Appendix A   Abbreviations

3G	Third Generation Mobile with wideband
ARPU	Average Revenue Per User
DLD	Domestic Long Distance
EDGE	Enhance Data Rate for GSM Evolution
HSCSD	High Speed Circuit Switched Data
IDD	International Direct Dial
IVR	Interactive Voice Response
GATS	General Agreement on Trade in Services
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
MVNO	Mobile Virtual Network Operator
SIM	Subscriber Identity Module
UMTS	Universal Mobile Telecommunications System
VAS	Value Added Services
VoIP	Voice over IP
WAP	Wireless Application Protocol
WLL	Wireless Local Loop

Appendix B   Schedule of Commitments of Malaysia in Communications Services of GATS

The following are the specific services offered under the Malaysian schedule of commitments for Communication Services Industry (Sieh 2000, pp35-39, 60-61, 64-65):

Telecommunication Services

- Enhanced value-added services must be provided from channels or lines obtained only from licensed network operators

- Data and Transmission services: covering electronic mail, voice mail, online information and database retrieval, enhanced facsimile, code and protocol conversion (7523) [1]

- Mobile data services (7523*)

- Telex and telegraph services (7523*)

Audiovisual Services

- Motion picture, video tape and audio recording distribution services (96113)

- Broadcasting services - covering transmission from foreign broadcast station of foreign broadcast matter from foreign territory through television or radio (7524*)

Malaysia's commitments reflect the current policy on foreign service suppliers participation in domestic services activities. Generally, there is no restrictions on cross border supply and consumption abroad (market access mode 1 and 2) of these services.

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[1] numbers in brackets are the Central Product Classification (CPC). An asterisk against a CPC code number indicates that the corresponding service subsector covers only a part or parts of the subsector

Appendix C Comparison of GSM Basic Services

C.1 Telephony

This service provides transmission of speech information and audible signalling tones of the fixed network. The transmission can be mobile originated as well as mobile terminated. Transmission of DTMF (e.g. for controlling voice mail boxes) from the mobile is provided.

Voice service is common to all providers. The differences would be in the quality of service, e.g. the probability of blocking (congestion), dropping, noise level, radio coverage, etc, which vary from one area to another, and require network measurements to produce such statistics. As all providers are providing GSM services, it is important for them to monitor their service quality in order to differentiate their service from the competitors'.

C.2 Emergency Calls

This is a mandatory service in the GSM network, providing speech transmission from the mobile to the fixed network. Only mobile originated calls are allowed. Emergency calls may be initiated from a mobile without using the SIM and the service supersedes all constraints imposed by supplementary services or mobile station features used for other teleservices or bearer services. It is however a network operators option whether to accept emergency calls made without using a SIM. The lock state of the mobile station is overridden by the Emergency Call procedure. Emergency calls will be routed to the emergency services in

accordance with national regulations. It might be possible to trace the calling party in order to prevent misuse of the service.

Emergency Calls are initiated by entering "112 SEND".

Subscribers may also enter the national emergency code, but this will only work if the correct code for that country is used. The SIM must in this case be present since this is not using the teleservice "Emergency Call".

This service is common to all providers. Same analysis as Telephony.

C.3 Short Message Mobile Terminated (SMS-MT)

This service provides transmission of a short message from a message handling system (e.g. the Service Centre) to a mobile station. The maximum length of the message is 160 characters. After receiving the short message an acknowledgement will be sent back from the mobile station to the service centre. If the mobile station is not reachable due to being switched off, out of radio coverage or other reason, the message is stored at the service centre until the mobile station is accessible. The message can be received whether or not the mobile station is engaged in a call.

This is mostly advertised as VAS by providers, e.g. DiGi group it together with voicemail, CLIP, call divert, multiparty conferencing, call waiting, call hold together as a RM5 package, although in the GSM MoU, SMS is considered a basic service.

C.4 Short Message, Mobile Originated (SMS-MO)

This service provides transmission of a short message from a mobile station to a message handling system (Service Centre). The maximum length of the message

is 160 characters. After receipt an acknowledgement is sent back to the mobile station. The message can be sent whether or not the mobile station is engaged in a call. In order to send the message the mobile station must be equipped with a key pad or equivalent or be connected to a data terminal/PC using appropriate protocols.

Same comment as SMS-MT.

