrees that the MCMC should continue to regulate access to duct and manhole infrastructure as it offers a route to obtaining the backhaul and fronthaul connectivity that DNB will require as it builds out its 5G access network. DNB also stated that this will help DNB to deliver its core objective to provide state-of-the-art connectivity and the duct and manhole may be especially important if the dark fiber is not added to the Access List.

4.66   edotco strongly supports the MCMC continuing to regulate access to duct and manhole infrastructure since it is essential for the fiberisation of towerco and related sites which is needed for 4G and 5G services. edotco believes this is the most efficient, cost effective and less disruptive (in terms of trenching of roads etc.) approach.

4.67   edotco highlighted that as key information related to the service is not available from the main Access Providers, this becomes a challenge to obtain physical access. edotco recommended to establish a database and/or process to expedite the process of acquiring the service from the Access Provider. edotco further opined that the MCMC could assist with the formulation of a standard database which could incorporate high-level information as well as standardising the applicable technical guidelines in relation to the facilities.

4.68   edotco reiterates that aerial/overhead type of lead-in should be included within the scope of the duct and manhole infrastructure definition. edotco believes it should be open to the Access Seeker to leverage the Access Providers' aerial infrastructure (e.g. 9 metre telco concrete pole, etc.) subject to the normal access conditions in the MSA/MSAP. edotco added that the same access arguments should apply to an underground duct space etc.

4.69   edotco strongly supports the proposed new definition for "Inter-exchange Duct" because ducts are already a bottleneck facility and, in the long run, will become even more important as all mobile sites for 4G and 5G will need to be fiberized to increase their transmission speed, and network uptime etc. Providing access to such inter-exchange duct is important as it is difficult to acquire approvals from the local councils for MNOs/infracos to lay new fibre infrastructure. The difficulties continue to persist notwithstanding the overarching Government policy supporting fiberisation via JENDELA and the Malaysia Digital Blueprint and ever-increasing demand from consumers especially during pandemic.

4.70   edotco further commented on exclusive zones pertaining to these ducts. edotco submitted that exclusivity granted by the property owner on a single site or a piece of land should be respected, as edotco believes the property owner should be allowed to select a preferred infrastructure provider. The property owner may have a range of reasons for selecting a single provider or a small number of providers (i.e. physical security, difficulty of access, limited space etc). edotco noted another reason that access may be provided on a commercial basis is where an owner may be seeking a much higher level of redundancy or alternate routing than normal, and the trade-off is perhaps then to have some level of exclusivity.

edotco provided the example of KLIA, which has a demanding client base in the case of Malaysian Airports Berhad.

4.71   edotco went on to discuss exclusive rights either to a State or a particular region (i.e. Putrajaya). edotco highlighted that it is not in support of such exclusivity, which has an adverse impact on competition over a wide area and population. edotco has stronger objections with regards to the exclusivity rights granted to TM by Putrajaya Corporation, as TM's exclusive rights by the Government does not have an expiry date and such arrangement effectively closes the door to competition and innovation in Putrajaya in perpetuity. edotco would like the MCMC to address such exclusivity needs when it comes to the proposed new definition for "Inter-exchange Duct".

4.72   Fiberail agrees that the MCMC should continue to regulate access to duct and manhole infrastructure, but without amendment to the current service description. Fiberail does not agree with the MCMC's proposed amendment as the current definition and its scope for exclusive areas is sufficient. Opening up access to ducts and manhole on a nationwide basis may eventually lead to lower investment by an operator for new ducts and manhole, which will be detrimental to the industry as a whole.

4.73   Maxis firmly supports the MCMC's view that access to duct and manhole infrastructure should continue to be regulated and proposes that it should be expanded to also include poles for fixed telecommunication infrastructure that have the capability to support the installation of fixed network equipment such as fibre cables, etc.

4.74   Maxis provided the following reasons that align with the LTBE to support its view above and noted that the continued regulation of duct and manhole infrastructure will support infrastructure competition and improve conditions for infrastructure entry in the longer run:

(a)   Drive infrastructure-based competition in a fixed broadband market characterised by low current penetration, ambitious JENDELA growth targets i.e. 2.2. million newly fiberized premises between 2021 and 2022 and a high degree of concentration with the incumbent fixed-line operator to rapidly increase fixed broadband penetration in Malaysia;

(b)   Aerial connectivity delivered by poles has significantly lower cost than laying underground cables, enabling lower cost of access and with savings that can be passed on to end users. Maxis estimates the cost of using poles to deploy fibre as up to 50-60% lower than laying fibre underground;

(c)   Facilitate the accelerated deployment of fibre transmission network e.g. fibre backhaul for mobile sites requires significant CAPEX investment. Greater sharing will reduce these costs, accelerating the rate of fiberization in Malaysia. This would be especially beneficial to East Malaysia and other less developed parts of the country where transmission distances are longer;

(d)   Markets with the highest growth in fixed broadband connections have regulated access to poles and other street furniture. Maxis benchmarked

major countries i.e. UK, Spain, Australia and France that have typically deployed symmetric regulation on poles except for Spain which has an asymmetric regulation targeting only the national incumbent Telefonica. Maxis noted that as a regulatory intervention, poles regulation has succeeded in reducing infrastructure access prices significantly in markets where it has been applied, and hence, helped drive more rapid FTTP penetration.

4.75   Maxis agrees with the MCMC's proposal to expand the scope of the regulation to regulate PDM as well as to retain existing regulation given the bottleneck nature of these facilities. The regulation would help promote downstream competition and encourage efficient use of poles, ducts and manhole infrastructure. To avoid dispute between carriers, Maxis proposes poles for fixed telecommunication infrastructure be included under the existing duct and manhole access service to form a new Poles, Ducts and Manhole Access Service.

4.76   On the service description proposed by the MCMC, Maxis highlighted the importance of including PDM that was developed by the developer, building owner etc. but was handed over to the Access Provider by the developer or building owner, for the rights to develop, use, maintain etc., via contracts, arrangements or understandings between the Access Provider and the developer, building owner etc. This is another bottleneck situation and challenge faced by the Access Seekers to provide their retail services to the end users, as Access Seekers need to liaise or request from the Access Provider to use the PDM.

4.77   Maxis strongly agrees with the MCMC's view to expand the scope of ducts and manhole services as Access Seekers will be more easily able to obtain access for the purposes of laying fibre to connect to equipment co-located in the Access Provider's building, including from the manhole immediately outside the Access Provider's premises boundary.

4.78   As for the proposed new definition for "Inter-exchange Duct", Maxis commented that the term "…locations" should be replaced with the term "premises", to avoid the term being too generic in nature as it could be broadly interpreted. Maxis proposed provided its proposed definitions for "Lead-in Poles and/or Duct", "Mainline Poles and/or Duct" and "Inter-exchange Poles and/or Duct".

4.79   SACOFA agrees for the MCMC to continue regulating last mile access to buildings e.g. those under developer, areas with limited access or way leave issues and separate duct ways and manhole for different operators. However, SACOFA does not agree with the MCMC continuing to regulate Infrastructure Sharing for trunk and access due to maintenance concerns of infrastructure and security of network. SACOFA proposed that the scope of regulation should be extended to the proposed items above.

4.80   TM agrees that the MCMC should continue to regulate access to duct and manhole infrastructure and strongly recommends that the MCMC maintains the existing 2015 obligations without broadening its scope, i.e. lead-in ducts nationwide, mainline ducts only in exclusive areas, no inter-exchange ducts, sub-ducts access to be limited to the scope of Duct and Manhole Access and this excludes Putrajaya as per the MSA conducted by the MCMC in 2015.   TM pointed out that there is no

evidence of market failure to necessitate further changes to this service and added that the current access regime in Malaysia is already more stringent compared to Singapore.

4.81   TM highlighted that there are significant security risks from the increased scope, namely, damages caused by other technicians, theft and criminal acts. The security breaches are not fictional as there has been occurrence in other developed markets like Singapore and the USA. Furthermore, TM's network is supporting all national stakeholders including residential homes, enterprises and government entities and it is essential to maintain the 2015 scope to protect the TM's critical infrastructure from potential threats.

4.82   While broadening the scope to nationwide is intended to address bottlenecks, TM stated that the bottlenecks are only present in the access areas. Therefore, TM submitted that the 2015 scope is sufficient to address these bottlenecks and the current regulation is in line with best practice markets such as Singapore. TM also stated that there is no need for further expansion of Duct and Manhole Access, since broadening the scope of other services in the Access List, such as leased lines and HSBB Network Services, would have achieved the MCMC's objective of improving service-based competition.

4.83   TM believes that the nationwide Duct and Manhole Access obligations will encourage Access Seekers to "cherry pick" and deploy in profitable areas, which will in turn penalise the Access Providers who funded the initial nationwide roll-out. This would result in duplication of infrastructure and disincentivise further roll-out in greenfield and rural areas to the detriment of JENDELA targets.

4.84   TM stated that most MNOs still have a strong preference to use their existing infrastructure i.e. microwave backhaul and the broadening of the definition by the MCMC will not likely to result in MNOs deploying fiber backhaul since 5G backhaul will also be consolidated under DNB.

4.85   TM concluded that the MCMC would need to consider the operational challenges posed by broadening the scope of Duct and Manhole Access to apply on a nationwide basis, as nationwide access requires significant manpower to track and monitor the infrastructure.

4.86   TM proposes that the Inter-exchange Duct Service be excluded from the scope of Duct and Manhole Access, as the main challenge is obtaining state or local council permits for access to land. TM believes the MCMC should therefore focus on addressing the main barriers of deployment. The exclusion is also in line with best practice markets, such as Singapore.

4.87   TT dotCom is of the view that the MCMC should not regulate access to duct and manhole infrastructure in the Access List and treat it under sections 228 to 230 of the CMA, similar to its opinion for Infrastructure Sharing service.

4.88   U Mobile agreed that the MCMC should continue to regulate access to duct and manhole infrastructure, and proposed to include poles for fixed infrastructure e.g. fibre. U Mobile believes the MCMC should also regulate access manholes to any building, swap or lease mainline duct or sub-duct and swap or lease inter-exchange duct or sub-duct.

4.89   YTLC agrees with the MCMC on the scope of the duct and manhole infrastructure which the MCMC now proposes to regulate, but proposed changes to the definition for lead-in ducts. YTLC proposed the definition of "Lead-in Duct" to mean a duct which extends from an End User, Access Seeker or Access Provider location to the first manhole associated with such a duct. YTLC also proposed that the network diagram be included in the definition for illustration purposes.

Discussion

4.90   Operators generally supported the MCMC's preliminary view to retain Duct and Manhole Access on the Access List, with most operators also supporting the MCMC's proposal to expand this service to include lead-in ducts, mainline ducts, inter-exchange ducts and manholes on an unbundled basis.

4.91   Some operators, including Fiberail and TM, submitted its views that the proposed expansions are too broad and should not be made, while TT dotCom submitted that the MCMC should altogether remove Duct and Manhole Access from the Access List and instead treat it under sections 228 to 230 of the CMA.

4.92   In relation to TM's submissions, the MCMC notes that:

(a)   the MCMC remains concerned about the broader bottlenecks observed by the MCMC in access to these facilities and services since the 2015 Access List review, and accordingly the MCMC does not agree with TM's statement that there is no evidence of market failure;

(b)   given the upcoming industry-wide changes expected as a result of the Malaysian 5G model, including the establishment of DNB as the 5G single wholesale network provider, it is critical that Access Seekers are able to obtain access to this service as intended, with reduced ambiguity as to whether the service is in fact within the scope of the Access List;

(c)   the MCMC considers that the risk of duplication of infrastructure is greater if the original service description were to be retained and existing challenges continued to prevail. Because these are bottleneck facilities, Access Seekers who are unable to acquire access to these facilities may have no other choice but to duplicate these facilities if the Duct and Manhole Access service is not expanded;

(d)   security-related considerations are primarily the subject of the MSA and access agreements between operators, rather than the Access List. In this regard, the MCMC notes that many facilities and services listed on the Access List are prone to security risks but that it is not the role of the Access List to address such risks. Security risks are managed in every other jurisdiction in which duct access is required to be provided. This issue is not sufficient, in and of itself, to warrant non-inclusion in the Access List. However, to address TM's concerns, the MCMC will consider and implement separate processes (whether under the MSA or otherwise) to ensure that reasonable security arrangements for access to these facilities are in place. The MCMC will closely monitor compliance with these processes by access seekers and take any enforcement action necessary to address any instances of non-compliance;

(e) the MCMC has adopted a balanced approach to regulating Duct and Manhole Access taking into account the need to balance the operational burden on Access Providers if the scope of the service is to be expanded. However, it is now evident to the MCMC that the current access regulation is not supporting the conditions of supply and competition that was intended by the MCMC under the original (narrower) service description, meaning the current regulatory framework is not fit for its intended purpose. At the same time, the MCMC has elected, for example, not to expand the scope of access to sub-ducts, in line with international practice and in recognition of the need to balance Access Seeker and Access Provider interests; and

(f) the infrastructure conditions in Singapore are different to Malaysia. Singapore, as a city state, has less reliance on inter-exchange ducting systems and wider availability of those ducting systems from other sources (e.g. electricity). In this way, the MCMC notes that Malaysia is more similar to other jurisdictions such as Australia, where inter-exchange duct access remains a bottleneck and is regulated.

4.93 While the MCMC acknowledges concerns raised by Fiberail regarding investment incentives for existing duct owners and operators if the scope of Duct and Manhole Access is expanded as proposed, the MCMC must also have regard to the efficient use of existing infrastructure to enable Access Seekers to develop new and innovative services and ultimately downstream competition. As Duct and Manhole Access is a key bottleneck facility, the MCMC must balance the concerns raised by Fiberail against the key LTBE benefits of expanding regulation.

4.94 Further, in response to TT dotCom's submissions, the MCMC repeats its comments in the 2015 Access List Review that it has previously supported the approach of pursuing regulation under section 228 of the CMA, yet the lack of industry consensus about the proper scope of or approach to access to ducts and manholes means it is necessary to list these facilities in the Access List to enable any MSA and MSAP regulation.

4.95 In relation to submissions by operators such as Maxis and U Mobile that fixed infrastructure poles should also be included, the MCMC notes that these facilities are covered by the proposed expansions to the Infrastructure Sharing service, as noted in paragraphs 4.52 to 4.53 above. The MCMC repeats these comments in respect of Digi's proposal for the Duct and Manhole Access service to be expanded to cover telecommunications sites and towers, which are more appropriately addressed under the Infrastructure Sharing service. Accordingly, the MCMC does not consider that these facilities should also be set out under the Duct and Manhole Access service.

4.96 edotco was the only operator to submit that aerial and overhead lead-in infrastructure should be regulated in the Access List. The MCMC still does not consider that there is sufficient evidence to support these facilities acting as effective substitutes for duct and manhole access, and in any event the MCMC's proposed expansions to the Infrastructure Sharing service should facilitate access of the type sought by edotco e.g. telecommunications poles, etc.

4.97   Finally, regarding comments by operators in respect of challenges experienced in exclusive zones and provision of information, the MCMC's views in respect of these matters are as set out in the PI Paper and are not repeated in detail in this PI Report. However, the MCMC adds that it would be inappropriate to selectively exclude exclusive arrangements from the Duct and Manhole Access service as proposed by edotco, as this would undermine the purpose of the MCMC's proposed changes to the scope of the service, which are intended to provide greater transparency to operators and rectify issues reported by Access Seekers in acquiring this service. Further, any information and transparency obligations will be dealt with in the context of a later the MCMC inquiry into the MSA.

MCMC Views

4.98   The MCMC confirms its preliminary view that it would be in the LTBE for the Duct and Manhole Access to be retained in the Access List with modifications to broaden the scope of duct and infrastructure included within the listed service and clarify the obligation of Access Providers, as follows:

4(20) Duct and Manhole Access

(a)   *Duct and Manhole Access is a Facility and/or Service which comprises provision of physical access to, at the Access Seeker's discretion, one or more of the following elements:*

(i)   *Lead-in Ducts and associated manholes;*

(ii)   *Mainline Ducts and associated manholes in areas in which a single operator has exclusive rights to develop or maintain duct and manhole infrastructure, whether or not in combination with other Facilities and Services;*

(iii)   *Inter-exchange Ducts;*

(iv)   *manholes, including any manholes associated with Lead-in Ducts, Mainline Ducts or Inter-exchange Ducts; and*

(iiiv)   *sub-ducts where there is no room for the Access Seeker to install its own sub-ducts.*

(b)   *Provision of physical access includes the provision of, or procurement of the provision of:*

(i)   *space at specified network facilities to enable an Access Seeker to install and maintain its own lines, equipment and sub-ducts; and*

(ii)   *access for the personnel of the Access Seeker, including to the land upon which any Lead-in Ducts, Mainline Ducts, Inter-exchange Ducts, sub-ducts and manholes are situated.*

(c)   *Exclusive rights to develop or maintain duct and manhole infrastructure includes exclusive rights in contracts, arrangements or understandings between the Access Provider and any person.*

4.99   Further, the MCMC confirms its preliminary view to amend the definition of "Lead-in Duct" to clarify that Lead-in Duct access is not limited to residential End User locations, but includes any Access Provider location, as follows:

> *"Lead-in Duct"* means a duct which extends from an End User <u>*or Access Provider*</u> location to the first manhole associated with such a duct.

4.100   Finally, the MCMC confirms its preliminary view to introduce the following new definition associated with the revised Duct and Manhole Access service:

> *"Inter-exchange Duct"* means each duct or series of ducts that connects (whether directly or indirectly) between two Access Provider locations, including exchange buildings.

5   Interconnection services

Interconnect Link Service

Introduction

5.1   The MCMC's preliminary view in the PI Paper was that it would be in the LTBE for the Interconnect Link Service to remain on the Access List, given SS7-based interconnect links are a key bottleneck facility.

5.2   The MCMC also proposed to expand the scope of the Interconnect Link Service to include IP-based interconnect links, given this would assist in achieving the objective of any-to-any connectivity in relation to communications services, consistent with the LTBE. Operators also generally expressed widespread support for this approach.

Submissions Received

5.3   Altel and Net2One require M2M, IOT, VoLTE, ViLTE and RCS Services for IP-based interconnection.

5.4   Altel and Net2One plan to acquire and supply IP-based interconnection on a commercial basis for industry usage and commented that they have not experienced any barrier or difficulties in acquiring the service.

5.5   Altel, Astro, DNB, Fiberail, Net2One, SACOFA and U Mobile agreed with the MCMC's proposed approach to include IP-based interconnection within the Interconnect Link Service.

5.6   Astro acquires the IP based interconnection on both commercial and via the registration of Access Agreement. Astro commented that it does not face any barriers at present in acquiring the service. Astro proposed for throughput monitoring and utilization report to be included as features to the amended service description, if the service description is amended.

