

CHAPTER 4

THE INTERNET BACKBONE AND SERVICE MARKETS IN MALAYSIA

4.1 A Brief History of the Development of Internet in Malaysia

The technical history of the Internet in Malaysia broadly reflects the developments in the US and other countries. The introduction of the Internet in Malaysia can be traced back to June 1987 when the Malaysian Institute of Microelectronic Systems (MIMOS) launched the setting up of a Malaysian computer network called *RangKoM*⁹ with the cooperation of several local institutions of higher learning. *RangKoM* was set up in response to the needs for a more effective means of communications between researchers in the local institutions of higher learning and government research institutes. MIMOS then serve as the international gateway for *RangKoM* with five dial-up lines to Australia, Indonesia, the Republic of Korea, the Netherlands and the United States (US). Due to overwhelming response, the Joint Advanced Research Integrated Networking (JARING) project was launched in 1991 as an extension to *RangKoM* to promote information exchange and database development. The installation of a 64 kilobits per second (kbps) international leased line and a satellite link between Malaysia and USA connects JARING to the Internet, which provided Malaysian users with accessibility to the Internet in more than 140 countries (Seventh Malaysian Plan, 1996).

⁹ For a more detail description of *RangKoM*, please see Awang Lah (1987).

Since the commercialisation of JARING in 1992, it has expanded its nationwide network infrastructure dynamically to cater for the continuously evolving technology and the rapidly growing population of Internet users. As in the US and other countries, the pressure to commercialise the Internet led to the creation of private networks. This led to the birth of Telekom Malaysia Berhad's (TMB) Internet arm, TMNet, which received its license in July 1996 and launched its service in November that year. The duopoly remains until the year 2000 when more licenses were issued to step up competition in the industry.

4.2 The Demand for Internet

The number of Internet dial-up subscribers has increased by leaps and bounds since the commercialisation of JARING. According to the Seventh Malaysian Plan, the number of JARING subscribers increased from 30 in 1992 to 14,400 in 1995, and this figure subsequently jump to 2.614 million subscribers in tandem with the mushrooming of the private networks as shown in Table 4.1. Correspondently, the estimated number of Internet users, according to the MCMC, has also risen significantly over the years, from 42,000 in 1995 to 7.842 million in 2002. In 2001, the Internet users per 10,000 inhabitants in Malaysia are 2,394.96¹⁰, which is higher than the Southeast Asian average of 360 but lower than other East Asian economies. What drives the number of Internet users are affordability, the necessary Internet infrastructure and human skills such as computing knowledge, literacy and command of language, particularly English. There is

¹⁰ This figure is different from those reported from the MCMC. Comparison of Internet user data can be misleading since there is no standard definition of frequency (e.g., daily, weekly, monthly) or services used (e.g., e-mail, browse the World Wide Web).

also an encouraging improvement in the penetration ratio of both the number of subscribers and users from 0.1 and 0.2 to 10.5 and 31.6 respectively as reported by MCMC.

TABLE 4.1: INTERNET DIAL-UP SUBSCRIBERS AND HOSTS IN MALAYSIA, 1992-2002

Year	Qtr	Hosts Total	Hosts per 10,000 inhabitants	Internet Dial-up					Number of broadband subscribers
				Number of subscribers ('000)	Growth rate (%)	Penetration rate	Estimated number of users* ('000)	Penetration rate	
1992		17	0.01	-	-	-	-	-	-
1993		435	0.22	-	-	-	-	-	-
1994		1,606	0.80	-	-	-	-	-	-
1995		4,194	2.03	14	-	0.1	42	0.2	-
1996		25,200	11.90	64	357.1	0.3	192	0.9	-
1997		32,269	14.89	205	220.3	0.9	615	2.8	-
1998		47,852	21.57	405	97.6	1.8	1,215	5.5	-
1999		59,012	25.98	668	64.9	2.9	2,004	8.8	-
2000		68,248	29.05	1,659	148.4	7.1	4,977	21.2	-
2001		-	-	2,115	27.5	8.8	6,345	26.4	-
2002	1	-	-	2,200	4.0	9.1	6,600	27.2	-
	2	-	-	2,295	4.3	9.4	6,885	28.1	-
	3	-	-	2,458	7.1	10.0	7,374	29.9	9,647
	4	-	-	2,614	6.3	10.5	7,842	31.6	19,302

* If only the number of subscribers is available, the estimated number of users is assumed to be 3 times the number of subscribers, following International Telecommunications Union (ITU) and Nua.com's methodology. Nua.com defines Internet users as adults and children who have accessed the Internet at least once during the 3 months prior to being surveyed.

