INTERNATIONAL TELECOMMUNICATION UNION and
KOREA AGENCY FOR DIGITAL OPPORTUNITY AND PROMOTION

SYMPOSIUM ON BUILDING DIGITAL BRIDGES

Document: BDB/09

Busan, Republic of Korea – 10-11 September 2004

BUILDING DIGITAL BRIDGES:

THE CASE OF MALAYSIA

September 2004

This case study has been prepared by Eric Lie <eric.lie@itu.int> of the Strategy and Policy Unit, International Telecommunication Union (ITU). Building Digital Bridges: The Case of Malaysia is part of a series of Telecommunication Case Studies produced under the New Initiatives programme of the Office of the Secretary General of the ITU. This case study also forms part of the set of background materials for the Symposium on Digital Bridges, held in Busan, Korea on 10 - 11 September 2004. The symposium is jointly sponsored by the Korea Agency for Digital Opportunity and Promotion (KADO) and the ITU and it is managed by Taylor Reynolds <taylor.reynolds@itu.int>, under the direction of Tim Kelly <tim.kelly@itu.int>. Other country case studies and background documents can be found at http://www.itu.int/digitalbridges.

The author would like to express his sincere appreciation to the Malaysian Communications and Multimedia Commission for supporting this study, and wishes particularly to thank Ms. Sulyna Abdullah for her invaluable assistance as well as everyone in the public and private sectors alike that gave their time. Without their support this report could not have been prepared.

Table of Contents

1 Introduction 4
2 Country background 4
2.1 Geography 4
2.2 Population 4
2.3 Economic Indicators 5
3 The information and communication technology sector 6
3.1 Policy and regulatory framework 6
3.1.1 Ministry of Energy, Water and Communications 7
3.1.2 Communications and Multimedia Commission 7
3.1.3 Other institutions 7
3.2 Industry overview 7
3.2.1 Key players 8
3.2.2 Networks and market segments 9
3.2.3 Prevailing network vision 11
4 The digital divide 12
4.1 Digital fault lines 12
4.2 Barriers to achieving universal service 14
5 Bridging the Digital Divide 14
5.1 The role of regulation 14
5.1.1 Universal Service Provision 14
5.1.2 Licensing 16
5.1.3 Spectrum management 16
5.2 Government led initiatives 17
5.3 Commercial expansion and corporate responsibility 19
5.4 Technology 20
5.4.1 Satellite 20
5.4.2 Terrestrial wireless 21
5.4.3 Fixed line 22
6 Conclusion 22

1 Introduction

Across Asia, ICT access has been expanding. Although the most spectacular growth has been seen in developed countries such as Korea and Japan, a large number of developing countries on the continent have also made great strides in making the benefits of ICTs available to their populations. In many such countries, however, ICT infrastructure development has accelerated dramatically in urban areas while large tracts of rural areas remain unserved by even the most basic of telecommunications services.

Malaysia is a country that is confronted with such a challenge. Faced with the danger of a growing divide between urban "haves" and rural "have-nots", the Malaysian government, in collaboration with the private sector, has undertaken a concerted effort to ensure that the broad rural segment of its population is provided with access to ICT services that have already become the norm among its urban population. In this respect, the challenge faced by Malaysia reflects those faced by many other developing and developed countries in the world where rapid and uneven economic growth has brought about this divide.

This report aims to provide an overview of Malaysia's efforts to bridge the digital divide within the context of its ICT environment. Chapter 2 gives a brief overview of the country in terms of geography, demographics and economic performance while chapter 3 gives the case study its context by describing the ICT sector in Malaysia today. Chapter 4 then goes on to describe the nature and extent of the digital divide faced by the country while Chapter 5 will go on to sample the range of initiatives taken and the variety of technology solutions employed by the Malaysian government and industry in its efforts to bridge this divide.

2 Country background

2.1 Geography

Malaysia is located in South East Asia. Its total landmass of around 330'000 square kilometres is divided into two geographical regions: East (or Island) Malaysia and West (or Peninsula) Malaysia (see Figure 1). Administratively, the country is divided into 13 states plus the federal territories of Kuala Lumpur, Putrajaya and Labuan. The country is also subdivided into 136 districts. The capital of Malaysia is Kuala Lumpur while Putrajaya is referred to as the country's administrative capital.

2.2 Population

The population of Malaysia during the 2nd quarter of 2004 was estimated at 25.58 million, giving the country an average population density of around 74 inhabitants per square kilometre. This, however, is not spread evenly among the 13 States and federal territories. The bulk of the nation's population resides in West Malaysia with the states of Pulau Pinang and Selangor having the highest population densities.

According to the UNDP 2003 Human Development Report, about 28.1 percent of the population reside in urban areas. The highest concentrations of urban population are found in the region centred on the capital dubbed the "Klang Valley" and the island of Penang.

Malaysia has a relatively young population with as much as 48 percent of population being below the age of 19 years. Malaysia is also a multi-ethnic nation with citizens consisting of Malays (60 per cent), Chinese (26 per cent), Indians (8 per cent) and various indigenous groups. The country's official language is Bahasa Melayu. English is also widely spoken.

Figure 1: Map of Malaysia

Source: PCL Map Collection

2.3 Economic Indicators

Despite recent setbacks such as the Severe Acute Respiratory Syndrome (SARS) outbreak in 2003 and a softening of the world's economy after 2000, Malaysia's economy has proven to be relatively robust. In 2003, its GDP was RM394 billion, representing a growth of 5.2 percent.[1] In 2003, the telecommunications sector recorded gross revenue of RM19 billion, contributing around 8 percent to the country's GDP.

Based on its 2002 Gross National Income (GNI) per capita of USD3'540, Malaysia is classified as an Upper-middle-income country by the World Bank. The mean monthly income for rural and urban households is set out in Table 1.

Table 1: Mean monthly household income in Malaysia by strata, 1999

Mean monthly household income (RM)	Urban	Rural	Overall
Top 20 per cent of households	7580	4125	6268
Middle 40 per cent of households	2844	1577	2204
Bottom 40 per cent of households	1155	670	865
Urban: Rural disparity ratio	1.81		

Source: EPU

[1] Malaysia's currency exchange rate has been fixed at 3.80 Malaysian Ringgit (RM) to 1 United States Dollar (USD) since September 2, 1998.

3 The information and communication technology sector

Malaysia's first telephone was installed at the British Resident's office in Perak in 1874. This was followed by the installation of telegraph lines and a submarine cable linking the island of Penang with the mainland. The country's first telephone exchange was installed in Kuala Lumpur in 1891.

Since then the Malaysian telecommunications sector has come a long way. Total telephone penetration rates in Malaysia have steadily increased reaching a combined telephone penetration rate (mobile and fixed) of 61.99 phones per 100 population at the end of 2003. Key drivers of increased penetration rates include strong GDP growth as well as an increasing level of familiarity with technology among the general population.

3.1 Policy and regulatory framework

The telecommunications policy and regulatory framework in Malaysia is defined by the Communications and Multimedia Act of 1998 (CMA). The broad scope of the CMA extends over electronic communications as well as the information that it carries, reflecting the convergence of traditional services such as broadcasting, telecommunications and content. In laying out the regulatory framework, the CMA also details the Government's national policy objectives for the communications and multimedia industry. This includes the universal service objective "to ensure an equitable provision of affordable services over ubiquitous national infrastructure."

Based on the principle of technology neutrality, the CMA also sets out the licensing regime in Malaysia, a regime that is aimed at facilitating convergence and encouraging industry development. With the enactment of the CMA, the previous regime of service specific licenses, of which there were 31 categories, was migrated a technology neutral one with only four types of generic licenses (see Box 1). Migration to the new licensing regime began in 1999 and was completed in 2002.

As a whole, the CMA incorporates a large degree of flexibility to ensure its continued relevance in a converging communications environment. Its provisions contain few definitions and few proscriptions, leaving a large degree of discretion to its two implementing institutions, the Ministry of Energy, Water and Communications and the Communications and Multimedia Commission, to formulate policies and regulations in keeping with the constantly evolving communications landscape.

Box 1: Licensing for Convergence

The four types of licenses that are envisaged by the CMA are:

- Network Facilities Provider (NFP) - infrastructure owners of satellite earth stations, fibre optic cables, communications lines and exchanges, radio transmission equipment and broadcasting equipment;
- Network Service Providers (NSP) – providers of basic connectivity and bandwidth to support various applications;
- Applications Service Providers (ASP) – providers of particular functions such as voice, data and content-based services. This would also include Internet access, VoIP and directory services;
- Content Application Services Provider (CASP) – providers of a special subset of applications services that include traditional broadcast as well as Internet content services.