5.7   Astro agreed that bandwidth be included within the scope of Interconnect Link Service for both SS7 and IP-based interconnection where the incremental for such bandwidth should be as follows:

(a)   5Mbps and 10Mbps for FE;

(b)   100Mbps for GE; and

(c)   1Gbps, 10Gbps and 100Gbps for 10GE.

5.8   Celcom stated that the Interconnect Link Service enables the function of interconnection service which provides its customers with call termination to other fixed and mobile networks. Celcom further stated that this functionality enables any-to-any connectivity. Celcom noted that it acquires and supplies IP-based interconnection and that operators have recently agreed to migrate interconnection via SS7 to IP-based interconnection. Celcom also added that the operators have signed supplemental agreements on this.

5.9   Celcom agreed to include IP-based interconnection within the Interconnect Link Service description and stated that operators have already migrated to IP-based interconnection. Since IP interconnection uses Ethernet transport technologies and SIP signalling, Celcom proposed that bandwidth be offered in the increment of 1Gbps.

5.10   Digi utilises IP-based interconnection for voice and signalling traffic. Digi enters into a bilateral arrangement for IP-based connection on a commercial basis and, to date, has not faced significant restraint either to provide and/or acquire from others. Digi is agreeable to the MCMC's proposal to include IP-based interconnection within the Interconnect Link Service due to the demand and changes of technology from legacy TDM to IP.

5.11   Digi would like the service description of IP-based interconnection to incorporate the interface type and capacity or bandwidth each party is allocated. This is because of Digi's current arrangement with another operator where bandwidth is shared on an equal basis with each operator owning half of the link.

5.12   Digi would also like bandwidth to be included within the Interconnect Link Service for both SS7 and IP-based interconnection where the bandwidth should be mutually agreed between two operators establishing the interconnection. As for increments of bandwidth to be offered, Digi commented that the interface type will determine the total bandwidth of the link (either 1GE or 10GE or more), and each operator shall be allocated with half of the total bandwidth for its own outgoing traffic.

5.13   DNB stated that it is unlikely to require SS7 interconnection. However, DNB supports the expansion of the Interconnect Link Service description to include IP-based interconnection, as it offers more options for achieving interconnection of networks in Malaysia. DNB is of the view that other features of IP-based interconnection and bandwidth increments need not be included in the service description at this stage. DNB would like both aspects to be left to commercial negotiations between market players.

5.14   Fiberail requires IP-based interconnection for interconnection with other service providers. Fiberail acquires or supplies IP-based interconnection on a commercial basis and has not faced any issues thus far. Fiberail is of the view that the updated definition is sufficient.

5.15   Net2One is of the opinion that bandwidth should be included within the Interconnect Link Service for IP-based interconnection and that the increments offered depends on the industry's requirements.

5.16   Maxis requires IP-based interconnection for voice services such as VoLTE, VoWiFi, VoNR (5G), fixed voices etc., and for non-voice services such as video call, and messaging. Maxis stated that it acquires and supplies IP-based interconnection on a commercial basis e.g. with TM, Digi, REDtone, etc. Maxis submitted that it has faced some challenges in terms of other operators' readiness for IP interconnection as not all are ready to migrate to IP-based interconnection technology-wise. Maxis also highlighted that some operators are operating primarily on TDM and other legacy technologies and have been slow or have limitations to make the upgrades to enable IP-based interconnection.

5.17   Maxis agrees with the MCMC's proposed approach to include IP-based interconnection within the Interconnect Link Service as it is a critical service in achieving any-to-any connectivity and promoting competition, thus, it would be in the LTBE for it to be included within the Interconnect Link Service. Maxis added that currently it is already using SIP-I for IDD traffic due to lower cost as compared to TDM for international interconnect. Maxis also noted that SIP-I interconnect which is the 3GPP standard for VoIP is widely deployed worldwide and that it is a key standard that is used for VoLTE, VILTE and VoWifi. Additionally, Maxis commented that Future Rich Communication Suite demands IP interconnect as all applications will run via IP protocols.

5.18   With regard to features of IP-based interconnection that can be included in the service description, Maxis proposed:

(a)   signalling protocol: SIP (Session Initiation Protocol), SIP I, and SIGTRAN;

(b)   codec type: EVS codec; and

(c)   QoS: latency, packet drop, and jitter, and utilization rate to maintain a maximum threshold of 80% utilization.

5.19   Maxis is of the view that the key features above are supported by IP-based interconnection, thus should be included in the amendment. Additionally, Maxis propose for both the Access Seeker and Access Provider to meet at a mutually agreed and/or neutral POI location (e.g. in AIMS, Cyberjaya etc.).

5.20   Maxis is of the view that bandwidth should be included for IP-based interconnection and proposes bandwidth increments that are multiples of 1Gbps or 10Gbps or as mutually agreed between the operators.

5.21   REDtone requires IP-based interconnection for voice services but it does not acquire the IP-based interconnection commercially. REDtone agrees with the MCMC's proposed approach to include IP-based interconnection within the definition of Interconnect Link Service. With regard to features of IP-based interconnection that need to be included in the service description if it is amended, REDtone commented that the MCMC can consider specifying a platform for IP-based interconnection where Operator can directly interconnect with the network of another Operator typically done via an IX. For example, operators can acquire a different port for voice IP-interconnect riding on IX without the need to acquire any direct link to connect to each other if both parties can meet via the IX to cater SS7 signalling for voice interconnection. As for incremental of bandwidths to be offered on IP-based interconnection, REDtone proposed increments by 100Mb.

5.22   SACOFA requires the IP-based interconnection for L3VPN, LAN and WAN type services. SACOFA acquires or supplies IP-based interconnection on a commercial basis and commented that the barriers are dependent on services requirements and conditions. At present, SACOFA stated that it uses the VLAN, E-LINE and ELAN based service, QoS and MTU features of IP-based interconnection and is agreeable for inclusion of bandwidth into IP-based interconnection. SACOFA, however, does not have any strong views for bandwidth inclusion in SS7. SACOFA provided bandwidth increments i.e. 1Mbps, 10Mbps, 100 Mbps, 200 Mbps, 500 Mbps, 750 Mbps, 1Gbps, 3 Gbps and 5Gbps as the bandwidth increment to be offered.

5.23   TM requires IP-based interconnection for the provision of FNTS and FNOS and for the acquisition of access to FNTS, FNOS, MNOS and MNTS services from other Access Providers. TM stated that it acquires and supplies IP-based interconnection on a commercial basis and does not face any barriers in the acquisition and provision of the service.

5.24   TM agreed with the MCMC's approach to include IP-based interconnection within the Interconnect Link Service, however noted that the approach on methods to implement the IP-based interconnection may be different between two interconnecting operators. TM stated that some operators prefer to set-up totally new links since the traffic handover can now be centralised while some operators prefer to maintain their existing physical arrangement. TM also notes that the MCMC has deleted the requirement for "physical" connection which denotes that the interconnection can also be done over an internet-based platform. TM proposes that the MCMC provides flexibility to operators to negotiate preferred method in the review of MSA and MSAP.

5.25   TM proposed that the service description for Interconnect Link Service specifies that the service be provided for any-to-any connectivity, limited to off-net calls and P2P SMS/ MMS services supporting FNTS, FNOS, MNTS and MNOS services.

5.26   TM proposed that bandwidth be excluded from the service description for the Interconnect Link Service since bandwidth requirements differ based on operators' traffic profiles and are usually negotiated on a commercial basis. TM commented that it has not faced any difficulties in its role as an Access Provider and Access Seeker to acquire or supply the Interconnect Link Service with the inclusion of bandwidth. For IP-based interconnection, both operators will share the same bandwidth for incoming and outgoing traffic, thus, the increment of bandwidth should be based on both operators' aggregated traffic.

5.27   TT dotCom requires IP-based interconnection for voice services and would like the multimedia services such as video or text messaging to be included in the IP-based interconnection. TT dotCom noted that it does not face any barriers to acquire or supply IP-based interconnection on commercial basis. However, upon migration to IP-based interconnection, TT dotCom predicted some issues may arise including the appropriate charging mechanism as the current pricing mechanism is based on E1 copper link.

5.28   U Mobile uses the IP-based interconnect for the exchange of traffic (voice and data) to connect to all the telcos. U Mobile stated it does not acquire or supply IP-

based interconnection on a commercial basis, however, U Mobile stated that they are supportive of the MCMC's decision to regulate the price.

5.29   U Mobile proposed QoS be included in the service description as other features of IP-based interconnection in the service description if it is amended and with regard to bandwidth, U Mobile would like bandwidth to be included for both SS7 and IP-based interconnection at increment of minimum 1Mbps.

5.30   YTLC requires IP-based interconnection for off-net voice services, including VoLTE calls and SMS. YTLC noted that more operators will switch to VoLTE with the sunset of 3G. YTLC stated that it acquires IP-based interconnection on a commercial basis since it is currently not included in the Access List/ MSA/ MSAP. With regards to barriers faced in relation to the acquisition of the IP-based interconnection, YTLC commented about the potential case of the meeting point of IP interconnection at neutral data centre i.e. AIMS, Cyberjaya and etc., which needs to be dealt with on a separate commercial basis for the additional charges from the data centre. YTLC also pointed out its difficulties with interconnection when it comes to the full-span arrangement as the parties' interpretation of the full span pricing in MSAP differs.

5.31   YTLC agrees with the MCMC's proposed approach to include IP-based interconnection within the Interconnect Link Service but sought the MCMC's clarifications in relation to the removal of word "physical" in the service description. YTLC would like to know if the MCMC allows to use public IP for interconnection purpose as YTLC is unable to guarantee the service quality and performance of the connection if it is not a direct point-to-point connectivity. YTLC also added that the use of public IP may lead to service degradation especially on voice call services.

5.32   YTLC proposes E1 links (2 Mbps per E1) to be used as the bandwidth measurement to the SS7 interconnect. For IP interconnection, YTLC commented that most Operators will apply 1GE port interface without performing the bandwidth capping. YTLC also stated that the Operators commonly measure the bandwidth based on the live traffics between the Operators. As for bandwidth increment to be offered, YTLC commented that for SS7, it has no choice but to use E1 as increment unit whereas for IP interconnection, YTLC suggests using 1Gbps or 10Gbps following the common port interface / practice in the market.

Discussion

5.33   Operators unanimously supported the MCMC's preliminary view to include IP-based interconnection within the Interconnect Link Service, as it enables any-to-any connectivity.

5.34   Most operators, with the exception of TM, also submitted that bandwidth should be included for IP-based and SS7-based interconnection, with the range of bandwidth inclusions and increments proposed by operators extracted below:

(a)   Astro: 5 Mbps and 10Mbps for Fast Ethernet, 100Mbps for Gigabit Ethernet and 1Gbps, 10Gbps and 100Gbps for 10 Gigabit Ethernet;

(b)   Celcom: 1Gbps increments in respect of IP-based interconnection;

(c)   Digi: increments depending on the interface type;

(d)   Maxis: for IP-based interconnection, multiples of 1Gbps or 10Gbps or as mutually agreed between operators;

(e)   REDtone: for IP-based interconnection, increments of 100Mbps;

(f)   SACOFA: for IP-based interconnection, increments of 1Mbps, 10Mbps, 100Mbps, 200Mbps, 500Mbps, 750Mbps, 1Gbps, 3Gbps and 5Gbps;

(g)   U Mobile: increments of 1Mbps for both SS and IP-based interconnection; and

(h)   YTLC: 2Mbps per E1 link, 1 Gbps or 10Gbps for IP-based interconnection.

5.35   Given the range of submissions, the MCMC intends to adopt a "hybrid" approach to including bandwidth in the service description, such that:

(a)   bandwidth will be included within the scope of the Interconnect Link Service, at increments of 1Gbps, 10Gbps or such other bandwidth increments as agreed between parties. The MCMC notes that operators submitted ranges from 1 Mbps to 100Gbps, highlighting that there are differing views regarding the appropriate bandwidth increments; and

(b)   no bandwidth requirements will be included in respect of SS7-based interconnection, given industry is continuing to transition to IP-based interconnection and noting the limited number of submissions in respect of bandwidth inclusions for that type of interconnection.

5.36   The MCMC intends that, by including bandwidth within the scope of the service description for the IP-based interconnection element of the Interconnect Link Service, Access Providers will be precluded from arguing that the service they provide goes beyond the scope of the Access List e.g. because Access Seekers have requested a particular amount of bandwidth.

5.37   Some operators, including Maxis and U Mobile proposed that additional features such as signalling protocol, QoS and utilisation rate should also be reflected in the service description for this service. The MCMC does not consider it necessary to include these elements in the service description at this stage, given the MCMC does not have sufficient information to determine what specific features should be included, and noting that no Access Seekers have reported difficulty in acquiring this service on a commercial basis, suggesting that the market for the supply of these services is already sufficiently competitive to incentivise operators to supply the QoS required by Access Seekers.

5.38   The MCMC also notes that by deleting the reference to "physical" connection from the proposed service description, the MCMC does not intend to preclude physical connections, but expand the scope of connections to include virtualised connections. Accordingly, if two operators agree to maintain their physical arrangement as raised by TM, the Access List service is capable of catering to such an arrangement.

5.39   Finally, the MCMC does not agree to limit the service description for the Interconnect Link Service to the provision of off-net calls and P2P SMS / MMS services supporting FNTS, FNOS, MNTS or MNOS services, in the manner proposed by TM. In circumstances where the industry has expressed no difficulties in acquiring this service, the MCMC considers it would be inappropriate to make such a change, which may lead to unintended consequences and hamper the ability of Access Seekers to acquire access to this key bottleneck facility.

MCMC Views

5.40   The MCMC confirms its preliminary view that it would be in the LTBE for the Interconnect Link Service to remain listed on the Access List with modifications to the service to include IP-based interconnection alongside SS7 interconnect links and to include bandwidth requirements for IP-based interconnection.

4(5)   Interconnect Link Service

(a)   An Interconnect Link Service is a Facility and/or Service which enables÷ (i)   the physical connection between the network of an Access Provider and the network of an Access Seeker for the purpose of providing an Interconnection Service, 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 paragraph 4(5)(a)(i) 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.

Network Co-Location Service

Introduction

5.41   In the PI Paper, the MCMC's preliminary view was that given the relevant owners of co-location facilities or exchange buildings have natural monopolies in relation to co-location services at any given POI, it would be in the LTBE for access to these facilities to remain on the Access List in order to promote competition.

5.42   The MCMC also proposed to make minor modifications to clarify the premises at which co-location must be supplied.

Submissions Received

5.43   Altel, Digi, DNB, MYTV and Net2One agreed to the proposed amendments to the Network Co-Location as set out by the MCMC.

5.44   Celcom accepts the proposed amendments to the Network Co-Location Service (i.e. to include "any location where a main distribution frame is housed").

5.45   DNB supports the MCMC's preliminary view as DNB notes that its clients will need to put their equipment in DNB's facilities for core network integration to work optimally in order to deliver the full suite of 5G functionality.

5.46   Maxis agree with the MCMC's proposed amendments to the service description for the Network Co-Location Service and proposes that the data centres are included at the network premises at which co-location is to be provided.

5.47   TM proposes revisions in the MCMC's proposes amendments to the Network Co-Location Service for part (a)(i) by including the phrase in red "…..provision of space in relation to a POI" and "…Facilities and/or Services of the Access Provider".

5.48   TM does not have further comments but clarified that the access route to TM's premises is already provided in its RAO under Network Co-Location for Access Seekers, thus, TM disagree with the MCMC's proposal to "expand the scope of the Duct and Manhole Access Service such that Access Seekers will be more easily able to obtain access to ducts and manholes for the purposes of laying fibre to connect to equipment co-located in the Access Provider's building including from the manhole immediately outside the Access Provider's premises boundary". TM feels this is not a bottleneck with the provision of Network Co-Location Service.

5.49   TM added that addressing the issue of access route under another service, such as, Duct and Manhole Access instead of limiting it to Network Co-location will require Access Seeker to negotiate for an additional service that will in turn prolong the already lengthy Access Agreements negotiations and registration process unnecessarily.

5.50   U Mobile agrees with the proposed amendment by the MCMC and noted that the Network Co-Location should be made available to connect within the same building as much as possible to avoid unnecessary cost i.e. additional transmission services.

5.51   YTLC agrees with the proposed definition of Network Co-Location and takes note that access to facilities and services on the Access List are SAO, thus, Access Seekers can seek their inclusion in Access Agreements based on future planning even if such facilities and services have not been requested in the past. YTLC has raised this point in particular because it is of the view that some Access Providers have been reluctant to include such facilities and services in the Access Agreements as there had been no access request in the past.

Discussion

5.52   All operators other than TM agreed to MCMC's proposed revisions to the Network Co-Location Service, which are intended to clarify rather than substantively amend the description or scope of the service.

5.53   TM proposed limiting physical co-location to the provision of space "in relation to a POI", to enable installation and maintenance of equipment necessary for the provision of services through the facilities and services of only the Access Provider, rather than "any Operator" as currently specified in the Access List.

5.54   The MCMC does not propose to make these amendments, and repeats its comments in the PI Paper that the premises at which co-location must be supplied is already limited to certain specified facilities. Accordingly, there is no basis to narrow the scope of the service as proposed by TM, particularly where no Access Seekers have reported major issues in acquiring this service, suggesting that it is operating as intended.

5.55   The MCMC's responses to TM's comments in respect of the proposed amendments to the Duct and Manhole Access service are set out in paragraph 4.92.

MCMC Views

5.56   The MCMC confirms its preliminary view that it would be in the LTBE for the Network Co-Location Service to remain in the Access List with modifications to clarify the premises at which co-location must be supplied. 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:

4(9)   Network Co-Location Service

(a)   The Network Co-Location Service is a Facility and/or Service which comprises:

(i)   physical co-location, which refers to the provision of space at an Access Provider's premises to enable the Access Seeker to install and maintain equipment necessary for the provision of the Access Seeker's services through the Facilities and/or Services of any Operator. Physical co-location includes physical space, power, environmental services (such as heat, light, ventilation and air-conditioning), security, site maintenance and access for the personnel of the Access Seeker;

(ii)   virtual co-location, which refers to the provision of Facilities or Services at an Access Provider's premises to enable the acquisition by the Access Seeker of Facilities and Services in the Access List, where equipment is owned and maintained by the Access Provider; or

(iii)   in-span interconnection, which is the provision of a POI at an agreed point on a physical cable linking an Access Provider's network facilities to an Access Seeker's network facilities.

(b)   Network premises at which co-location is to be provided includes switching sites, submarine cable landing centres, earth stations, exchange buildings, other Customer Access Modules including roadside cabinets, 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, and includes co-location provided at any location where main distribution frame is housed.