Source: Data compiled from MCMC

The growth of Integrated Services Digital Network¹¹ (ISDN) subscribers, on the other hand, is equally strong at a rate of 82.1 percent relative to the overall number of

¹¹ There are several varieties of ISDN service. In Malaysia, the Basic Rate Interface ISDN (BRI) service is the most common kind of ISDN service available, consisting of two 64 kbps Bearer-channels or B-channels, which is the main data channel in an ISDN connection and one Delta-channel or D-channel for transmitting control information (written as 2B+D in ISDN shorthand), for a theoretical total of 144 kbps and an actual rate of 128 kbps. This is approximately five times the bandwidth of a 28.8kbps modem. In North America, the ISDN Primary Rate Interface (PRI) has 23 B-channels and one beefed-up 64-kbps D-channel (23B+D) for a total of 1544 Kbps. This is equivalent to a T-1 line, over 25 times the bandwidth of

Internet subscribers, which grows at 85.6 percent for the period of 1996-2002. In the provision of leased lines as shown in Figure 4.1, a huge proportion of the subscribers are still using analogue connections. Leased lines, which are traditionally used by large businesses to provide permanent phone connections, are being used by service providers for the provision of business and consumer Internet access in Malaysia. This is because leased lines usually represent the only practical way to link a customer with the new entrant's local point of presence.

TABLE 4.2: A CROSS-COUNTRY COMPARISON OF INTERNET USERS AND ESTIMATED PERSONAL COMPUTERS (PCS) IN 2001

	Internet		Estimated Personal Computers (PCs)	
	Users (million)	Users per 10,000 inhabitants	Total PCs (million)	PCs per 100 inhabitants
Asia	157.78	437.49	117.09	3.31
Europe	144.41	1,804.60	140.59	17.94
US	142.82	4,995.10	178.00	62.25
China	33.70	260.00	25.00	1.93
Hong Kong	3.10	4,586.14	2.60	38.46
India	7.00	68.16	6.00	0.58
Indonesia	4.00	186.19	2.30	1.07
Japan	57.90	4,547.10	44.40	34.87
Korea	24.38	5,106.83	12.00	25.14
Malaysia	5.70	2,394.96	3.00	12.61
Philippines	2.00	259.30	1.70	2.20
Singapore	2.50	6,051.51	2.10	50.83
Taiwan	7.82	3,490.20	5.00	22.32
Thailand	3.54	556.11	1.70	2.67