Licenses can be issued on an individual or a class basis, depending on the level of regulatory control that is deemed necessary. This is particularly so in the case of NFP licenses where there are a number of reasons to limit the number of licensees. These include resource constraints, such as spectrum and numbering, the avoidance of duplication or national security. Individual licenses require approval by the Minister and involve an application fee of RM10'000. Examples of individual licenses include public fixed line and mobile telephony.

Class licenses, on the other hand, simply require registration on the part of the applicant and the payment of a RM 2'500 fee. Examples of services that are class licensed include Internet access and radio paging.

Source: MCMC

3.1.1 Ministry of Energy, Water and Communications

The Ministry of Energy, Water and Communications (MEWC) was established on 27 March 2004 following a government cabinet reshuffle. It takes the place of the former Ministry of Energy, Communications and Multimedia (MECM). The MEWC is responsible for the communications and multimedia industry, which include telecommunications, broadcasting, computing and postal services, as well as that of water and energy.

In the area of communications and multimedia, the role of the MEWC remains largely similar to that of its predecessor, the MECM, which was established on 1 November 1998 pursuant to the CMA. The CMA vests the role of communications and multimedia policy-decision making in the Minister of Energy, Water and Communications. In the area of communications, its mission is defined by the national policy objectives that have been set out in the CMA.

3.1.2 Communications and Multimedia Commission

The Malaysian Communications and Multimedia Commission (MCMC) was formed on 1 November 1998 and assumed responsibility for the regulation of the communications and multimedia sector on 1 April 1999 when the CMA came into effect. The Minister for Energy, Water and Communications appoints the MCMC's five commissioners, including its chairman. The staff of the MCMC is spread over five regional offices and its headquarters in Cyberjaya.

Pursuant to the CMA, the MCMC is tasked with four key functions: economic regulation, which includes licensing and competition; technical regulation, which encompasses spectrum management and numbering; consumer protection, which includes the role of ensuring service affordability and availability; and social regulation, which includes the areas of content development and regulation. More than just a regulator in the traditional sense, the MCMC has also been given the role of promoting and fostering the development of the communications and multimedia industry. To facilitate the role of regulator as well as promoter, the CMA and the Malaysian Communications and Multimedia Commission Act of 1998 grant the MCMC a large degree of flexibility as well as a broad range of powers.

3.1.3 Other institutions

Aside from the two institutions envisaged by the CMA, a number of other government bodies are also involved in ICT development. Among these the National Information Technology Council (NITC) plays a leading role in shaping ICT policy for the nation. Chaired by the Prime Minister and composed of members from the public, private and community sectors, the NITC sets the National IT Agenda (NITA) which is a framework for the use of ICT to convert Malaysia into a knowledge-based society (K-society) in line with Malaysia's national goal to achieve developed country status by the year 2020. It covers the entire spectrum of ICT issues from ICT industry development to extending ICT access. Each NTIA is drafted on a five-year basis with the present one in effect from 2001 to 2005.

The influence of the NITC is significant. Recommendations from the Council result in concrete directives and initiatives taken by the individual Ministries and government agencies. Examples include the establishment of the MCMC, the launch of the Multimedia Super Corridor (MSC) project and the enactment of five Cyberlaws to provide the appropriate legal framework for ICT development[2].

3.2 Industry overview

The path to market liberalization was taken early in 1989 when a second mobile operator, Celcom, was licensed. From 1993 to 1995, four more companies were granted licenses to provide the full range of telecommunications services. Entry into the communications and multimedia market was eased further by the enactment of the CMA in 1998. Market entry by providers of certain services and applications, such as Internet access, were made much easier through the introduction of a class-licensing mechanism. Ease of entry into the market for infrastructure provision, however, remained largely unchanged largely as a result of

[2] Digital Signatures Act 1997, Computer Crime act 1997, Telemedicine Act 1997, The Copyright (Amendment) Act 1997 and The Communications and Multimedia Act 1998.

significant concerns over infrastructure duplication, particularly in the backbone segment, and the small size of the domestic market.

The financial crisis that swept through South East Asia in 1997, reinforced concerns over market saturation and infrastructure duplication with large-scale debt and negative equity hitting the telecommunications sector hard. In the following years, the Malaysian government became a strong proponent of consolidation in the industry. In 2002, it awarded two 3G licenses in what was initially a five-player mobile market sending a strong signal to industry. Later that year two mergers in the mobile market brought the number of mobile players down to three.

Despite this trend toward consolidation, the level of competitiveness in the sector remains high. In the first quarter of 2004, there were 20 NFP individual and 27 NFP class licensees, 31 NSP individual and 26 NSP class licensees, and 78 ASP individual and 110 SAL class licensees.

3.2.1 Key players

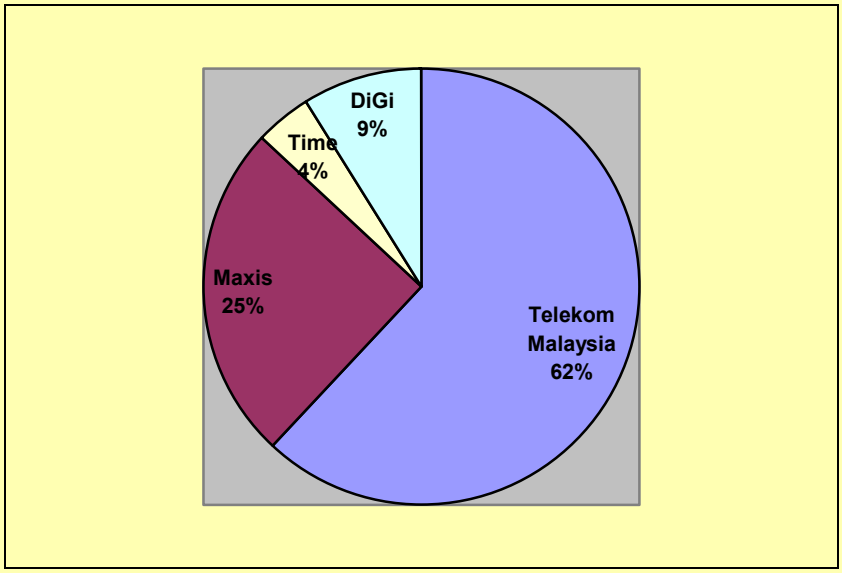
Four major operators make up the lions share of the Malaysian telecommunications market (see Figure 2).

The former state owned incumbent, Telekom Malaysia Berhad (TMB), remains the dominant telecommunications operator. Together with its mobile subsidiary, Celcom, the group accounts for 62 per cent of the telecommunications sector's total revenue. Partly privatised in 1990, the majority of the shares in the company are still owned by the government through various government agencies and investment arms. TMB provides the entire range of telecommunications services from fixed-line and mobile voice telephony to broadband Internet access and leased lines.

In October 2002, TMB acquired the second largest mobile operator in Malaysia at that time, Celcom, merging it with its existing mobile arm, TM Touch. Retaining the name Celcom for its mobile arm, TMB operates a nationwide GSM network and was awarded a license for 3G spectrum in 2002. TMB continues to operate a NMT 450 analogue service.

Starting out as an infrastructure provider by constructing a nationwide fibre optic network, Time dotCom (TIME) is Malaysia's second largest fixed-line operator. It is majority owned by the Malaysian government through a number of investment arms.

Figure 2: Operator market share by revenue, 2003



Source: MCMC Industry Performance Report 2003

Maxis Communications is the country's leading mobile operator in terms of subscriber numbers with a GSM network spanning most of Peninsula Malaysia and the major cities and towns in East Malaysia. Launched in 1993, its GSM network capacity and subscriber numbers were further augmented when it purchased TIME's mobile unit TimeCell in late 2002. While its main focus is on its mobile business, Maxis also provides a full range of services including dial-up and broadband Internet access. Maxis was awarded a license for 3G spectrum in 2002.

DiGi Telecom, the smallest mobile operator by subscribers, operates a nationwide GSM 1800 cellular network that was launched in 1995 and a small fixed line network concentrated mainly on individual buildings in the capital. It is 61 per cent owned by Norwegian operator Telenor.

