

## CHAPTER 3

### THE INTERNET INDUSTRY: WHOLESALING, RESELLING AND RETAILING

#### 3.1 What Constitute the Internet Industry?

Within the network of networks, the industry structure is shaped by technical forces such as the desire for end-to-end service quality, economic forces such as scale and scope economies, regulatory forces such as interconnection policies, and social forces such as universal service provision. The Internet industry generally consists of a whole array of firms ranging from IBPs, ISPs, various web hosting companies, application service providers, content delivery networks, content providers, e-commerce traders, solutions providers, hardware vendors, systems integrators, Internet law firms, educational and training institutions, Internet research firms, and a range of other businesses providing professional and technical support services. These firms in general come in various shapes and sizes, providing competitive and wide-ranging services that are appealing to a variety of niche markets.

It is widely accepted that today's Internet industry has a vertical structure<sup>5</sup>: in the US, there are over 40 Internet Backbone Providers (IBPs) including 5 top-tier backbones constitute the upstream industry (Kende, 2000) and over 10,000 ISPs for accessing the Internet make up the downstream industry (Weinberg, 2000). The same can be said of the

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<sup>5</sup> Vertical integration occurs when firms at different stages in the value chain combine while horizontal integration refers to the combination of firms at the same stage in the value chain. However, their distinction is often blurred in reality where integration of firms in different industries takes place.

structure of the Malaysian Internet industry. Upstream IBPs provide intermediate good and downstream ISPs using this input to sell connectivity to their customers. Their relationship can be likened to those of wholesalers and retailers. Box 3.1 above illustrates and explains the basic relationship between the wholesale IBPs, the retail ISPs and the end-users. In reality, however, such relationship is more complicated than it is seen. The IBPs may provide services directly to end-users and may also interconnect with other IBPs. The ISPs, on the other hand, may exchange information directly among themselves.

### **3.2 The Relationship between the Telephone and Internet Industry**

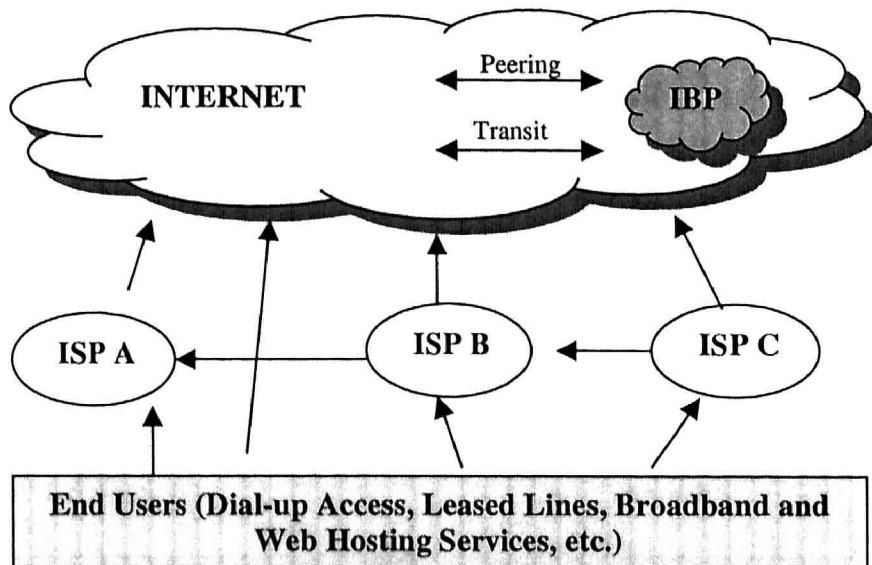
Since the telephone industry is tightly intertwined with the Internet industry, I will begin by taking a brief look at their relationship. There are several ways of connecting to the Internet, from a simple dial-up link using a standard telephone line to ISDN, ADSL, “cable”<sup>6</sup> or faster and “always on” connections using a leased line. Dial-up access using PSTN is the most universal form of Internet access, which is also the most prevalent type in Malaysia. The modem translates the analogue telephone signal into a digital signal recognised by a computer, and the connection is initiated by dialling an ISP’s Internet access telephone number. In Malaysia, there is generally a per-minute local telephone call cost and an ISP subscription charge, although charging models are many and various<sup>7</sup> (see Figure 3.1).

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<sup>6</sup> At the moment, there is still no Internet access through cable modem in Malaysia. However, with the technological barriers to using the Internet rapidly coming down, and emerging technologies predicted to revolutionise the market over the next few years, permanent connections are eventually expected to predominate in both the residential and commercial sectors together with access through TV sets, mobile phones, lap-top and handheld computers and all manner of similar devices.