Source: ITU

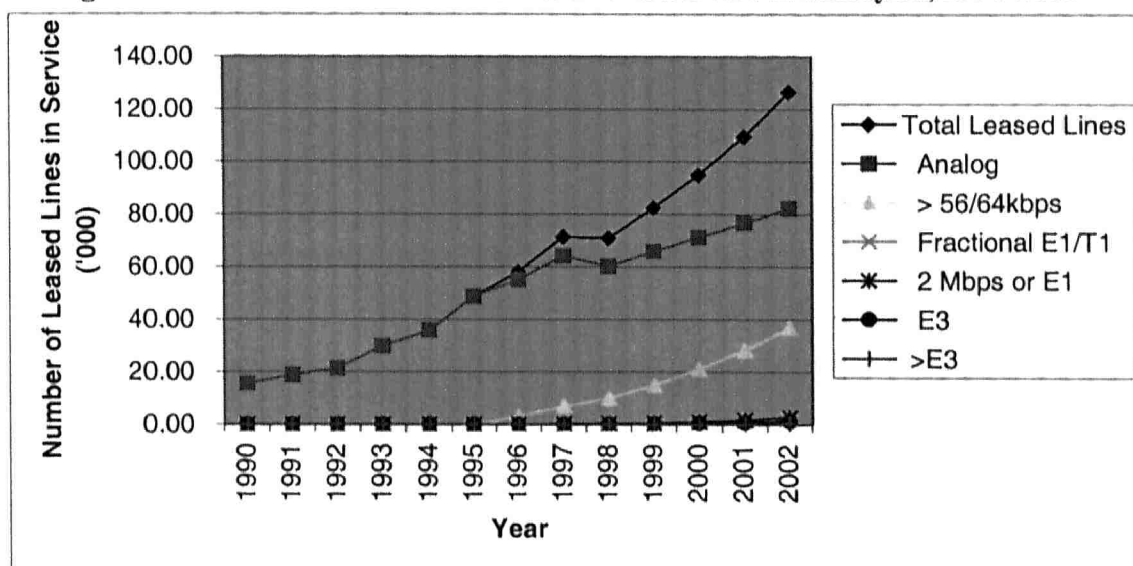
a 28.8kbps modem. In Europe, the ISDN PRI has 30 B-channels and one D-channel (30B+D), for an incredible 2048 kbps bandwidth, which is equivalent to the European E-1 line service. T-1 is a fast (1544 Kbps) but point-to-point mechanism, which means that your T-1 box communicates only to one other specific T-1 box somewhere in the world, and it is always talking to that box. This is similar to an E-1 line.

TABLE 4.3: INTEGRATED SERVICES DIGITAL NETWORK (ISDN) SUBSCRIBERS IN MALAYSIA, 1996-2002

Year	ISDN Subscribers	ISDN B-Channel Equivalents
1996	1,949	3,898
1997	4,576	9,152
1998	8,866	17,732
1999	18,089	36,178
2000	34,512	69,024
2001	52,202	104,404
2002	71,181	142,362

Source: MCMC

Figure 4.1: Total Number of Leased Lines in Service in Malaysia, 1990-2001



Source: World Bank/InfoDev

The implementation of broadband, on the other hand, is still at a nascent stage with only a few companies providing such services. There is currently no commonly adopted definition of broadband in Malaysia. The interpretation of broadband differs from country to country (or dependent on the level of development) and changes dynamically. What is known to be broadband today will be narrowband in the future.

Table 4.4 gives us a snapshot of the broadband market in Malaysia, which indicates that the provision of broadband is very much confined to the Digital Subscriber Line¹² (xDSL) deployment, or more specifically, the Asymmetric Digital Subscriber Line (ADSL) or the Symmetric Digital Subscriber Line (SDSL).

TABLE 4.4: ESTIMATED NUMBER OF BROADBAND SUBSCRIBERS BY TECHNOLOGY FOR THE THIRD AND FOURTH QUARTER OF 2002

Year	Quarter	Number of subscribers					Total
		ADSL	SDSL	Others			
				<i>Fibre Optic</i>	<i>Satellite</i>	<i>Wireless</i>	
2002	3	8,988	413	3	63		66
	4	18,511	542	5	224	20	249

Source: MCMC

4.3 The Major Players in the Internet Backbone and Services Market

In Malaysia, the terms Network Facilities Provider (NFP), Network Services Provider (NSP), Applications Service Provider (ASP) and Content Applications Service Provider (CASP) are used in accordance to the more generic licensing structure adopted by the newly established MCMC¹³. The MCMC has replaced the previous system of 31 specific services-based licenses with the current system of 4 generic ones as mentioned above. Table 2.5 illustrates the scope of operations for each licensee.

¹² xDSL refers to the digital subscriber line technology where the "x" is the placeholder that refers to a particular DSL standard being employed. The ADSL is the most common form of DSL service for users since most of its two-way bandwidth is dedicated to the downstream activities, while the SDSL, consists of a single line (cannot share the line with analogue signals) that offers data up to 2 Mbps in each direction on a duplex line, offer equal speed for downstream and upstream activities.