3.2.2 Networks and market segments

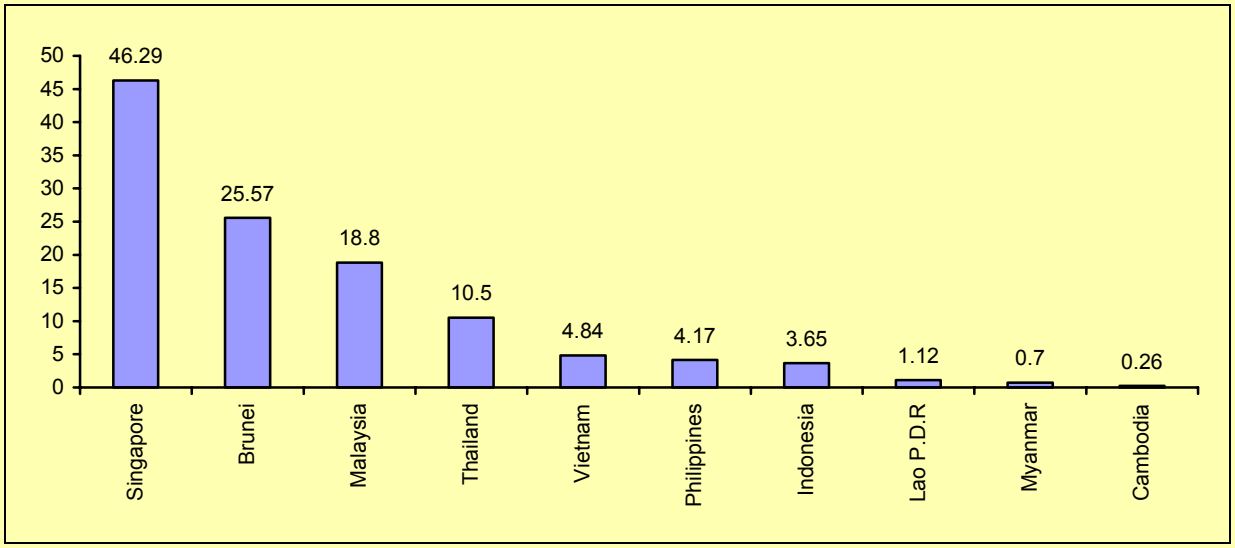
3.2.2.1 Fixed line

In the end of 2003, the number of direct exchange lines (DEL) stood at 4'572'000 nationwide. This represents a penetration rate of 18.1 per cent. Fixed line growth, however, has declined over the past few years, down from a recent peak of 19.7 per cent in 2000. In keeping with global trends, this decrease in the number of fixed lines largely reflects a gradual migration towards mobile usage. Nevertheless, Malaysia has done relatively well in terms of penetration rates when compared to its South East Asian neighbours (see Figure 3).

All four major operators are involved in some form in the provision of fixed line voice services. TMB, however, overwhelmingly dominates this market segment with more than 97 per cent of all fixed telephone lines subscribers. Given TMB's dominance in the local market, the major alternative operators have concentrated mainly on data and long-distance and international services, focusing particularly on the business segment of the telecommunications market. The ratio between residential and business users is around 7 to 3.

In February 2002, TMB was allowed to raise its tariffs for the first time since 1996. It increased the cost of local calls by around 33 per cent and slashed long distance calls by 54 per cent and international calls by 67 per cent. Despite this hike, local call rates in Malaysia remain relatively low. Monthly line rental rates for residential subscribers are RM25 while the price of a two-minute peak rate call is set at RM0.08.

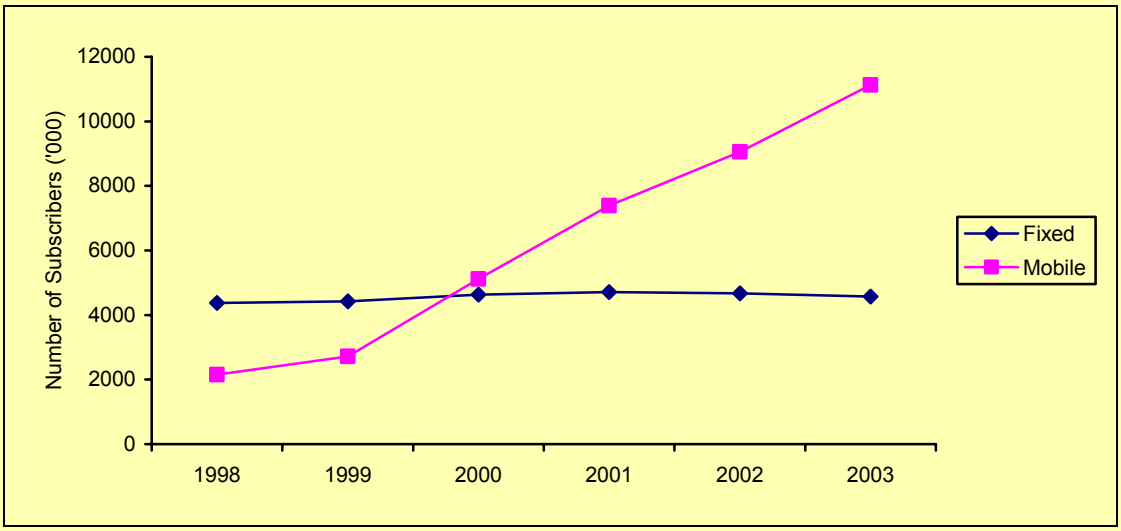
Figure 3: Main telephone lines per 100 population, selected ASEAN economies, 2002



Source: ITU, MCMC

.

Figure 4: Mobile overtakes fixed



Source: MCMC Industry Performance Report, 2003

3.2.2.2 Mobile

In 1985, Malaysia was the first country in South East Asia to launch a cellular mobile network when TMB launched its NMT 450 based service called Atur 450. At its peak, Malaysia had eight cellular networks operated by five different companies. Industry consolidation has reduced the current number of operators to three. At the end of 2003, Maxis had a 40.5 per cent share of the mobile subscriber market, Celcom, 39.5 per cent and DiGi 20 per cent.

At the end of 2003, there were 11'124'000 mobile subscribers in the country. Mobile penetration stood at 43.9 per cent compared to a rate of just 21.8 per cent in 2000. The number of mobile phone subscribers in Malaysia overtook the number of DELs in 2000 (see Figure 4).

Over the last two years, post-paid subscriber growth rate has been negative with more subscribers migrating to pre-paid subscriptions. At the end of 2003, 77 per cent of all subscribers were pre-paid subscribers. According to the claims of some operators, national mobile network coverage, taking into account both analogue and digital networks, extends to more than 95 per cent of the population.

Although the MCMC stopped regulating mobile phone rates in August 2000, mobile phone rates in Malaysia have continued to be relatively low. According to price data collected by the MCMC in 2003, a monthly subscription for a standard plan costs around RM60 with a three-minute local call priced at RM0.90 during peak hours.

WAP and GPRS services were introduced progressively by all operators between mid-2000 and mid-2001. Take up of these services by subscribers, however, has been slow. A 2003 Consumer Satisfaction Survey conducted by the MCMC indicated that only around 10 per cent of mobile phone subscribers used MMS and GPRS services.

In 2002, the government conducted a beauty contest to award three 3G spectrum blocks of 15 MHz. In July 2002, it decided to only award two blocks to Celcom and Maxis. Under the terms of the license, each operator would pay a relatively low fee of RM50 million payable in instalments over the 15-year period of the license in addition to recurring spectrum maintenance fees. Both operators have already conducted W-CDMA trials and forecast a wider year-end 2004 commercial launch.

3.2.2.3 Data and Internet

Malaysia's Internet development started in 1988 when a university computer network was set up by the Malaysian Institute of Microelectronic Systems (MIMOS). In 1993 the Joint Advanced Integrated Networking (Jaring) was set up by MIMOS as a commercial ISP. It remained the only ISP until the licensing of TMB's TM Net in 1996. The market remained a duopoly until 2000 when additional licenses were granted. At the end of 2003, TM Net was the largest ISP by dial-up subscribers with a 53.6 per cent share of

the market. Jaring had 26.9 per cent, TimeNet 17.5 per cent, CelcomNet 1.55 per cent, Maxis Net 0.3 per cent and DiGi Net 0.2 per cent of the market.