Internet Interconnection Service

Introduction

5.57   In the PI Paper, the MCMC noted that it is considering whether to regulate an IP Transit Service, given the unavailability of peering in Sabah leading to significantly higher pricing for IP transit services in that region.

5.58   The MCMC considered that the arguments for regulating IP transit were balanced. In particular, while the MCMC acknowledged the success of commercial IP peering arrangements (particularly in Peninsular Malaysia), the MCMC took the preliminary view that it would promote competition, any-to-any connectivity and infrastructure investment to regulate IP transit where IP peering is not available (particularly in Sabah).

5.59   The MCMC accordingly invited views on IP peering arrangements in both Sabah and Sarawak, in order to assist the MCMC in understanding whether IP transit services should be regulated in those regions.

Submissions Received

5.60   Astro has not experienced any issues in acquiring capacity of internet interconnection in respect of IP transit via commercial basis.

5.61   Astro submitted that it is not supportive on the proposal to include IP transit service in the Access List only where peering is not available e.g. in Sabah. Astro noted that if the MCMC decides to regulate IP transit, the scope of IP transit should cover specifically East Malaysia as a whole in order to provide affordable internet connectivity to that region. This is to ensure existing incumbent players make peering and competitive IP transit pricing compared to West Malaysia.

5.62   Celcom has not experienced any issue in acquiring capacity of internet interconnection services. Celcom has IP peering arrangements at MyIX and prefers peering arrangements as they provide better customer experience. In order to cater for Sabah and Sarawak, Celcom submits that it would be better if MyIX is to establish strong peering points with bigger capacity for Sabah and Sarawak.

5.63   Celcom Timur (Sabah) agreed with the MCMC's proposal to regulate IP transit.

5.64   Digi considers that the current commercial arrangement is working well. As such, Digi is of the opinion that regulation of IP transit service is unnecessary and the supply and demand of IP transit service should remain driven by market forces.

5.65   Typically, Digi does not face difficulty in acquiring interconnection with partners for traffic exchanges. However, Digi does face challenges in acquiring the required interconnect capacity from some partners. Digi noted that capacity provisioning between peering partners is crucial to avoid congestion. Nevertheless, a workaround option is available for Digi to ensure customer experience is preserved.

5.66   Digi welcomes the establishment of more internet exchanges in Malaysia. Initiatives such as the recent National Interconnection Eco-System Lab (NIEL) will provide more option for ISPs to seek their ideal peering interconnection services, and Digi continues to support industry consortium MyIX as it is non-commercial, operated by industry and aligned with industry goals.

5.67   DNB supports the addition of the proposed IP Transit Service to the Access List. DNB has yet to deploy its network and cannot comment on the availability of IP peering in the region. Nevertheless, the higher cost of IP transit services and limited availability of Internet exchanges in Sabah indicates a structural issue

within the region. This may impact investment in broadband infrastructure in Sabah, including inputs that DNB may require to deploy and support its 5G network.

5.68   DNB notes that the MCMC's proposals have, in effect, a built-in failsafe: if peering becomes available again in Sabah, then the regulation of IP transit will be reduced accordingly. From this perspective DNB considers that the regulatory risk is limited.

5.69   Fiberail submitted that it has experienced no issues in acquiring sufficient capacity of internet interconnection services.

5.70   Maxis peers both via the open peering exchange e.g. MyIX in Malaysia, as well as bilateral peering (private peering) arrangements with the other operators. So far, Maxis has not experienced any major issues with open peering exchange but have faced some issues with bilateral peering arrangements for internet interconnection.

5.71   Maxis considers that the reason IP Peering is not available in Sabah is due to high submarine cable prices (e.g. SKR1M) that need to be incurred by the operators to establish the IP peering in Sabah. Maxis strongly recommends that the MCMC review the existing pricing imposed by Access Providers for SKR1M transmission between East and West Malaysia. If this high SKR1M price can be resolved by the MCMC whether through MSAP or other regulatory instruments that the MCMC deem fit to be used, Maxis believes that there may not be a need for the MCMC to regulate IP Transit Services in the Access List.

5.72   Based on Maxis's experience, IP transit prices in East Malaysia are significantly higher than IP transit prices in West Malaysia and Singapore. For comparison purposes, Maxis estimates that the IP transit prices (per MB per month) in West Malaysia (Kuala Lumpur) are 1 to 2 times higher than the IP transit prices in Singapore. However, the IP transit prices in East Malaysia are 3 to 4 times higher than the IP transit prices in West Malaysia.

5.73   MyIX submitted that from a supply perspective, capacity is not an issue, as MyIX has ample available ports for members to subscribe in all their nodes. MyIX noted that it supports open peering at MyIX as per their Rules of Persatuan, and also further facilitate greater depth of peering by expansion of their POP to new areas. This makes options of locality wider to parties who wish to peer with MyIX. MyIX encourages members to upgrade port capacity to ensure smooth exchange of traffic, however this also requires member's commitment and co-operation.

5.74   MyIX noted that its traffic grows significantly over time and being non-profit organisation, the preferred type of connection is dark fibre. MyIX acknowledged that it does have difficulties in acquiring dark fibre services in some areas as the suppliers prefer to supply bandwidth over dark fibre.

5.75   MyIX noted its mandate is only peering services. MyIX operates a node in Kuching with partnership with Danawa Resources Sdn Bhd. Currently SACOFA, Danawa and TM are peering in this node.

5.76   Net2One has no issues in acquiring sufficient capacity of internet interconnection services, but supports the proposal to include an IP Transit service in the Access List where peering is not available.

5.77   REDtone notes that it has not faced any issues in acquiring IP transit on commercial basis especially in central region as most providers focus their cores centrally.

5.78   SACOFA has only experienced issues in the commercial feasibility of acquiring internet interconnection services.

5.79   SACOFA obtains IP Transit outside of Sarawak for its customers via its own infrastructure. There is no viable IP Transit provider within Sarawak as the transmission between Peninsular Malaysia and Sarawak accounts for ~75% of the total cost. Due to the lack of content providers at MyIX Sarawak, the local peering service is largely dependent on the cost of transmission between Sarawak and Peninsular Malaysia to achieve interconnection with the content providers at MyIX Central.

5.80   However, SACOFA considers that regulating End-to-End Transmission Services between Sabah and Peninsular Malaysia would address this pricing constraint. The cost of IP ports is insignificant compared to the cost of transmission and over-regulation will deter any potential investment into infrastructure to compete in this market

5.81   TT dotCom currently does not face any issue in acquiring sufficient capacity of internet interconnection services.

5.82   TT dotCom submits that IP Transit services should not be included in the Access List where peering is not available as sustainability may be an issue. MyIX had in the past established POPs in Sabah and Penang but were decommissioned due to insufficient take-up.

5.83   TM faces no impediment in acquiring sufficient capacity on the Internet Interconnection Service, as TM is present at MyIX. TM also practices open peering with all domestic operators. Additionally, TM also does not face impediments to acquire Internet Interconnection Service via a private peering arrangement.

5.84   TM offers IP transit services in Sarawak and does not differentiate its IP transit pricing for Access Seekers in Sarawak from its pricing in Peninsular Malaysia. IP transit pricing is determined based on the bandwidth required by each Access Seeker. In addition, TM is not aware of any capacity issues for IP peering and transit services in Sarawak (i.e. TM's port in Sarawak for MyIX has no congestion issues) as highlighted by other operators.

5.85   However, TM understands that one of the key barriers for IP peering arrangements in Sarawak is the availability of local access services at regulated prices. Some of the local operators in Sarawak have not been providing local access service at regulated prices, as noted in paragraph 5.87 below.

5.86   TM commented that the industry intends to deploy Internet Exchange Point (IXP) POPs in Sabah and Sarawak, which will improve the availability of IP peering and

IP transit services in these states. TM therefore proposes that IP transit services remain excluded from the Access List.

5.87 While the industry has plans to deploy IXP POPs in East Malaysia, in TM's view the key reasons for the current lack of deployment of IXP POPs in Sabah and Sarawak is due to other factors, including:

(a) there is low underlying fixed broadband service demand in Sabah and Sarawak – in Q4 2020, fixed broadband penetration was at 19% of the population in Sabah and 26% of the population in Sarawak[17]; and

(b) it can be costly to acquire local access services from local operators, as some of the Access Providers in Sabah and Sarawak may not be providing local access service at regulated prices.

5.88 Based on JENDELA+ targets, TM submitted that the industry plans to deploy 62 IXP POPs in various areas, including Sabah and Sarawak, by 2023.[18] This increases the availability of internet exchanges and means that more suppliers will provide IP peering and IP transit services in Sabah and Sarawak. As such, the Internet Interconnection Service is expected to become more competitive, and there should be no immediate need for regulation to address any market failure.

5.89 As such, TM proposed that the MCMC not include the Internet Interconnection Service in the Access List, as it is expected to be competitive in the next two years (i.e. by 2023).

5.90 U Mobile does not experience any issues in acquiring sufficient capacity of internet interconnection services at this point of time. However, the limited available international providers in Malaysia still requires U Mobile to seek more competitively priced internet services, IX Peering and content outside of Malaysia.

5.91 More external content (IX Peering, Internet Transit Providers and Content) would need to be available locally to give U Mobile a better selection of services instead of relying on the content that is available in Singapore.

5.92 Given the above, U Mobile agrees with the MCMC's preliminary view that it would be in the LTBE to regulate the supply of IP transit services where IP peering is not available, particularly in Sabah. U Mobile does not have a regional IP POP in East Malaysia, with all IP traffic currently brought back to Peninsular Malaysia.

5.93 U Mobile noted that localising IP Transit as an Access List service in locations where peering is not present will help local Access Providers e.g. Celcom Timur (Sabah), but demand for IP Transit is still largely driven by the local requirements (for content etc.). If demand in East Malaysia is like West Malaysia, IX Peering providers will more likely invest in the relevant infrastructure.

5.94 U Mobile suggested that Sabah and Sarawak leverage on their strategic locations in Borneo to connect to Philippines, Jakarta, Hong Kong and Singapore to provide an alternative route to reach the internet. Improvements to IXP infra (IP Transit

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[17] https://www.mcmc.gov.my/skmmgovmy/media/General/pdf/Q1-2021-C-M.pdf
[18] https://www.mcmc.gov.my/skmmgovmy/media/General/pdf/National-Interconnection-Ecosystem-Lab-NIEL-Report.pdf

and IX Peering) will provide U Mobile with an alternative to reach the internet locally in East Malaysia instead of channelling traffic back to Peninsular Malaysia.

5.95 As for IP Peering arrangements in Sarawak, U Mobile noted again that in a situation where there is limited supply, and/or a lack of competition, price should be regulated. Increase in demand will encourage investment by IX Providers – and the relevant infrastructure would in turn drive demand for new data centres into East Malaysia to invest. This would provide U Mobile with the choice of data centres to host its IP POP to localise transit traffic more cost efficiently than bringing traffic back to West Malaysia.

5.96 YTLC does not encounter problems in acquiring internet interconnection services. YTLC submitted that to further improve competition, the MCMC should consider liberalising the landing of cable systems in Malaysia. This will attract submarine cable systems that have bypassed Malaysia and offer more choice to Malaysian operators. YTLC concluded more suppliers will enhance competition and result in lower prices which in turn will promote the LTBE.

Discussion

5.97 Most operators reported no issues in acquiring capacity of internet interconnection services, and generally, operators were supportive of the MCMC's proposal to list the IP Transit Service on the Access List.

5.98 Operator submissions appear to indicate that there is a particular issue being experienced in acquiring internet interconnection services in Sabah, as noted by Astro, DNB and U Mobile. However, the MCMC is concerned that submissions are also indicative of some form of market failure across East Malaysia in general, although there was no consensus amongst operators as to the existence of failures, or any specific cause for these failures. For example:

(a) Celcom submitted that rather than the MCMC regulation, MyIX should establish strong peering points with larger capacity for Sabah and Sarawak;

(b) Digi faces challenges in acquiring required interconnect capacity, but uses a workaround option to ensure customer experience and suggests that more internet exchanges be established in Malaysia;

(c) Maxis has faced issues with bilateral peering arrangements for internet interconnection and considers that high submarine cable prices are the cause behind the absence of IP Peering in Sabah;

(d) MyIX encourages members to upgrade their port capacity; and

(e) SACOFA cited that it faces issues in the commercial feasibility of acquiring internet interconnection services, and considers that high transmission costs between Peninsular Malaysia and Sarawak accounts for 75% of the total cost of IP Transit.

5.99 The MCMC acknowledges submissions by TM that the proposed increase to the availability of internet exchanges means that more suppliers will provide IP peering and IP transit services in Sabah and Sarawak – leading to the Internet

Interconnection Service becoming more competitive and thus removing the need for regulation. The MCMC agrees with TM's rationale, and notes that the proposed IP Transit service description already accounts for such a scenario, by ensuring that once peering becomes available, the scope of the regulated IP Transit service will automatically reduce in the relevant region. Accordingly, the MCMC does not agree with TT dotCom's submission that the proposed service description creates any sustainability issues.

5.100   Further, the MCMC does not consider it appropriate to remove regulation pre-emptively. Given this is a key bottleneck service, and operators are experiencing ongoing issues particularly in certain geographic areas in East Malaysia, the MCMC's preference is to regulate the IP Transit service and to later consider opportunities for complete de-regulation if justified. It is also relevant to note that the MCMC cannot force operators to build new infrastructure through regulation, but can use its regulatory powers to promote competition and encourage efficient investment where market forces are exhibiting a failure to do so.

5.101   The MCMC acknowledges the various submissions by operators regarding pricing issues in the supply of these services, including in the context of local access services, access to submarine cable landing stations, IP transit and pricing of transmission services. The MCMC will consider these issues holistically in the context of a later review of the MSAP.

MCMC Views

5.102   The MCMC proposes to regulate IP transit services in areas where peering is not available.

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.

6   Broadcasting services

Digital Terrestrial Broadcasting Multiplexing Service

Introduction

6.1   In the PI Paper, the MCMC noted that the Digital Terrestrial Broadcasting Multiplexing Service (**DTBMS**) continues to exhibit bottleneck characteristics, due to the existence of a monopoly provider in MYTV.

6.2   Given the criticality of the service in promoting competition in downstream markets (particularly in the provision of FTA services), the MCMC took the preliminary view that it would be in the LTBE for this service to remain on the Access List. The MCMC also proposed minor modifications to the definition of "Transport Stream" to clarify that the service includes not only audio-visual streams but also audio-only streams.

Submissions Received

6.3   Astro clarified that digital radio broadcasting services should be excluded from the Access List and such services should only be acquired on commercial basis. It

should not be included within the description of DTBMS, even though digital radio broadcasting services can be supplied based on DTT.

6.4   Celcom does not intend to seek nor supply broadcasting services.

6.5   MYTV is in the opinion that digital radio broadcasting services is already included within the description of the DTBMS, and the current description describes multiplexing activities (e.g. combining multiple content applications service transport stream which consist of audio-videos, audios and data). As such, MYTV is of the view that the current description does not need any amendments.

6.6   WorldDAB is of the view that digital radio broadcasting services should be included as a new service on the Access List, with the description as follows:

> *"The Digital Terrestrial Broadcasting Multiplexing Radio 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 for wireless delivery to mobile and portable receivers."*

6.7   WorldDAB explained that radio needs its own DTBMS description as radio has defined radio coverage areas where commercial, community and possibly public service broadcasters deliver local news and information. There are approximately 11 separate areas in Peninsular Malaysia, 11 in Sarawak and 5 in Sabah. This is completely different to the myFreeview channel offering on DVB-T2 which is nationwide with no content variation between areas. This demonstrates a significant and fundamental difference between television and radio broadcasting and therefore, the need to define radio and television services separately.

6.8   WorldDAB added that the architecture of radio broadcasting contribution networks will be different from DTT due to the localized nature of radio. The contribution networks which feed the multiplexer(s) in each radio coverage will receive content from local sources as well as some national services, e.g. RTM services, rather than a centralized approach used for myFreeview over DVB-T2.

6.9   WorldDAB suggested the current description of DTBMS should be refined as follows:

> *"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 where different system implementations can be used to deliver the Transport Streams' content to digital television and digital radio receivers."*

Discussion

6.10   The MCMC refers to submissions by WorldDAB that, given technical differences between digital radio broadcasting and television broadcasting, these services should be listed separately or further distinguished.

6.11   The MCMC has adopted a technology-neutral approach to the Access List, and considers that the existing Digital Terrestrial Broadcasting Multiplexing Service as described, taken together with the MCMC's proposed amendments to the definition of "Transport Stream" are sufficient to cover digital radio services, which aligns with submissions by MYTV. However, the MCMC proposes to make a

clarification to the Digital Terrestrial Broadcasting Multiplexing Service to clarify the intention.

6.12   The MCMC does not agree to expand the definition of "Transport Stream" to include "multimedia" as proposed by WorldDAB, as the MCMC considers that this would be unnecessarily broad in circumstances where both audio-visual and audio-only streams are already captured by the service description.

6.13   Finally, for the reasons set out in the PI Paper, the MCMC does not agree to Astro's proposal that digital radio broadcasting services should be excluded from the Access List and acquired on a commercial basis.

MCMC Views

6.14   The MCMC confirms its preliminary view that it would be the LTBE for the Digital Terrestrial Broadcasting Multiplexing Service to remain in the Access List with modifications to clarify the scope of the service as regards digital radio broadcasting, as follows:

> #### 4(16) Digital Terrestrial Broadcasting Multiplexing Service
>
> *The Digital Terrestrial Broadcasting Multiplexing Service is a Facility and/or Service for the combining of multiple content applications service Transport Streams into a single Transport Stream with or without the addition of conditional access information and regardless of the system used to deliver that Transport Stream to receivers.*

6.15   The MCMC also confirms its preliminary view to amend the definition of "Transport Stream", to reflect that this service is capable of being supplied as an audio-visual or audio-only service:

> *"Transport Stream" means a packet-based method of multiplexing one or more digital video audio-visual and or audio streams having one or more independent time bases into a single stream; and*

5G broadcasting services

Introduction

6.16   In the PI Paper, the MCMC took the preliminary view not to regulate 5G broadcasting services in the Access List, given there was no strong evidence that such regulation would result in the promotion of competition, particularly given the nascent stage of 5G technology and the MCMC's broader approach to 5G service regulation as discussed in section 3 above.

Submissions Received

6.17   Astro contemplates to acquire 5G broadcasting services if necessary. Astro further suggested the MCMC to support an initiative to ensure that new devices such as future car receivers and home smart speakers to have capacity to receive 5G broadcasting services.

6.18   DNB agreed that 5G broadcasting services should not be included on the Access List, as these are nascent services.