¹³ Prior to its establishment, the authority classified licensable activities under the label of mobile cellular services, free to air television, fixed line telephony, and Internet access services.

TABLE 4.5: CLASSIFICATION AND NUMBER OF FIRMS IN THE NETWORK INDUSTRIES IN MALAYSIA AS AT DECEMBER 2002

Category	Number	Scope of Operation
Network Facilities Provider (Individual)	25	Earth Stations, Fixed Links and Cables, Radio Communications, Transmitters and Links, Poles, Public Payphone Facilities, Satellite Hubs, Towers, and Ducts and Pits used in conjunction with network facilities.
Network Services Provider (Individual)	25	Bandwidth Services, Broadcasting Distribution Services, Cellular Mobile Services, Customer Access Services, and Mobile Satellite Services.
Applications Service Provider (Individual)	60	Internet Protocol (IP) Telephony
Applications Service Provider (Class)	78 ^a	Audiotex Hosting Services, Directory Services, Internet Access Services, Messaging Services, Privates Payphone Services, and Telegramme Services.
Content Applications Service Provider (Individual)	19	Subscription Broadcasting, Terrestrial Free to Air TV, and Terrestrial Radio Broadcasting.

Note: ASP (I) – Application Services Provider (Individual)
 ASP (C) – Application Services Provider (Class)
 a – Since the ASP(C) license is renewable annually, the figure here is for the year 2002.

Source: MCMC

A company that wishes to provide Internet access needs to register with the MCMC to obtain a class¹⁴ ASP license. This license, however, does not allow the firm to provide its own infrastructure. A potential ISP must then either lease the necessary equipments from licensed provider(s) or obtain its own NFP and NSP licenses. A NFP license holder is usually a NSP as well. But a NSP may not be a NFP licensee since it can lease network facilities owned by others, for instance, Baycom Sdn Bhd. To be vertically integrated and provide a whole range of services, it is no surprise to find that the major IBPs/ISPs will possess all the licenses issued by the MCMC.

¹⁴ The MCMC has introduced two types of licenses, namely the individual and class licenses. The individual licenses are for activities where a high degree of regulatory control is required while the class licenses are renewable annually and subject to lighter conditions. Obtaining individual licenses is more difficult since the government wish to encourage the sharing of infrastructure. Further details on regulatory issues will be dealt with in a later chapter.

TABLE 4.6: CATEGORISATION OF FIRMS IN THE INTERNET INDUSTRY

Internet Backbone Provider Only (Physical Carrier)	Internet Backbone and Access Service Provider	Internet Access Service Provider Only
<ol style="list-style-type: none"> 1. Fiberrail 2. Fibrecomm (has yet to receive any operating license) 	<ol style="list-style-type: none"> 1. TMNet (Telekom Group) 2. JARING 3. TIME dotNet (Time dotCom Group) 4. Maxis 5. Celcom 6. Digi 	<ol style="list-style-type: none"> 1. NTT MSc (Arcnet) 2. Prismanet 3. Solsisnet 4. PutraNet 5. Information Network Services 6. Ivoli Networking 7. Asiaspace Dotcom 8. Merchantrade Asia 9. Central Data Centre 10. W.I. Networks 11. K.K.I.P. Communications 12. P&O Global Technologies 13. Quicknet 14. Messaging Technologies 15. VADS Bhd. 16. Intelligent Essence 17. Xirrus One 18. AT&T Communication Services 19. Hi-Band Network 20. VTS Communications 21. eTouch 22. Seri United Resources 23. Penang Network Topologies 24. Dataone Asia 25. Action Point Computers 26. EB Technologies 27. Sacofa 28. Rfotec 29. KUB Telecommunications 30. WAP Portal 31. Virtual Commerce 32. Reach Internet Services 33. Articulate New Media 34. Gold Information 35. Etanium 36. NasionComm 37. Communications and Satellite Services 38. Cordoda Corp. 39. Enhanced TV Technologies 40. CMNet Dotcom 41. Technology Park Malaysia Corp. 42. Amquest 43. Clear Comm