At the end of 2003 Malaysia had total of 2.9 million a dial-up subscribers. This translates to a dial-up penetration rate of 11.4 percent. At the end of 2003, Malaysia's PC penetration rate stood at 16.6 per cent. The cost of dial-up Internet access has been kept relatively low with subscribers being able to connect to a dial-up point of presence at local call rates. As an example of a service offering, a dial-up subscription to TM Net costs RM24 annually with access fees at RM0.01 per minute and PSTN charges at RM0.015 per minute. A subscription free offering marketed by TimeNet charges RM0.04 per minute.

Commercial broadband services were first launched by TIME in June 2001. At the end of 2003, there were a total of 110'247 subscribers. Although a modest number, it represented a remarkable increase from the 20'000 broadband subscribers recorded in 2002. In 2003, Malaysia had a broadband subscriber penetration rate of 0.44 per cent or a household broadband penetration rate of 1.98 per cent. Around 98 per cent of all broadband connections are over DSL. In 2003, there were 108'173 ADSL subscribers, 1'931 SDSL subscribers and 143 subscribers using other technologies.

Internet usage in Malaysia has been found to be relatively mature in a recent Consumer Satisfaction Survey conducted by the MCMC. Online shopping and online transactions proved popular among Internet users sampled with around 21 per cent of respondents having shopped online. Four out of 10 Internet users accessed e-government services for registration and information purposes. Approximately 23 per cent of Internet users were aware of the presence of Wi-Fi hotspots in the capital while 12 per cent displayed some knowledge of 3G services. VoIP services have also become increasing popular with Malaysians with around 12 per cent of telecommunications users (business and individuals) surveyed having used the service.

3.2.2.4 Backbone connectivity

The main operators have different degrees of nationwide connectivity to connect their scattered local networks. The mobile providers Celcom, Maxis and DiGi rely on a range of different technologies such as microwave, fibre optic and satellite for backbone connectivity while TMB and Time operate larger backbone networks employing primarily fibre optic cables.

TMB operates a fibre-optic network that consists of three separate backbones that span the length and breadth of Peninsula Malaysia. Through Fibrerail Sdn Bhd, TMB's joint venture with the national railway company, it has also laid a further 1'600 kilometres of fibre optic cable along the railway lines in Peninsula Malaysia. TIME operates a 3,600 fibre-optic network that includes a main backbone along the Peninsula's North-South highway and a 1'624km festoon submarine cable system along the coast of Peninsula Malaysia.

3.2.3 Prevailing network vision

As a country with multiple industry players, the future growth of Malaysia's ICT network is predicted to take a number of different directions over the next few years. Nevertheless, given the abundance of backbone infrastructure all players in the market are expected to focus largely on expanding and upgrading their network at the local level, with a view towards accommodating the delivery of high-speed Internet services.

Future activity in the fixed-line segment will largely be driven by TMB's efforts to expand its fixed line network. Despite a decline in fixed line penetration, TMB has continued to add fixed lines. In 2002 it deployed 200'000 lines and in 2003 it added another 70'000 lines based on CDMA Wireless Local Loop technology. Around 80 per cent of these new lines were added in rural areas.

At the same time, TMB has focused on upgrading its existing copper infrastructure in order to permit the delivery of DSL services. Given its relatively recent start, however, TMB's DSL upgrading plans are currently still concentrated on urban and suburban areas. A concerted expansion of broadband services to rural areas on a commercial basis is not currently envisaged in the short term.

While the other major operators like Jaring, Maxis and TIME are also active in the fixed-line broadband market, their network presence has mainly been limited to the main financial and commercial districts and individual high-rise residential buildings. For example, TIME, the main fixed-line competitor to the incumbent, has pursued a strategy of making the leap to fibre in dense urban areas, targeting new high-density developments in urban and semi-urban areas for deployment. Currently, it serves around 500 buildings in the Klang valley area through a hybrid wireless and fibre optic network.

With the absence of regulations requiring local loop unbundling and difficulties in arriving at commercial arrangements to use the incumbent's local loop, competitors to the incumbent have largely found it necessary to deploy their own last-mile infrastructure. Wireless broadband access in particular has been the preferred choice due to its ease of deployment allowing the quick implementation of business plans. With the broadband market in its infancy and the incumbent's slow pace of deployment, competitors have placed a premium on speedy network deployment and the early launch of services.

In May 2004, TIME became the first operator in Malaysia to deploy a commercial wireless broadband service called Webbit for business and residential users. Based on a proprietary platform developed by Navini Networks deployed over the licensed 2.6GHz band, the service offers connection speeds of up to 512Kbits/s over a radius of up to 3km. The service has debuted in the heavily urbanised Petaling Jaya district in the Klang valley area with expansion throughout the Klang valley area ongoing.[3] New player AtlasONE has also announced its intention to roll out a wireless broadband network utilising a UMTS TD-CDMA based solution developed by IPWireless and Thales over the licensed 2.5 GHz frequency band. The company plans to serve over 500'000 subscribers on its network by the end of next year.[4] Having recently obtained an NFP last mile license to provide broadband services, Jaring is also currently deploying a wireless broadband network. The company plans to focus on the Klang Valley region, Penang and Johor Baru before moving outwards to suburban areas. Jaring expects around 30 per cent of its 800'000 dial-up customers to migrate to broadband over the next three years. [5] The service is expected to be launched in October 2004.

In the mobile segment, continued subscriber growth for voice services have necessitated a consistent effort on the part of operators to expand network capacity in urban areas, particularly in the Klang valley. The expansion of network coverage to rural areas beyond the main highways is not generally seen as a priority. Instead, the deployment of 3G networks (Maxis and Celcom) and EDGE (DiGi) has largely occupied the attention of the mobile operators. The deployment of these networks is currently only envisaged for urban areas. Plans to expand into semi-rural or rural areas are contingent on the successful take-up of the service in urban areas.

4 The digital divide

4.1 Digital fault lines

Like in many other countries, both developing and developed, Malaysia's ICT infrastructure development has been concentrated mainly in its cities and towns. ICT infrastructure distribution on a geographical basis has largely reflected regional differences in economic development and population density with the predominantly rural states of Sabah and Sarawak falling far short of the national average (see Figure 5).

Out of 136 districts that make up the country, 89 have been identified as underserved areas (i.e. with a teledensity of 20 percent below the national average). Most of these districts come overwhelmingly from the East Malaysian states of Sabah and Sarawak, states which have the lowest population densities in the country (see Table 2). While districts vary in terms of size and population, underserved areas are designated on a district level as they from the main administrative unit. According to the MEWC, around 3000 villages nationwide are not served by telecommunications infrastructure.

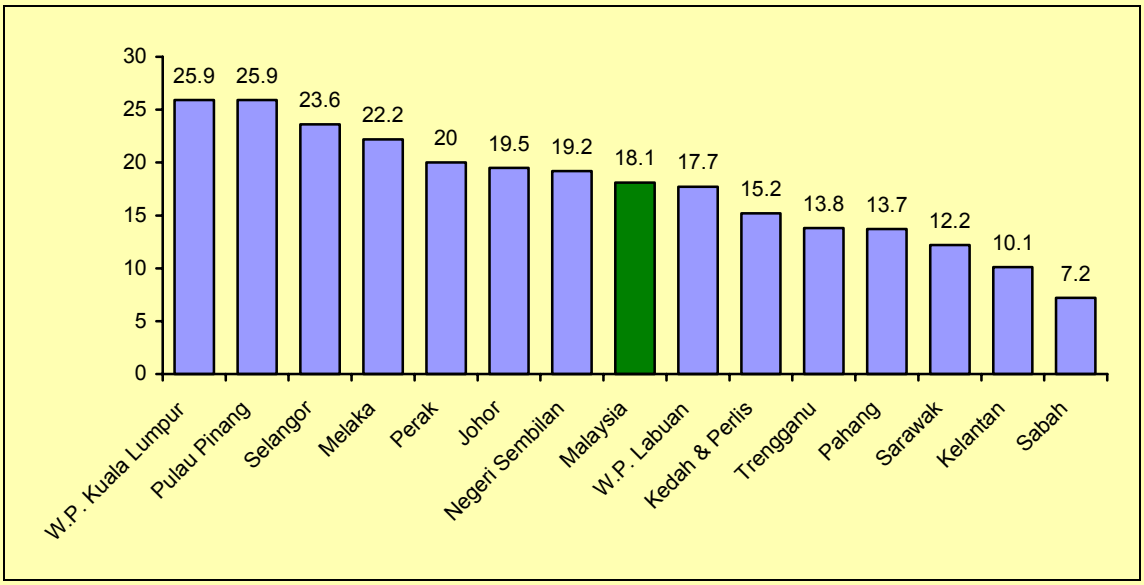
---

[3] Press release at http://www.time.com.my

[4] IPWireless Mobile Broadband System Deployed for AtlasONE Malaysia, Wi-Fi Technology News at http://www.wi-fitechnology.com

[5] Jaring to tap wireless broadband market, 16 July 2004, The Edge Daily at http://www.theedgedaily.com

Figure 5: DEL penetration rate by state, 2003



Source: MCMC

In respect to access to data and Internet services, a similar divide exists between the urban and rural areas. According to an Internet subscriber study in 2002, more than 90 per cent of the subscribers of the largest ISP, TM Net, were located in the Klang Valley area and cities such as Johor Baru, Penang, Kuantan, Kota Kinabalu and Ipoh. Similarly, around 73 per cent of the subscribers of Malaysia's second largest ISP, Jaring, came from the capital and the more urbanised states of Selangor, Johor and Pulau Pinang.