6.19   Maxis agreed that 5G broadcasting services should not be included on the Access List. As the 5G technology is still on the nascent stage, potential use cases for 5G broadcasting services are insufficiently well-defined to include on the Access List.

6.20   MYTV plans to acquire 5G broadcasting services in the near future. MYTV is also of the view to include 5G broadcasting services in the description of the DTBMS. MYTV recommended that 5G broadcasting services to be provided by the same operator of DTBMS, and as such, this service should be included in the DTBMS.

6.21   SACOFA does not intend to acquire nor supply 5G broadcasting services.

Discussion

6.22   Only one operator, MYTV, considered that 5G broadcasting services should be included on the Access List, as part of the Digital Terrestrial Broadcasting Multiplexing Service. Meanwhile, Astro commented that it may acquire 5G broadcasting services if necessary.

6.23   As noted in the PI Paper, the MCMC considers that 5G services generally are in a very nascent phase, and it would be inappropriate for the MCMC to regulate 5G broadcasting services at this time. Accordingly, the MCMC has not changed its position as expressed in the PI Paper.

6.24   Regarding Astro's comments that the MCMC should consider compliance standards for devices to be able to receive 5G broadcasting services, the MCMC repeats its comments above and notes that in any event, the Access List is not the appropriate vehicle through which to address this matter.

MCMC Views

6.25   The MCMC confirms its preliminary view not to include 5G broadcasting services on the Access List.

7   Transmission services

End-to-End Transmission Service

Introduction

7.1   In the PI Paper, the MCMC noted that the essentiality of the End-to-End Transmission Service in promoting competition in dependent downstream services, whether transmission services, mobile services, business-grade services or others. The MCMC also noted its concern that the same issues are prevalent in the market today as those that were brought to the MCMC's attention in the 2015 Access List Review, namely that certain Access Providers were not allowing Access Seekers to purchase trunk and tail transmission services separately.

7.2   Given these conditions of competition, the MCMC's preliminary view in the PI Paper was that it would be in the LTBE for the End-to-End Transmission Service to be retained in the Access List, subject to modifications to include certain technical parameters and to clarify the scope of the service.

Submissions Received

7.3   Allo agrees with the amendments proposed to the description of the End-to-End Transmission Service, including the proposed technical parameters. Allo confirms it can supply the service as per the proposed amended service description. For "network availability", Allo proposes standard service availability of 99.9% yearly, equivalent to 8.77 hours' downtime per year. Allo comments that higher service availability shall be subject to commercial arrangement. In terms of "latency", Allo proposes standard latency based on the distance between both end point where round trip latency is <1.5ms/100km. Allo refers to 4(22)d of service description and states that satellite link will not meet clause (i)(ii) any latency between <1ms and <40ms.

7.4   Altel, MYTV and Net2One believe that the description of regulated services should remain technology neutral and suggested that 4(22)f needs to be clearer on the technology neutrality by adding "..or any other technologies applicable for end-to-end transmission..) after the words "..Metro-E may..". MYTV is capable of supplying the End-to-End Transmission Service as per the proposed amended service description and is of the opinion that specific definitions for "network availability" or "latency" are not necessary to be included in the Access List.

7.5   Astro is agreeable to the amendments proposed by the MCMC in relation to description of the End-to-End Transmission Service. In terms of technical parameters, Astro proposed for the inclusion of monitoring and performance report where the monitoring is to provide visibility on link status based on the Internet Control Message Protocol (**ICMP**) result and aggregated utilisation report. Astro opines that the Access List should include a specific definition for "network availability" and the definition for network availability should include planned activity downtime for purposes of network availability calculation. Astro has no further comments on the current definition of "Latency".

7.6   Celcom supports the MCMC's view that the service description for End-to-End Transmission Service should include parameters that the Access Provider provides to itself and subsidiaries from time to time. Celcom proposes to replace the following parameter "any network availability between 99.90% and 99.992%, whether per month" with "network availability of 99.90% or higher as what the Access Provider provides to itself and subsidiaries". Celcom also proposes that the service description also include third party premises as point of presence. Celcom suggested that the definition of "latency" to refer to the Return Trip Time (**RTT**) of data transfers on a network which is duration for the data to travel to and from its destination and measured in millisecond (ms).

7.7   Celcom Timur (Sabah) submits that if the proposed insertion of description of End-to-End Transmission Service is implemented, then there must be a commitment by the MCMC that a more detailed pricing mechanism will be introduced in MSAP. Such amendment to the Access List without a corresponding amendment in MSAP would adversely impact Celcom Timur (Sabah)'s ability to secure ROI or incapacitate Celcom Timur (Sabah) from providing such service. Celcom Timur (Sabah) views that the Access List should not define "network availability" and "latency". Instead, the Access Provider and Access Seeker should define "latency" according to distance, whereas "network availability" is subject to the type of service, location and measured yearly.

7.8   Digi submits that the SLA should be defined based on the network designed i.e. with or without redundancy - 1+0 (unprotected) or 1+1 (protected) while network availability should be in the range of 99.00% to 99.99%. Common parameter for transmission service such as latency, jitter and packet loss should be listed in the description of the service. Digi also commented that latency of <40ms is most common within West Malaysia and within East Malaysia.

7.9   DNB supports the MCMC in making the proposed changes as long as the MCMC is confident its changes will be sufficient to address the issues raised. DNB views it important for all the capacity needs of Access Seekers are met through the availability of regulated end-to-end transmission services provided by the Access Providers. DNB submits that Access Providers should not be able to circumvent the regulations through asserting technical differences.

7.10   edotco does not support the inclusion of technical parameters such as network availability and latency in the Access List. edotco views it inappropriate extension in the Access List as technical parameters are best addressed in quality of service regulation and/or for wholesale services in commercially negotiated agreements.

7.11   Fiberail views that the current description is sufficient and that the inclusion of the proposed technical parameters, with quite a big range, give less incentive for Access Providers to value add the services in term of Quality (or any other parameters) in exchange for customer's willingness to pay. Fiberail submits that a minimum or basic parameter should be maintained while allowing for anything higher (or lower) to be determined by commercial negotiations. Fiberail is able to offer End-to-End Transmission service as long as the price is right. Fiberail proposes 99.0% service availability with zero redundancy within the agreed service period as the basic offering and latency between 1ms and 40ms within Peninsular.

7.12   Fibrecomm views that the proposed amendments to the service description are applicable only for new service activation over existing readily infrastructure. Fibrecomm proposes for basic SLA of 99.0% per annum, latency of less than 40ms for intra-region network, zero redundancy and any other technical parameters specified or utilised by the Access Provider from time to time with regard to SLA and redundancy. Fibrecomm submits that any SLA beyond 99.0% should be provided on commercial basis. Fibrecomm views that "service level availability" instead of "network availability" should be included in the Access List. Fibrecomm proposed definitions for service level availability and latency. "Service level availability" means percentage of time (measured in minute) in a calendar year whereby the service is available in accordance with the standards practiced in the telecommunications industry, while "latency" means the time it takes for data to be transferred between its original source and its destination, measured in milliseconds.

7.13   Maxis agrees with the MCMC's view that it would be in LTBE for the End-to-End Transmission Service to be retained in the Access List. Maxis also agrees with the detailed technical parameters for End-to-End Transmission Service proposed by the MCMC in the Access List as this can minimise the potential disputes between Access Seekers and Access Providers. However, for clarity, Maxis proposes that the technical parameters are divided into two parts i.e. for the Access Network

and for the Core Network as both typically have different network availability and redundancies.

7.14   However, Maxis views that the phrase "Access Seeker Point of Presence" is retained instead of replacing it with the "Access Seeker premises". Maxis submits that it is more accurate and complete to use "Point of Presence" (POP) instead of "premises" because not all locations or premises are owned by the Access Seeker. If the MCMC use the phrase "Access Seeker's premises", End-to-End Transmission Services will only be limited to the Access Seeker's premise. This would be significantly disadvantageous to the Access Seekers as they would not be able to request for End-to-End Transmission Services to/from premises that they do not own.

7.15   Maxis proposes that network latency is applicable only for End-to-End Transmission Services that involve submarine cable connectivity between East and West Malaysia e.g. SKR1M. As the connectivity between East and West Malaysia typically has higher bandwidth, used for trunk/back-haul connectivity, and only uses fibre infrastructure, there will be significant impact to end user experience if there are any issues. Maxis views that network latency should not be applicable to End-to-End Transmission Services within East Malaysia or within West Malaysia as measurement is very subjective depending on multiple factors during the measurement such as link distance, link utilisation, link routes, type of infrastructure, etc. Maxis highlighted that in developed countries like UK, Australia, France, and Germany, latency specifications are typically not included in their access list definitions for End-to-End Transmission Services.

7.16   Maxis also submits that the regulation of End-to-End Transmission service is aligned with best practices seen in other developed countries that regulate this service to encourage competition in alignment with the LTBE. Maxis is capable of supplying the End-to-End Transmission Service as per the proposed amended service description by the MCMC with amendments proposed by Maxis. Maxis agrees that the Access List should include a specific definition for network availability and proposed the following definition:

> Network Availability" means the availability of the network as calculated by the below formula:
>
> Network Availability = [(24 X M)-O) / (24 X M)] x 100
>
> where M = number of days in Measurement Period
>
> > O = Outage time in hours
>
> The Measurement Period for the purpose of Network Availability is one (1) calendar month.

7.17   REDtone is agreeable to the proposed amendments by the MCMC and proposes to have MTTR parameters. REDtone proposes for network availability: 99.5% for (1+0) and 99.9% for (1+1) – protected links. For latency, REDtone proposes <20 ms within Peninsular and <40ms for Peninsular to East Malaysia.

7.18   SACOFA has no issue on the proposed amendments by the MCMC on the description of the End-to-End Transmission Service and SACOFA is able to offer the service based on the proposed amendments. SACOFA proposes for "network availability" to state that it shall be within a close range of the tower radius and "latency" shall subject to site's location such as distance, region etc.

7.19   TM agrees with the proposed amendments by the MCMC but would like to propose an alternative service description to facilitate the supply of the regulated service. TM submits that it faces challenges in the provision of the End-to-End Transmission Service based on the proposed amended service description, and thus requests the MCMC to revise the technical parameters specified in the service description as follows:

> (i)   *any Service network availability between 99.90% and 99.992% of 99.0% with zero redundancy, whether per month or otherwise:*
>
> (ii)   *any latency of between <1ms and <40ms for End-to-End Transmission Service limited to within Peninsular Malaysia, within Sabah and within Sarawak; and*
>
> (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 limited to parameters of a type referred to in paragraphs (i) to (iii) (i) and (ii) above.*

7.20   TM submits that the definition of End-to-End Transmission Service includes last-mile network to termination equipment and the basic service availability that TM can offer is 99.0%. TM views that latency is highly dependent on distance and region. It is also impacted by the Access Seeker and/or end-user location's distance to the nearest Access Provider's network equipment. Based on observation, TM is only able to achieve latency between <1ms and <40ms within Peninsular, within Sabah, and within Sarawak. TM submits that higher technical parameters should be at commercially negotiated pricing as a much-improved network architecture will be required to enable higher availability, redundancy and QoS. Furthermore, access to redundant infrastructure is not available nationwide. Thus, service availability beyond 99.0% is only available in very selected areas and should not be price regulated.

7.21   TM is currently providing a wide variety of commercial leased-line service offerings in the market and has multiple access agreements with Access Seekers, highlighting TM's willingness to provide and ability to arrive at fair commercial pricing. As such, TM views that the MCMC should only regulate the price of basic End-to-End Transmission Service (i.e. with 99.0% service availability with 0 redundancy; and latency of between <1ms and<40ms within Peninsular Malaysia and within Sabah/Sarawak).

7.22   TM also proposes that the process to remove competitive routes for End-to-End Transmission Service is retained in the Access List. TM highlights that this is in line with best practice observed in other advanced best-practice markets. TM proposes for "network availability" be replaced with "service availability" as service availability is more apt for the End-to-End Transmission Service which comprises of different network sections.

7.23 TT dotCom submits that if the inclusion of all of these Transmission Services as an access service does not meet the purpose of promoting investment and innovation in the sector, Transmission Services should be excluded. TT dotCom highlighted that Transmission Services are purchased on a commercially negotiated basis, with service levels reflecting prices. This is because large Access Seekers will push the price offered by small providers as low as possible. TT dotCom views that the commercial negotiation power is always one sided and favours the Access Seekers. TT dotCom comments that network owners do not build networks for their own use only but also sell the services on a wholesale basis to other operators. Thus, there are economic incentives for such a provider to make sure that the prices demanded by the Access Seeker is met.

7.24 TT dotCom further highlights that the inclusion of Transmission Services on the Access List is a form of ex-ante regulation, and does not provide protection for smaller providers as it is applicable to all licensees. This creates disincentives and distortions in the market to the advantage of large Access Seekers. TT dotCom highlights that the Access List and the MSAP act as a form of benchmark prices to the market, which influences commercially negotiated deals. TT dotCom views that by including SLAs into the service, it removes one differentiator that a provider can offer to its customers and this may have serious unintended consequences to the market.

7.25 TT dotCom proposes that the definition of Transmission Services in the Access List is amended to include a network size and scope criteria. This would make the service applicable to only those network providers who have achieved that network size and scope. By doing this, investment is encouraged into new fibre transmission in Malaysia, provide protection for smaller providers who are investing and will achieve the LTBE outcome, thus enabling the MCMC to effectively undertake asymmetric regulation.

7.26 TT dotCom is of the opinion that the measurement and calculation for "network availability" should be similar to the existing definition and methodology of "service availability" as outlined in the MSQoS (Digital Leased Line Service) Determination No. 3 of 2009. As for the definition of "Latency", TT dotCom currently adopts the definition by MEF 3.0 which is an international standard and should be considered in the Access List.

7.27 U Mobile agrees to the proposed amendments by the MCMC. Other parameters proposed by U Mobile are:

(a) Link shall be transparent, and any user protocols & native packets shall not be discarded by provider's network (including but not limited to Unicast, Multicast, LACP, BFD);

(b) Provider shall not modify user traffic (Header, Payload and VLAN) and shall be able to deliver QoS without modifying user's traffic priority;

(c) Support MTU size up to 9000 bytes;

(d) Round trip packet latency of ≤ 10ms (for distance below 250km). Please refer to Q47 for details of latency requirement;

(e)   Packet jitter of ≤ 3ms (for distance below 250km);

(f)   Packet loss of ≤ 0.01%; and

(g)   SLA of 99.9% (for 1+1 protection) & 99.5% (for 1+0).

7.28   U Mobile proposes a specific definition for "Network Availability" where network availability is measured as the percentage of time a service stays fully operational over a period of time and it should relate to the SLA commitment agreed between Access Seeker and Access Provider. U Mobile submits that the Access Provider needs to ensure that the agreed SLA is met, otherwise, penalty should be imposed. Furthermore, the Access Provider should be required to commit on "Network Quality". U Mobile highlights that some providers categorise quality issue such as packet loss as lower severity level and take longer time for troubleshooting and restoration.

7.29   U Mobile proposes a specific definition for "Latency". U Mobile suggested to introduce guideline and reference parameter for latency based on network distance and between Peninsular & East Malaysia as follows:

(a)   Round Trip Latency ≤ 10ms, for network distance 250 km and below;

(b)   Round Trip Latency ≤ 20ms, for network distance 251 – 500 km;

(c)   Round Trip Latency ≤ 40ms, for network distance above 501 km; and

(d)   Round Trip Latency ≤ 50ms, between Peninsular & East Malaysia.

7.30   YTLC agrees with the proposed amendments by the MCMC. However, YTLC requests to specify the latency of between <1ms and <40ms is for one-way or round trip. YTLC suggests for this parameter for round trip. Also, YTLC highlighted that network availability between 99.90% and 99.992%, whether per month or otherwise, should be end-to-end and not limited to the core network. For clarity, YTLC proposes to include a network diagram. Further, YTLC comments that Transmission services are important input to Access Seekers, thus should have higher degree of regulation in the access instruments. YTLC also confirms that technically, it is possible to supply End-to-End Transmission Service at the proposed service description.

7.31   YTLC views that specific definition of network availability and latency should be included in the description of services in the Access List. YTLC proposes the following:

(a)   Network Availability % = {1-(Total outage time / (Total no. of time)} x 100%;

(b)   The parameter Total no. of time in measured period;

(c)   The parameter of Total outage time based on start and end time for outage calculated from time service becomes unavailable (service outage) based on the timestamp recorded within network monitoring system(s) (including EMB, NMS, etc.) until the time service is restored; and

(d)   Latency is the amount of time it takes for a signal to be sent plus the amount of time it takes for acknowledgement of that signal having been received. This time delay includes propagation times for the paths between the two endpoints.

Discussion

7.32   Operators were generally supportive of the MCMC's preliminary view to retain the End-to-End Transmission Service in the Access List, including modifications to clarify the scope and technical parameters of the service.

7.33   Several operators suggested additional or other technical parameters for the service description. The MCMC reminds operators that it is not the role of the Access List to specify all technical parameters with which a service can be supplied.

7.34   The MCMC's proposal to include certain key technical parameters in respect of the End-to-End Transmission Service is supported with a "catch-all" provision in paragraph 4(22)(i)(iv) which captures "any other technical parameters specified or utilised by the Access Provider from time to time". Accordingly, given the disparity of views between operators regarding the appropriate parameters for inclusion in the service description, the MCMC's preference is to retain the key technical parameters of network availability, latency (i.e. whether round-trip or one-way) and redundancy, as currently specified in the draft service description. This is to ensure that the service reflects what is supplied in practice, so that operators can enter into enforceable access agreements regardless of the parameters with which the service is supplied.

7.35   Similarly, in response to submissions from operators that certain technical parameters e.g. redundancy is only relevant in a certain region, the MCMC notes that the proposed technical parameters are drafted broadly and in ranges to ensure that even where the service is supplied with different technical parameters in one deployment compared to another, it is still covered by the Access List service description and hence enforceable under an access agreement. This is no different to the MCMC's ongoing approach to regulation of HSBB Network Services, in respect of which the MCMC specifies bandwidth ranges and latency / QoS ranges that the MCMC understands may not be available in every single location.

7.36   At the same time, the MCMC acknowledges that the supply of services with certain parameters may have cost implications for Access Providers and accordingly price implications for Access Seekers. These consequences will be the subject of a later MSAP inquiry, but it would be inappropriate for the MCMC's approach to access regulation – which is based fundamentally on regulation in the LTBE – to be governed by what Access Providers consider is the appropriate approach to price regulation.

7.37   For the above reasons, the MCMC rejects submissions by edotco, Fiberail and TT dotCom to omit technical parameters from the service description altogether, and Fibrecomm's submission to limit the scope of the application of the technical parameters to new service activations over existing infrastructure.

