



Suruhanjaya Komunikasi dan Multimedia Malaysia
Malaysian Communications and Multimedia Commission

A REPORT ON A PUBLIC INQUIRY

Access Pricing of VoIP Services Based on Pre-fix Number 0154

29 June 2007

This Public Inquiry Report was prepared in fulfilment of Sections 61 and 65 of the Communications and Multimedia Act 1998.

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ABBREVIATIONS AND GLOSSARY

3G	Third Generation
BTS	Base Transceiver Station
CDR	Call Detail Records
CMA	Communications and Multimedia Act 1998/Act 588
CPE	Customer Premises Equipment
CPP	Calling Party Pays
ENUM	Telephone Number Mapping
ETRI	Electronics and Telecommunications Research Institute
FCC	Federal Communications Commission
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
IDA	Infocomm Development Authority
IP	Internet Protocol
ISP	Internet Service Provider
ISDN	Integrated Services Digital Network
LRIC	Long Run Incremental Cost
MMSC	Multimedia Messaging Service Centre
MyIX	Malaysian Internet Exchange
MCMC	Malaysian Communications and Multimedia Commission
NGN	Next Generation Network
PI Paper	Public Inquiry Paper
PLMN	Public Land Mobile Network
PoI	Point of Interconnection
PoP	Points of Presence
PSTN	Public Switched Telephone Network
QoS	Quality of Service
RPP	Receiving Party Pays
SS7	Signalling System 7
SMSC	Short Message Service Centre

SIP	Session Initiation Protocol
TSLRIC	Total Service Long Run Incremental Cost
TDM	Time Division Multiplexing
VoIP	Voice Over Internet Protocol
WiMAX	Worldwide Interoperability for Microwave Access

1. INTRODUCTION

1.1 Public Inquiry Process

The Malaysian Communications and Multimedia Commission (MCMC) had issued the Public Inquiry Paper on Access Pricing for Voice over Internet Protocol Services Based on 0154 Pre-fix (PI Paper) on 18 April 2007. Apart from proposals on access pricing, the MCMC also sought views on other general matters that are related to access pricing for voice over internet protocol (VoIP).

In most cases, the MCMC had set out its preliminary views and had requested feedback from stakeholders. However, the views on these matters will only be finalised based on the feedback and information provided by stakeholders.

1.2 The MCMC's Legislative Obligations

Section 61(1)(d) of the Communications and Multimedia Act 1998 (CMA) requires that a public inquiry (PI) period should at least be forty-five days, within which members of the public are invited to make submissions to the MCMC. The MCMC had provided stakeholders 45 days to provide submissions in response to the PI Paper. The closing date for the PI was 1 June 2007.

The MCMC issues this Public Inquiry Report on Access Pricing for Voice over Internet Protocol Services Based on 0154 Pre-fix (PI Report) in compliance with Section 65 of the CMA. In particular, Section 65(2) of the CMA requires the MCMC to publish the PI Report within thirty days of the conclusion of the inquiry.

1.3 Submissions Received

At the close of the PI at 12 noon on 1 June 2007, the MCMC received written submissions from the following parties:

Table 1.1: List of Submissions Received

No.	Submitting Parties	Documents
1.	Asiaspace Sdn. Bhd.	1 Submission (18 pages)
2.	Celcom (Malaysia) Bhd.	1 Submission (11 pages)
3.	DiGi Telecommunications Sdn. Bhd.	1 Submission (8 pages)
4.	IP Mobility Sdn. Bhd.	1 Submission (13 pages)
5.	Jaring Communications Sdn. Bhd.	1 Submission (13 pages)
6.	Maxis Communications Bhd.	1 Submission (10 pages)
7.	MiTV Corporation Sdn. Bhd.	1 Submission (5 pages)
8.	NasionCom Sdn. Bhd.	1 Submission (7 pages)
9.	Packet One Networks (Malaysia) Sdn. Bhd.	1 Submission (18 pages)
10.	REDtone Telecommunications Sdn. Bhd.	1 Submission (10 pages)
11.	Telekom Malaysia Bhd.	1 Submission - Appendix A (11 pages) - Appendix B (5 pages) - Appendix C (3 pages)
12.	TIME dotCom Bhd.	1 Submission (18 pages)

2. ISSUES RELATED TO VOIP INTERCONNECTION

2.1 General Comments

2.1.1 Comments received

Celcom (Malaysia) Bhd. (Celcom) stated preference to continue with commercial negotiations. In addition, Celcom also drew the MCMC's attention to a White Paper on Economic Study on IP Interworkings that was prepared by Gilbert & Tobin. Celcom outlined the five key recommendations that are contained in the paper as follows:

- (a) Proceed cautiously: Regulators should be very cautious in mandating internet protocol (IP) interconnection charging models for the unfolding next generation network (NGN) IP environment.
- (b) Don't mandate a single charging model: Even if a particular charging model develops considerable commercial currency, it does not follow that this model would be an appropriate "one-size-fits-all" model for regulators to mandate.
- (c) Don't assume bottlenecks will be replicated: A regulator should not assume that currently perceived bottlenecks would be replicated in an NGN environment.
- (d) Use existing regulatory frameworks: In any event, existing regulatory frameworks, based on objective tests of market power, are likely to be adequate to resolve problems should they arise.
- (e) Employ consumer welfare analysis: In circumstances where regulators identify market failure, or are requested to resolve disputes, their intervention should be based on sound analysis and applied only as broadly as necessary to solve the problem.

Celcom also highlighted the fact that the quality of service of IP operators is on best attempt basis and may affect mobile or fixed operator's own quality of service as a consequence of interconnecting with IP operators. As such, if the MCMC is pushing for IP interconnection, Celcom proposed that the MCMC consider reviewing the Mandatory Standard for quality of service (QoS).

Similarly, Telekom Malaysia Bhd. (TM) advocated a light handed approach in regulating IP-enabled services and proposed that intervention should only be considered in the event of failure to reach commercial agreement in a timely manner. Even then, the MCMC should ensure that intervention can achieve efficient allocation of resources and differentiate between bottleneck services and new services where:

- (a) Intervention should occur only in the event of the failure of commercial negotiation and only in relation to established bottleneck services that are essential for competition in downstream markets and unlikely to be priced efficiently in the absence of competition.
- (b) Innovative new services should not be subject to cost-based pricing, unless an economic cost-benefit analysis demonstrates a significant net positive benefit.
- (c) Regulation of access prices should not produce an inefficient allocation of resources.