C.5   Cell Broadcast (CBS)

This service provides the transmission of a short message from the service centre to all reachable mobile stations within one cell or a group of cells. To receive cell broadcast messages, the mobile station must be in idle mode. There is no acknowledgement message after reception. The maximum length of the message is 93 characters. It is possible to combine a number of messages thereby creating longer streams of messages. Since this is a broadcast service, no special subscription is required for this service, and it is not encrypted.

All providers seem to utilise this service to broadcast marketing related information to subscribers, e.g. activation of a new service and promotional information (such as dedication of song during a festive season).

C.6   Speech and Facsimile Group 3

This teleservice allows the connection of a group 3 facsimile terminal to the mobile station. Facsimile connections may be established to and from group 3 fax terminals in the fixed network or a GSM network.

The following possibilities are supported :

- set up of a call, starting with speech and switch later to fax mode

- set up of a call, starting immediately in fax mode.

Further switching at a later stage is possible in both cases.

Connection of other types of facsimile terminals in the fixed network might be possible using the appropriate interworking functions of the fixed network. This service can be either mobile originated or mobile terminated.

Maxis, DiGi, Celcom, Time dotCom and TM Cellular all provide this service. However, the charges varies. E.g. Maxis charges 15 ringgit for registration and 10 ringgit monthly fee; whereas DiGi charges 5 ringgit registration and 2 ringgit monthly fee.

C.7   Automatic Facsimile Group 3

This service supports facsimile group 3 only. The service allows connection of a group 3 facsimile terminal to the GSM mobile stations. Connections may be established to and from group 3 terminals in the fixed network, or a GSM network. The service can be either mobile originated or mobile terminated.

Same comment as G3 fax above.

Appendix D   Comparison of GSM Supplementary Services

D.1   Call Forwarding

The Call forwarding services enable the mobile subscriber to have incoming calls, or calls associated to a specific basic service, forwarded to a national or international directory number.

The maximum number of tandem forwarding connections within a network is limited to a number between 1 and 5, depending on the network operator.

Four different call forwarding services are offered:

- Call forwarding unconditional (CFU)

- Call forwarding on mobile subscriber busy (CFB)

- Call forwarding on no reply (CFNRy) (within a period set by the subscriber between 5 and 30 seconds)

- Call forwarding on mobile subscriber not reachable (CFNRc) (e.g. due to radio congestion, out of radio coverage)

All service providers provide these services (with different charges or packages). It is not possible to use service for differentiation.

D.2 Call Barring

The Call barring services enables the mobile subscriber to bar categories of outgoing and/or incoming calls associated to all Basic services or a specific Basic service Group.

The service barring of outgoing calls contains the following services:

- all outgoing calls

- outgoing international calls

- outgoing international calls except those directed to the home country (i.e. calls to directory numbers of the country where the mobile subscriber is currently staying and to his home country are not barred).

If a visited network does not support the service barring-of-outgoing-international-calls-except-those-directed-to-the-home-country, then that barring service is replaced with barring-of-outgoing-international calls.

The ability to set up emergency calls is not affected by the outgoing call barring services. The service Barring of incoming calls consists of two services:

- all incoming calls

- incoming calls when roaming outside the home country

There is a choice of subscription options. First the subscriber can select a set of barring services, and second the barring services can be made controlled by the user, using a password, or can leave the control to the service provider. The options chosen apply to all basic service groups subscribed to.

All service providers provide these services (with different charges or packages). It is not possible to use service for differentiation.

D.3   Call Waiting

The call waiting (CW) service enables the subscriber to be notified of an incoming call when he is busy on another call. The subscriber can then choose whether to answer the call, reject it or ignore it.

The Call waiting service is applicable to all circuit switched services except emergency calls. The incoming, waiting call may be of any kind.

Only one call can be waiting at any one time.

All service providers provide these services (with different charges or packages). It is not possible to use service for differentiation.

D.4   Call Hold

The Call hold (HOLD) service enables the subscriber to put an active call on hold. The subscriber can subsequently make another call or accept a waiting call. In the state where one call is held and one is active, it is possible to shuttle between the two calls. Either of the calls may be cleared without affecting the other. It is possible that each party involved in a call may have another on hold.

The Call hold service is only applicable to telephony. Furthermore a subscriber having a call on hold may set up another call using a different telecommunication service e.g. sending a fax.

Only one call can be held at a time.

All service providers provide these services (with different charges or packages). It is not possible to use service for differentiation.