Instead of using the MCMC terms, I will attempt to categorise the firms in the Internet industry as shown in Table 4.6 above. To string their networks together, the various companies have different degree of nationwide connectivity. JARING, TMNet, TIME dotNet and Fiberail possess extensive networks including fibre optic cables, while companies like Maxis, Celcom and Digi have smaller networks with varying levels of coverage using microwave, fibre optic and satellite links. Most of the companies under the category of “ISP only”, typically offer leased lines only as pointed out earlier, while others have yet to begin operations. As such, I will only look at several companies in this category. We shall now take a tour into the Malaysian Internet backbone and service providers market with the highlights on several major players to obtain a more vivid picture (information obtained from annual reports, newspaper articles and homepages of the Internet providers).

Before doing so, let us take a look at the share of subscribers by ISPs. As shown in Table 4.7, TMNet has been taking a lion’s share in terms of the subscriber base, followed by Jaring and Time dotNet in the retail market. Without revenue or sales data, we can only use the breakdown of subscribers by ISPs as a crude guide to market share. This is because having more subscribers does not necessarily means more revenue or sales generated from the Internet market. While TMNet is gaining the edge in the Internet adoption rate, Jaring has been slipping. This, according to Awang Lah as quoted in the article by Yapp (2002), is attributed to “Jaring’s inability to share its infrastructure the way it had planned, and the lack of local human resources with the right skills to understand and run the business effectively”. However, with the increasing adoption of

broadband and the changes in technology, the picture might change somewhat, paving way for new entrants.

TABLE 4.7: INTERNET DIAL-UP SUBSCRIBERS BY ISPS

(’000)

ISPs Year	TMNet	JARING	MaxisNet	Celcom Net	Time dotNet	DigiNet	Arc Net	Total
1997	105	100						205
1998	250	155						405
1999	409	254	5					668
2000	856	359	297	10	137			1,659
2001	1,269	451	23	39	325	5	3	2,115
2002	1,441	685	19	53	409	6	1	2,614

Source: MCMC

4.3.1 JARING

We have seen earlier that the birth of JARING, the first ISP and IBP, was a result of the extension to *RangKom*. After setting its first international lease-line 64 kbps, JARING was commercialised in 1992. The international network, which connected Malaysia to Stockton in the United States, has enabled JARING network users to be linked directly to the global Internet clout, including BITNET and NSFNet. In 1994, JARING has placed their nodes from 2 to 16 locations in the country and has upgraded its international lease-line to 1.5 Mbps.

Within a year, JARING has increased its capacity by upgrading the bandwidth in Penang and Johore Bahru to 2Mbps with the expansion of 40 new nodes. In June 1997, JARING became the first IBP/ISP in Southeast Asia to install the T3/45Mbps line, which

provides JARING users with faster access to the Internet. Two years later, in August 1999, JARING launched the SuperJARING, an OC-48 Internet backbone infrastructure with 2.5 Gbps transmission speed and bandwidth, in a bid to lead the Internet industry. The backbone network was built completely on Cisco 12000 series Gigabit Switch Routers (GSRs) over dark fibre without the need for a transport layer of equipment such as SONET or SDH, saving on network and operational costs. SuperJARING, which runs from the northern high-tech manufacturing island of Penang, through the capital Kuala Lumpur, to the southern tip of the country Johore Bahru, will raise JARING's capacity by a potential factor of 10.

The backbone will subsequently link up the entire nation and will be capable of supporting over 175,000 dial-up users sending and receiving files at the same time. The 73 existing JARING Net nodes, run by local ISP, MIMOS Bhd., will be able to take advantage of the new backbone. More importantly, SuperJARING can provide next-generation services like Internet telephony, Internet protocol virtual private networks (IP VPNs), video-on-demand, distance learning and telemedicine. Today JARING is fully prepared to accept new challenges, explore new technologies, and set precedence for others to follow thereby facilitating the creation of an information-rich society.

