

**MALAYSIAN COMMUNICATIONS AND MULTIMEDIA COMMISSION**

**Concepts and Proposed Principles on  
the Implementation of  
IMT-2000 Mobile Cellular Service  
in Malaysia**

Discussion Paper

10 November 2000

## **Section 1 : Introduction**

In this discussion paper, the Malaysian Communications and Multimedia Commission (CMC) seeks to invite submissions in relation to the introduction and implementation of IMT-2000 services in Malaysia, in particular:

- a) the principles under which IMT-2000 services shall be implemented in Malaysia,
- b) the methodology for the allocation of the spectrum for purposes of IMT-2000 implementation and roll out, and
- c) the proposed timeframe for its introduction.

## **Section 2 : Background and current state of development in Malaysia**

This section contains a brief discussion of the current level of development in the mobile market in Malaysia.

## **Section 3 : Choice of IMT-2000 standards in Malaysia**

This section discusses the options on IMT-2000 standards that Malaysia should adopt.

## **Section 4 : Spectrum allocation and methodologies of award of spectrum**

This section discusses the spectrum allocation process, the methodologies put forward for discussion and the amount of spectrum available for Malaysia.

## **Section 5 : Competition and efficient resource utilization**

This section discusses the concept of promoting competition at the service level and options for minimizing wasteful duplication of investments at the facilities or network level.

## **Section 6 : Conclusion**

## 2. Background

### 2.1 Formation of the Joint Working Group between the Ministry of Energy, Communications and Multimedia and the Malaysian Communications and Multimedia Commission

Recognising the importance of the introduction of IMT-2000 services, more popularly known as 3G mobile services, the Ministry of Energy, Communications and Multimedia, Malaysia ("MECM") and the Malaysian Communications and Multimedia Commission ("CMC") had formed a 3G Joint Working Group ("JWG").

The JWG first met in early September 2000 to discuss the policy position on the introduction of IMT-2000 services in Malaysia. Various discussions were held on issues relating to spectrum allocation, the current status of mobile services, comparison between the various means of marketing spectrum and the current market situation. Subsequently, these discussions led to an industry consultation session on 16 October 2000 whereupon the JWG presented its proposal to industry, comprising of a number of existing operating companies. Those present were then invited by the JWG to submit their preliminary comments to the CMC.

The CMC would like to formally acknowledge that it has to date received preliminary comments from Telekom Malaysia Berhad, TIME dotCom Berhad, DiGi Telecommunications Sdn Bhd, Celcom (M) Sdn Bhd, Maxis Communications Berhad and Suidar Elektronik Sdn Bhd.

### 2.2 What is IMT-2000 and its relevance to Broadband

For purposes of establishing what is IMT-2000, it is necessary to have an overall picture of what broadband technologies and services are all about. As shown in Diagram 1, it is a part of this broader picture and is an important technology in broadband mass market access.

Diagram 1: Broadband Technologies & Services

Medium	WIRED		WIRELESS		
Infra-structure	Fibre	DSL over copper	Satellite	Terrestrial	
Mode	2-way		1-way	2-way	1-way
Typical Services	Interactive Multimedia services		DTH	IMT-2000	Digital broadcast

IMT-2000 services will provide voice services, internet access and higher speed data services to mobile subscribers and platforms using both satellite and terrestrial systems.

IMT-2000 services will permit data rates of :

- up to 2 Mbps to stationary subscribers,
- up to 384 kbps to pedestrian subscribers, and
- up to 144 kbps to subscribers on moving vehicles.

In a nutshell, broadband refers to the ability to deliver a multitude of interactive services including the Internet via the same medium of transport and it can be either wired or wireless. Quick access to the Internet will no longer be confined to access via fixed terminals. With the introduction of IMT-2000, we will be able to access the Internet over mobile handheld terminals, watch video on mobile terminals and many other multimedia services which till now were unable to be delivered via mobile terminals due to bandwidth limitations.

3G stands for 3<sup>rd</sup> Generation and it is a next generation wireless communications service which combines high-speed fixed and mobile access with Internet Protocol (IP) based services. It means a new and speedier way to communicate, access information, conduct business and moves away from the current slow connections.

Although the service is popularly referred to as 3G, the service is also known as International Mobile Telecommunications 2000 (IMT- 2000); in Europe it is more commonly known as UMTS or Universal Mobile Telecommunications Service. For the purposes of this paper, we will only be addressing the wireless aspect of 3G services. We also set out in [Appendix 1](#) to this paper a brief glossary of words or terminologies that are relevant to the discussion in this paper.