TM cited the United States, European Union, United Kingdom and Japan as examples of countries that have adopted a light handed approach in order to promote innovation and competition in VoIP services.

TM also refuted the reason provided by MCMC for regulatory intervention, i.e. difficulties faced by negotiating parties for a commercially negotiated and agreed access pricing. TM highlighted that negotiating parties have the option of initiating dispute resolution procedure under the Mandatory Standard on Access and refer the dispute to the MCMC. Since none of the negotiating parties had opted to do this, TM views the lack of action to mean that there is no urgency on the part of access seekers to conclude access agreements for VoIP services.

TM also thought that VoIP services using pre-fix number 0154 may be positioned as value added service to operators' core business of broadband providing data, video etc., hence the lack of urgency for these operators to seek interconnection with Public Switched Telephone Network (PSTN) or mobile operators. TM also pointed out that although the MSA contains fast track provisioning procedures, the provisions have not been utilised by any 0154 operators. As such, TM viewed this as another indication of lack of urgency on the part of VoIP operators to conclude access agreements. In addition, TM also pointed out that VoIP operators have other options to obtain access from fixed and mobile operators to provide VoIP services such as via 1800 freephone number range.

Based on the arguments provided above, TM urged the MCMC to minimise or refrain from regulatory intervention as the lack of interconnection agreements at this point in time does not necessarily mean that there is market failure.

2.1.2 The MCMC's final views

The MCMC noted the suggestion by Celcom and TM that the MCMC adopt a light handed approach for VoIP services. In particular, the opinions submitted by TM on dispute resolution and fast track provisioning procedures are duly noted. Similar

views were submitted by many respondents during the PI that was carried out by the MCMC on access pricing in 2005, leading to the MCMC's decision to leave VoIP origination and termination prices to commercial negotiations.

In relation to TM's statement on 1800 freephone numbers, the MCMC wishes to clarify that VoIP services provided using 1800 freephone numbers cannot be considered a substitute to VoIP services using pre-fix 0154. The VoIP services using 1800 numbers originate over PSTN network and needs to be accessed using multi-stage dial-up, while VoIP services using pre-fix 0154 does not require origination over PSTN network.

The MCMC is also mindful of the available literature and on going debates with regards to regulation of VoIP services. The MCMC will continue to monitor the developments in other jurisdictions. The MCMC had taken Celcom and TM's comments into account in shaping its final views with regards to access pricing for VoIP services, which will be discussed in further detail in Section 2.5.

2.2 IP Interconnection

- Q1. The MCMC seeks views on the statements above on the key issues pertaining to IP interconnection and the compensation mechanism.**
- Q2. The MCMC also seeks comments on whether it is appropriate to evolve the compensation model of the PSTN to that of IP network in the Malaysian environment.**

2.2.1 Comments received

In the absence of full fledged NGN rollout by all operators, Asiaspace deemed capacity based interconnection as practical as and more efficient than per minute rates based on long run incremental cost (LRIC). The rates are more efficient with mark-ups for cost recovery, are a practical means of pricing wholesale interconnection service and are well-suited to both circuit and packet-based networks. On the compensation model, Asiaspace urged the MCMC to conduct more studies before making a decision on the compensation model because PSTN has always been based on time while IP can adopt all models including subscription charge.

Celcom requested the MCMC to define what constitutes VoIP services and address the quality of service issue for IP networks. Otherwise, Celcom was concerned that mobile operators run the risk of not meeting QoS standards and billing disputes when VoIP calls are not satisfactory. In examining the application of PSTN compensation model to IP, Celcom was of the opinion that consideration should be given to the responsibilities of facility providers who have obligations to make

investments to roll out networks with mandated QoS levels. Such obligations are not stipulated for VoIP services which don't have comparable level of infrastructure investments. Celcom pointed out that the PSTN architecture is different from IP, whereby PSTN is based on connection-oriented circuit switched technology with a guaranteed QoS while IP is connectionless and based on packet switched technology which uses statistical multiplexing and compression.

DiGi Telecommunications Sdn. Bhd. (DiGi) thought it was inappropriate to evolve the compensation model of PSTN to IP network in Malaysia because the technological changes towards NGN is still at the early stages of development. In addition to interconnection rates applicable to 0154 operators, regulatory oversight should also cover other obligations such as quality of service and access to emergency services for customer benefit.

IP Mobility Sdn. Bhd. (IP Mobility) believed that the internet compensation model would be the best way forward as carriers compute the data sent and received as in the peering agreements. The advantages of this model are:

- (a) simple interconnect arrangement;
- (b) cost of monitoring will not outweigh cost of providing service, highly reduced regulatory cost (no termination regulation);
- (c) lower prices to consumers as receiving operators recoup costs from the return calls to IP operators from its own users; and
- (d) asymmetries in traffic will be compensated by proportioning the cost of the link.

IP Mobility advocated new regimes of interconnect for new technologies because they originate from different technologies, industry structures and regulatory histories. As such, pricing is based on quality and volume, unlike traditional communications that is distance dependent and based on per minute pricing. Technical developments are improving the ability of consumers to manage their own telecommunications services and as a result, the premise that calling party is the sole cost causer may no longer be valid.

In terms of evolving the PSTN compensation model to IP, IP Mobility thought that it is appropriate since PSTN is migrating to NGN and evolving to IP.

Jaring Communications Sdn. Bhd. (Jaring) submitted that there is a need to separate interconnection from pricing issues. In terms of interconnection, it must be made available and enforced. As for unregulated prices, the terminating party should have the right to set any non-discriminatory prices and market forces will eventually determine the right price. Similarly, Jaring is of the opinion that the

originating party too has a right to make a reasonable margin as long as it does not become a barrier.

In relation to the compensation model, Jaring explained that there is a possibility of service providers offering only voice or even video over an IP network. Hence the compensation model should be based on the cost of providing a single service irrespective of the underlying infrastructure.

Maxis Communications Bhd. (Maxis) commented that the arrangement for IP interconnection is different from the current arrangements for PSTN and mobile. As such, Maxis believes that the compensation scheme chosen should be fair to both the calling and terminating parties. The compensation model of PSTN should be reviewed upon migration to the NGN. Maxis expects the compensation scheme to evolve from the current PSTN model to the application of voice in the IP network.