In addition to this urban – rural divide, it is important to note that the pace of infrastructure development has also not been uniform across all urban areas. Among the country's cities and towns, infrastructure providers have also favoured particular areas. These areas include, in particular, the Klang Valley region, the town of Penang in the North and the town of Johor Baru in the South.

Table 2: Number of underserved districts by state, 2003

State	No. of underserved districts
Sarawak	26
Sabah	22
Kelantan	9
Pahang	8
Kedah	6
Selangor	4
Terengganu	6
Johor	3
Melaka	2
Perak	2
Negeri Sembilan	1
Total	**89**

Source: MCMC

4.2 Barriers to achieving universal service

Notwithstanding the relative lack of telecommunications services available in rural areas, considerable demand for such services exist at the price levels they are supplied at in urban areas. For example, in 2003, a Universal Service Provision (USP) project implemented in the underserved rural district of Yan, Kedah had an initial subscription target of 600 lines to be taken up over a staggered period of 5 years. On completion of the network, 500 lines were already fully subscribed at the same national rates found in urban areas. This unexpected demand prompted plans for the further deployment of 600 lines. In 2003, TMB had a nationwide waiting list of around 60'000 applicants for a fixed phone line, with most of the demand coming from rural areas.

Based on an average monthly income of RM1'577 for a rural household, a monthly fixed line rental cost of RM25 and an average of 200 minutes worth of local calls per month at RM0.08 a minute, the average monthly telecommunications expenditure of an average rural household would make up only 2.5 per cent of its income. This is a relatively small percentage in comparison to what is spent in other ASEAN countries such as Thailand, Indonesia and the Philippines where average rural household income levels are much lower and telecommunications charges higher.

The high cost of installing and maintaining these services in remote and sparsely populated areas, however, make it difficult for commercial operators to provide telecommunications services in such areas at urban prices even though there is considerable demand. In deploying networks to some remote areas, operators have had to spend up to RM6'000 per line in comparison to a per line cost of less than one tenth of that in urban areas.

A host of obstacles stand in the way of cheap deployment costs. In terms of geography, parts of Malaysia's rural population, particularly in Sabah and Sarawak, live scattered in the midst of dense rainforest, often in hilly terrain that obscure line of sight. Severe weather conditions that can alternate between flooding and drought further complicate telecommunications infrastructure deployment and the maintenance of equipment. Depending on their level of isolation, the level of infrastructure development in some rural areas can also be relatively poor. Electricity in rural locations, particularly in rural Sabah and Sarawak, is often only provided by diesel generators that operate only during certain hours of the day. The lack of paved road access also requires additional costs to be incurred in delivering and maintaining equipment at these sites.

5 Bridging the Digital Divide

The approach Malaysia has taken to bridge its digital divide can be described as a pragmatic one that acknowledges the commercial reality of the situation and the need for extensive government leadership and financial support to achieve results. While the government has assumed leadership in this effort, it nevertheless seeks to harness the strengths of private industry, particularly in the area of technology where constant advances promise a reduction in the cost of deploying ICT infrastructure in rural areas.

5.1 The role of regulation

The cornerstone of Malaysia's effort to achieve universal service nationwide is its Universal Service Provision programme (USP), which is managed by the regulator, the MCMC. Beyond this programme the MCMC has also introduced a number of regulations in areas such as licensing and spectrum management to support the expansion of ICT access, particularly in underserved areas.

5.1.1 Universal Service Provision

In 1998, the CMA and the MCMC Act established a framework for the creation of a Universal Service Provision fund. While the specifics of such a fund were established, the incumbent TMB was appointed the sole universal service obligation operator for an interim period of 2 years by government order. This interim period was subsequently extended to January 1, 2002 to enable the MCMC to finalize a new USP framework.

Box 2: USP fund collection

Since its inception in 2002, the USP fund received the following amounts:

- RM 87.3 million received in 2002;
- RM 317.3 million received in 2003;
- RM 200.9 million received in January 2004 as the first installment
- RM 200.9 to be collected for 2004 as the second installment

Payments made to USP providers in 2003 amounted to RM 10.6 million.

Source: MCMC

In October 2002 USP regulations establishing a USP fund were gazetted. Under these regulations, all licensees, except CASP licensees, with revenues greater than RM500'000 generated from designated services were required to contribute six per cent of their revenue generated from these designated services on a weighted basis. This threshold was raised from RM500'000 to RM2 million by amendments to the CMA in 2003 in order to alleviate the financial burden placed on smaller licensees and to promote their growth.

These amendments also provided greater flexibility to the USP programme by allowing a wider range of technologies, and as a result a wider range of licensees, to be employed in its implementation.[6] It also reduced the weightage factor of certain services on which USP charges are levied such as national long distance and increased the weightage factor of other services such as cellular mobile service and international roaming.

Proceeds of the USP fund are used to pay a designated universal service provider for capital expenses (Capex) and yearly operational expenses (Opex) incurred in implementing the approved universal service plan. Under the current programme, yearly operational expenses are paid for by the fund for a period of five years after which they are borne by the operators. Costs incurred by the USP providers are reimbursed yearly on the submission of an audited written claim for payment to the MCMC after the expenses have been incurred. In July 2004, the USP fund had a balance of RM795.8 million (see Box 2).

Under the USP programme, the MCMC selects universal service providers via a tender process where interested parties submit bids based on specifications laid out by the MCMC. A remarkable amount of flexibility is given to the bidder. Tender specifications are usually generic, specifying mainly the number of lines required and the type (residential or payphones). Bidders are allowed to propose the technology used, a suitable timeframe for network deployment as well as the target sites within a given district. This large scope of discretion given to industry has been seen as a key contributor to the rapid pace of implementation of the USP programme (see Box 3).

---

[6] Communications and Multimedia (Universal Services Provision) (Amendment) regulations 2003

Box 3: Getting the ball rolling
Implementing the USP programme

The implementation of the USP programme, which came into effect in October 2002, was initiated with remarkable speed. Pilot projects deploying telecommunications services to multiple sites in the three districts of Yan in Kedah, Kinabatangan in Sabah and Julau in Sarawak were successfully completed in 2003. This was followed by the deployment of basic telecommunications services to a further 86 districts in 2004 in two groups. Tenders were awarded for the first group of nine districts in March 2004 with completion of the projects targeted for August 2004. The tender award process for the second group of 77 is ongoing with tenders for a first sub-group of 18 sites having been awarded in May 2004 with completion expected by November 2004.

With a staff of only five executives, the USP department at the MCMC was required to assess 1089 bids submitted by different operators ranging from the incumbent to smaller application service providers acting in partnership with network facilities providers. Bids were invited for all 86 sites at around the same time. In addition to a desire for a quick implementation of the project, the large scale launch was partly motivated by an intention to involve as wide a range of providers as possible. In the end, bids from 16 different providers were received with tenders being awarded to more than six different providers including smaller providers such as EB Technologies and NasionCom.

Under the USP programme, RM688 million was allocated to Capex and RM 258 million to Opex for the 86 districts. This works out to a Capex allocation of RM8 million and an annual Opex allocation of RM3 million for each district.