D.5   Multi Party Service

The multi party service enables the subscriber to have a simultaneous communication with more than one party. Having established one active call and one held as described under Call hold the subscriber may establish a three party call. The number of parties can then be increased to a maximum number of six (controlling party plus five others) by adding one remote party at a time, (a remote party is any participant in a multi party call who is not the initiating party.)

Only the initiating party is able to add another party to the multi-party call.

The Multi-Party service is only applicable to telephony. Furthermore the subscriber must have call hold provisioned.

All service providers provide these services (with different charges or packages). It is not possible to use service for differentiation.

D.6   Advice of Charge

This supplementary service provides the mobile station with the information to produce an estimate of the cost of the service used. Information will be given both for outgoing calls and for those incoming calls that are subject to charging, i.e. incoming calls when roaming.

Charges for use of certain supplementary services e.g. Call Forwarding service will not be indicated.

At the beginning of each call the mobile station will receive a message containing the necessary charging information to indicate to the user the charge in home network units. The mobile station will display the units of the current or latest call and also the cumulative cost of all calls.

The Advice of Charge service is offered with two subscription options as purely for "information" or alternatively for "charging" for applications such as hire phones.

This is not provided by any service provider. It could be due to the complexity of calculating actual charges. For instance, there is usually a peak rate and an off-peak rate, and on top of that, providers may roll out promotional programs with discounts during festive season. This makes the reliable calculation of charges extremely difficult. However, most modern mobile stations have an option to display the total time spent on the last call (and an accumulated count since the last reset of the counter).

D.7 Calling Line Identification Presentation

The Calling Line Identification Presentation (CLIP) service provides the called party with the possibility to receive the line identity of the calling party at the time he receives a call.

The line identity consists of a number of information units e.g. the subscriber's national ISDN/MSISDN number, the country code. In a full ISDN environment it shall include all address information necessary to unambiguously identify a subscriber.

The CLIP service is applicable to all Telecommunication services except for the Short Message service.

All service providers provide these services (with different charges or packages). It is not possible to use service for differentiation.

D.8 Calling Line Identification Restriction

The Calling Line Identification Restriction (CLIR) service enables the calling party to prevent presentation of its line identity to the called party.

For the CLIR service following options apply:-

i) The service is offered permanently, e.g. the CLIR is invoked automatically for each outgoing call.

ii) The service is offered temporary on a per call basis, with default values presentation restricted or presentation not restricted.

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With the presentation restricted value, the CLIR is invoked automatically for each outgoing call unless the default value is overridden by the subscriber's request at the time of call request by entering *31*DN.

With the presentation not restricted value, the CLIR is not invoked for any outgoing call unless the default value is overridden by the subscriber's request at the time of call request by sending #31#DN.

Networks may provide for some classes of subscribers (e.g. police) the ability to override the presentation restriction and have the calling line identity presented. If a call is made between two different networks the rules and regulations of the destination network apply.

The CLIR service is applicable to all Telecommunication services except for the Short Message service.

All service providers provide these services (with different charges or packages). It is not possible to use service for differentiation.

D.9 Connected Line Identification Presentation

The Connected Line Identification Presentation (COLP) service provides the calling party with the possibility to receive the line identity of the called party. This may differ from the dialled number e.g. if the called party forwards the call to another directory number.

The line identity consists of a number of information units e.g. the subscriber's national ISDN/MSISDN number, the country code. In a full ISDN environment it shall include all address information necessary to unambiguously identify a subscriber.

The COLP service is applicable to all telecommunication services except for the Short Message service.

This service does not seem to be provided by any service provider.

D.10 Connected Line Identification Restriction

The Connected Line Identification Restriction (COLR) service enables the connected party to prevent presentation of its line to the calling party. It is invoked automatically for each incoming call at the call set-up phase.

Networks may provide for some classes of subscribers (e.g. police) the ability to override the presentation restriction and have the connected line identity presented. The ability is a national option.

The COLR service is applicable to all telecommunication services except for the Short Message service.

This service does not seem to be provided by any service provider.

D.11 Closed User Group

The Closed User Group (CUG) enables the subscribers to form a group in which communication among each of the members is possible but not in general, with users outside this group. To originate a call to a member of a CUG a CUG-index to identify the required group must be entered by the calling user. This CUG index has only significance within the context of an individual subscription.