## **2.2 Where are we now?**

Current initiatives for mobile wireless access to the internet tend to be slow due to bandwidth limitations and therefore imposes limitations on introduction of new multimedia services which require large amounts of bandwidth. It is expected that with the introduction of IMT-2000, this impediment caused by bandwidth limitations will be overcome.

At this stage, it is necessary, for purposes of further discussion to review the state of development in the provision of mobile services in Malaysia.

## **2.3 Market and service status of mobile telephone services in Malaysia**

Malaysia's first generation systems (started from 1985 onwards) were:-

- Nordic Mobile Telephone System (ATUR 450 service);
- Extended Total Access Cellular System (Celcom 900 service); and
- Advanced Mobile Phone System (Mobifon 800 service).

Then, second generation digital systems were introduced:-

- Digital Advanced Mobile Phone System or the IS-136 standards (Mobifon Digital 800 service)
- Global System for Mobile Communications at 900MHz (Maxis and Celcom GSM Service)
- Global System for Mobile Communications at 1800MHz (TM Touch, TimeCel - *formerly known as ADAM*, and Digi1800 service)

Since the introduction of the mobile services in Malaysia, there has been a dramatic growth over the last 10 years. To date, the number of subscribers has reached about 3.6 million. The first generation systems supported up to about 0.8 million subscribers before the second-generation systems came on-stream in 1995 to relieve network congestion.

Network development in the second-generation digital systems are still on going with the GSM-900 system approaching nationwide availability whereas the GSM1800 has reached about 35% in terms of nationwide roll out. The spectrum in the 2<sup>nd</sup> generation systems has been substantially used, except in the GSM1800 band where only approximately 60% of the spectrum has been utilized.

The type and variety of services offered by the industry is currently voice-based although data services such as SMS are available and WAP/IP based applications are beginning to appear.

The upgrade of the 2G network to GPRS and EDGE/GSM384 should allow the providers to offer broader band data services. It is envisaged that many new multimedia services can already be introduced even before IMT-2000 is initiated due to the ability of GPRS to offer higher access speeds as compared to current 2G systems. Such development will depend on the availability of spectrum on each of the network service since data service applications may take up substantial system capacity.

The present capacity provided by the allocated spectrum (a total of 2x110MHZ) for digital mobile network service is sufficient in our projections to carry the demand for voice and data services to year 2003 based on the assumption of an annual 25% increase in subscription rate and an increase of data traffic (data applications) from an almost 100% voice traffic now to 50% voice and 50% data (SMS/WAP/IP) in year 2003.

This also assumes that the present providers upgrade their network to GPRS and EDGE/GSM384. This assumption together with the estimated subscriber base on the existing network service of about 5 million in 2003 will probably utilise all the 2G/2G+ capacity. To prevent congestion and stifling innovation and growth in new wireless data service applications, introduction for IMT-2000 services have to be considered.

However, despite the promises of new applications pursuant to the introduction of IMT-2000 services, it should be noted that IMT-2000 is still very new and yet unproven and perhaps in the immediate term the Malaysian industry should exercise some degree of care in its adoption. *The CMC would argue that notwithstanding technological advancement, there are also different priorities in Malaysia such as the provisioning of Universal Service to equip the rural areas with communications facilities. There should perhaps be more emphasis and investment placed by the operators on the roll out of 2G/2G+ mobile services in order to fully utilize the capacity of existing networks before they are permitted to build IMT-2000 networks.*

***The CMC invites comments on the proposition that there should be more emphasis and investment on rolling out 2G/2G+ for the purpose of providing greater geographical coverage before new investments in 3G are permitted.***

### **3 What standards should Malaysia adopt?**

#### **3.1 Choice of options in IMT-2000 International Standards**

While the IMT-2000 standards have determined global spectrum usage, because there are different transmission standards on offer due to the different 2G families in commercial operation, a family of 3G standards has been developed under the umbrella of the International Telecommunications Union (ITU).

Basically there are two main contending groups, i.e. the 3GPP (supporting W-CDMA) and the 3GPP2 (supporting cdma2000) supported by the different organizations wanting to provide migration paths for their operating 2G systems. The main contenders are the W-CDMA (European/GSM) standards and the cdma2000 (American) standards.