MiTV Corporation Sdn. Bhd. (MiTV) agreed with the statement about IP networks recovering costs from own customers based on bandwidth and throughput of link provided to customers. However, this is not true if IP networks are interconnected with PSTN or mobile networks for the carriage of voice. MiTV acknowledged that some form of convergence is taking place between PSTN, mobile and VoIP at the technology level, but notes that regulatory treatment of these services are not the same. Since TM, the largest PSTN operator has announced plans for NGN rollout, MiTV thinks it is opportune to undertake a study on evolution of PSTN network and its impact on interconnect pricing.

NasionCom Sdn. Bhd. (NasionCom) explained that all 0154 operators will interconnect at Malaysian Internet Exchange (MyIX), which requires them to pay connection charges to MyIX and bear the cost of leased lines for connection to MyIX. Since most 0154 operators are small, they would most certainly have to pay for transit arrangements. NasionCom believes that these cost factors must be considered in determining access pricing. NasionCom's 0154 service is provided to anyone with broadband, not necessarily NasionCom's broadband network only. There is no/very low subscription fee and NasionCom recovers its costs from call charges, not subscription fee. Customers are charged based on the voice service usage, i.e. data and voice services are separate and are not bundled.

In relation to the compensation model, NasionCom was of the opinion that it is more appropriate to evolve the compensation model of PSTN to the IP network because in the Malaysian environment, the Tier-1 network is still circuit-switched and for connectivity, the IP network have to convert from IP to circuit-switched and vice versa at each region in order to connect with Tier-1 networks. NasionCom explained that the cost of these switches at each region and the associated interconnect link services (leased line as backhaul) for the interconnection is borne by the IP network provider. Currently there are more customers on the circuit-switched networks and there will be more termination charges to be paid to these

networks. Therefore it is appropriate to evolve the PSTN model and use average per minute cost since this model is better understood.

Packet One Networks (Malaysia) Sdn. Bhd. (Packet One) was of the opinion that in IP networks where customers can make and receive calls from off net, there is additional cost incurred by the IP service providers to terminate the calls into other interconnecting network. Transit arrangements provides avenue for smaller VoIP service providers to widen their service offering without having to build the network. However, transit arrangement is not preferred in Malaysia as there is still a strong resistance among the Tier 1 operators who see this trend as a threat instead of opportunity.

Packet One thought that the evolution of the PSTN compensation model can only be achieved if there is no monopoly and all major service providers migrate their network to NGN. Where the market is not dominated by one or two operators, the bill and keep and transit compensation model may be applicable. In PSTN, the incumbent controls more than 90% market share. Bill and keep will not be the right model in this case. In Malaysia, in the absence of a compensation model for IP network, it is more appropriate to emulate the PSTN/mobile compensation model for the IP network.

REDtone Telecommunications Sdn. Bhd. (Redtone) felt that if the cost of bandwidth is already addressed by IP wholesale arrangements as in an internet exchange, then the cost of VoIP will be reduced to incidental components such as database, information hosting and directory services. Voice carried over the network may be charged accordingly as this may be deemed value added services, and will require additional cost on top of the transmission cost. However, in Malaysia, most Application Service Providers will depend on Network Facilities Providers/Network Service Providers to provide the transmission service from point to point and there will be costs in these which have to be accounted for. Redtone proposed that a study be conducted to ascertain the cost and principles governing the provision of VoIP and PSTN services. Once the parameters are clearly defined, cost and compensation models can be better implemented.

TM acknowledged the theory of calling party being sole cost causer, and the Calling Party Pays (CPP) approach may no longer be valid in IP networks, but it continues to support inter-carrier compensation mechanism. Interconnection charges should apply when VoIP calls terminate on PSTN network. In addition, VoIP providers should also pay network operators for the use of the IP network since it is necessary for them to recover the network investment and costs. TM recommended that the MCMC address quality of service for IP networks because the poor VoIP quality calls that terminate on the PSTN or mobile networks may result in these operators not being able to comply with their mandatory QoS requirements.

TIME dotCom Berhad (TIME) supported the principle of cost causation. However, TIME does not believe that this mechanism applies to the IP network where cost is recovered from the customer. The customer purchases bandwidth and the network cost is embedded into the pricing packages as a monthly fee which customers pay. Therefore, the ideal interconnection settlement between IP networks is sender keeps all, and there should not be interconnection settlement when the traditional PSTN operators have migrated to NGN. Until such time, the existing compensation model should not be phased out as proposed by the United States' Federal Communications Commission (FCC).

TIME explained that in Malaysia, currently there are still traditional PSTN operators using Time Division Multiplexing (TDM) circuit switched network where interconnections is in a serial fashion to complete a long distance or international call. There can be multiple operators in any leg of the call as the traffic is bought and sold. Settlement (the fee to handle the call) follows the flow of the call with each operator making a margin on the per-minute cost of terminating the call with their supplier. In this environment, many network assets are utilized and the compensation model is based largely on the recovery of switching cost through per-minute charge which MCMC has mandated for voice services.

TIME was of the view that in IP based interconnect, the real issue will not be how operators reconcile their net exchange of calls but more likely to be QoS. In efforts to minimize cost of operation and project a favourable image to customers, operators will not be averse to compressing traffic to be delivered on another network. The poor call quality then becomes a problem for the innocent party that receives the traffic. VoIP operators' cost is lower as their IP transmission is based on best effort. As a result, interconnection between these different grades of IP transmission would jeopardize the quality of latency, jitter and may raise the possibility of packet loss which would affect the level of required QoS. The challenge for the MCMC is to regulate all VoIP operators to comply with the Mandatory Standard on QoS in order to protect the end users who are actually paying for the services.

In addition, TIME also clarified that there is no authentication mechanism in IP environment, which may result in one operator accessing another operator's IP network. Therefore, there is a possibility for a call to be made using another operator's IP because no verification can be made. This will result in call settlement disputes by the terminating operators, which may be harder to resolve. Therefore, TIME surmised that it is inappropriate to evolve the compensation model of PSTN to IP network in Malaysia because the technological changes towards NGN is still at the early stages of development. In addition to interconnection rates applicable to 0154 operators, regulatory oversight should also cover other obligations such as quality of service and access to emergency services for customer benefit.

2.2.2 The MCMC's final views

The MCMC noted that respondents have expressed diverse views on issues pertaining to IP interconnection and the compensation mechanism.