7.38   There were mixed views from operators on the MCMC's query regarding whether the Access List should include a definition for "network availability" or "latency". Even amongst operators who agreed that a definition should be provided, there was a divergence of views regarding what the definition should actually be. In the circumstances, the MCMC does not have sufficient information, and there does not appear to be sufficient industry consensus, to specify standard definitions for these terms. However, the MCMC will closely monitor market developments and intervene as necessary to ensure that Access Providers are not adopting unreasonable definitions which do not align with their historic practice, or current industry practice.

7.39   TM proposed a number of amendments to reflect its views on whether certain elements of the End-to-End Transmission Service should or should not be price-regulated, specifically in relation to service availability above 99.0% and redundancy routes. The MCMC believes that the technical parameters of the regulated service should reflect, as closely as possible, the parameters available commercially. The End-to-End Transmission Service is a critical bottleneck input and the MCMC rejects the view that the regulated services should be a basic, low quality / speed service when compared with services available commercially.

7.40   The MCMC reminds operators that inclusion of a service on the Access List does not necessarily mean that it will or will not be price-regulated. Price regulation is a separate exercise that will take place under a later MSAP inquiry, at which time operators will be invited to make detailed submissions regarding their views on pricing, which the MCMC acknowledges will be a critical inquiry given the amendments proposed by the MCMC to the Access List in the context of this review, along with industry-level changes more generally.

7.41   Maxis submitted that the phrase "Access Seeker Point of Presence" be retained, rather than a reference to "Access Seeker's premises" as proposed by the MCMC. The MCMC notes that "Access Seeker's premises" is not intended to be a reference to premises which are necessarily owned by the Access Seeker, but to broaden the scope of the term to ensure that it is not capable of being read narrowly by Access Providers.

7.42   To assist operators in interpretation of this term, references to "Access Provider's premises" and "End User's premises" are used throughout the Access List with no intention that they refer to ownership (e.g. Access Providers may lease facilities from a third party, but these would still comprise "Access Provider's premises" for the purposes of the Access List, and similarly many End Users may not own their premises). Accordingly, the MCMC will retain the proposed amendments, given the earlier concerns raised by industry regarding confusion over the existing "POP" reference.

7.43   The MCMC agrees to amend paragraph 4(22)(f) of the service description as proposed by Altel, MYTV and Net2One, to clarify that the service is technology-neutral.

7.44   Finally, the MCMC notes again that it has not responded to submissions by operators on price and non-price terms and conditions of access which are more relevant to later inquiries into the MSAP and MSA respectively.

MCMC Views

7.45   The MCMC confirms its preliminary view that it would be in the LTBE for the End-to-End Transmission Service be retained in the Access List, subject to modifications to clarify the parameters, scope and description of the service, as follows:

4(22) End-to-End Transmission Service

(a)   The End-to-End Transmission Service is a Facility and/or Service for the carriage of communications between:

   (i)   two End User locations;

   (ii)   between two Access Seeker*s' premises* ~~Points of Presence~~; or

   (iii)   between one End User location and one Access Seeker*'s premises* ~~Point of Presence~~,

   via such network interfaces at such transmission rates as may be agreed between the Access Provider and the Access Seeker on a permanent or virtual basis.

(b)   Network interfaces may use any technology as may be agreed between the Access Provider and the Access Seeker including, for example, Ethernet interfaces.

(c)   The functionalities of the End-to-End Transmission Service include:

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

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

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

   (iv)   a digital protocol including Internet Protocols.

(d)   An End User location or Access Seeker*'s* ~~Point of Presence~~ *premises* in subparagraph (a) may include submarine cable or satellite link between Sabah and Sarawak and Peninsular Malaysia, submarine cable landing centre or an earth station.

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

(f)   Technologies used to supply End-to-End Transmission Service, such as Metro-E*, 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 <1ms and <40ms:

    (iii) zero or more routes of redundancy; and

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

Wholesale Local Leased Circuit Service

Introduction

7.46 In the PI Paper, the MCMC's noted that the Wholesale Local Leased Circuit Service is supplied in the last mile of the access network, which is commonly regarded as a bottleneck in the supply of telecommunications services, given the difficulty of infrastructure duplication in that network segment and its necessity for the promotion of downstream competition.

7.47 Accordingly, the MCMC considered that it would be in the LTBE to retain the Wholesale Local Leased Circuit Service in the Access List, subject to modifications to clarify that the service includes the provision of a Trunk Transmission Service where required for the provision of the service, and to reflect that the service may be incorporated into a Metro-Ethernet network.

Submissions Received

7.48 Allo supports the changes proposed by the MCMC to include the Trunk Transmission Service and acknowledges that MCMC will review the MSAP at a later time to ensure that the regulated prices for these services are set at an appropriate level. Allo confirms that it is capable of supplying the service as per the proposed amended service description. For Wholesale Local Leased Circuit, Allo proposes typical distance of 10km while the furthest distance for the Trunk Transmission is 30km. Allo agrees that Metro-E technology should be included in the Wholesale Local Leased Circuit Service and should be the preferred platform for the service. Allo also agrees that the Wholesale Local Leased Circuit Service is defined with the same technical parameters as those proposed for the End-to-End Transmission Service.

7.49 Altel and Net2One support on the inclusion of subparagraph (c) since it provides better clarity to the description of the Wholesale Local Leased Circuit Service. Altel and Net2One agree that Wholesale Local Leased Circuit should be defined with the same technical parameters as those proposed for the End-to-End Transmission Service.

7.50 Astro is agreeable to the MCMC's proposal to include Metro-E in the proposed service description. However, Astro also suggest for MPLS and DWDM to be

included in the service description. Astro is agreeable that the Wholesale Local Leased Circuit Service be defined with the same technical parameters as those proposed for the End-to-End Transmission Service.

7.51   Celcom agrees with the proposed changes to include within the Wholesale Local Leased Circuit Service any Trunk Transmission Service. However, this should be an option on top of the standalone Wholesale Local Leased Circuit to avoid bundling the two services. Celcom submits that it will be able to supply the Wholesale Local Leased Circuit Service according to the proposed amended service description. Celcom clarified that it does not have arrangement with any Access Seeker in providing onward transmission via Trunk Transmission Service.

7.52   Celcom also highlights that it has experienced operators offering metro-ethernet network as substitute for Transmission Services (leased lines). These services appear to be substitutable for high-speed broadband service and as such, are offered in the same market. Celcom views that such connectivity should be subject to regulatory intervention especially where there is significant market power of operators who have been "exclusively" appointed as nominated facilities providers by the owners of the network facilities to operate the facilities. Celcom comments that other operators would not be able to duplicate infrastructure in those areas.

7.53   Celcom views that the technical parameters of Wholesale Local Leased Circuit Service can be the same with the technical parameters proposed for the End-to-End Transmission Service.

7.54   Celcom Timur (Sabah) submits that Trunk Transmission and Wholesale Local Leased Circuit Service should be separate, as the two are not made up of the same network characteristics. If trunk is to be included as part of Wholesale Local Leased Circuit Service, there should be a revision in the current MSAP where the price should be higher. Celcom Timur (Sabah) submits that the typical distance to enable connectivity via Trunk Transmission is 60-80KM and the furthest distance is 700KM. Celcom Timur (Sabah) also views that the Wholesale Local Leased Circuit Service should be defined with the same technical parameters as those proposed for the End-to-End Transmission Service.

7.55   DNB submits that the changes proposed by the MCMC to include a new subparagraph (c) to the description of the Wholesale Local Leased Circuit Service is helpful and hopefully will address the present market failures.

7.56   Fiberail views that it is not technically possible to provide Wholesale Local Leased Circuit on its network due to security, quality and operational requirements. According to Fiberail, any type of services for the carriage of information between 2 points (i.e. end user, Access Seeker POI, any technically feasible points) will require similar design and network component as the End-to-End Transmission, regardless of short or long distance. Hence, Fiberail believes that End-to-End Transmission is already sufficient for the intended purpose of carrying of information between 2 points which is Metro-E compliance.

7.57   Fibrecomm submits that Wholesale Local Leased Circuit requires an additional "trunk component service" and active network element. In this case, Fibrecomm views Wholesale Local Leased Circuit and Trunk Transmission services should be separated because of the different network set up and cost structure between

Wholesale Local Leased Circuit and Trunk Transmission. Fibrecomm comments that it is not capable of providing Wholesale Local Leased Circuit Service as Fibrecomm only provides End-to-End Transmission Service. Fibrecomm clarifies that it does not have such collector node that aggregates the same Access Seeker's multiple circuit from Access Seeker's premises to another Access Seeker's premises.

7.58 Fibrecomm submits that Metro-E technology may be included in the Wholesale Local Leased Circuit Service but with certain distance limitation and that the same technical parameters proposed for End-to-End Transmission could be applied for the Wholesale Local Leased Circuit Service.

7.59 Maxis views that the Wholesale Local Leased Circuit Service does not need to be a separate service in the Access List as the service can be provided under the End-to-End Transmission Service. Maxis clarifies that the End-to-End Transmission Service as defined currently does not depend on distance, as such it can also be provided within the same local exchange areas of the respective Local Exchanges. Maxis submits that it is easier for the Access Provider to manage the End-to-End Transmission Services and easier for the Access Seeker to subscribe to the End-to-End Transmission Service in which the Access Provider will be responsible for end-to-end connectivity. On the contrary, Wholesale Local Leased Circuit Service requires the Access Seeker to co-locate (one leg) in the Access Provider Local Exchange, and the other leg (i.e. from the Access Provider Local Exchange to the End-User premise or Access Seeker POP) is managed by the Access Provider. As such, Maxis proposes to remove the Wholesale Local Leased Circuit Services from the Access List.

7.60 REDtone agrees with the changes proposed by the MCMC and is of the opinion that the Wholesale Local Leased Circuit Services should be defined with the same technical parameters as those proposed for the End-to-End Transmission Service.

7.61 SACOFA agrees with the changes proposed by the MCMC to include a new subparagraph (c) to the service description. SACOFA is capable of supplying the Wholesale Local Leased Circuit Service according to the proposed amended service description, subject to the connectivity type and service type requirement such as transparent Layer 2 or Layer 3 services. SACOFA submits that the typical distance for the trunk component is 10Gbps within range 10km-80km, while the furthest distance is 100Gbps – 10km from the Access Seeker's connectivity. SACOFA is agreeable with the MCMC's proposal to include Metro-E technology for the service. SACOFA is also agreeable that both Wholesale Local Leased Circuit Service and End-to-End Transmission Service should be defined with the same technical parameters for easier integration.

7.62 TM agrees with the MCMC's proposal regarding the expansion of the WLLC Service, but it notes that the service description would need to be clarified by using the term 'trunk component service' and not 'Trunk Transmission Service' in Section 13.149 in the PI paper. TM views that the trunk component should also be limited to the distance required for a cross-connect cabling to run from the Access Provider's intermediate location to the equipment in the mini-DC, which is the POI, as the last mile circuits for the WLLC service.

7.63   TM highlights that the proposed WLLC Service requires additional "trunk component service" and network equipment. The additional cost components would need to be accounted for in the upcoming MSAP review. In the interim, TM views that it should not be required to provide the proposed WLLC Service at current MSAP, as the current MSAP does not account for the additional components.

7.64   TM confirms that it is able to supply the Wholesale Local Leased Circuit Service according to the proposed amended service description. However, TM would like to highlight that Wholesale Local Leased Circuit Service should only involve connectivity where the backhaul network from the POI is being provided by the Access Seeker either via its own network or via the Trunk Transmission Service provided by the Access Provider. As such, the Wholesale Local Leased Circuit definition is not applicable to leased line services connecting the Access Seeker to another service of the Access Provider such as full-span interconnection, HSBB backhaul transmission or internet interconnection.

7.65   TM submits that clear distinction and demarcation should be made between the 'trunk component' of a WLLC service and the Trunk Transmission service. Where the Access Seeker chooses to make its own arrangement for the backhaul network, the Access Provider is not required to provide a Trunk Transmission Service. TM proposes that the trunk component be limited to the distance required for a cross-connect cabling that runs from the Access Provider's intermediate location to the equipment in the mini-DC, which is the POI, as the last mile circuits for the WLLC service. The typical distance for the trunk component (internal wiring) of the Wholesale Local Leased Circuit Service should be a maximum of 400m within the same building and calculated on a per-unit basis. Additional charge is required for distance beyond 400m.

7.66   TM views providing Trunk Transmission Service for each WLLC service is akin to providing an End-to-End Transmission Service. This renders the combined Wholesale Local Leased Circuit Service with Trunk Transmission Service redundant. However, TM views that the Access Seeker may subscribe a separate Trunk Transmission Service from the same location to another location at the Access Provider's premise, but the Trunk Transmission should not be an exact mapping of individual WLLC bandwidth but rather an aggregation of the total WLLC bandwidth.

7.67   TM reminds that the amended service description should take account of all the providers different network architectures, including but not limited to, TM's network architecture. TM is of the understanding that the definition of transmission services is already technology neutral and agrees that the WLLC Service should be defined with the same technical parameters as those proposed for the End-to-End Transmission Service.

7.68   U Mobile agrees with the MCMC's proposed amendment to include a new subparagraph (c) to the description of the Wholesale Local Leased Circuit Service. U Mobile agrees with the MCMC's proposal to include Metro-E technology in the Wholesale Local Leased Circuit Service.

7.69   YTLC agrees with the MCMC's proposed amendment to include a new subparagraph (c). However, referring to Figure 39 on page 213 of the PI Paper, the labelling on Trunk Transmission Service network boundary could imply that there will be double charges of Trunk Transmission Service where there are 2 segments of Trunk Transmission Service (Intermediate point of connection – POI – Access Provider's premise and Access Provider's premise (Link to Backhaul Network) to next Access Provider's premise via Access Provider network) besides the Wholesale Local Leased Circuit Service segment. YTLC views it should be clarified that the segments of Trunk Transmission Services are subsumed in the description of Wholesale Local Leased Circuit Services at one single price or charge.

7.70   YTLC also proposes that for clarity purposes, the network diagram should be included for illustration and to include point 13.150 of the PI Paper in the description.

Discussion

7.71   Most operators agreed with the MCMC's proposal to retain the WLLC on the Access List, including the amendments proposed to the service to include Trunk Transmission Service to the extent required to enable connectivity.

7.72   Further, all operators who proposed technical parameters for the WLLC service agreed that the same technical parameters should be adopted as set out in the proposed amendments to the End-to-End Transmission Service. Accordingly, the MCMC proposes to include those parameters as a new paragraph 4(6)(e) to the service description.

7.73   In response to Celcom Timur (Sabah)'s submission that the MCMC's proposed amendments to the WLLC Service should result in a revision to the current MSAP, the MCMC invites Celcom Timur (Sabah) to provide its views in response to a later MSAP inquiry.

7.74   The MCMC notes submissions by Fiberail and Fibrecomm that it is not technically possible to provide the WLLC Service as described, including due to security, quality and operational requirements. The MCMC notes in response that:

(a)   as noted above, the MCMC proposes to include technical parameters in the service description for this service so that the service is captured by the Access List regardless of the QoS with which it is supplied;

(b)   operators must not refuse access to a listed facility or service on the basis of security or operational requirements unless these requirements are consistent with the MSA;

(c)   the WLLC service (with included trunk component) does not comprise an End-to-End Transmission Service. The End-to-End Transmission Service only includes services between two end-user locations, two Access Seeker POPs or an end-user location and an Access Seeker premises. It does not include services which have an end point at an Access Provider POI or premises;

(d) while the Access List does not require operators to build new facilities or services in order to comply with their SAOs, operators must supply access to existing facilities or services on request by Access Seekers.

7.75 The MCMC also notes submissions by Maxis that the End-to-End Transmission Service is sufficient and the WLLC service can be removed from the Access List. However, most Access Seekers reported that they would like to continue acquiring the WLLC service, but have experienced difficulties in doing so. Given most Access Seekers complained about Access Providers treating WLLC service as an End-to-End Transmission Service, the MCMC considers it preferable for the transmission services to remain available to Access Seekers to acquire on an unbundled basis as required. The MCMC acknowledges that this approach may have price implications for operators, and the MCMC will consider these separately in a later MSAP inquiry.

7.76 The MCMC welcomes TM's confirmation that it is technically capable of supplying the WLLC service as described. The MCMC also notes submissions by TM that the trunk component of the WLLC service is not unlimited but should be limited to cross-connect cabling that runs from the Access Provider's intermediate location to the equipment in the mini-DC, which is the POI. TM cites that this should be a maximum of 400m within the same building, with additional charges needed for distances beyond 400m.

7.77 In response, the MCMC refers to the draft service description, which specifies that the Trunk Transmission Service is included "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, meaning any Trunk Transmission Service beyond that which is required for connectivity would not be included in the scope of the service. As noted in the PI Paper, the MCMC expects that this would be, for example, between an Access Provider's intermediate location to its central POI, and would not be within the same building. Any cost / distance related issues will be addressed by the MCMC as part of a later MSA / MSAP inquiry.

7.78 TM also noted that the included trunk component should not be labelled as a "Trunk Transmission Service" and should instead be labelled as a "trunk component", to avoid confusion between the WLLC and the End-to-End Transmission Service. Again, the MCMC rejects any submissions by TM and other operators that this arrangement would result in an End-to-End Transmission Service. The End-to-End Transmission Service does not include any service with an end point at an Access Provider Premises or Access Provider POP, which would be the case under the revised WLLC service, even where a trunk component is required.

7.79 YTLC submitted its concern that Figure 39 of the PI Paper could result in double charges of Trunk Transmission Service where there are two segments of Trunk Transmission Service (i.e. including onwards transmission to the backhaul network). The MCMC confirms that the diagram set out in Figure 39 is accurate; the MCMC does not intend that the WLLC will include onwards transmission beyond the POI at the Access Provider's premises. In this regard, the MCMC agrees with submissions by TM that the WLLC does not include connectivity to

other Access Provider services upstream of the POI, e.g. HSBB backhaul transmission, etc.

7.80 Regarding YTLC's submission that the network diagram should be included in the service description, the MCMC notes illustrations and diagrams are provided to assist consultation and understanding only, and at this stage the MCMC does not propose to include a network diagram in respect of the WLLC or any other services.

MCMC Views

7.81 The MCMC confirms its preliminary view that it would be in the LTBE for the Wholesale Local Leased Circuit Service to be retained in the Access List with modifications to clarify that the service includes the provision of a Trunk Transmission Service (where required for the provision of the service) and that the service may be incorporated into a Metro-Ethernet network. The MCMC also proposes to replicate in the WLLC service the technical parameters that apply to the End-to-End Transmission Service, as follows:

4(6) Wholesale Local Leased Circuit Service

(a) A Wholesale Local Leased Circuit Service is a Facility and/or Service for the carriage of communications by way of a private circuit between a POI at ~~the~~ an Access Provider's premises and an End User location or an Access Seeker's premises ~~Point of Presence~~, available only at one end of a private circuit. ~~The Wholesale Local Leased Circuit Service comprises transmission and switching, whether packet or circuit,~~ at such transmission rates as may be agreed between the Access Provider and the Access Seeker on a permanent or virtual basis.