The radio air interface of each group is different and incompatible enough to potentially warrant the need for different handsets for each mode. For spectrum efficiency, a single standard radio transmission interface is recommended. Although handset manufacturers may produce dual mode handsets (i.e. handsets with two types of radio interface) the cost to the consumer could possibly be higher.

#### **3.2 Industry Working Group's recommendation**

The industry working group (ITU Malaysia/WG6 Industry Working Group) on the draft Malaysian IMT-2000 standard has recommended their choice of 3GPP (W-CDMA standard) due to its large support base and the successes under the existing GSM grouping which was built upon by the 3GPP group. A draft standard has been completed and is being studied by the CMC.

***The CMC would like to invite comments as to the choice of IMT-2000 standard being proposed for adoption.***

### **4. Spectrum Allocation**

#### **4.1 Approaches to spectrum allocation**

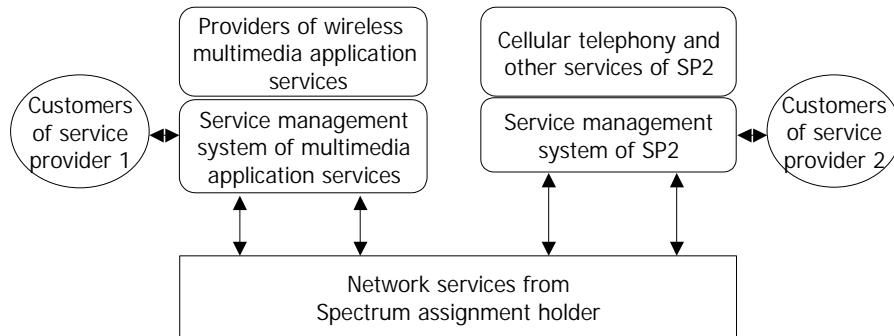
Based on published articles and reports around the world, it is evident that the whole world is still debating on the appropriate options to exercise in determining the award of licences to operate on 3G systems. Some have chosen to auction the 3G licences, whilst others are holding 'beauty contests'. Some have carried it out in such a way that limits new entrants. In the global context the award of IMT-2000 licences may mean awarding the operating licences as well as the right to use the necessary spectrum.

It must however be clarified here that in the Malaysian context under the Communications and Multimedia Act 1998 (CMA 1998), there is no need to issue specific "licences" for the provisioning of IMT-2000 services as the licensing regime pursuant to the CMA 1998 is technologically neutral. For so

long as the intended operator possesses the necessary licence, the operator could technically provide IMT-2000 services. For purposes of illustration, please refer to Diagram 2 below.

Diagram 2: Separation of services from the network

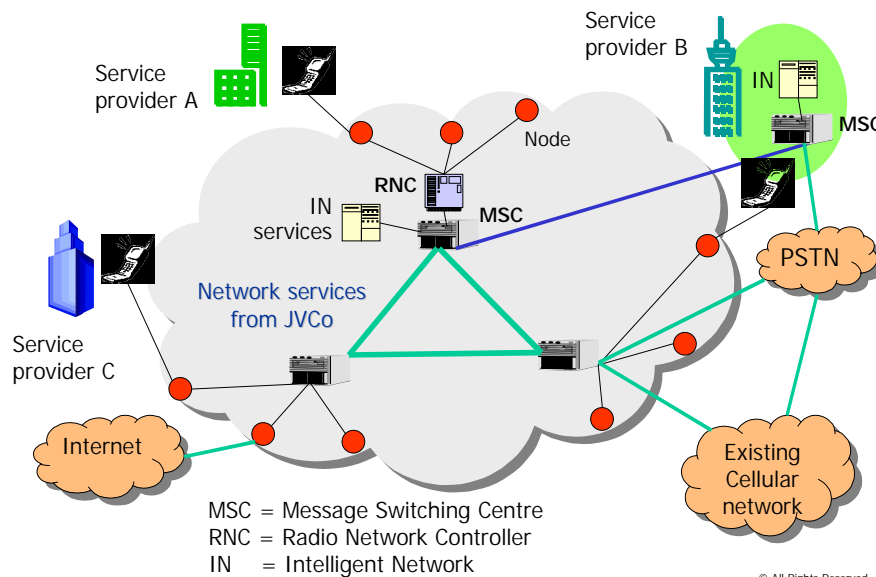
- Service providers may provide wireless multimedia services using the network provided by the spectrum holder. Service providers may buy/lease/rent facilities to provide their services.