The MCMC also observed that some operators such as NasionCom and Packet One have identified the transit and leased line cost for backhaul services and are of the view that such cost should be taken into consideration in computing access prices. The MCMC acknowledges the occurrence of such cost for provisioning of VoIP services. However, the difficulty that is likely to be faced is attributing the cost to various services that is provided using the same infrastructure. Nonetheless, the MCMC will take the views into consideration when a costing study is carried out.

The MCMC noted the views expressed by some operators such as Celcom, DiGi, TM and TIME about QoS issues and the need for regulatory oversight to ensure QoS provided to customers is not compromised. The MCMC concurs that QoS is an important issue that will demand further consideration in future.

In relation to evolving the compensation model of the PSTN to that of IP network, the views were divided. While some have expressed support to migrate PSTN compensation mechanism to that of IP, others have rejected the idea based on the fact that NGN is still at an inception stage. The views are duly noted and the MCMC will revisit this issue when the migration to NGN has developed to an advanced stage.

2.3 Cost Drivers for VoIP

Q3. In your opinion, is there a correlation between distance and cost for VoIP services?

2.3.1 Comments received

Asiaspace, Celcom, DiGi, Packet One, Redtone and TIME do not believe that there is correlation between distance and cost for VoIP services, while IP Mobility, Jaring, Maxis, MiTV, NasionCom and TM believe that distance does affect cost, at least to some extent.

Asiaspace believed that there are technical and economic challenges in determining a correlation between distance and cost.

Celcom's view is that in IP networks costs are driven by the capability of IP to handle voice, data and video using compression, encoding and packet switching.

As such, Celcom deems that it will be difficult to categorise the IP network elements based on distance. In addition, the nomadic nature of the IP based services renders distance based charges as inappropriate.

DiGi agreed with MCMC that there is no direct correlation between distance and network utilization to cost of providing services.

IP Mobility explained that the cost for leased lines is dependent on distance. Some of the transport elements include leased lines to connect the Tier 1 and Tier 2 Points of Presence (POPs), incoming analog and Integrated Services Digital Network (ISDN) phone lines, monthly costs for the Internet Service Provider to network access point, etc. However, it is difficult to establish a direct correlation between distance and VoIP services because it is routed via lines or gateways that are least congested.

Jaring asserted that there is definitely a correlation between distance and cost for VoIP services. Anyone who provides VoIP must have IP infrastructure, which cost is still distance dependent. For example, the cost of lease lines between East and West Malaysia is still distance dependent.

Maxis explained that for VoIP service providers who own the broadband and network infrastructure, there is some correlation between distance and cost for VoIP services. However, the element of carriage/infrastructure may have been somewhat compensated by the access fees paid by the customers for broadband services. This concept will not apply to VoIP service providers who do not own any broadband infrastructure and therefore do not bear the carriage/infrastructure cost. For them, there is no direct correlation between distance and network utilization to the cost of providing VoIP 0154 services. In IP networks, packets do not require a dedicated time slot on a wire and are transmitted over different routes to take advantage of idle capacity in the network. This makes it difficult to identify node utilization.

MiTV believed that there is still a correlation between distance and cost for VoIP services.

NasionCom did not think that there is correlation between distance and cost in a pure IP network. However, where there is a need for interconnection between IP networks and circuit-switched networks, there is correlation between distance and cost due to the reasons mentioned for question 2.

Packet One did not believe that there is a correlation between distance and cost for VoIP services.

Redtone submitted that there is no correlation between distance and cost of VoIP services other than the leveraging of infrastructure of the terminating parties. Even if there are correlations, it is difficult to ascertain with a high level of certainty for costing purposes or to evaluate build or buy decisions. Cost of deployment of the network should be included in the costing. The correlation can be examined in future when there is wider sample data based on proper commercial deployment.

TM explained that for voice services over IP network, careful route planning is still required to have satisfactory QoS. Therefore, there are costs in the network that depend on route cost such as transmission.

TIME did not believe that there is correlation between distance and cost for VoIP services. Costing models for PSTN takes into account distance and time but these cannot be applied to IP networks where volume and time are the cost related factors. In the IP network, data is segmented into packets and these packets do not require a dedicated time slot on a wire. Instead, packets are routed over different routes to take advantage of idle capacity in the network. The network does not establish a permanent or exclusive path between the points.

2.3.2 The MCMC's final views

There is no broad consensus amongst respondents on whether or not there is a correlation between distance and cost. When the MCMC derived origination and termination rates for VoIP services in 2005, the rates were not dependent on distance. Similarly, the rates that were proposed in the PI paper dated 18 April 2007 are not based on distance. If the MCMC carries out a costing study, the MCMC will consider if it is appropriate to derive distance dependent rates for VoIP services.

- | | |
|------------|---|
| Q4. | Which do you think is a better cost driver for VoIP calls: capacity or per minute based cost? |
| Q5. | Apart from the cost drivers identified above, are there any other significant cost drivers for VoIP calls? |

2.3.3 Comments received

Asiaspace believed that capacity is a better cost driver for VoIP. According to Asiaspace, the most significant cost drivers for VoIP calls in future are embedded in NGN.

Celcom holds the view that for VoIP traffic, interconnection charges based on bandwidth used or peering would better reflect underlying cost and would be more consistent with economic efficiency. However, currently the percentage of VoIP

traffic is small compared to switched traffic. And operators have made significant investments in billing systems based on minutes of use. Therefore, in the interim period, per minute cost should be used rather than capacity based cost.

Celcom explained that other cost drivers for NGN networks may include packet processing rates for control related functions, variety of applications/services and related platforms, content storage and location within the network, leasing of physical or communication resources. International Telecommunications Union and Electronics and Telecommunications Research Institute (ETRI) Korea are also working towards developing "flow based traffic measurements" within IP routers which could possibly indicate prospective drivers for charging IP traffic.

DiGi believed that capacity is the appropriate charging principle, and because there is direct correlation between wholesale and retail billing, the same should be reflected in the interconnection regime. When assessing options for IP interconnection, the following should be considered:

- (a) familiarity of end users with CPP and receiving party pays (RPP);
- (b) relationship between wholesale and retail pricing;
- (c) compatibility with retail tariff schemes; and
- (d) network and usage externalities.

IP Mobility believed capacity is a better cost driver for VoIP calls but a combination of two costing approaches may be adopted where the cost of transmission on IP network should be based on capacity while VoIP could be based on per minute cost.

Jaring submitted that for VoIP calls, the better cost driver is capacity. QoS is a significant cost driver for VoIP as uninterrupted services will require more redundancy features.