4.3.2 TMNet

Telekom Malaysia Berhad (TMB), being the incumbent telecommunication operator, ventured into the Internet industry when they received a license in July 1996

and launched their services in November that year. The Internet arm of TMB, TMNet, is currently the leading brand for Internet access services in Malaysia. Besides serving a dial-up service over PSTN (TMNet 1515) and ISDN (TMNet 1525) for the mass market and TMNet Direct¹⁵ for corporate customers, TMNet offers a host of other Internet and multimedia services such as TMNet Myloca, EastGate, etc.

TMNet has recently introduced some new services namely, the TMNet Pre-paid and the TMNet Streamyx, as a response to greater market demand. TMNet Pre-paid, launched in September 2001 provides convenience and a hassle free Internet access service that enable users to get access to the Internet from any computer terminal and location, with no monthly bills, are targeted at students, travellers and budget conscious users¹⁶, while TMNet Streamyx is the broadband Internet access service targeted at users who demand high-speed Internet connections. The service was made available for the business community and consumers in April 2001 and in September 2001 respectively, complementing the normal service of digital dial-ups and TMNet Direct. TMNet Streamyx has attracted a high level of interest and this will be the precursor to the broadband drive in the coming year. With this service, Internet users will be able to enjoy a different level of experience, which in turn would cause a shift in the nature and usage of the Internet.

¹⁵ TMnet Direct is a service using the managed leased networks began offering a new premium value added service with a dedicated ISDN back-up.

¹⁶ The start-up pre-paid card is priced at RM30 inclusive of an Internet account, an email ID, 35 hours of Internet access plus 30 minutes bonus time for registration purpose. Reload cards cost RM20 each.

On the domestic trunk backbone, TMNet is aggressively upgrading its domestic Internet infrastructure with modems and nodes installation, in addition to commissioning HyperNet, which is touted to be the nation's largest Internet backbone using the Juniper Networks M40 routers. The new IP backbone, HyperNet, has a 10 Gbps capacity with four 2.5 Gbps (STM-16/OC-48) fibre optic connections in each of the three POPs located in Penang, Kuala Lumpur and Johore Bahru. TMB has close to 70 POPs (where all local Internet traffic heads to) in Malaysia and have a modem-to-user ratio of 1:10. TMB used to have 50,000 modems but now have 70,000 and are increasing this number in tandem with their rising subscriber base.

TMB's international backbone infrastructure, which used to be weak, currently has bigger pipes connecting to the US, Japan and other countries than even Singapore. TMB has three T3 lines with 45 megabits connection and added two STM1 pipes, which carry traffic at a speed of 155 Mbps. It has a dedicated 155 Mbps link to the US via submarine cable system and satellites.

TMNet introduced the TMNet EastGate, Malaysia's sole Internet Exchange, in April 2000, to reduce the channeling of traffic via SingNet's Internet Exchange (STIX) and Singapore's UUNet and MCI-Worldcom connections. The EastGate is an Internet Exchange and Hubbing Facilities Service, providing an efficient exit avenue out to the USA via Japan. Telekom Malaysia will be providing the 45Mbps link to the hub in Portland, Oregon, USA via Miura, Japan. This is done through Asia Bone (A-Bone), one of the largest backbone providers in the greater Asian region, which provides the route to

Japan. EastGate's scalable bandwidth capabilities will ensure that users enjoy zero-congestion and higher transmission accuracy. EastGate will enable domestic and regional ISPs and bandwidth-intensive users to communicate and conduct business within a centralised facility built on a secured bandwidth platform.

Via EastGate, ISPs especially and other similar service providers will enjoy a broad range of service options that includes server co-location and hosting services, local area network (LAN) connectivity capabilities, global multilateral peering benefits and share traffic to ensure efficient routing and connectivity. On the international front, TMNet EastGate is offering transit services for ISP's in the region peering services covering most of the Asian region. TMNet international Internet link goes via both submarine fibre cable systems and satellite, providing redundancy support and reliability in its connectivity. Coupled with Netmyne, it provides a means for corporate users to migrate cost-efficiently into the Internet space. In addition to the offering, TMNet EastGate is also in line with the Government's effort to make Malaysia an Internet hub through a planned effort of setting up an ASEAN Regional Internet Exchange, an e-ASEAN endorsed project.