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What is necessary is only to allocate the necessary spectrum for spectrum holders to provide wholesale airtime to operators for IMT-2000 services. Spectrum is given by way of spectrum assignment and the assignment of spectrum does not necessarily require the spectrum holder to have a licence to provide retail services as in the previous regime. The Malaysian regulatory framework makes it possible for several operators of IMT-2000 services (service providers) to utilize the spectrum held by a single spectrum holder (Diagram 3)

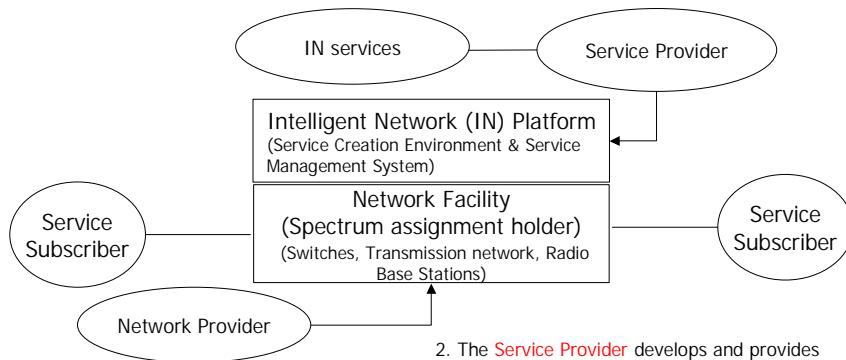
Diagram 3: Multiple service providers supported on a Network



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Diagram 4 shows an option of how the concept shown in Diagram 3 could be implemented.

Diagram 4: Multiplayer Application Service on a Network Service Facility



Note:

1. The **Network Provider** owns the physical network including the spectrum. The network may be PSTN, ISDN, mobile cellular, IP, or broadband network. The IN platform will allow service providers to supply IN services on the integrated networks.

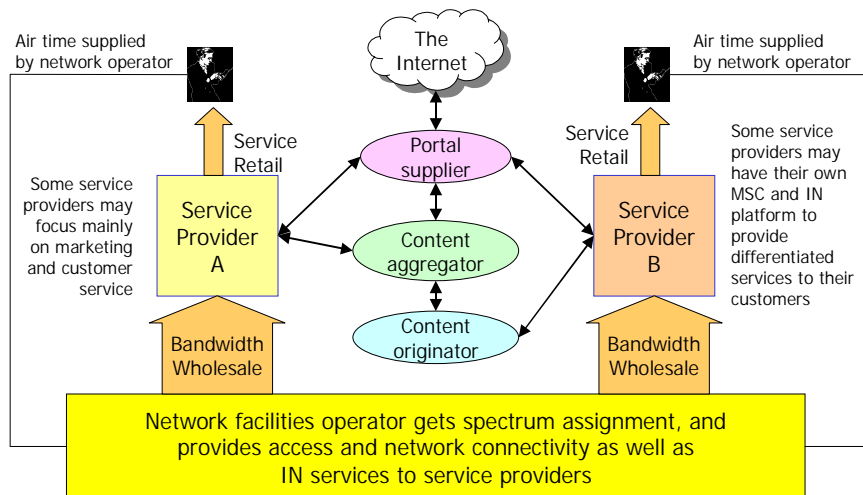
2. The **Service Provider** develops and provides services over the common IN platform and underlying network service facility. Its role is mainly in service creation and management and it relies on the network service facility for the execution of the services by means of the physical network and its resources.

3. The service subscriber is the user/organisation that obtains the service from the Service Provider.

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Furthermore, by segregating the network facilities from the retail service provisioning, it is possible new market entrants along the IMT-2000 value chain could emerge. Such new entrants could be content providers, portals operators, content aggregators etc. Diagram 5 illustrates the possibility for the new entrants in the value chain to work together with the mobile operator, especially in the area of content development. Consequently, the potential beneficiaries of the mobile market will no longer just be mobile telephony operators only but content providers as well.