In the absence of other agreed mechanism of costing and pricing, Maxis believed that per-minute based costing can be maintained for VoIP calls in the meantime. Apart from those mentioned above, other indirect cost drivers which may be considered could be related to QoS and reliability aspects.

NasionCom deemed capacity to be a better cost driver for VoIP calls when all networks are IP-centric. However, in the current environment with a mix of circuit-switched and IP networks and the volume of voice traffic is largely circuit-switched, per minute based cost would be the better cost driver. VoIP providers in a mixed environment need to establish the whole set-up for voice calls, e.g., soft switches (gateways), billing system and operational support systems to support VoIP calls. These are cost factors.

Packet One was of the view that in the current environment where circuit switched networks co exists with packet switched networks, per minute based cost or duration is the appropriate cost driver. Packet One identified quality of service, reliability and security as the primary cost drivers.

Redtone believed that charging of VoIP services should be on per minute basis. Due to technology convergence where traditional networks are migrating to IP, having two divergent methods will raise issues. Since the underlying service is a voice call, there should be a common unit for charging. This is also consistent with the CMA which promotes technological neutrality. To have two different methodologies for charging may penalize one form of technology against another. Arbitrage may actually be encouraged by having two different methods of charging. Per minute charging is also something that is understood by both operators and customers. It is the current method for charging and backend systems such as billing and fraud management are on per minute basis. In terms of other cost drivers, Redtone could not identify any that are of major significance.

TM said that interconnection charges based on bandwidth use would better reflect underlying cost drivers and would be more consistent with economic efficiency. However, in some circumstances, per minute charging is more appropriate. This is when a VoIP service is a premium service running over a managed network and the bandwidth consumed must be reserved for the call so that QoS for the call is satisfactory for a voice connection. It is not appropriate for VoIP to be charged at the same rate as equivalent volume of data when it has been prioritized by having "tags". Therefore rather than data volume being the appropriate measure of network capacity for voice service, it is the duration of the call which must be reserved to ensure the required quality.

TM explained that the cost of VoIP will include broadband access, traffic charges, cost of upgrades to IP networks to meet PSTN speech quality, call blocking and network availability standards. TSLRIC is not suitable to determine cost-based price for NGN services because they are not determined by actual network resource usage alone but may be affected by other factors such as equivalent cost of renting a DVD versus downloading a movie.

TIME is of the opinion that capacity based cost is a better cost driver for VoIP. As VoIP traffic increases and more services are delivered as packets over IP networks, minutes of use are no longer an important cost driver. Charging on a per minute basis creates opportunities for VoIP operators to avoid interconnection charges and to engage in regulatory arbitrage. However, capacity can be easily manipulated. For example, 1 Megabit per second (Mbps) with G711 codec can provide 100 concurrent calls but it is possible to compress the voice packet to allow more voice to go through just by using a G79 codec. To control any manipulation, TIME

suggested the number of calls be limited to the number of channels, for example, to allow 24 channels for one E1.

TIME's view is that voice quality is highly valued by majority of customers. VoIP operators could offer higher bandwidth to ensure better quality of voice. Customers who do not put an emphasis on voice can opt for a lower bandwidth for a lower cost. A high quality router can also ensure better network quality. Security is another cost driver. For a more secure network, VoIP operators can invest in expensive equipment such as Session Border Controller or firewall which is cheaper.

2.3.4 The MCMC's final views

Regarding capacity drivers for VoIP services, the MCMC noted that most operators believe capacity to be a better cost driver than per minute cost but would like to retain per minute cost due to operational issues. The MCMC values the views of the industry and in the event that the MCMC decides to carry out costing for VoIP services, due consideration will be given to developing capacity based pricing instead of per minute based pricing.

The MCMC also takes note of the additional cost drivers that have been identified by operators. Some operators have identified QoS as a possible cost driver and the MCMC concurs that this could be a driver that can be considered in future.

However, the MCMC wishes to clarify that the additional cost elements such as soft switches, billing and fraud management system, etc. are items that would typically be taken into consideration in costing for origination and termination prices.

2.4 Setting Cost Based Charges for VoIP Interconnection

In the PI Paper, the MCMC had made reference to the ICT Regulatory Toolkit that was developed by the InfoDev and International Telecommunications Union and the three forms of cost reflective interconnection pricing that have been identified for VoIP services.

Q6. Apart from the three forms identified above, are there any other forms of cost reflective interconnection prices for VoIP services in the Malaysian environment?
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2.4.1 Comments received

Most of the operators were unable to identify any other forms of cost reflective interconnection prices for VoIP services in the Malaysian environment.

DiGi commented that due to the absence of an illustration of the three forms identified by the MCMC, it is difficult to identify any other forms. However, they urged the MCMC to carefully monitor arbitrage problems as this will impose additional hardship on existing operators.

IP Mobility stated that in the unbundling approach, the cost should be differentiated in accordance with the QoS, while Packet One cautioned that the cost arrangements for the three models should be differentiated.

TIME was of the view that the principle of mobile international roaming should be adopted for VoIP services where the both the caller and called party will equally bear the cost of the call.

2.4.2 The MCMC's final views

Based on the responses received, the MCMC concludes that the three forms of cost reflective interconnection prices for VoIP that have been identified in the PI Paper generally reflect the scenario in Malaysia.

2.5 Payment between VoIP and PSTN and Mobile Operators

Q7. Do you think that the payment between VoIP, PSTN and mobile operators should be reciprocal?
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2.5.1 Comments received

Asiaspace believed that reciprocal payment can be adopted provided that the VoIP services are supported by the same level of QoS as offered by PSTN and mobile.

Jaring, IP Mobility, NasionCom and Packet One are of the view that payment should be reciprocal for all voice services.

Redtone thinks charging should be reciprocal for operators who are providing voice services over Worldwide Interoperability for Microwave Access (WiMAX) network. Although there are arguments that this may lead to arbitrage, Redtone proposes that the MCMC assess this proposition from a practical and commercial standpoint. Redtone also cautioned that arbitrage is likely to take place in the event of technology convergence where VoIP services are offered over Global System for Mobile Communications (GSM) or 3G networks using 0154 numbers.

Celcom, DiGi, Maxis, MiTV, TM and TIME do not think that payment should be reciprocal. Celcom cited the United States as an example where the FCC ruled that

internet service provider (ISP) bound traffic should not be subject to reciprocal compensation because it involves "information access". In addition, Celcom thought that the two criterions that should be used for treating services as equivalent are quality of service and investments into the infrastructure. The quality of service by VoIP operators is not comparable to PSTN or Public Land Mobile Network (PLMN). Also, VoIP operators do not make substantial investments into infrastructure.