Each individual subscriber may be a member of a maximum of 10 CUGs, defined for one or more Basic Service groups

The service is provided after prearrangement with the service provider. It is applicable to all Telecommunication services, except Emergency Calls, SMS, dedicated PAD access and dedicated Packet access.

This is not provided by any service provider to consumers. It is not clear whether this service is offered to businesses, or that it is simply not expected to be a popular one.

D.12 Operator Determined Barring

Although Operator Determined Barring is not a Supplementary Service it is described in this chapter because this network feature has impact on Supplementary Services.

The network feature Operator Determined Barring enables the service provider to regulate access to the GSM services by barring of certain categories of outgoing or incoming calls or of roaming.

The Operator Determined Barring applies to all Teleservices and Bearer services.

This service could be used by service providers to prevent fraud. E.g. Maxis bar all outgoing calls to India by default, but the barring could be disabled if requested by a subscriber (who goes through some application procedures).

D.13 Itemised Billing

All service providers provide this service (with different charges or packages). It is not possible to use it for differentiation.

D.14 International Roaming

All service providers provide international roaming (with different charges or packages). However, due to the different speed in signing up roaming agreement with overseas operators, it is possible to use this service for differentiation. The provider that have roaming agreement with more countries and/or more operators would gain first-mover advantage.

Appendix E   Why is GPRS Important

(Src: www.mobileipworld.com)

The most important aspects of GPRS are that it allows data transmission speeds to over 100 Kbps, that it is packet based, and that it supports the world's leading Internet communications protocols, Internet Protocol (IP) and X. 25.

The fact that GPRS will operate at much higher speeds than current networks should provide a huge advantage from a software perspective. Today, wireless middleware is often required to allow slow speed mobile clients to work with fast networks for applications such as e-mail, databases, groupware or Internet access. With GPRS, wireless middleware will often be unnecessary, and thus it should be easier to deploy wireless solutions than ever before.

Whereas today's wireless applications tend to be text oriented, the high throughput offered by GPRS will finally make multimedia content, including graphics, voice and video practical. Imagine participating in a video conference while waiting for your flight at the airport, something completely out of the question with today's data networks.

Why is packet data technology important? Because packet provides a seamless and immediate connection from a mobile PC to the Internet or corporate intranet allowing all existing Internet applications such as e-mail and Web browsing to operate smoothly without even needing to dial into an Internet service provider. The advantage of a packet-

based approach is that GPRS only uses the medium, in this case the precious radio link, for the duration of time that data is being sent or received. This means that multiple users can share the same radio channel very efficiently. In contrast, with current circuit-switched connections, users have dedicated connections during their entire call, whether or not they are sending data. Many applications have idle periods during a session. With packet data, users will only pay for the amount of data they actually communicate, and not the idle time. In fact, with GPRS, users could be "virtually" connected for hours at a time and only incur modest connect charges.

While packet-based communications works well with all types of communications applications, it is especially well suited for frequent transmission of small amounts of data, what some call short and bursty, such as "real time" e-mail and dispatch. But packet is equally well suited for large batch operations, and other applications involving large file transfers.

GPRS will support the widely used Internet Protocol (IP) as well as the X.25 protocol. IP support is becoming increasingly important as companies are now looking to the Internet as a way for their remote workers to access corporate intranets.

The IP protocol is ubiquitous and familiar, but what is X.25, and why is support for it important? X.25 defines a set of communications protocols that prior to the Internet constituted the basis of the world's largest packet data networks. These X.25 networks are still widely used, especially in Europe, and so wireless access to these networks will benefit many organizations. But what does this really mean? Quite simply it means that any existing IP or X.25 application will now be able to operate over a GSM cellular

connection. You can think of cellular networks with GPRS service as wireless extensions of the Internet and existing X.25 networks.

The User Experience

GPRS connection is similar in many ways to a local area network (LAN) connection. Just as with a LAN connection, once a GPRS mobile station registers with the network, it is ready to send and receive packets. A user with a laptop computer could be working on a document without even thinking about being connected, and then automatically receive new e-mail. The user could decide to continue working on their document, then half an hour later read the e-mail message and reply to it. All this time the user has had a network connection and not once had to dial in, as he or she must today with circuit-switched connections. Furthermore, GPRS allows for simultaneous voice and data communication, so the user can still receive incoming calls or make outgoing calls while in the midst of a data session.