(b) The functionalities of the Wholesale Local Leased Circuit Service include:

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

   (ii) the signalling required to support the Interconnect Link Service or onward transmission via a Trunk Transmission Service provided by the same Access Provider; and

   (iii) a digital protocol including Internet Protocols.

   Examples of technologies used in the Wholesale Local Leased Circuit Service would be Integrated Services Digital Network ("ISDN"), Metro-E, IP based networks and Ethernet interfaces.

(c) Without limiting subparagraph (a), the Wholesale Local Leased Circuit Service includes the provision of any Trunk Transmission Service by the same Access Provider to the extent required to enable connectivity between the relevant End User location or Access Seeker's premises and a POI at the Access Provider's premises.

(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 <1ms and <40ms:

Trunk Transmission Service

Introduction

7.82   In the PI Paper, the MCMC took the preliminary view that it would be in the LTBE for the Trunk Transmission Service to remain on the Access List, noting that these services are supplied over sunk infrastructure assets that are difficult to replicate, and facilitate essential connectivity between major capital cities in Malaysia, promoting competition in dependent downstream markets.

7.83   The MCMC also proposed to make a minor modification to the service description to clarify that the service may be incorporated into a Metro-Ethernet network.

Submissions Received

7.84   Altel and Net2One agree with the proposed changes to the service description for the Trunk Transmission Service to clarify that the service must also be supplied over Metro-E.

7.85   Astro is agreeable on the MCMC's proposed changes to the service description for the Trunk Transmission Service to clarify that the service must also be supplied over Metro-E.

7.86   Celcom agrees with the proposed changes to include metro-ethernet in the service description and Celcom will be able to supply the service as per proposed amendments.

7.87   Celcom Timur (Sabah) submits that Trunk Transmission Service should be removed from the Access List for the state of Sabah.

7.88   Digi is agreeable to the proposed changes to the service description for the Trunk Transmission Service to clarify that the service must also be supplied over Metro-E. Digi submits that it is capable of supplying Trunk Transmission Service over Metro-E.

7.89   DNB is a potential Access Seeker for Trunk Transmission Service. DNB supports the proposed changes to the service description.

7.90   Fiberail believes that End-to-End Transmission is already sufficient for the intended purpose of carrying of information between 2 points which is Metro-E compliance.

7.91   Fibrecomm views that Trunk Transmission Service is described as technology neutral. Fibrecomm is capable of supplying the Trunk Transmission Service as per the proposed amended service description but only for new service activation over existing readily infrastructure.

7.92   Maxis is agreeable with the service description proposed by the MCMC for the Trunk Transmission Services, including the proposed changes to include Metro-E as part of the technology for Trunk Transmission. However, Maxis proposes to replace "Access Seeker's premises" with "Access Seeker's Points of Presence".

7.93   Maxis finds the Trunk Transmission Service usable as an input e.g. for the Layer-2 HSBB Network Services where the Access Seeker has selected for a centralized POI instead of Regional POI for the interconnection with the Access Provider. However, Maxis highlights that to acquire the Trunk Transmission Service, Access Seekers need to co-locate equipment in the Access Provider's premises and Maxis has experienced impediments in acquiring the Network Co-Location Service and the access route to the Access Provider's premises.

7.94   Maxis submits that the Trunk Transmission Service should be technology neutral and applicable to all current and future technology. In addition, Maxis views that the current service description should also cover speed ranges up to multiples of 100Gbps per interface.

7.95   Maxis also submits that that no locations or areas should be excluded from the scope of the service due to lack of substitutability for Trunk Transmission Services between the Access Providers (both Point A and Point B are located at a premises of the same Access Provider).

7.96   Maxis confirms that it is capable of supplying the Trunk Transmission Service per the proposed amended service description with the minor changes (i.e. "Access Seeker's Point of Presence") as proposed by Maxis.

7.97   REDtone agrees with the proposed changes to the service description for the Trunk Transmission Service to clarify that the service must also be supplied over Metro-E.

7.98   SACOFA agrees with the proposed changes to the service description for the Trunk Transmission Service to include Metro-E as all of SACOFA's access is Layer 2 interfaces. SACOFA is able to supply the service based on the proposed amendments on the description of the Trunk Transmission Service.

7.99   TM proposed that the Trunk Transmission Service be defined in the service description as a transmission service provided between two Access Provider premises. TM highlights that the upcoming MSAP review should also take account of the distance between the two premises, along with the additional network equipment as well as internal wiring or cross connect cabling required between the Access Seeker equipment and the Access Provider equipment (POI). TM is in the process of establishing mini-DCs across the country (at least two per region) to enable such Trunk Transmission services between such mini-DCs. This would safeguard the security of the network.

7.100   TM confirms that it is able to supply the Trunk Transmission Service as per the proposed amended service description.

7.101   U Mobile agrees to the proposed changes and addition of Metro-Ethernet as an option for Trunk Transmission Services. U Mobile suggested adding more details or parameters (e.g. SLA, latency / jitter & QoS) to address the service quality

concern using Metro-Ethernet as Trunk Transmission Services, especially for long distance.

7.102 YTLC agrees with the proposed definition of Trunk Transmission Service. For clarity, YTLC proposed including a network diagram outlining the co-location of Access Seekers equipment in an Access Provider's network to clarify that this does not convert service into an End-to-End Transmission Service. YTLC submits that this will facilitate access and avoid misunderstandings.

7.103 YTLC also proposed including the same technical parameters as those proposed for End-to-End Transmission Service. However, YTLC does not agree with the suggestions to remove the competitive routes as the routes are not similar. Some routes could be along the railway line, highway or along federal or state roads separated by substantial distance. Thus, these routes are not substitutable for each other.

7.104 YTLC is capable of supplying Trunk Transmission Service per the proposed amended service description but limiting to available network footprint area and network capacity.

Discussion

7.105 All operators, with the exception of Celcom Timur (Sabah) and Fiberail, submitted that the Trunk Transmission Service should be retained on the Access List, with most Access Providers noting that they would be able to supply the service as described.

7.106 The MCMC does not agree with those operator submissions that the service should be removed from the Access List. Again, the MCMC's preference is to permit operators to acquire transmission services on an unbundled basis if they wish to do so, to ensure the efficient use of existing infrastructure in promotion of the LTBE. It would be inappropriate to remove the service from the Access List at this time.

7.107 The MCMC does not propose to limit the Trunk Transmission Service to a service provided between two Access Provider premises as proposed by TM. The broader description of the Trunk Transmission Service as being between two "technically feasible" points has been utilised since the inception of the (then) Transmission Service in the 2009 Access List Determination, and the MCMC considers it would be inappropriate to narrow this service now at a time when Access Seekers are reporting difficulties in acquiring access to transmission services on an unbundled basis. The MCMC invites TM to make further submissions on its views on pricing of the Trunk Transmission Service in the context of a later MSAP inquiry.

7.108 While Maxis, U Mobile and YTLC suggested that the Trunk Transmission Service include further details and parameters to address QoS concerns, the MCMC notes that it received limited submissions from operators regarding the specific QoS parameters that should apply. Further, as the Trunk Transmission Service relates to transmission between two (typically) Access Provider premises, the MCMC expects that Access Seekers are primarily concerned with transmission capacity where an end-point is an Access Seeker or end-user premises, and the required technical parameters in those contexts are addressed under the proposed

amendments to the End-to-End Transmission Service and WLLC service. Additionally, the MCMC notes that in meeting the minimum QoS parameters for those services, Access Providers would in any event need to provide any trunk components that are capable of satisfying those QoS parameters. Accordingly, the MCMC does not propose to also include technical parameters for the Trunk Transmission Service at this stage.

7.109 The MCMC agrees with YTLC's submissions that the requirement for an Access Seeker to co-locate its equipment at the Access Provider's premises should not result in the service being treated by Access Providers as an End-to-End Transmission Service. However, the MCMC notes that the service descriptions as proposed already preclude such an interpretation by Access Providers. Rather than making the clarifications sought by YTLC in respect of this service (which may lead to inconsistent interpretations by Access Providers in other contexts where similar clarifications are not included), the MCMC reminds operators to report any issues of non-compliance to the MCMC so that the MCMC can intervene as necessary.

7.110 Finally, no operators suggested any competitive routes which should be removed from the scope of the regulated service. Accordingly, the MCMC does not propose to deregulate any particular routes.

MCMC Views

7.111 The MCMC's confirms its preliminary view that it would be in the LTBE for the Trunk Transmission Service to be retained in the Access List with minor modifications to the service description to clarify that the service may be incorporated into a Metro-Ethernet network, as follows:

4(19) Trunk Transmission Service

(a) *The Trunk Transmission Service is a Facility and/or Service for the carriage of communications between any two technically feasible network transmission points, not being End User locations or Access Seeker's premises Points of Presence, on the Access Provider's network, via such network interfaces at such transmission rates as may be agreed between the Access Provider and the Access Seeker on a permanent or virtual basis.*

(b) *Network interfaces may use any technology as may be agreed between the Access Provider and the Access Seeker including, for example, Ethernet interfaces and Metro-E.*

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

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

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

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

    (iv) *a digital protocol including Internet Protocols.*

(d)   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.

Domestic Connectivity to International Services

Introduction

7.112   In the PI Paper, the MCMC noted that access to cable landing or earth stations is a bottleneck service, given the only possible supplier of access is the owner of the relevant landing station or earth station, with no scope for competitive entry.

7.113   Accordingly, the MCMC proposed to retain this service in the Access List without any modification.

Submissions Received

7.114   Altel and Net2One agree with the MCMC's preliminary view that Domestic Connectivity to International Services should remain in the Access List.

7.115   Celcom does not acquire the service as an Access Seeker. Celcom acquires Point of Access service on a commercially agreed basis.

7.116   Digi is agreeable to retain Domestic Connectivity to International Services in the Access List.

7.117   DNB submits that it will require access to international gateways and agrees with retaining the Domestic Connectivity to International Services in the Access List. DNB finds the proposed service description adequate.

7.118   Maxis agrees with retaining Domestic Connectivity to International Services in the Access List given that access to cable landing stations is a bottleneck service. In addition, Maxis views that "Point of Access" (**POA**) arrangement is to be considered as part of the Domestic Connectivity to International Services in the Access List. The reason is the high prices imposed by the Access Providers even though the connection distance at the cable landing station is relatively short. Maxis views that that access to cable to landing stations is a bottleneck service in a monopolistic market, therefore the prices imposed by the Access Providers including the POA arrangement should be regulated as well.

7.119   SACOFA is agreeable to retaining Domestic Connectivity to International Services in the Access List.

7.120   TM provides Domestic Connectivity to International Services and agrees to the retention of the service in the Access List. TM experiences no impediments in supplying the service. TM further highlights that submarine cable landing stations

are important and strategic types of telecoms infrastructure that enable connectivity between Malaysia and the rest of the world.

7.121   However, TM disagrees with Maxis' claims of Access Providers charging "exorbitant" prices for only "a few meters" of connection and the MCMC's conclusion that "Point of Access arrangement is a connection service and hence it falls within the service description of Domestic Connectivity to International Services", as stated in section 13.206 in the PI paper. TM would like to stress that unlike Domestic Connectivity to International Services, Point of Access arrangement (POA) is not a passive physical connection service by definition and Access Seekers would naturally incur additional charges for additional services such as bandwidth. Furthermore, TM confirms that it has never received a request from Maxis to activate the Domestic Connectivity to International Services.

7.122   U Mobile agrees with the MCMC to retain the Domestic Connectivity International Services in the Access List.

7.123   YTLC agrees that Domestic Connectivity International Services should be retained in the Access List.

Discussion

7.124   All operators agreed to the MCMC's proposal to retain the Domestic Connectivity to International Services in the Access List, with no amendments proposed.

7.125   The MCMC notes the difficulties reported by Maxis in acquiring access to POA arrangements under this service, and TM's responses to these submissions. The MCMC repeats its comments in the PI Paper – and in the 2015 Access List Review – that POA arrangements fall within the service description for the Domestic Connectivity to International Service, and Access Providers must provide access to these services upon request.

MCMC Views

7.126   The MCMC's confirms its preliminary view that it would be in the LTBE for Domestic Connectivity to International Services to remain in the Access List without modification.

Dark Fibre services

Introduction

7.127   In the PI Paper, the MCMC acknowledged that the state of competition in the supply of dark fibre access has changed since the 2015 Access List Review, in that there are now few competitive constraints on the incumbent providers of these services. The MCMC expressed concerns regarding the supply of these services, given the high barriers to entry in the supply of these services, and the existence of SBCs in certain states which operates to prevent new entrants from trenching activities.

7.128   However, the MCMC also balanced in the PI Paper the potential benefits of dark fibre regulation against the costs of such regulation. In this regard, the MCMC took the preliminary view that the costs associated with regulation of dark fibre

services in the core network would likely outweigh the LTBE, and that accordingly, it would not be in the LTBE for these services to be included in the Access List.

Submissions Received

7.129   Astro, Celcom, DNB, U Mobile and YTLC are supportive of including dark fibre service in the Access List, while Digi, Maxis and TM concurred with the MCMC's preliminary position.

7.130   Altel and Net2One stated that they do acquire dark fibre as an Access Seeker and they have not experienced any difficulty in acquiring the service.

7.131   Astro does not currently acquire dark fibre but would like to do so in the future. Currently dark fibre is offered based on provider's desire to offer the service but local points are not transparent to Access Seekers and pricing is not standardised. The services are offered via barter between the telcos and commercially offered to enterprise customers. For these reasons, Astro is of the view that dark fibre should be included in the Access List. In terms of unbundling the access and core segments of GPON based networks, Astro opines that it is technically difficult as it has to be hand in hand with dark fibre. Astro suggested an alternative option whereby the Access Seeker introduces its own set of Optical Network Unit (ONU) instead of being subjected to Access Provider's ONU.

7.132   Celcom wishes to acquire dark fibre service and but has not been able to acquire incumbent's dark fibre service in exclusive areas. Instead, incumbent offers only wholesale transmission. Celcom added that dark fibre would be used for backhaul for 5G which would reduce cost for roll out with benefits for end users. Celcom also opined that access to dark fibre requires regulatory intervention as incumbent operator has been very defensive in opening up access, especially in brownfield areas. This impedes effective competition in the provision of services in the downstream market. Celcom cited UK as an example where Ofcom has mandated access to dark fibre on Openreach in 2019.

7.133   Digi concurred with the MCMC's views that there is competition in the supply of wholesale dark fibre services. Further, regulating dark fibre in the core network would not encourage efficient use in communications infrastructure and may disincentivise investment.

7.134   DNB stated that international benchmarks provide a strong case for not regulating dark fibre. In addition, there is also a strong economic case for not regulating for market players that offer retail services as the regulated price must provide an appropriately balanced build or buy signal and should be positioned between other competing access services such as transmission service, laying new fibre or bitstream. Hence, it poses regulatory challenge to preserve competition and incentives for infrastructure build.

7.135   However, according to DNB, above arguments are not relevant for wholesale only Access Provider such as DNB who do not provide retail services and is a sole provider of 5G services. DNB does not need dark fibre as an intermediate step in the provision of fibre based retail products where consideration of build and buy signals are relevant. Besides, DNB's pricing is driven by sustainability rather than profit maximisation. Any material increase or decrease in its input cost will be

reflected back directly to its retail partners and their end users. DNB will require substantial supply of fibre-based transmission capacity over the next 10 years. DNB will be an Access Seeker and is currently negotiating supply of dark fibre from TM. If DNB is unable to secure dark fibre, it will materially impact and potentially undermine the Government's objectives for 5G. In terms of unbundling of access and core segments of GPON based networks, DNB recognises the technological, commercial and regulatory challenge and does not advocate it. Instead, a commercially driven initiative backed by regulatory intervention should be sufficient.

7.136   Maxis submitted that it will have limited access to dark fibre and they mostly rely on the End-to-end Transmission Service to meet their transmission needs. Maxis highlighted similar reluctance by other regulators to regulate dark fibre services and cited Australia, France, Japan and US as examples. In the UK, although access to dark fibre in the core network was regulated, Ofcom faced challenges and only succeeded in imposing dark fibre remedies in areas in which BT Group faces no competition from rival backhaul providers within a 100m distance. Based on that, Maxis concluded that regulation would not be in line with LTBE.

7.137   REDtone does not acquire or supply dark fibre.

7.138   SACOFA acquires dark fibre on a case-by-case basis. SACOFA also suggested to bundle access and core segments of GPON-based networks for backhaul transmission for E2E network.

7.139   TM does not acquire or provide dark fibre service on a wholesale basis. TM noted that markets that regulate dark fibre have different market characteristics to that of Malaysia. TM highlighted three differences namely, these countries have high FTTx coverage, the wholesale operators are legally or structurally separated and the governments in these countries provide significant funding to deploy new fibre. Since Malaysia's fibre market is still developing and relies on industry funding, the MCMC should continue to exclude dark fibre service from the Access List. TM does not believe that it is viable to unbundle the access and core segments of the GPON-based network.

7.140   U Mobile would like to be able to access dark fibre from fibre providers/telcos and cited that it has faced some difficulties in acquiring the service. U Mobile viewed that it is viable to unbundle access and core segment of GPON based network but it would be challenging to do so as both segments are owned by the same provider.

7.141   YTLC stated that they acquire dark fibre as an Access Seeker and proposed that this service is regulated as YTLC is experiencing difficulty in acquiring this service.

Discussion

7.142   There were balanced views from operators regarding the MCMC's preliminary view not to regulate access to dark fibre services. However, most operators acknowledged the commercial, technical and regulatory challenges of regulating dark fibre in Malaysia, as outlined by the MCMC in the PI Paper.

7.143   The key upcoming development that will inform the MCMC's position on dark fibre services in future is the ability for DNB to acquire access to dark fibre for the

purposes of its 5G network deployment. However, even DNB expressed its preference for commercial negotiation of access to dark fibre services, with regulatory intervention by the MCMC in the event DNB is unable to secure such access.

7.144   In the MCMC's view, the significant potential costs and challenges associated with dark fibre regulation continue to outweigh the potential benefits to competition of such regulation. Accordingly, the MCMC does not consider it would be appropriate to regulate access to dark fibre services and maintains its views as set out in the PI Paper.

MCMC Views

7.145   The MCMC confirms its preliminary view not to include access to dark fibre services in the Access List, given the technical barriers to mandating dark fibre access in respect of the HSBB access network, as well as the fact that (for the core network) the costs of regulating such access would likely outweigh the LTBE.