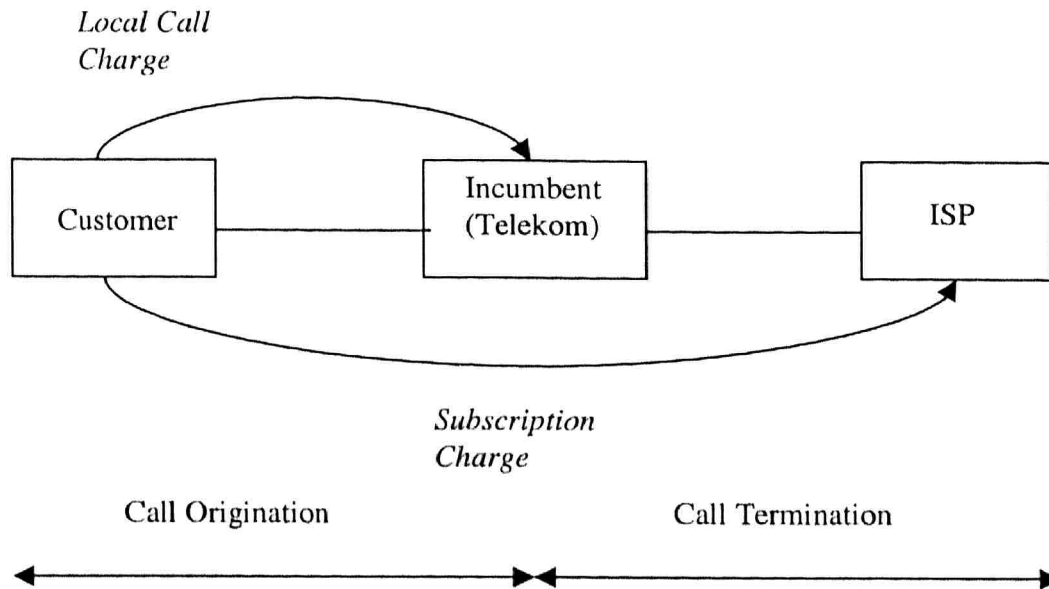
<sup>7</sup> Such a modem call in the US is typically a local call without a per-minute charge.

**Box 3.1: The Vertical Structure of the Internet Industry**



As shown in the above diagram, on top of the vertical lies the physical carriers such as fibre optic owners, wireless fixed and mobile carriers, electric utilities, satellite companies, etc. Under these physical carriers are the resellers, integrators and ISPs. The ISPs basically purchase wholesale connectivity from different IBPs for resale to end-users. Some IBPs also serve as ISPs, providing direct Internet access to the end-users. Many ISPs also sell Internet-related value added services, such as web hosting, server co-location and security products. Looking at this vertical structure, we also need to understand that there exist complex horizontal relationships between IBPs related to the interconnection arrangements, namely public and private peering, and transit.

**Figure 3.1: A Traditional Retail Internet Charging Model**



The facilities of IXC and LEC are often used to support dial-up Internet communications. First, the IBPs and the larger ISPs often construct their backbone networks by leasing lines from the IXCs and LECs. Then, the switching system in the Central Office of LECs is generally used to connect calls between ISPs' modem pool and Internet users. As a result, the telephone industry can be said to provide the basic infrastructure needs for the Internet industry.

## 2.5 Internet Backbone and Service Providers

I will set out in this section to answer the question "what is an IBP and why is it important to the Internet". IBPs are basically Internet companies that own and lease long-

haul fibre-optic cables spanning a large region, as well as possess communications gear that direct traffic over the Internet. In other words, IBPs generally route data traffic over long distances using high-speed fibre lines, that is, they sell high-speed access to the main Internet “pipes” that criss-cross the country and connect to international telecommunications networks. The IBPs, with some simplification, have multiple Points of Presence (POPs) distributed over the country to make the Internet a seamless network. They are usually located in large urban centres. These POPs are connected to each other with owned or leased optical carrier (OC) lines, which are normally defined using the SONET<sup>8</sup> hierarchy. The POPs and OC lines would then make up the IBP backbone network. The IBPs’ POPs are also connected to the POPs of many ISPs. Briefly, the backbone infrastructure is made up of individual networks connected at public exchange points and private peering points. To better characterise the Internet and its players, think of it as the highway system where the freight of the Internet travels.

Internet backbone networks are overwhelmingly made up of capacity owned by the world’s public telecommunications operators. Since these companies own the infrastructure needed for telephone services, they are favourably positioned to provide the facilities and equipments required by the IBPs. Furthermore, due to their size, they are able to offer large volume discount or bundling agreements of both telephone and

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<sup>8</sup> SONET stands for Synchronous Optical Networking. It is an octet-synchronous multiplex scheme defined by the American National Standards Institute (ANSI) standard (T1.1051988) for optical digital transmission at hierarchical rates from 51.84 megabits per second (Mbps) to 2.5 gigabits per second (Gbps) or equivalently, using the Synchronous Transport Signal, from STS-1 to STS-48 and greater. Thus, the capacity of OC-*x* is based on that of OC-1 (51.84 Mbps). For example, the capacity of OC-48 is 48 times of OC-1, that is, 2.488 Gbps. Synchronous Digital Hierarchy (SDH) is an equivalent international standard for optical digital transmission at hierarchical rates from 155.52 Mbps (STM-1/OC-3c) to 2.5 Gbps (STM-16/OC-48c) and greater.

Internet lines for the services provided. This is even more likely since the Internet industry is lightly, if at all, regulated.

In addition, the entry barrier into the backbone provision market is high because there is a large sunk cost for nationwide backbone infrastructure and switching equipments as well as the technical ability to make such provision. There are also significant amount of economies of scale and the rapid growth of technological change generates huge amount of uncertainty about the future return of investments. Before I proceed to the chapter on potential monopolising conducts posed by the incumbents' market power, there is a need to clarify the terminology used in Malaysia.