Diagram 5: Commercial relationships in service provision



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## 4.2 Method of allocation and spectrum available for allocation

The frequency bands in the IMT-2000 core band (terrestrial component) that is currently available for spectrum assignment in Malaysia are those designated for the Frequency Division Duplex (FDD) mode and Time Division Duplex (TDD) mode. Each band is divided into blocks of 5MHz bandwidth. In total there are 12 blocks of paired FDD and 8 (5+3) blocks of unpaired TDD available for allocation as follows:

Table 1: IMT-2000 Core Band

Frequency Range (MHz)	Bandwidth Available (MHz)	Application	Bandwidth Per block (MHz)	Total No. of Blocks Available For Allocation
1895 - 1920	25	TDD	5	5
1920 – 1980	60	FDD (paired)	5	12
2010 - 2025	15	TDD	5	3
2110 - 2170	60	FDD (paired)	5	12

Numerous countries around the world have proposed to allocate a combination of paired and unpaired blocks and in some cases, certain countries have chosen to allocate only the paired FDD portion of the spectrum. However, in essence the amount of spectrum allocated to each operator by the authorities in various countries is either 2X10 MHz FDD + 1X 5MHz TDD, 2X15 MHz FDD + 1X5MHz TDD or 2X20 MHz FDD.

In the current Malaysian context as set out in Table 1 above, based on the current available twelve (12) 5MHz blocks of paired FDD and eight (8) 5 MHz blocks of unpaired TDD, there obviously are numerous permutations for allocation of the spectrum for IMT-2000<sup>1</sup>.

The present proposition being put forward is for the spectrum holder (facilities provider) to be given a combination of paired and unpaired portions of the IMT-2000 spectrum. It should be noted that the unpaired portion of the spectrum will allow IMT-2000 services to handle asymmetric traffic, such as Internet access, in an efficient manner.

***The CMC invites views on the proposed utilization of the unpaired portion of the spectrum together with the paired portion of the spectrum.***

<sup>1</sup> Note : As stated earlier, in the Malaysian context, provisioning of retail IMT-2000 services to end-customers (consumers) pursuant to CMA 1998 is not dependent on spectrum allocation. Spectrum allocation is only necessary for those operators who wish to run IMT-2000 networks and resell capacity to the service providers.

The current spectrum assignment options already proposed by the CMC to members of the Malaysian communications and multimedia industry during the IMT-2000 Presentation is set out in the table below.

Table 2: Spectrum assignment options

No.	Blocks	Bandwidth (MHz)	Phases	Assignment holders	Note
1.	Six	6 X [(2x10MHz FDD) + (1x5MHz TDD)]	One	Six	All spectrum released in one go.
2.	Five	3 X [(2x10MHz FDD) + 1x5MHz TDD] plus 2 X [(2x15MHz FDD) + (1x5MHz TDD)]	One	Five	All spectrum released in one go.
3.	Four	4 X [(2x15MHz FDD) + (1x5MHz TDD)]	One	Four	All spectrum released in one go.
4.	Two	6 X [(2x10MHz FDD) + (1x5MHz TDD)]	More than one phase	Two JVCo initially	Two assignments in one go and remaining blocks reserved for later use.
5.	One	1 X [(2x60MHz FDD) + (1x40MHz TDD)]	One	One JVCo	All spectrum released in one go.
6.	One	1 X [(2x10MHz FDD) + (1x5MHz TDD)] or 1 X [(2x15MHz FDD) + (1x5MHz TDD)]	More than one phase	One JVCo	All spectrum released in one go.

Spectrum is a scarce resource. In some of the options in the Table 2 above, there are proposals for spectrum blocks be released either simultaneously or for there to be prudent assignment of spectrum in the early stages of the introduction of IMT-2000 services in Malaysia and for the balance spectrum to be released in the future to those holders of existing IMT-2000 spectrum for purposes of expansion or in the event (in the future) the uptake of IMT-2000 services is overwhelming, the possibility for the introduction of a new market entrant at the facilities level.

## 4.2 Spectrum Assignment – fixed price, auction or tender?

The Communications and Multimedia Act 1998 (Spectrum Regulations) 2000 (hereinafter referred to as Spectrum Regulations 2000) already sets out the three possible ways in which spectrum can be assigned i.e. by way of fixed price, auction or tender<sup>2</sup>.

The CMC takes note of the view proposed by the industry working group (ITU Malaysia/WG6 Industry Working Group) that the spectrum award or assignment be by way of a beauty contest (tendering) and notes that ITU Malaysia/WG6 report- SAA/TEMP/1(Rev.4)-E - Section 2.3.2 shows industry consensus on this matter.