8   High speed broadband (HSBB) services

Introduction

8.1   This section deals with the following HSBB services, which were considered together in the PI Paper:

(a)   Layer 2 HSBB Network Service with QoS; and

(b)   Layer 3 HSBB Network Service

8.2   In the PI Paper, the MCMC noted that there have not been significant changes to the state of competition to HSBB services since the 2015 Access List Review, given the following two very significant barriers to entry:

(a)   rolling out a fixed broadband network involves very high capital costs and sunk investments; and

(b)   due to the economic characteristics of broadband network infrastructure, it is unlikely to be efficient for a new operator to duplicate the incumbent operator's (TM's) national network in most parts of Malaysia.

8.3   The MCMC again expressed concerns regarding access to this service, given impediments reported by Access Seekers in acquiring access to Layer 2 HSBB services. Accordingly, the MCMC expressed the preliminary view that until those impediments are resolved, the Layer 2 HSBB Network Service with QoS should continue to be regulated in the Access List.

8.4   The MCMC also proposed to make modifications to the service description to remove low speed tiers, to reflect the availability of higher speed tiers, and to broaden the scope of the services to cover any technical parameters with which they are supplied.

Submissions Received

8.5   Allo is providing three options of Layer 2 HSBB Network with QoS to Access Seekers:

(a) The first option is from end-user premises' to Access Provider's exchange and then to centralised SG/POI identified or specified by the Access Provider via trunk transmission services.

(b) The second option is from end-user premises' to Access Provider's exchange and Access Seeker will establish its own backhaul (trunk transmission) from Access Provider exchange to its core network.

(c) The third option is from end-user premises' to Access Provider's exchange and then to regional SG/POI identified or specified by the Access Provider. Access Seekers will establish their own backhaul (trunk transmission) from Access Provider regional SG/POI to their core network. Trunk transmission service (local) is required to connect Access Provider exchange to the regional SG/POI.

8.6 Allo requested that the MCMC redefines the demarcation between Access Provider's network and Access Seeker's network for the three options provided to Access Seekers. Allo agrees with the amended proposal to include new bit rates as proposed for Layer 2 HSBB Network Service with QoS but suggested that the upstream bandwidth is capped at 500Mbps.

8.7 Altel and Net2One are agreeable to the proposed clarifications to the service description for the Layer 2 HSBB Network Service with QoS since it provides better clarity.

8.8 Astro supports the MCMC's proposal to include a general requirement that Access Provider must provide such speeds that it makes available to its own retail arm on an equivalent of input basis. Astro is also agreeable to the proposed clarifications for the Layer 2 HSBB Network Service with QoS. However, Astro proposed that the MCMC also include bit rates currently being offered by Access Providers to market and cited 500 Mbps upload and 500 Mbps download. In addition, for Layer 3 HSBB service, besides COS, the service description should also take into account QoS parameters such as jitter, packet loss and latency. These metrics should be equivalent to the standards of Layer 2 HSBB with QoS.

8.9 Celcom supports the MCMC's proposal for new higher speed tiers for Layer 2 HSBB Network Service with QoS as it is consistent with the principle of Equivalence of Input. Similarly, they support the revision of service description for Layer 3 HSBB Network Service. However, Celcom proposed to delete 4(21)(b)(i) of the service description to avoid misinterpretation that Access Provider is allowed to offer a different service other than Layer 3 HSBB service on a stand-alone basis. Celcom also proposed that Access Seekers are allowed to build in-span interconnection instead having to acquire full span from Access Provider. This is important in the case where Access Providers POIs are not necessarily available at the prescribed locations.

8.10 Digi is agreeable to the MCMC's proposal for the bit rate of Layer 2 HSBB Network Service with QoS and Layer 3 HSBB Network Service to start at 30Mbps, in support of JENDELA ambitions for fixed broadband. For both services, Digi proposed to consider bandwidth speed above 1Gbps to facilitate the supply of the service for next 3-5 years. The bit rates for upstream and downstream should be customised

according to Access Seekers requirements as this will enable Access Seeker to tailor make offerings and provide more choices to end users.

8.11   Digi is of the view that Access Seekers should have more autonomy in controlling technical parameters and the Porting (Transfer Request) process should be regulated and standardised to ensure minimum interruption when switching from donor service provider to new service provider. Processes to address insufficient ports should also be established.

8.12   Maxis is fully supportive of the MCMC's assessment in paragraphs 14.60 and 14.61 to maintain both Layer-2 and Layer-3 HSBB Network Services in the Access List and rejected TM's proposal to remove Layer-2 HSBB from the Access List. Maxis is of the view that continued regulation of both Layer-3 and Layer-2 HSBB Network Service is necessary to ensure that Access Seekers can obtain adequate access to the service. Maxis provided international benchmarks such as UK, Australia, Germany and France to support the proposal to retain Layer 2 HSBB service in the Access List.

8.13   Maxis proposed several changes to service descriptions of Layer 2 and Layer 3 services as follows:

(a)   Access Provider should offer interconnection at regional level instead of district/local level for Layer-2 HSBB Network Service with QoS. This is to circumvent some regional operators from imposing additional transmission charges if Access Seekers do not have POI in each district/local area. For both Layer 2 and Layer 3 services, Maxis strongly believes that that it is critical to include the POI locations under the Access List service description.

(b)   Access Provider should allow Access Seeker its equipment at Access Providers premises.

(c)   The service description should state that the contention ratio to be used by the Access Seeker either at the Service Gateway or the Transmission Capacity should be determined solely by the Access Seeker. This will avoid situations where Access Provider insists on unreasonable contention ratio.

8.14   Maxis agreed with the MCMC's proposed clarifications to the service description, except for the proposed change on removing the bit rates categories below 30Mbps. The proposed clarification will address ongoing difficulties among Access Seekers to overcome impediments imposed by Access Providers such as not offering bit rates above 100Mbps at MSAP rates or offering inferior SLA/QoS.

8.15   Maxis disagrees with removing bit rate categories below 30Mbps as they believe that lower bit rates may be a useful option for situations where end users required a low bit rates, for example in underserved areas, tertiary towns and applications or machine requiring only low bit rates such as ATMs and Point-of-Sale devices. Maxis is agreeable to the new bit rates increments proposed by the MCMC.

8.16   Maxis disagrees with the MCMC views that it remains open to removing regulation on Layer 3 HSBB Network Service from the Access List. Maxis pointed out that

there continues to be difficulties in acquiring HSBB services and it remains in the LTBE to continue regulation of both Layer 2 and Layer 3 Network Services.

8.17   SACOFA is of the view that changes can be made to service description of Layer 2 HSBB Network service with QoS based on their current settings which is voice (priority 1), IPTV (priority 2) and high speed internet (priority 3). As an Access Provider, SACOFA is agreeable to follow the new amended bit rates as long as the Access Seeker is capable of complying with them as well. As for Layer 3 HSBB Network Service, SACOFA is currently not providing the service.

8.18   TM submitted that they remain committed to providing Layer 3 HSBB Network Service on a non-discriminatory basis and terms and conditions that are fair and transparent. They requested that the existing Layer 3 HSBB Network Service is maintained in the Access List but at a revised pricing that allows for fair return on investments and reflects the reality in Malaysia. TM cited a speech by Ofcom to the FTTH Council where Ofcom had stated that to ensure compelling investment case, it would allow for a margin above the cost of capital to reflect the risks.

8.19   TM highlighted that it faces financial and technical challenges in providing the Layer 2 HSBB Network Service with QoS and requested that they are excluded from providing the service. TM pointed out that Layer 3 HSBB Network service has been the main service that is acquired by Access Seekers and it has promoted competition in the fixed broadband market.

8.20   Further, TM plans to upgrade Layer 3 HSBB Network Service offered under TM's RAO to the Next Generation Transport Network (**NGTN**), which has a network intelligence capability to proactively access problems before the network is critically affected and allows for faster restoration. TM would not be able to carry out the upgrade if they have to provide the Layer 2 HSBB Network Service with QoS as it would require additional investment for extra switches at new POIs as well as resources for network operation.

8.21   In addition, TM submitted that the provision of Layer 2 HSBB Network Service also increases the risk of network outages brought about through potential broadcast storms which is an inherent problem in Layer 2 and the service restoration downtime cannot be isolated from one Access Seeker to another. The latency of broadband services will also increase due to the additional number of hops in the delivery traffic. The provision of Layer 2 is also impractical as Access Seekers may incur higher cost, exposed to higher risk of service outage and longer provisioning time.

8.22   With the exemption to provide Layer 2 HSBB Network Service, TM can focus on using the funds to roll out infrastructure outside of existing coverage areas which would help the industry stay on track to achieve JENDELA's objectives. TM pointed out that the existing Access Providers such as Maxis, TT dotCom, Allo are also offering only one type of HSBB Network Service in their RAO and it would be challenging for Access Providers to provide both Layer 2 and Layer 3 services. Therefore, the MCMC should enable Access Providers including TM to choose to offer either Layer 2 HSBB Network Service or Layer 3 HSBB Network Service depending on their network design.

8.23   TM agrees with the proposed clarification to the service description for Layer 3 HSBB Network Service but highlighted that the additional bit rates proposed may not be feasible. TM proposed to remove the additional bit rate of 1000Mbps downstream and 500Mbps upstream due to MSQoS that mandates that throughput must be not less than 90% of the subscribed level for 90% of the time. In addition, regulators in other best practice markets do not mandate high minimum bit rates with high QoS standards. Most regulators such as Ofcom in UK and IMDA in Singapore specify minimum bit rates based on attainable speeds without high standards of QoS.

8.24   U Mobile welcomed the amendments proposed by the MCMC for both Layer 2 HSBB Network Service with QoS and Layer 3 HSBB Network Service. However, they proposed to include in the description, items regarding costs that will be charged by Access Provider to Access Seeker. As for increments of bit rates, U Mobile proposed upstream choice 50 or 100 for download speed of 250Mbps, increment of 100 or 200 for download speeds of 500Mbps to 700Mbps and increment 200 or 400 for 800 Mbps and increment of 200 or 500 for 1000Mbps.

Discussion

8.25   Operators were generally supportive of the MCMC's proposed clarifications to the HSBB Network Services, however operators proposed a number of further changes for the MCMC's consideration, which are considered together in this section in respect of both the Layer 2 HSBB Network Service with QoS and the Layer 3 HSBB Network Service.

8.26   Some operators, including Astro, Digi, Maxis and U Mobile, submitted that additional bit rates should be added to the service descriptions for these services, or that bit rates under 30 Mbps, which the MCMC is proposing to remove, be reinstated. Maxis also commented that contention ratios must be determined solely by the Access Seeker.

8.27   Taking these submissions together, the MCMC notes that the Access List service descriptions are not intended to set out every possible parameter or QoS with which services are supplied. Further, each of the HSBB Network service descriptions contains "catch-alls" which capture other bit rates specified, and other technical parameters specified or utilised by Access Providers from time to time. This ensures that the service descriptions are future-proof without the need to specify all possible parameters in the Access List.

8.28   The MCMC proposes to expand these "catch-alls" to also include:

(a)   technical parameters which are "agreed" by the Access Provider from time to time, as this would allow customisation of the type sought by Digi (in respect of bit rates) and Maxis (in respect of contention ratios);

(b)   bit rates that are "lower, higher or different" than those specified in the Access list service description.

8.29   These expansions will also mean that even while sub-30 Mbps services continue to be acquired in certain areas, those services would still be covered by the Access List service description. However, given the low level of demand for these

services, the MCMC does not anticipate any issues with removing these bit rates from the listed Access List service description.

8.30 For similar reasons to those set out above, the MCMC does not agree to remove any higher-speed bit rates from the service descriptions as proposed by TM.

8.31 Maxis also commented on onerous interconnection requirements imposed by certain Access Providers. The MCMC considers that its proposed amendments to the Layer 2 HSBB Network Service with QoS address the concerns raised by Maxis. In particular, the service must now be provided between an End User's premises and either a POI at the Access Seeker's premises "or the Access Provider's premises, as selected by the Access Seeker". Accordingly, the service description effectively caters for any Access Provider premises at which interconnection occurs.

8.32 In relation to Maxis's comments that Access Providers must allow co-location of Access Seeker equipment at Access Provider's premises, the MCMC notes that co-location is covered under the Network Co-Location Service and the MCMC does not consider it necessary to include this reference in the descriptions for the HSBB Network Services.

8.33 The MCMC rejects TM's submission that it be "excluded from providing" the Layer 2 HSBB Network Service with QoS due to its financial and technical challenges in providing the service. While the MCMC takes into account the costs and impact on investment incentives on one hand in its approach to regulation, the MCMC must balance these against the significant LTBE benefits arising from the wider availability of Layer 2 HSBB Network Service with QoS on the other hand. Accordingly, it is not appropriate to view TM's concerns in isolation as proposed by TM without also considering these significant benefits, which are noted in the PI Paper and have been previously noted by the MCMC on several occasions.

8.34 Further, the Access List is not based on an asymmetric ex-ante regulatory model. All access obligations apply equally to all Access Providers. In any event, given TM's size and market position, the MCMC considers - as it has done in the past - that there is no doubt that all HSBB Network Service obligations, both Layer 2 and Layer 3 - apply to TM.

MCMC Views

8.35 The MCMC confirms its preliminary view that it would be in the LTBE for regarding the Layer 2 HSBB Network Service with QoS to be retained in the Access List with modifications to reflect the availability of higher speed tiers for the service, and to broaden the scope of the service to cover any technical parameters with which the service is supplied, as follows:

4(18) Layer 2 HSBB Network Service with Quality of Service ("QoS")

(a) *The Layer 2 HSBB Network Service with QoS is an access and transmission Facility and/or Service for the provision of Layer 2 connectivity for the carriage of certain communications, being data in digital form and conforming to Internet Protocols, between customer equipment at an End User's premises and a POI at the Access Seeker's premises* or the Access Provider's premises, as selected by the Access Seeker, *where in respect of the service:*

(i)   the customer equipment is directly connected to an Access Provider's High-Speed Broadband Network;

(ii)   the Access Seeker selects the bit rate;

(iii)   the Access Seeker selects the QoS Class; and

(iv)   the Access Seeker assigns the Customer with an IP address.

(b)   The Layer 2 HSBB Network Service with QoS includes shared splitting services, interfaces to operational support systems and network information.

(c)   Nothing in this service description is intended to limit:

(i)   the number of concurrent Layer 2 HSBB Network Services with QoS acquired by an Access Seeker from an Access Provider associated with a single Customer;

(ii)   concurrent acquisition of Layer 2 HSBB Network Service with QoS and other HSBB Network Services by an Access Seeker from an Access Provider associated with a single Customer; or

(iii)   the number of HSBB Network Services that may be acquired by a single Access Seeker, either in a single location or at multiple locations (or permit an Access Provider to require an Access Seeker to acquire any minimum or maximum number of HSBB Network Services, either in a single location or at multiple locations), as a condition of an Access Provider supplying the Layer 2 HSBB Network Service with QoS.

(d)   The Layer 2 HSBB Network Service with QoS shall be supplied to the Access Seeker as follows:

(i)   at pre-defined speeds which are capable of providing the bit rates specified below, as selected by the Access Seeker:

Bit rate		Note and example applications
Downstream	Upstream	
Unconstrained	Unconstrained	Access Provider does not constrain the speed of the service itself but would provide an unconstrained network service which the Access Seeker rate shapes, i.e. determines the speed. This option is only available with QoS Class 5.
32 kbps	32 kbps	Voice over Internet Protocol ("VoIP") service
64 kbps	64 kbps	
135 kbps	135 kbps	
1 Mbps	256 kbps	Residential and Entry level Business
1 Mbps	1 Mbps	

Bit rate		Note and example applications
Downstream	**Upstream**	
6 Mbps	*1 Mbps*	*Low-speed* broadband services
6 Mbps	*6 Mbps*	*Medium-level Business broadband services*
10 Mbps	*5 Mbps*	
10 Mbps	*10 Mbps*	
20 Mbps	*5 Mbps*	
20 Mbps	*10 Mbps*	
20 Mbps	*20 Mbps*	
25 Mbps	*5 Mbps*	
25 Mbps	*10 Mbps*	
25 Mbps	*25 Mbps*	
30 Mbps	5 Mbps	
30 Mbps	10 Mbps	
30 Mbps	30 Mbps	
50 Mbps	10 Mbps	
50 Mbps	20 Mbps	
50 Mbps	50 Mbps	
100 Mbps	40 Mbps	
100 Mbps	50 Mbps	*High-speed residential, business broadband services, or* Enterprise Grade Business broadband services
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*	
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 – VoIP
1	≤ 200 ms	≤ 50 ms	≤ 10⁻³	Real-time, jitter sensitive, interactive – IPTV
2	≤ 100 ms	-	≤ 10⁻³	Transaction data, highly interactive – signalling
3	≤ 400 ms	-	≤ 10⁻³	Transaction data, interactive – business data
4	≤ 1 s	-	≤ 10⁻³	Low loss only (short transactions, bulk data) – video streaming
5	-	-	-	Best efforts – traditional applications of default IP networks

(iii)   any other technical parameters or standards specified, utilised or agreed by the Access Provider from time to time.

8.36   The MCMC also confirms its preliminary view that it would be in the LTBE for the Layer 3 HSBB Network Service to be retained in the Access List with modifications to reflect the availability of higher speed tiers for the service, and to broaden the scope of the service to cover any technical parameters with which the service is supplied, as follows:

4(21) Layer 3 HSBB Network Service

(a)   *The Layer 3 HSBB Network Service is an access and transmission Facility and/or Service for the provision of Layer 3 connectivity for the carriage of certain communications, being data in digital form and conforming to Internet Protocols, between customer equipment at an End User's premises and a POI at the Access Provider's premises or the Access Seeker's premises, as selected by the Access Seeker, where in respect of the service:*

(i)   *the customer equipment is directly connected to an Access Provider's High Speed Broadband Network;*

(ii)   *the Access Seeker selects the bit rate; and*

(iii)   *the Access Seeker selects the Classes of Service ("CoS").*

(b)   *The Layer 3 HSBB Network Service includes:*

(i)   *any hybrid Layer 2 and/or Layer 3 functionality required for the provision of the service;*

(ii)   *shared splitting services;*

(iii)   interfaces to operational support systems; and

(iv)   network information.

(c)   Nothing in this service description is intended to limit:

(i)   the number of concurrent Layer 3 HSBB Network Services acquired by an Access Seeker from an Access Provider associated with a single Customer;

(ii)   concurrent acquisition of the Layer 3 HSBB Network Service and other HSBB Network Services by an Access Seeker from an Access Provider associated with a single Customer; or

(iii)   the number of HSBB Network Services that may be acquired by a single Access Seeker, either in a single location or at multiple locations (or permit an Access Provider to require an Access Seeker to acquire any minimum or maximum number of HSBB Network Services, either in a single location or at multiple locations) as a condition of an Access Provider supplying the Layer 3 HSBB Network Service.