Source: MCMC

Internet access is also included in Malaysia's definition of universal service. This includes the goal of providing all communities and households with Internet access. The USP programme prioritizes the provision of basic telephony, public payphones and Internet access services to all communities on a collective level first. The second priority would be to extend this access to basic telephony and Internet services to all households and businesses on an individual level. In practice, however, the MCMC has taken a multi-pronged approach. Depending on the level of services already provided in an underserved district, its USP programme has focused on providing both collective and individual access. In underserved districts in Peninsula Malaysia the deployment of 500 residential lines has been set as the primary target and the deployment of 30 public phones as the secondary target. In underserved districts located in Sabah and Sarawak the priorities have been reversed with the deployment of collective access though public phones receiving priority.

5.1.2 Licensing

Through the licensing regime prescribed in the CMA, the MCMC is left with a significant amount of discretion in determining licensing conditions. This flexibility has been applied in addressing Malaysia's apparent imbalance in infrastructure development that has resulted in an extensive and highly developed backbone network and an under-developed and limited last-mile network, particularly in terms of last mile broadband connections.

Market entry by providers intending to rollout last mile infrastructure have been eased by the creation of a category of NFP (Last Mile) licenses. Although technology neutral, a NFP (Last Mile) license restricts a licensee's scope of infrastructure related activities to infrastructure deployment only at the last mile level. This prevents further infrastructure duplication in the backbone segment while also ensuring that new entrants tap the abundant capacity available on the existing backbone network. Jaring, a recent beneficiary of such a license, is currently in the process of deploying a last-mile wireless broadband network on the basis of the license.

5.1.3 Spectrum management

Recognizing the potential of wireless technologies to distribute basic telecommunications services as well as broadband Internet access affordable and rapidly, the MCMC has reviewed its spectrum allocations and assignments in order to make spectrum more widely available for the deployment of these technologies.

The MCMC has recently undertaken a review of MMDS 2504 – 2688 MHz bands that have previously been used for analogue broadcasting. These frequencies have been refarmed for wireless broadband use on a national level. Frequency blocks in this spectrum range were assigned to TIME and AtlasONE in 2003 for the rollout of a wireless broadband network.

The MCMC has also endeavored to make spectrum affordable to providers in order to encourage lower end-user charges. 3G licenses, for example, were awarded at a price of RM30 million which was made even more affordable by allowing for payment in installments over the 15-year license period.

5.2 Government led initiatives

The determination of the Malaysian Government to drive infrastructure development through direct funding of infrastructure projects in underserved areas is a hallmark of the Malaysian effort to bridge the digital divide. This push goes well beyond the projects initiated within the regulatory USP fund framework, taking the form of numerous initiatives undertaken by different government bodies.

Taking the leading lead role in bridging the digital divide, the MEWC and its predecessor Ministry, the MECM, have embarked on numerous initiatives aimed at fulfilling the national objective of ensuring equitable provision of affordable ICT services over ubiquitous national infrastructure as set out by the CMA. Conscious that the USP programme run by the MCMC is targeted firstly at expanding access to basic telecommunications services, MEWC efforts have focused instead on expanding access to the Internet, particularly in underserved areas.

Earlier efforts of the MECM tackled the basic problem of making PCs affordable. Programmes such as the Gerakan Desa Wawasan project launched in 1996, which provided village authorities with PCs, the PC ownership campaign in October 1999, which allowed citizens with children over 10 years of age to use their retirement contributions to purchase PCs, and complementary government-industry projects have helped to raise PC penetration rates.

Connectivity to the Internet in rural areas was also addressed through initiatives that include the Ministry's Rural Internet Centres programme and its own Universal Service Provision programme. Launched on 3 April 2000, the Rural Internet Centres programme (RIC) was one of the earliest rural Internet initiatives launched in Malaysia. The programme was developed as a holistic approach to establishing Internet access in rural areas by addressing infrastructure needs, capacity building as well as content development.

Under the RIC programme, private sector operators funded by the government provide computer equipment and Internet connectivity while the site, security and electricity are provided by local post offices. Training is also provided to the RIC supervisor and its users as part of the package. A local committee of volunteers is also tasked with the development of a local website that would showcase community products and services as well as provide content relevant to the local community. In the first phase of the project RICs were deployed in post offices in semi-rural areas that were within reach of a TM Net DSL or ISDN enabled exchange.

To date, 42 Rural Internet Centres (RIC) throughout the country have been equipped with five to six PCs connected to the Internet via ADSL or ISDN. Statistics compiled in July 2004 indicate that more than 53'000 users use RIC services while more than 35'000 users have undergone training under one of the RIC training programmes since its implementation.

In 2002, the MECM embarked on much larger initiative that aimed to extend Internet access to schools, libraries and health clinics located in rural unserved areas. Through its own Universal Service Provision programme (not to be confused with the USP fund programme managed by the MCMC) the government funded the deployment of computer equipment and Internet to public institutions in unserved areas. Equipment and connectivity were supplied by private sector providers who were selected via a tender. Each site was equipped with two to three PCs, public telephones and other computer peripherals as well as Internet access at speeds of up to 64 Kbit/s upstream and 2Mbit/s downstream. Due to the remoteness of the locations selected, VSAT technology was primarily used for the project. Deployment sites were selected after consultations with district administrations and with the Ministry of Education (in the case of schools and libraries) or the Ministry of Health (in the case of clinics). The unlikelihood of a site being served by commercial providers independent of government intervention in the foreseeable future acted as a factor in the selection of sites.

During the first phase of the project in 2002, 220 government primary schools in rural unserved areas of Sabah and Sarawak were connected at the cost of RM50 million. In the second phase in 2003 the project was extended to 174 libraries and 50 health clinics in rural areas nationwide were connected at the cost of RM 41 million. The third and current phase of the project intends to connect 300 health clinics and 200

libraries at the cost of RM 80 million. More than 2.1 million rural inhabitants are projected to benefit from this project.

In August 2004, while this report was being prepared, the MEWC was awaiting cabinet approval for a national broadband plan. Although details have yet to be released, the plan involves a proposed government allocation of RM800 million to expand access to broadband services through substantial public investment in basic broadband infrastructure. The proposed broadband plan will also leverage on existing government programmes such as SchoolNet and MyRen, the Malaysian Research and Education Network, to extend broadband coverage and increase broadband usage.

Box 4: Community Communications Development Programme (CCDP) or "Kedai.com"

The CCDP programme was launched in December 2002 with an allocation of RM90 million. Deployment was mainly targeted at semi-rural areas that did not have broadband Internet access and were unlikely to see any commercial deployment of such services in the immediate future. In most of the locations selected, voice services were already available to the community.

Under the programme, the MCMC provides all capital and operational expenses for the deployment of facilities to enable broadband access along with the LAN hub, five PCs, two telephones and necessary furniture to set up a "kedai.com" (kedai is the word for shop in Bahasa). These are supplied and maintained by a private sector provider chosen by tender. Although the tender is technology neutral, most operators have selected VSAT for backhaul. The private sector provider also provides training for the operator of the kedai.com in the areas of small business management and basic IT skills.

In the implementation of the project, the local community is involved from the onset. Community leaders select a local entrepreneur to operate the kedai.com and a location for the kedai.com itself. Kedai.coms have been mainly located in heavily trafficked areas in the community, such as near schools or shops, while kedai.com operators are selected by from a pool of local entrepreneurs. The operator retains the proceeds of the kedai.com but provides the premises and pays for the basic upkeep and security of the centre. Rates charged by operators are recommended by the MCMC.

Operators are expected to act as promoters of the service, particularly by encouraging members of the community to establish a web presence on the Internet for the purposes of marketing local products and attractions such as handicrafts and local tourist sites. Having been trained by the private sector service providers, operators are also expected to give basic courses on subjects such as e-mail, web surfing and word processing. In effect, the kedai.com is positioned not as a cybercafe but more of a community centre. Kedai.coms have been deployed so far in 60 sites, 1 in Sarawak, 1 in Sabah, 2 in Kedah, 1 in Perlis and 55 in Perak. The deployment of further kedai.coms has been suspended in 2004 as resources have been channelled to the SchoolNet initiative.