***Based on the current developments worldwide, the CMC acknowledges that there appears to be reservations within industry with respect to the auctioning of IMT-2000 spectrum. In this regard, the CMC would like to invite comments on the most suitable method to be applied for assigning spectrum in the Malaysian context.***

It should be noted however, that in the event either an auction or a tender route is chosen, the Spectrum Regulations 2000 require that the CMC prepare an applicant information package (AIP). The following are the salient information that needs to be set out in the package:

- a) the pre-requisite for a general invitation by the CMC to apply for an assignment;
- b) the eligibility requirements of persons who may apply for an assignment;
- c) the type of auctions or tenders;
- d) the entry fees for prospective bidders or tenderers;
- e) the reserve price and deposits (if any);
- f) the basis on how the CMC would handle two or more equal bidders or tenderers;
- g) the methods of payment of the assignment fee
- h) the extent of the geographic unit and spectrum band of the assignment which is on offer;
- i) the extent, if any, to which the transfer or dealing with a spectrum assignment will be permitted;
- j) the extent, if any, to which third party authorization of an apparatus assignment will be permitted;
- k) the geographic unit and spectrum unit that may be traded; and
- l) any other matters as the CMC may deem necessary.

The Spectrum Regulations 2000 also stipulate that eligibility requirements could be set by the CMC. Some examples of the proposed criteria are as follows:

- a) Corporate experiences and past performances
- b) Corporate financial strength
- c) Roll-out plan

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<sup>2</sup> Note : For more details, please refer to the Spectrum Regulations 2000 which is available for viewing at [http // www.cmc.gov.my](http://www.cmc.gov.my).

- d) Network performance guarantees
- e) Service coverage guarantees
- f) Infrastructure sharing
- g) Comprehensive plans for network services and applications service
- h) Domestic roaming to existing Second Generation (2G) cellular mobile users
- i) Eligible level of foreign ownership/investment and strategic partnership
- j) Spectrum offer price

***The CMC would welcome comments on the appropriateness of the criteria (a) to (j) listed above, in respect of the Malaysian context.***

## **5. Competition and consolidation**

### **5.1 Encouraging competition at the service level**

The CMC is of the view that for the benefit of consumers, competition should be fostered at the service level instead of spectrum holders racing against one another to build facilities. What this means is that any prospective operator of IMT-2000 services should compete in delivering quality service to the consumer and not compete by way of the number of towers erected or facilities rolled out. The CMC is also of the view that duplication of investment at the network facilities level does not promote efficient allocation of resources as towers continue to be built and duplicated.

### **5.2 Encouraging more efficient use of network facilities and the use of existing infrastructure resource**

Based on similarities in spectrum band with the current network set up, it is estimated that a major portion of the existing cellular base station sites may be used to deploy IMT-2000 cellular base stations. The availability of the combined pool of base station sites from the existing operators that have been developed over the years can be utilized thereby minimizing the need to set up new base station sites.

Furthermore, the CMC is of the view that a commitment to embark on IMT-2000 services involves very high capital expenditure. There is therefore merit in service providers sharing a common network whilst continuing to provide services to customers under their own brand. In this respect, please refer to Diagram 3 above for a clearer illustration of multiple services being offered over a shared network.

A very important consideration for Malaysia is that the equipment for deploying IMT-2000 services is likely to be imported. Should there be too many operators at the facilities level, there would be tremendous outflow of funds as each facilities provider would on their own be importing communications equipment for IMT-2000 services. By sharing a common infrastructure for IMT-2000, the negative impact on the economy caused by excessive network duplication will be minimized.

The rationale for proposing such an option is that 3G is a new service and it is still not proven whether there will be sufficient uptake to ensure commercial success for those involved in investing in the infrastructure. At the same time, the operators can themselves continue to improve their 2G/2G+ services. The CMC is of the view that this approach should also ensure that interoperability between 2G and 3G networks is optimized as the stakeholders themselves already have an existing customer base which they will have to continue to service in order to ensure a secure income stream.

***The CMC would like to invite views and comments on the above proposition of having only one spectrum holder providing 'wholesale' airtime services to the service providers. If one spectrum holder is thought not to be optimal, how many should there be and why?***

## **6. Conclusion**

### **6.1 Applications services to meet customer needs**

In introducing new services under IMT-2000, one has to bear in mind that perhaps, the potential take up rate from retail subscribers to the IMT-2000 service in the initial stages may not be as expected due to barriers to entry such as the potential high cost of mobile terminals.