4.3.3 TIME dotNet

TIME dotNet has over 3,600 kilometres of fibre optic trunk network connecting major cities, which include those along the North-South Expressway (PLUS) running the length of the Peninsula Malaysia, and the large capacity of its fibre optic network is

upgradeable to IP platform. TIME dotNet has also laid a 1,624-kilometres festoon submarine cable system covering 25 landing points in the Peninsula Malaysia. Given its extensive network, TIME dotNet can also offer wholesale broadband to ISPs. Besides TMB, TIME dotNet is the other integrated telecommunications services provider (even though Maxis is fast catching up). This put them in an advantageous position relative to other operators because they are able to bundle and offer competitive products and services, particularly to their ready customers from the Renong Group of companies, of which they are under.

Unlike other providers, TIME dotNet commercially offer symmetrical and always-on broadband Internet access to residential users, utilising a hybrid of its fibre optic trunk network and wireless last mile. The SDSL packages offered by TIME dotNet, namely SoNET and BizNET, are particularly ideal for small offices, and small and medium enterprises (SMEs) that have an equal need to upload and download data over the Internet. However, the use of SDSL in the HomeNET package will be more challenging since most of a typical household's activities are watching streaming videos, receiving files or surfing large web pages instead of video conferencing and uploading files, making ADSL the more likely choice.

4.3.4 The Others

Beside the three major players, we will now take a sample of other smaller players, beginning with the physical carriers only. Fiberail, granted a license in January

1995, provide telecommunications network related services via a 1,600-kilometres fibre optic cable network, laid along the railway tracks in Peninsula Malaysia. Since Fiberail, a joint venture between TMB (60 percent) and the national railroad company (KTM, Keretapi Tanah Melayu), does not compete in the consumer market, it positions itself as a neutral wholesaler.

Fibrecomm, a joint venture between Tenaga Nasional Bhd (59 percent) and Celcom Transmission Sdn Bhd (41 percent), installs and leases fibre optic cables along Tenaga's grid. Its fibre optic backbone is much alike the TIME dotNet's network spanning the PLUS, with a land-based network of 3,600 kilometres of fibre optic cables and a 1,600 kilometres festoon submarine cable system, which linked up more than 100 cities and towns.

Fibrecomm is basically an IBP offering Internet access based on digital power lines (DPL) technology and providing solutions to ISPs as an alternative to conventional telecommunications channel. As such, Fibrecomm is very much like Fiberail as they do not compete in the retail market. The entry of Tenaga into the Internet industry via Fibrecomm looks promising in addressing the "last mile" problem since the reach of power distribution network is more extensive. Despite this, Fibrecomm has yet to receive a NFP license, which gives them the right to provide, construct and maintain facilities such as earth stations, ducts, poles, satellite hubs and towers.

Amongst the other retail players, Maxisnet seems to be one of the more aggressive ISPs, offering wireless local area network (WLAN), ADSL, leased line Internet access, domestic and international private leased circuit. Maxis' WLAN service is very much the much talked about Wireless Fidelity (Wi-Fi), which I will discuss in passing in the next chapter.

Celcom's involvement in the Internet industry includes the provision of leased lines, mobile-related mailing and messaging services, and Virtual Private Network (VPN), while Digi offers customers at selected areas Internet access and email services through its iDigi product. PutraNet, a private network hosted by Smart Global Network (M) Sdn Bhd (SGN), started its operation as an ISP in November 1996. PutraNet basically offers dial-up PSTN, dial-up ISDN and leased lines as well as some value-added services such as Internet consulting services and systems integrator.

Nippon Telegraph and Telephone Corporation (NTT) has been given a 'class' license to offer Internet access in Malaysia, which means that it is the first foreign telecommunications company to enter the previously closed local ISP market. Then there are companies such as Prismanet and Solsisnet who provide leased lines only, while newer companies such Cordoda and EB Technologies are hoping to capture part of the broadband pie.