Source: MCMC

Working closely in conjunction with its overseeing Ministry, the MCMC has also been given the mandate by the CMA to embark on initiatives to meet universal service objectives that go beyond the activities specifically funded by the USP fund. Complementing the basic telecommunications service focus of USP programme, the MCMC has used some of the (non-USP fund) regulatory fees that it has collected such as license and spectrum fees to embark on an initiative called the Community Communications Development Programme (CCDP) or "Kedai.com". Similar in some ways to the RIC programme run by the MEWC, the CCDP project is aimed at bringing broadband Internet access to local communities in rural areas with the long-term goal of making these deployments self sustainable through the efforts of local entrepreneurs. The project focuses first on providing Internet access to the community and then on capacity building in the community and the upgrading of community welfare through Internet access (see Box 4).

It is interesting to note that with the same objectives laid down for the MEWC and the MCMC in respect to universal service, the projects initiated by the two institutions have many similarities. Nevertheless, to avoid overlaps and duplication, coordination between the two institutions takes place often.

Apart from initiatives originating from the MEWC and the MCMC, a large host of other public bodies such as ministries and state governments have initiated projects and programmes associated with their areas of policy responsibility. For example, in cooperation with the MEWC, the Ministry of Education launched a project called SchoolNet in February 2004. By leveraging on existing initiatives such as Smart Schools and phase one of the MEWC USP project, the SchoolNet project intends to provide broadband access to more than 10'000 schools nationwide, focusing particularly on schools in rural and remote areas, by the end of 2004. While SchoolNet will concentrate on the carriage and distribution of education content and serve as a school-wide Intranet, the infrastructure that will be deployed for the project is also intended to serve as springboard for an eventual wider rollout to the community. The SchoolNet network is envisaged as a fully managed national network that would exploit current excess capacity in the national backbone. Based on minimum bandwidth requirements of 1 Mbit/s downstream and 128 kbits/s upstream and depending on the location of the sites, a range of technology solutions will be deployed by commercial suppliers engaged by the government. It is estimated that ADSL will be used by around 60 per cent of the sites, wireless broadband by about 20 per cent and VSAT by another 20 per cent.

5.3 Commercial expansion and corporate responsibility

In the fixed line segment, TMB has continued with the continued the commercial expansion of its fixed-line network. As mentioned above, in 2002, TMB has deployed around 270'000 lines nationwide using CDMA WLL technology with around 80 per cent of them being deployed in rural and semi-rural areas. The company has plans to continue its fixed line network expansion in rural areas independently or in collaboration with government initiatives.

In terms of the deployment of broadband network deployment, the immediate short-term network development plans of commercial operators remain concentrated on urban areas. Taking into account the relatively slow pace of broadband network deployment following its introduction and the fact that high levels of unmet demand will continue to exist in urban areas for some time, operators are unlikely to shift their focus to broadband network deployment in rural areas where demand is uncertain. Nevertheless, major operators have shown optimism with those currently offering or intending to offer wireless broadband services expressing their intention to expand their networks beyond city limits to semi-rural areas on a commercial basis within two to three years.

In the mobile market segment GSM operators have expressed the unlikelihood of expanding their coverage into remote areas with low population densities. To date, only very few GSM cells have been deployed in remote areas on a commercial basis. The commercial deployment of GSM services through the use of VSAT backhaul to remote locations has been limited to those that see high tourist numbers. With figures of around 10,000 users quoted by some mobile providers to make one GSM site connected by VSAT profitable, it is unlikely that commercial deployment on a large scale will take place in non-touristed remote areas.

Despite conservative rural expansion plans by most operators, their level of participation in government led initiatives has been strong with bids received from the entire spectrum of licensees for digital divide projects. On a more modest scale, major operators have also been active in initiating and funding digital divide projects independently as part of a sense of corporate responsibility.

Examples include the Maxis-Shell initiative to deploy Internet access points at Shell petrol kiosks located in rural areas, the Maxis Cyberkids Software Camp and the TM Net Cyberschool Community project. The Maxis Cyberkids Software Camp is aimed at helping school children, particularly those located in rural areas, learn more about the benefits of ICT. The first camp was held in Sabah in 2002 and plans have been made to extend the project to more than 100 schools in the country. Similar in focus, TM Net launched its Cyberschool Community Project in early 2004. This project is aimed at creating awareness of broadband services among Malaysian youths, particularly those located in rural and semi-rural areas. It involves the donation of broadband ready PCs with free broadband connectivity and maintenance for two years to around 16 schools around the country. The company also plans to conduct training for students and teachers. Broadband Internet access for the project is provided through TM Net's DSL network.

5.4 Technology

A range of technologies has been employed to extend ICT services to rural and remote areas in the country. The challenges of both deploying backhaul connectivity from rural and remote sites and expanding the last mile network over a scattered population have required operators to rely on different network configurations involving a combination of technologies.

5.4.1 Satellite

Although Malaysia is blessed with an extensive, high-capacity fibre optic backbone network, the network currently only serves major towns and cities. The problem is particularly acute in East Malaysia where the national fibre network connects fewer than 10 towns located mostly on the coast. Establishing backhaul connectivity for inland areas has been a particularly big challenge to expanding access.

Satellite technology, particularly the use of VSAT, has been a popular choice among Malaysian operators seeking to provide backhaul connectivity for both the provision of voice and Internet access services. VSAT systems have been employed extensively by USP providers funded by the MCMC USP programme. For example, in the pilot phase of the USP programme, VSAT systems were deployed by TMB in ten scattered sites located in each of the two remote districts of Jalau in Sarawak and Kinabatangan in Sabah. Each VSAT system provides capacity for up to six voice channels and one Internet line although only three public payphones have currently been connected at each site. The VSAT terminals are powered by a mix of solar panels and diesel generators. Under the project, prepaid cards are used for the payphones with village longhouse headmen appointed as agents to sell them. The costs involved in deploying this solution were relatively high with CAPEX costs around RM1 million and an annual OPEX of around RM20'000 for each site.

VSAT technology has also been used extensively to provide Internet access in the MCMC's CCDP (or kedai.com) programme and the MEWC's USP initiative. Under the CCDP programme, each kedai.com site is connected by VSAT at speeds of up to 128Mbit/s uplink and 384Mbit/s downlink. For the 45 kedai.com sites it maintains, Maxis provides a collective bandwidth of 2Mbit/s that is burstable to 8Mbit/s during peak hours.

In Malaysia, remoteness has not been the only consideration involved in choosing VSAT technology for connectivity. As examples in a few projects have shown, the inability to reach an agreement to access to a rival operator's network near a site can also act as a significant factor in deciding to deploy a VSAT solution there, particularly when the operator's own exchange is located far from the site.

Besides the use of VSAT systems, other forms of satellite-based technology have been proposed as a solution to provide rural connectivity. Under the MCMC USP programme, a smaller Malaysian operator has submitted a proposal to provide basic telecommunications services to unserved sites through the use of GMPCS handsets. With handsets costing in the region of RM2'000 to RM3'000, the cost of providing collective access over a small number of lines can be considered as relatively modest. Project implementation is also instantaneous with such a solution. High traffic charges and limited bandwidth, however, do act as countervailing considerations. Nevertheless, with forecasted costs comparable to those of other technologies, the MCMC has shown itself willing to test this solution by awarding the proposing company the tender for four districts under phase two of the USP programme.

As a result of the overall increase in use of satellite systems to provide rural connectivity, providers that have been involved in universal service initiatives have increasingly formed partnerships with regional satellite companies to obtain more transponder capacity.

5.4.2 Terrestrial wireless

In locations where access is required to be distributed over sparsely populated areas, providers have relied increasingly on terrestrial wireless technologies for parts of their networks. Solutions deployed have ranged widely from systems based on fixed-GSM technology to those based on OFDM technology.

In the early stages of wireless use for rural connectivity, TMB introduced an analogue wireless system using radio phones to provide basic voice services in selected rural areas. Dubbed TMRiLL (Radio in Local Loop), the service was introduced in 1994. The deployment of this technology was supplanted by the deployment of other wireless local loop solutions based on more advanced technologies. Wireless local loop (WLL) networks using FDMA technology was deployed between 1999 and 2001 in three rural locations at a cost of around RM3'500 per line. Data transmission speeds up to 9'600Bit/s were possible over the network.

In September 2001, TMB introduced a CDMA WLL (IS-95) service in September 2001, using Motorola supplied equipment to connect a rural location in Sibu, Sarawak. Use of the CDMA based system was then extended to other rural locations in Sabah and Sarawak. The system utilises the 800MHz frequency band that was originally used for TMB's Mobicom AMPS and D-AMPS network. According to TMB, the cost of a CDMA WLL phone terminal is around RM1'200. With a current CDMA WLL network of over 270'000 lines, TMB operates three dedicated CDMA exchanges in Putrajaya, Kota Kinabalu (Sabah) and Kuching (Sarawak).