DiGi submitted that the network elements involved in terminating traffic on the mobile network remains intact and operators have to be compensated based on the regulated prices. Reciprocal pricing may lead to arbitrage opportunities and such incidents must be minimised at all cost.

Maxis' view is that different network elements are involved in terminating calls to VoIP, PSTN and mobile networks. Also, VoIP calls via broadband has already been borne and paid by broadband subscription. In circumstances where the VoIP service provider uses a third party infrastructure, the cost of carrying calls is expected to be minimal or absent.

MiTV is of the opinion that terminating rates should reflect the different underlying technologies and compensate accordingly. MiTV also noted that unlike PSTN and mobile operators, VoIP operators are not subjected to Mandatory Standard on QoS, required application services and other obligations.

From TM's perspective, payments between respective operators should be driven by underlying costs of provisioning. For example, mobile termination requires real time processing which requires dedicated radio time slot and transmission route while PSTN requires a permanent connection for each line. In the IP network, the network elements to assess the costs are unclear. Reciprocal payment may reduce incentives for the PSTN and mobile operators to invest in infrastructure.

TIME explained that the underlying technology and switching costs differ from one network to another. TIME estimates transmission costs on IP network to be between 40 and 60 percent lower than PSTN and therefore, the cost recovery by VoIP operators should be $\frac{1}{4}$ of a PSTN local termination.

2.5.2 The MCMC's final views

The MCMC observes that the views are divided. The MCMC takes note of the views submitted by operators who have disagreed with the reciprocal payment and are of the opinion that the access prices should be reflective of the underlying technology. The MCMC has in the past developed different costing models for different technologies to ensure that access prices will provide the appropriate "build" or "buy" signals. The MCMC is likely to continue with this approach until technological convergence has taken place in the market.

Q8. The MCMC seeks views on whether the statement that VoIP operators do not incur any additional costs for originating the service and hence should not be compensated is an accurate reflection of the VoIP operations in the Malaysian context. Please describe your views with your reasons. If your views are that additional costs are incurred, please also describe and provide details of the additional cost elements that are incurred.

2.5.3 Comments received

Asiaspace believed that there is no additional cost involved in peer-to-peer connections but when dedicated connection to PSTN are made, capital expenditure consideration needs to be addressed as well as recurring charges imposed by the PSTN and mobile operators for the interconnection.

Celcom, DiGi, Maxis, MiTV and TM do not believe that VoIP operators incur additional cost for originating a call since the cost for internet connection and high speed broadband connection are borne by users. In addition, Maxis commented that VoIP service providers predominantly rely on third party infrastructure providers and therefore the carriage cost is minimal. TM equated the VoIP traffic to a calling party pays financial model in the sense that VoIP subscribers pay for and route telephone traffic through their internet access link.

IP Mobility believes that the cost of call origination in the IP network is similar to PSTN line rental and bundled access fees in the mobile network. As such, IP Mobility argued that VoIP operators should be treated the same way as PSTN and mobile operators with respect to interconnection payment. IP Mobility also added that additional cost elements are incurred by VoIP operators to provide QoS, security and good control on session initiation protocol (SIP).

Jaring submitted that additional cost is incurred for switching the calls. Also, dedicated customer premises equipment (CPEs) are sometimes provided by service providers and the costs of these CPEs are recovered from number and/or duration of calls.

NasionCom explained that VoIP customers may call from any broadband network that they are connected to and not necessarily confined to NasionCom's network. As such, NasionCom will incur cost for carrying the call into their network or sending the call to other networks. Since the call set-up cost is borne by the IP operators, NasionCom believes that IP operators should be compensated accordingly.

Packet One commented that the interconnection to enable VoIP customers to receive and make calls from and to other PSTN and mobile operators involves a lot of investment. For example, cost is incurred for switches, leased lines and other

network elements such as Base Transceiver Station Terminal (BTS), Multimedia Messaging Service Centre (MMSC) and Short Message Service Centre (SMSC). Also, VoIP operators have to weigh and balance the cost incurred for building Points of Interconnect (POIs) against cost of call termination.

Redtone observed that there is a distinction between VoIP services that are provided over networks and VoIP services that are independent of channel or transmission networks. As such, Redtone is of the opinion that the statement in question 8 is only applicable to the latter service model. For VoIP services provided over WiMAX, Redtone thinks it is inappropriate to separate access from application and believes that the deployment cost of WiMAX should be included in the cost.

TIME highlighted that there are two types of VoIP service providers, i.e. pure VoIP operator with minimum infrastructure and VoIP operators with physical network. The cost that pure VoIP operator incurs is minimal and is recovered from their customer. However, PSTN operators who have migrated from TDM to NGN have higher investment cost due to multiple POIs in their network. In such cases, TIME maintains that there are additional costs incurred for originating the service and operators should be compensated fairly. According to TIME, the types of additional costs incurred are for querying the multiple Telephone Number Mapping (ENUM) databases, building exchanges that can convert large volume of incoming TDM calls into VoIP and signal using SIP to the called service provider or end user, cost of CDRs (Call Detail Record) etc.

2.5.4 The MCMC's final views

The MCMC noted that the opinions on whether the VoIP operators incur any additional costs for originating a service on its network are divided. The PSTN and mobile operators generally do not believe that VoIP operators incur any additional cost while VoIP operators believe otherwise. The MCMC also observed that some have distinguished VoIP operators with and without network and have suggested that those without network incur minimal cost. When the MCMC carried out costing for VoIP origination and termination, the study indicated that VoIP operators do incur cost, albeit minimal, to originate a call. The MCMC will revisit this issue when the next costing study is carried out. Also, the MCMC will consider whether there is merit to distinguish VoIP operators with and without network.

In relation to IP Mobility's view that the cost of call origination in the IP network is similar to PSTN line rental and bundled access fees in mobile network, the MCMC wishes to clarify that the PSTN line rental is cost of access network. The access cost is generally excluded when costing is carried out for fixed origination and termination charges as access cost will not rise in tandem with traffic volume (not an incremental cost). As for the mobile network, the entire access cost is taken into consideration when mobile origination and termination prices are computed because it is difficult to attribute the cost of base stations for coverage and capacity. In addition, the mobile operators do incur additional cost as a result of growth in traffic such as additional investment in transceivers. Also, voice services

in mobile networks are carried over circuit switched network which require dedicated links, unlike IP network.