(d)   The Layer 3 HSBB Network Service shall be supplied to the Access Seeker as follows:

(i)   at pre-defined speeds which are capable of providing the bit rates specified below, as selected by the Access Seeker, subject to the maximum bit rate supported by the access technology used at particular End User premises:

Symmetric base bit rates
4 to 30 (inclusive) in 1 Mbps increments
32
50
60
100

Additional Bit Rates the Access Seeker may request	
Downstream	Upstream
32 kbps	32 kbps
64 kbps	64 kbps
128 kbps	128 kbps
256 kbps	256 kbps
512 kbps	512 kbps
1 Mbps	256 kbps
6 Mbps	1 Mbps
10 Mbps	5 Mbps
20 Mbps	5 Mbps
20 Mbps	10 Mbps
25 Mbps	5 Mbps
25 Mbps	10 Mbps
30 Mbps	5 Mbps
30 Mbps	10 Mbps

Additional Bit Rates the Access Seeker may request	
Downstream	**Upstream**
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.*

9   Copper-based services

Introduction

9.1   This section deals with the following copper-based local access services, which were considered together in the PI Paper:

(a)   Full Access Service;

(b)   Line Sharing Service;

(c)   Sub-Loop Service;

(d)   Bitstream with Network Service;

(e)   Bitstream without Network Service; and

(f)   Digital Subscriber Line Resale Service.

9.2   In the PI Paper, the MCMC took the preliminary view that there are high barriers to entry in the supply of national copper-based local access services and that it may still be in the LTBE for these services to remain on the Access List.

9.3   However, the MCMC acknowledged that these services are not currently being acquired by any Access Seekers, and accordingly the MCMC proposed to take a balanced approach to deregulating copper-based services, by:

   (a)   retaining the Bitstream with Network Service, Bitstream without Network Service and the Digital Subscriber Line Resale Service on the Access List; and

   (b)   removing the Full Access Service, Line Sharing Service and Sub-Loop Service from the Access List.

9.4   The MCMC also proposed to make modifications to clarify that the Bitstream Services are limited to copper-based services and are not technology-neutral.

Submissions Received

9.5   Altel and Net2One, Astro, Digi and TM agree with the MCMC's preliminary view to remove the Full Access, Line Sharing and Sub-Loop Services from the Access List, while Maxis proposed to retain these services.

9.6   Astro requested for MCMC to explicitly clarify that if the speeds of Full Access, Line Sharing and Sub-Loop Services are upgraded and sufficient to transmit heavy content like video, these services should fall within the definition of HSBB and the scope of Access List.   Astro submitted that Bitstream does not provide any functionality which they are not able to obtain through Layer 2 HSBB Network Service with QoS or Layer 3 HSBB Network Service.   Astro is also agreeable to the removal of Digital Subscriber Line Sharing and Bitstream Services from the Access List.

9.7   Digi is of the view that Bitstream service may be utilised as an input for services that require speeds which are lower than fibre FTTH. However, Digi does not anticipate any impact of removal of Digital Subscriber Line Resale Service or Bitstream Services.

9.8   Maxis is of the view that the Full Access, Line Sharing and Sub-Loop Services should be retained in the Access List as these are bottleneck services and there are significant number of end-users that still under the incumbent operator copper network.   Maxis also proposed that the definition of HSBB should cover hybrid fibre and/or VDSL solutions to avoid risks access to such infrastructure affected in the event the MCMC removes copper access regulation. Maxis also opposed to removal of Digital Subscriber Line Resale Service or Bitstream services from the Access List and proposed that Bitstream services are retained in areas where Layer 2 HSBB Network Service with QoS or Layer 3 HSBB Network Service is not available.

9.9   In addition to proposed removal of Full Access, Line Sharing and Sub-Loop Services, TM requested that the MCMC also removes the Bitstream Service and the Digital Subscriber Line Resale Service from the Access List. In response to the two key concerns highlighted by the MCMC related to removing these services from the Access List, TM clarified that there is no impact on the commercial product. TM is committed to fulfilling its contractual obligations and will provide the commercial product until the decommissioning of copper in 2025.

9.10 Furthermore, TM is actively migrating subscribers of the DSL wholesale service to fibre services. TM stated that in the past five years, there have been no connections or requests from Access Seekers copper based services. Given the shift to fibre based services, it is unlikely that Access Seekers will requests for copper based services. Retention of copper based services which do not have any demand adds unnecessary regulatory burden on TM and the MCMC. TM submitted that the demand for copper services continues to dwindle but the cost of maintaining the network remains the same and this results in higher unit cost passed down to Access Seekers. This has been acknowledged by regulators such as Ofcom in the UK.

9.11 The Government has announced targets to decommission the copper network by 2025. The remaining copper subscribers will be migrated to fibre services by 2025. In order to decommission copper-based services in 2025, copper-based services need to cease in 2022 and if the MCMC continues to regulate these services, they would only be available for about one year. TM cited UK and Singapore as examples where regulators have removed copper-based network obligations.

Discussion

9.12 Most operators agreed with the MCMC's proposal to remove these services from the Access List.

9.13 The MCMC considers that, given the additional information provided by TM regarding its proposed timeframes for decommissioning of its copper network, and taking into account the MCMC's analysis in the PI Paper (including international approaches to copper de-regulation), there is no longer any basis or need to continue regulating these copper-based services, including the Bitstream Services and the Digital Subscriber Line Resale Service.

9.14 In the MCMC's view, it is very unlikely that any Access Seekers will begin to acquire access to these services in a scenario where the industry is finalising its transition to fibre-based infrastructure, and given the increasing convergence between fixed-line services and mobile services, particularly as 5G deployment progresses. This view is also supported by the fact that no operator commented that they require ongoing access to this service, while few operators commented on these services generally.

9.15 The MCMC acknowledges Maxis's comments regarding the remaining end-users still being served using TM's copper network, but considers that the information available to the MCMC weighs in favour of de-regulation. The MCMC also disagrees with Maxis's suggestion that the HSBB Network services should be expanded to cover hybrid fibre and/or VDSL solutions. The MCMC notes that the HSBB Network services are defined broadly and in a technology-neutral manner, meaning there is no need to specifically refer to these types of solutions in those services.

9.16 While the MCMC believes services should remain on the Access List where there is a need to preserve options for regulation to promote the LTBE, the MCMC does not believe that services should be "kept in reserve" forever to cater for a diminishing market in the foreseeable future.

MCMC Views

9.17 The MCMC confirms its preliminary view that it would be in the LTBE for the Full Access Service, Line Sharing Service and Sub-Loop Service to be removed from the Access List.

9.18 The MCMC also proposes to remove the Bitstream with Network Service, Bitstream without Network Service and Digital Subscriber Line Resale Service from the Access List.

Annexure 1

5G New Radio – Service Description proposed by Maxis

Access Seeker for this 5G New Radio means an NFP(I) and NSP(I) licensee with LTE spectrum. Access Provider for this 5G New Radio means DNB.

1. **Mode of Access**

5G New Radio has two (2) mode of access:

a) **Multi Operator Core Network ("MOCN")** which involves the integration of an existing Access Seeker's core network with the Access Provider host network's (in this case DNB) 5G Radio Access Network (RAN) at a technically feasible POI. MOCN allows the host spectrum to be shared by all Access Seeker for better network efficiency with other elements such base station, site infrastructure and transmission to be shared as well.

b) **Multi Operator Radio Access Network ("MORAN")** which involves the integration of an existing Access Seeker' core network with the Access Provider's host network's (in this case DNB) 5G Radio Access Network (RAN) at a technically feasible POI. MORAN requires dedicated allocation of spectrum to be allocated per Access Seeker while other elements such base station, site infrastructure and transmission to be shared.

   For clarification, the Access Provider should offer MOCN and MORAN mode of access network sharing mechanism (as selected by the Access Seeker) to be interconnected with the core network built by the Access Seeker. Option to deploy MOCN or MORAN will depend on the Access Seeker's requirement depending on the scenario and use cases.

2. **Access Seeker 5G Standalone Core with Access Provider 5G RAN Access (5G Standalone Architecture ("SA") Access)**

Access Seeker 5G Standalone Core with Access Provider 5G RAN Access is a Facility and/or Service for access to the Access Provider 5G New Radio radio network, for the purpose of the Access Seeker providing:

a) MVNO Access and/or onward wholesale service;

b) services to enterprise and/or government Customers;

c) public cellular services to the public; and/or

d) wireless or mobile broadband services to the public.

Access Seeker 5G Standalone Core with Access Provider 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.

The functionalities of Access Seeker 5G Standalone Core with Access Provider 5G RAN Access include:

a) integration between the Access Provider's gNodeB and the Access Seeker's 5G Standalone Core; and

b)   support for 3GPP Release 15 Options 2 and any updates to that standard from time to time.

3. **Access Seeker 4G EPC with Access Provider 5G RAN Access (5G Non-Standalone Architecture ("NSA") Access)**

Access Seeker 4G EPC with Access Provider 5G RAN Access is a Facility and/or Service for access to the Access Provider 5G New Radio radio network, for the purpose of the Access Seeker providing:

a)   MVNO Access and/or onward wholesale service;

b)   services to enterprise and/or government Customers;

c)   public cellular services to the public; and/or

d)   wireless or mobile broadband services to the public.

Access Seeker 4G EPC with Access Provider 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.

The functionalities of Access Seeker 4G EPC with Access Provider 5G RAN Access include:

a)   a) integration between the Access Provider's gNodeB and the Access Seeker's Evolved Packet Core ("EPC"), whether using anchor technology or otherwise; and

b)   b) 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.

c)   For clarifications, the main difference of NSA and SA is that NSA anchors the control signalling of Access Provider's 5G RAN to the Access Seeker's 4G EPC (referring to DNB's 700Mhz LTE), while the SA scheme connects the Access Provider's 5G RAN directly to the Access Seeker's 5G core network, and the control signalling does not depend on the 4G network. The SA and NSA capability should be supported nationwide and not on certain location areas only.

d)   Unless otherwise specified, the following sections 4, 5, and 6 address obligations to be provided for by the Access Provider with respect to the services and facilities detailed in sections 1, 2 and 3 above.

4. **5G Services and Use Cases**

The Access Provider's 5G New Radio shall be supplied to the Access Seeker in compliance with 3GPP Release 15 Quality of Service (QoS) 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 5G services and/or use cases, as selected by the Access Seeker:

a)   Enhanced Mobile Broadband (eMBB) i.e. Mobile Broadband at 5G speeds e.g. with average speeds ranging of 100-200Mbps and peak speeds of >1Gbps; 95% > 30Mbps during Busy Hour (Minimum requirement, this is subject to change from time to time depending on the needs of the customers and use cases).

b)   Wireless Broadband Access ("WBA") with 5G speed and capacity e.g. with average speeds ranging of 100-200Mbps and peak speeds of >1Gbps; 95% > 30Mbps during Busy Hour (Minimum, this is subject to change from time to time depending on the needs of the customers and use cases), allowing in-home WiFi broadband services using indoor/outdoor Customer Premise Equipment installed at subscriber premises as an alternative to fibre (FTTH).

c)   Ultra-Reliable Low Latency Communications (uRLLC) e.g. to support for example low latency <5ms for use cases such as smart manufacturing, video analytics, smart vehicles (V2X), drone, etc. (applicable to section 2 5G SA access only)

d)   Massive Machine Type Communications (mMTC) e.g. to support large number of connected devices for use cases such as smart agriculture, logistics and utilities. (applicable to section 2 5G SA access only)

e)   Bespoke Coverage i.e. for Access Seeker to provide services to its customers based on business/enterprise demand e.g. In-building coverage in selected office buildings or areas. To allow option for the Access Seeker to build the infrastructure itself to provide the service/coverage exclusively for its customer.

f)   Private Network i.e. specifically to cater to meet Enterprise use cases within a localized area. The network can only be accessed by the specific use cases which are not open to public users e.g. offshore platforms, manufacturing factories. To allow option for Access Seeker to have the access to the 5G spectrum at that specific location from the Access Provider and be able to rollout the private network by itself.

For clarification, the Service Catalogue requirements for 5G Services to be provided by the Access Provider (included but not limited) are as per the table below.

Service Type	Service Description
NSA RAN via MOCN	Providing network wide and polygon coverage requirement
NSA RAN via MORAN	Providing network wide and polygon coverage requirement
SA RAN via MOCN	Providing network wide and polygon coverage requirement
SA RAN via MORAN	Providing network wide and polygon coverage requirement
Bespoke NSA RAN via MOCN (outdoor/indoor)	For bespoke request for dedicated coverage For dedicated RAN for Private Network
Bespoke NSA RAN via MORAN (outdoor/indoor)	For bespoke request for dedicated coverage For dedicated RAN for Private Network

Service Type	Service Description
Bespoke SA RAN via MOCN (outdoor/indoor)	For bespoke request for dedicated coverage For dedicated RAN for Private Network
Bespoke SA RAN via MORAN (outdoor/indoor)	For bespoke request for dedicated coverage For dedicated RAN for Private Network
Private Network – NSA	Dedicated use of spectrum for MNO private network service deployment
Private Network – SA	Dedicated use of spectrum for MNO private network service deployment
Private Network – mmWave	Only MNO dedicated use of spectrum for MNO private network service deployment
Co-Location at POI	Co-Location service at POIs for hosting equipment (neutral location) (geo-redundancy 1+1)
Co-Location at RAN	Co-Location service within the RAN and cell sites (e.g. to host MNOs' MEC hardware)

5. **Service Element**

The Access Provider's 5G New Radio shall provide at least the following key service elements to the Access Seeker:

a) 5G RAN (including for IBC): Means the 5G RAN provided by the Access Provider to the Access Seeker. The Access Provider should provide and keep their 5G RAN at the leading edge of available features and capability according to the latest 3GPP standards and leading vendors' solution roadmap.

b) Connectivity: Means the connectivity services from the Access Provider's 5G RAN Sites (including IBC), or MEC locations to the POI location.

c) c) POI (including network co-location and access route): Means any technically feasible point of interconnection between the network of the Access Provider and the network of the Access Seeker. The Access Provider should allow the Access Seeker to have its own traffic break-out points from the Access Provider's local transport network, at close proximity to its customers nationwide. The Access Provider should only own or operate the 5G RAN and local transport layer (i.e. the connectivity) up to the POI (including network co-location and access route to access the POI) where it will be interconnected with the core network of the Access Seeker. The Access Seeker then will bring the respective traffic back to its own network using its own core network. The location for POI point will depend on the use cases which could be on the edge, metro or regional. As a minimum, at least one POI should be placed per region and expanded later driven by the Access Seeker's requirements.

d) Access Seeker's MEC co-location: The Access Provider should allow the Access Seeker to be able to deploy innovative, cost-effective Multi-Access Edge Computing (MEC) solutions in the wide variety of possible configurations/locations required to meet evolving customer requirements. This includes option to co-locate Access Seeker MEC at technically feasible location.

6. **Service Parameters**

The Access Provider shall provide their 5G New Radio service parameters including (but not limited) to the following:

a) Technical Parameters: The Access Provider should provide relevant technical parameters that should be clearly defined including network diagram, network demarcation, POI locations, service availability, network slicing and QoS.

b) 5G New Radio Service Catalogue: The Access Provider should provide service catalogue including various quality-of-service class and network slice options covering diverse use case requirements. Example of varying Grade of Service (GoS) options include real-time gaming (high speed, low latency), live streaming (high speed), smart robotic control (ultra-low latency, high reliability).

c) Technical Capabilities: The Access Provider should ensure that all technical capabilities of 5G services that require Access Provider's 5G RAN support are fully available to and configurable by Access Seeker. For example (not limited to), Access Seeker is allowed to configure:

    i. Site/cell level parameters in Access Provider 5G RAN to support Access Seeker' mobility (handover parameters) and layering strategy between 4G/5G networks.

    ii. Site/cell level QoS and network slicing related setting in Access Provider 5G RAN to ensure consistent end-to-end QoS homogeneity from Access Seeker' core network to Access Provider's 5G RAN.

d) 5G-4G Interoperability: The Access Provider should allow the Access Seeker customers to switch back to respective 4G network (multi-carrier) when out of C-Band coverage to avoid poor user experience on 700MHz layer, allow seamless 4G-5G mobility for voice and data services between Access Seeker' 2G/4G and Access Provider's 5G RAN under Access Seeker control e.g. individual Access Seeker' neighbour cell definition, IRAT thresholds and other PLMN-specific radio parameters.

e) Spectrum Sharing: The Access Provider should ensure that for standard configuration, which is shared among all Access Seekers, spectrum is the same for all sites e.g. 100MHz C-Band bandwidth is configured on all sites. There should also be allowance where spectrum can be dedicated to MNOs via MORAN (e.g. mmWave spectrum spilt blocks between MNOs). Any related parameters must be defined to ensure equal access of Access Seeker to the network, e.g. all sites must transmit all Access Seeker' PLMN ID. All 5G RAN sites are configured to have a standardized backhaul setting which allows peak and average throughput to be achieved for all Access Seeker, e.g. 5Gbps per site to be similar. All that are available in the features set must be available to all the Access Seeker, e.g. all Access Seeker have the same features set list. All QoS for Access Seeker must be standardized such that there is a common definition to avoid abuse of network resources on equitable and non-discriminatory basis e.g. Non-Guaranteed Bit Rate ("non-GBR") type traffic is on the same QoS level.

f)   Network Slice: The Access Provider should support wide variety of network slice options in order to meet diverse requirements from different market segments e.g. high priority access for enterprise applications, low latency slice for smart robotic control etc.

g)   Private Network: For the Private Network, the Access Provider should allow the Access Seeker to build and deliver private network solutions which involve stringent requirement on isolation, security and QoS as well as complex end to end solution which requires customization. The Access Provider should allow the Access Seeker to utilize part of its 5G spectrum for private network deployment to cater for these customized requirements.

h)   Single Point of Failure: The Access Provider should avoid any single point of failure in any part of their 5G New Radio network as it is the only 5G New Radio network in Malaysia. It should provide certain degree of redundancy and it should be transparent to all Access Seekers.

i)   Network Security: The Access Provider should ensure the Access Seeker subscribers' data privacy and network security are utmost priority by providing proactive monitoring & detection, mitigation and response to any malicious cybersecurity attacks that could potentially lead to service disruption/coordinated failure, interception, customer information disclosure, fraud and/or other security breaches. The Access Provider should also provide the provision/policy for data privacy, network security, net neutrality policy and device approval process.