Data transmission speeds of up to 64Kbit/s are currently available over the network with an upgrade to the CDMA 2000 1x protocol making an increase in speeds up to 144Kbit/s possible. The availability of a path to further upgrades such as to CDMA 2000 1x EVDO, which offers speeds of around 400Kbit/s burstable up to 2.4Mbit/s, and CDMA 2000 1xEVDV, which offers speeds of around 1.5Mbps burstable up to 3.6Mbit/s, was reported to have played a large role in TMB's decision to utilise CDMA technology.

Aside from its WLL CDMA network, TMB has also reviewed and experimented with other proprietary technologies to address its varied network deployment needs. For example, it has recently commissioned a trial of CapeRange Wireless' Arcadian system with a view to using it to replace portions of its older radio network that serves Malaysia's small offshore islands (see Box 5).

Besides TMB, other operators have also deployed a range of wireless solutions. A fixed GSM solution was introduced by Maxis when it rolled out its network for the MCMC USP project in Yan, Kedah in 2003. At the time, Maxis reported costs of around RM5'300 per line when the network of 500 lines was fully deployed.

In another district, an OFDM based proprietary solution supplied by Siemens was proposed by TIME in its deployment of networks in rural sites across Sarawak. The company was awarded the tender for 14 districts in Sabah by the MCMC in July 2004 and completion of the network is targeted for November 2004.Operating on the license-exempt 5.8GHz frequency band, the network can support transmission speeds of up to 3Mbit/s over a distance of 5 to 8 km. Presently, however, the network is configured for voice in order to reduce costs and possible network congestion. Network bandwidth is limited by VSAT backhaul transmissions speeds of 256Kbit/s. Nevertheless, TIME uses a VoIP based solution to provide voice telephony.

While WLAN technologies have been used widely in urban areas, such through as the establishment of Wi-Fi hotspots, the use of wireless networks based on the 802.11 family of standards have not been as popular in rural areas. Operators have generally expressed a preference for proprietary solutions that can be tailor made more easily for particular purposes. With licensed spectrum for wireless broadband available and affordable, some advantages of using license-exempt spectrum are also been discounted. It is interesting to note that TIME's decision to use the 5.8GHz license-exempt spectrum for the deployment of its OFDM network in the USP project was motivated more by a desire to avoid spending time on a spectrum license application process than on the desire to economise on spectrum fees.

Box 5: Arcadian

Designed and developed by CapeRange Wireless, a Malaysian based company listed on the Australian Stock Exchange, the Arcadian system tested by TMB on the offshore island of Langkawi was used to provide backhaul for a network covering three villages on the island. Remote stations in three villages were connected to a TMB switch in the mainland town of Alor Star which was 67km away.

The network deployed involved the deployment of a single base station and three remote stations. A single base station is designed to support up to 30 remote stations while a remote station can support up to eight simultaneous calls and 64 subscribers. Using the company's spread spectrum "Havana" technology, the network is designed to provide data transmission speeds of up to 2Mbit/s over a radius of 50km. Although primarily designed for voice communications in mind, interfaces that allow the provision of DSL or ISDN services over the network are also available. The company estimates a starting cost of around USD1'400 for the deployment of just one line to a single remote station.

Source: CapeRange Wireless

5.4.3 Fixed line

Despite the increasing popularity of wireless solutions, many operators continue to use copper cables as drop wires to distribute access from remote wireless units to subscriber units in rural and semi-rural sites where the population is relatively concentrated. Overhead copper cables are relatively cheap to deploy between areas under a kilometre and do not require line of sight.

6 Conclusion

Malaysia's efforts to bridge the digital divide have been laudable. Through its Ministries and its agencies the Malaysian government has clearly taken a pro-active role in achieving its goal of universal access to ICTs by channelling significant amounts of resources in terms of financial and administrative support into initiatives designed to meet that objective.

At times, it can be remarked that with the sheer volume of initiatives undertaken by the government in the area of ICT it can be difficult to gain a complete overview of all ongoing ICT initiatives and the different government institutions that manage them. Understanding the division of responsibilities between the different government institutions can also be difficult for an observer. Nevertheless, the ongoing internal coordination between the different institutions involved has prevented operational overlaps in practice.

With many of these initiatives having been launched recently, particularly the MCMC's USP programme, it may be still too soon to paint an accurate picture of the Malaysian success in bridging the digital divide. Nevertheless, it must be acknowledged that the general opinion on these efforts so far has been favourable. The development of the new USP framework by the MCMC, in particular, is seen as a positive step forward in the government's efforts. The setting of priorities and specific targets by the MCMC in its USP programme allows the government and private industry to visualise the extent of the shortfall in rural connectivity and provides a reference point against which progress can be measured. More importantly, the new USP framework also provides a mechanism for greater competition and transparency in the effort to provide universal services through an open process of bidding available to all licensees. The degree of flexibility given to providers to propose solutions is another commendable characteristic of the framework, allowing private sector operators to propose a wide range of technology solutions for deployment. The greater discretion given to providers to propose their own timeline and sites have also allowed the regulator to launch its USP programme rapidly and with far less manpower.

Government initiatives outside the MCMC's USP programme have also met with considerable success. The provision of training programmes in addition to the deployment of equipment and connectivity has played a key role in ensuring that a rural community not only has a connection to the Internet but also the capacity to benefit from that connection. A gradual rise in the number of customers at such sites indicates the start of a growing base of Internet-savvy users at the rural level.

As in many parts of the world, private industry in Malaysia has mostly viewed the provision of ICT services in rural areas as a loss making proposition. Nevertheless, their participation level in digital divide initiatives launched by the government has been high. Public perception and government encouragement has largely

motivated the major telecommunications providers in the country to initiate digital divide initiatives of their own, albeit on a modest scale currently.

In this respect, both the Malaysian government and private industry may stand to benefit from a closer look at a range of private sector driven rural expansion initiatives that have been tried in different parts of the world. The adoption of a more private sector led initiatives could both alleviate the burden on the government and provide benefits to the private sector. Such initiatives, for example, could leverage on the large commercial presence of non-ICT related industries that are present in rural areas. Large companies involved in agricultural production and procurement, mineral resource extraction, logging and tourism stand to gain by an improvement in ICT accessibility by the local population in the areas in which they operate. The possibility also exists for them to act as anchor tenants or catalysts for the deployment of wider ICT networks in their hinterland.

At this point it may also be worthwhile to remark that closer cooperation between the government institutions that formulate ICT policy and regulation and the government's scientific and research institutions, such as the Ministry of Science and Technology, would prove extremely valuable in the consideration of the different technological solutions that have been proposed for government digital divide initiatives.

While overall progress has been made on bridging the digital divide, a key area of wider concern still remains. The slow deployment of broadband access in the country in general has been an area of particular concern highlighted by the government itself and by industry observers. With a penetration rate of only 0.44 per cent, Malaysia ranks low on the list of broadband enabled Asia-Pacific countries. Industry observers and some operators have advocated a number of measures aimed at remedying the situation. The imposition of local loop unbundling obligations on the incumbent, the acceleration of licensing procedures for licenses to provide broadband services and the promotion of the development of relevant local broadband content. To some extent, the opening up of the incumbent's network to competitors on regulated terms and conditions could also encourage competitors that lack the infrastructure reach of the incumbent to use the incumbents infrastructure to deploy last mile solutions in rural areas.

The Malaysian government has shown itself to be aware of the problem and has taken a number of steps to remedy the situation. These include, for example, the MCMC's introduction of a NFP (Last Mile) license category to support the deployment of last mile broadband infrastructure and its efforts to make spectrum more readily available for that purpose. The MEWC's is also close to releasing nationwide broadband initiative that is expected to addresses a number of broadband related issues.

Looking at what it has done and what it intends to do, Malaysia's commitment to address the digital divide is clear. Through numerous policy statements, initiatives and activities the Malaysian government has impressed upon the population the importance of ICT development as a vehicle for wider economic prosperity. This overriding national goal to become a developed country through the creation of a knowledge-based economy can be regarded as the biggest driving motivation behind the country's huge effort in bridging the digital divide.