Q9. Should VoIP calls that terminate on mobile network be treated as data services or normal voice services? Please explain your reasons.
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2.5.5 Comments received

Asiaspace and IP Mobility agreed that VoIP calls that terminate on mobile networks should be treated as data services. Asiaspace qualified that this should be the case until the implementation of NGN. IP Mobility's view is based on the fact that VoIP services are part of emerging mobile data services and therefore a capacity based approach will be more appropriate.

Celcom, Jaring, Maxis, MiTV, NasionCom, Packet One, Redtone and TM disagreed with the statement above and are of the view that that VoIP calls should be treated as normal voice services. This is due to the fact that VoIP and video calls require real time processing and cannot be equated to General Packet Radio Service (GPRS) and other packet type services. Since the mobile network is predominantly circuit switched and signalling system 7 (SS7) is used, voice termination is more appropriate.

DiGi's view is that the treatment essentially depends on the kind of traffic that is terminated on the mobile network as dedicated circuits are established for the purpose of carrying voice and data services over mobile networks.

TIME is of the view that VoIP calls that terminate on mobile network should not be treated as either data or voice because VoIP calls terminated as IP traffic on mobile network can be part of emerging mobile services.

2.5.6 The MCMC's final views

The MCMC observed that most respondents do not agree that VoIP calls that terminate on mobile network should be treated as data services as voice calls are carried over circuit switched network. As such, the MCMC concludes that voice services in the mobile network should be treated as voice termination until there is sufficient evidence to indicate that voice services are being carried over data network.

Q10. Do you agree with MCMC's preliminary position not to carry out another costing study for the time being? Please provide your reasons.
Q11. Do you agree with the proposal where prices are based on "glide path" approach and with the rates proposed? If not, please provide reasons and other alternatives.

2.5.7 Comments received

Asiaspace, Jaring, IP Mobility, Redtone and TIME agreed with the MCMC's preliminary position not to carry out another costing study for the time being. Redtone felt that even if a costing study is undertaken now, the technology is still not mature and a lot of assumptions will have to be made. Redtone believed that a costing study will be more accurate if applied to matured networks and such study should take into account new costing and charging paradigms in light of technological convergence that is affecting competitive dynamics. TIME's view is that cost modelling for VoIP services is relatively new and there is no established position at this point in time.

Celcom, DiGi, MiTV, Maxis, NasionCom, Packet One and TM proposed that a proper costing study be carried out for VoIP services based on 0154 pre-fix before a decision is made to mandate prices.

Asiaspace commented that they agree with the glide path proposed by MCMC and believe that it is better than abrupt prices that may affect their business planning strategy.

Celcom noted that whilst it appreciates the initiatives taken by the MCMC to resolve VoIP interconnection, they are of the view that it is more prudent to follow a consistent approach backed by solid analytical framework rather than adopting an ad hoc approach.

DiGi urged the MCMC to adopt an approach that is consistent with jurisdictions worldwide where the regulators undertake a thorough stock take of IP interconnection issues to gain sufficient understanding of its implications on the network and pricing. In addition DiGi also noted that there is no basis for the proposed pricing and if such prices are mandated, it could result in arbitrage.

Jaring thought that the proposed prices by the MCMC are rather low. However, Jaring was willing to agree with the proposal for the time being, provided that the MCMC carry out a costing exercise within the next 12 months. In addition, Jaring also urged the MCMC to look into access pricing for wireless broadband services such as WiMAX.

IP Mobility was of the view that the proposed prices would put an end to VoIP services as it glides down over time while mobile interconnection prices glide up. The prices should be reciprocal and not differ from PSTN until another study is undertaken in 2008.

Maxis disagreed with the termination rates proposed by the MCMC. They are of the view that voice termination for 0154 is based on the following:

- (a) Mainly provided using third party infrastructure;
- (b) It is a value added service and is an alternative voice service;
- (c) Best effort delivery; and
- (d) Not required to offer Required Application Services.

Maxis viewed the proposed prices as higher than necessary as the cost of providing the service is almost nil. Maxis drew comparison between the proposed rate by the MCMC of 1.5 sen per minute for 2008 and the internet access charge of 1 sen as regulated in the Communications and Multimedia (Rates) Rules 2002 for residential users. Based on the comparison, Maxis believed that the price could be lower. Instead, Maxis and MiTV proposed that the prices be published as indicative rates. Maxis recommended an indicative rate of no more than 1 sen.

MiTV's view is that the proposed prices are without basis and therefore should not be mandated. Mandating the prices is inconsistent with the regulatory principles that the MCMC has applied in determining current access prices. MiTV also stated agreement with MCMC's guiding principles that LRIC methodology is only appropriate for well established traditional services. MiTV cited an example where Infocomm Development Authority (IDA) of Singapore has imposed obligations on VoIP service providers to provide access to emergency number services, directory services, etc. As such, MITV is of the opinion that in circumstances where VoIP calls are offered to the public at the same level as PSTN, similar treatment is warranted.

NasionCom proposed that pending a costing study, the origination/termination rates should be between 2.63 sen per minute and 8.18 sen per minute for 2007 and 8.36 sen per minute for 2008.

Maxis, NasionCom and TM requested the MCMC to justify the basis for the proposed prices.

Packet One suggested different termination rates for VoIP fixed services and VoIP services with mobility. Packet One was of the opinion that the access price for 0154 fixed should follow the termination rates of PSTN, while VoIP services with mobility should follow the mobile termination rates. In addition, Packet One also proposed that the future WiMAX based VoIP services be grouped under mobile services instead of classifying the service under 0154 fixed services.

Redtone strongly disagreed with both the proposed glide path and the prices. Instead, as a minimum standard, Redtone is proposing reciprocal charges for both mobile and fixed. In addition, Redtone is of the view that the reciprocal rates be implemented for no less than three years in order to allow VoIP operators to roll out

their network and for the services to mature. Redtone however emphasized that the prices must be mandated by the MCMC. Redtone supported the MCMC's assessment that placing prices higher than LRIC would provide incentive for operators to invest in IP networks. Redtone noted that such incentives will also positively influence build decisions especially in the light of rolling out WiMAX services.