Furthermore, it is also possible that not all of the mobile phone population may immediately want to subscribe to the 3G services for other reasons. As an example, mobile customers may very well be happy to continue with GPRS-based services and may not feel the need to upgrade. In the event demand for such services is very limited, there will necessarily be a longer lead-time before any network operator can recover its investment in the IMT-2000 networks.

The CMC acknowledges that migration to the IMT-2000 services is a complex issue to contend with especially with our large number of existing operators in the market place. Many perceive that when a mobile operator is granted spectrum for IMT-2000 that necessarily means the preservation of the current mobile operators investment and enhancement of their market value. This is not always true as can be seen from the recent reports of earlier efforts around the world at introducing 3G licences.

For the customer, migration to 3G must serve their needs. If the customer's needs are met with the 2G/2G+ services, would there be a need to urgently roll out IMT-2000 services? A balance must be struck between the two. Ideally, anyone, especially the existing operators who have indicated an interest and commitment to IMT-2000 should be given the necessary spectrum. However, this approach may not necessarily be in the best interest of the country as a whole as there may potentially be duplication of networks in the event each spectrum holder is also permitted to roll out infrastructure for IMT-2000.

Based on the present subscriber base as well as projections for the next few years, the CMC is of the view that in the near future, IMT-2000 services will only serve a 'niche' market. This is because it is likely that most multimedia services can already be delivered on the GPRS platform. The CMC is

therefore of the view that until such time prices for mobile terminals for end users and cost of network equipment is reduced, it would not be prudent to have too many operators at the facilities level.

***The CMC would like to invite comments on the proposition that in the immediate term, IMT-2000 would only serve a 'niche' market in Malaysia.***

The CMC would also welcome comments on any other aspects of this discussion paper where views had not been specifically sought.

## **7. Next Steps**

The CMC proposes to use this discussion paper to facilitate public discussion on the subject of introducing IMT-2000 services in Malaysia. The CMC is conscious that the discussion paper raises a broad range of complex issues which may be difficult to address but wishes for public inputs on these issues.

Written submissions on this discussion paper should be provided to the CMC by **12 noon on Monday 11 December 2000**. Written submissions should be provided both in hard copy as well as in electronic form and may be addressed to:

Chairman  
Malaysian Communications and Multimedia Commission  
Level 11, Menara Dato' Onn,  
Putra World Trade Centre,  
45, Jalan Tun Ismail,  
50480 Kuala Lumpur

for the attention of : Mohamed Sharil Tarmizi  
Industry Policy and Regulation

To foster an informed and robust discussion process, the CMC reserves the right to make public any comments or part of comments received from the respondents to this discussion paper. In the event a submission contains confidential information, these should be provided in an appendix marked 'Confidential' which may be detached so that the main submission may be made available to the public.

### Glossary

"Broadband" is essentially, the ability to deliver a multitude of interactive services including the internet via the same medium of transport and it can be either wired or wireless.

"Bluetooth" is the technology for wireless connectivity. It is radio based and it eliminates the need for cable attachments for connecting computers, mobile phones and handheld devices. This is to be contrasted with existing infra-red data transfer protocols which require line of sight and has a relatively low data transfer rate.

"FDD" means Frequency Division Duplexing, a technique of radio transmission that uses paired frequencies for transmit and receive to allow for two-way communication.

"GPRS" stands for general packet radio service and it brings packet data connectivity to the GSM market paving the way for next level of personal multimedia services. GPRS integrates GSM and IP protocol technologies and is the next step in technological advancement over existing GSM networks. The existing GSM network elements need only software upgrades.

"TDD" Time Division Duplexing, a technique of radio transmission that uses unpaired frequency i.e. the same frequency for transmit and receive. This is done by allowing time for transmit and receive to achieve two-way communication.

"WAP" is the global open standard for applications over wireless networks. It provides a uniform technology platform with consistent content formats for delivering internet and intranet services to digital mobile phones.

"2G" means the current digital mobile communications system. Examples of such system in Malaysia are GSM 900, PCN 1800 (also known as GSM 1800 in other countries) and D-AMPS.

"3GPP" is Third Generation Global Partnership Project, the organizational partners that are co-operating for the production of technical specifications for a 3G system based on the GSM core networks and radio access technologies and often referred to as W-CDMA. Main partners are from Japan and Europe.

"3GPP2" is the second group of the Third Generation Global Partnership Project, producing technical specifications based on CDMA 2000. Main partners are from US and Korea.