Redtone proposed a distinct separation between VoIP services provided over WiMAX and those services that are independent of channel or transmission networks. The proposed rates are as follows:

Option 1 – Preferred Option

Year	Service	Proposed 24 hour weighted average for VoIP services that are independent of channel or transmission network
2007	VoIP Origination and Termination Service	3.5 sen per minute
2008	VoIP Origination and Termination Service	3.3 sen per minute

Year	Service	Proposed 24 hour weighted average for VoIP services that are provided over WiMAX network
2007-2010	VoIP Origination and Termination Service	8.0 sen per minute (flat rate)
2007 - 2010	VoIP Origination and Termination Service	5.0 sen per minute (flat rate)

Option 2

Service	Proposed 24 hour weighted average for all VoIP services
VoIP Origination and Termination Service	8.0 sen per minute (flat rate)
VoIP Origination and Termination Service	5.0 sen per minute (flat rate)

TM proposed that the MCMC carry out another costing study but cautioned that it is only appropriate to carry out such study when customer base and traffic growth is more significant and the IP market is more mature. TM also asserted that any form of regulatory intervention should only take place in the event of failure of commercial negotiation and only in relation to bottleneck services that are essential for downstream markets and unlikely to be priced efficiently in the absence of competition. In addition, TM suggested that the MCMC carry out a comprehensive cost-benefit analysis prior to imposing mandatory prices for VoIP services.

On the proposed rates, TM raised strong objection and commented that the proposed rates are about 10 times higher than LRIC rates and would overly compensate VoIP operators. TM also pointed out that the rates do not reflect the reality of low investment and poor VoIP QoS. Further, TM is of the opinion that the cost of transmitting calls within network is zero or has been recovered and what remains is the cost of establishing POI and interconnect link. Compared to circuit switching, the cost of packet switching equipment is cheaper and more versatile. With the latest compression technologies, up to less than 80% bandwidth is needed to transmit calls.

TIME believed that the one time cost for provisioning of VoIP services are recovered from the customer and the set up cost is approximately 1/3 of PSTN cost. As such, TIME did not agree with the proposed prices as these prices are based on PSTN or mobile services that are dependent on distance and switching cost. TIME also commented that since VoIP services in Malaysia are based on non-geographical numbers, new interconnection arrangements are required.

TIME agreed with the glide path approach but strongly disagrees with the proposed prices and basis for the prices. Alternatively, TIME proposed three options as follows:

(a) Alternative 1 – Based on ¼ of PSTN Local Access Pricing

Year 2007 = $2.63/4 = 0.66$ sen per minute

Year 2008 = $2.52/4 = 0.63$ sen per minute

(b) Alternative 2 – Fix the Termination Rate for 2 years

1.5 sen per minute for 2007 and 2008.

(c) Alternative 3 – Use MCMC indicative pricing

0.22 sen per minute for 2007 and 2008.

Of the three proposed alternatives, TIME indicated preference for Alternative 3.

2.5.8 The MCMC's final views

The MCMC acknowledged industry views that mandating prices for VoIP services is not an approach that is consistent with international regulatory practices. The MCMC took note of the general comments provided by TM, whereby TM pointed out that failure to conclude access agreements should not be taken to mean market failure and that it could be due to lack of urgency.

However, the MCMC also observed that although the origination and termination services for VoIP services using pre-fix 0154 had been included in the Access List since July 2005, the operators thus far appeared to have difficulties in concluding the negotiations for access agreements for the service and that the main issue appears to lie with the pricing. The submissions received for this PI also did not provide sufficient information or argument to indicate that the parties are able to agree on the pricing or that the negotiations are near successful conclusion. The MCMC is concerned that this difficulty strongly indicates that a light-handed approach did not result in the desired market outcome. The MCMC is also concerned that if no access agreements are established in the near term, consumers will not be able to enjoy any-to-any connectivity. In view of the above, the MCMC has formed its view that there is a need to mandate the access prices so that the operators enter into access agreements and commence providing the VoIP services with any-to any connectivity.

In respect of the pricing to be adopted, the MCMC observed that most operators did not agree with the MCMC's preliminary position not to carry out another costing study for the time being. On the proposed prices based on glide path, the MCMC notes that the operators have broadly disagreed.

The MCMC however also observed that diverse views and proposals were submitted by the operators in respect of the pricing and the pricing structure to be adopted. Additionally, some operators such as Redtone, TIME and NasionCom had provided specific alternative proposals on the prices.

The MCMC is mindful that the diverse views could partly be due to the attributes of the IP technology that lacks structured approach of circuit switched network. In cases where alternative prices were proposed, it is noted that such prices do not appear to be supported by any form of costing or economic rationale. As such, the MCMC is unable to adopt those prices recommended by the operators in their submissions.

Given the above, MCMC's final view is that the prices ought to be mandated and that the maximum prices will be as follows:

Year	Services	Proposed 24 hour weighted average rate
2007	VoIP Origination and Termination	2.63 sen per minute
2008	VoIP Origination and Termination	1.5 sen per minute

Q12. Do you agree with the timelines proposed above? Do you anticipate any issues in adhering to the timelines specified above?
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2.5.9 Comments received

Asiaspace, IP Mobility, Jaring, Packet One and Redtone agreed with the proposed timeline. Packet One believed that a Determination will definitely encourage the new service providers to invest in their IP networks. Redtone commented that it has been negotiating with various operators for over a year and had addressed most issues. As such, if there is genuine interest on the part of incumbents, agreements can be concluded.

Based on the disagreement for the proposed glide path, Celcom, DiGi, MiTV, NasionCom and TM are of the view that VoIP pricing should not be imposed unless a comprehensive study is carried out.

Maxis was of the view that the proposed pricing for 2007 will be short lived. As such, Maxis proposed that a single tiered rate be adopted pending the completion of a detailed costing study.

TIME felt that the proposed timeline is not feasible even if the MCMC regulates 0154 pricing. TIME pointed out that the earliest agreements can be concluded will be in October or November of 2007. In light of that, TIME is proposing a single termination rate.

2.5.10 The MCMC's final views

Based on the conclusion to mandate access prices for VoIP services, the MCMC will mandate the maximum prices, effective from 1 August 2007.

3. ACKNOWLEDGEMENTS

The MCMC wishes to thank all those who took part in this PI by providing written submissions of their constructive comments. The MCMC gave close considerations to all submissions received, and the submissions have assisted the MCMC to arrive at the decision on whether or not access pricing of VoIP services based on pre-fix number 0154 should be mandated. In addition, the comments and views submitted will also be taken into consideration when the next costing study is carried out.