The digital divide and the competitive behaviour of Internet backbone providers

Part 1 – issues and arguments

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Abstract *Against the background of international telecommunications liberalization and declining settlement payments for many developing countries, charging arrangements for Internet interconnection services have become a controversial issue. This article presents the essence of the complaints and counter-arguments regarding whether current charging arrangements for Internet interconnection are inequitable and subject to anti-competitive behaviour on the part of Internet backbone providers. A second paper, to be published in the next issue of* info, *reviews proposals for action to date and makes a number of recommendations as to how to move the debate usefully forward, including a number of positive measures that developing countries can take.*

Introduction

Charging arrangements for Internet interconnection services (IIS) are a very controversial issue in the context of international telecommunications liberalization, the so-called "digital divide" and the hard-currency earnings of developing countries. Important economic interests are at stake, although the precise dimensions are uncertain due to the lack of reliable data.

The essence of the IIS debate is:

- whether current charging arrangements for Internet interconnection are inequitable and subject to anti-competitive behaviour; and
- whether (and if so, how) to subject the relations between Internet carriers to international rules and regulations in order to prevent or redress real or perceived abuses of dominance, or to let the market evolve and companies work out competitive, commercial solutions.

This debate has been raging since 1996 in a number of fora, ranging from the Organization for Economic Cooperation and Development (OECD), to Asia-Pacific Economic Cooperation, the International Telecommunications Union (ITU) and the Inter-American Telecommunications Commission (CITEL). However, these fora are not competent in competition matters, and the fruitless debate has left the parties – "complainants" and "complacents" – frustrated.

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It is well known that many developing countries used to be net recipients of telecommunications settlement payments, particularly from US carriers, and that these payments typically constituted the principal hard currency earner for these countries. While the magnitude of this reversal of fortunes is unclear, IIS has become one of the many sensitive and difficult – perhaps intractable – issues in the so-called "digital divide", the large and growing gap between developed and developing countries in terms of the deployment and use of information and communications infrastructure and services.

This study, appearing in two instalments in *info*, does not provide new empirical evidence. Indeed, there is a serious lack of empirical data to substantiate claims on either side of the divide, pro or con. Rather, the study is based on a review of recent studies and the positions of key participants. The first instalment presents the essence of the complaints and counter-arguments regarding the competitive behaviour of Internet backbone providers. The second instalment reviews proposals for action to date and makes a number of recommendations as to how to move the debate usefully forward, including a number of positive measures that developing countries can take.

Brief overview of IIS

In the pre-Internet world, most international telecommunications traffic was voice. Bilateral imbalances in voice traffic flows were settled on the basis of non-cost-oriented "accounting rates". The introduction of competition by a number of developed countries in the 1980s and 1990s led to reduced charges for international calls and, given the price elasticity of demand, an increase in out-going calls from those countries to others that had not reformed. The increase in calls originating in lower-priced jurisdictions led to growing traffic imbalances, and in turn to growing settlement outpayments from developed countries (in particular, the USA, and to a lesser extent Canada) to developing countries (not to mention other developed countries that had not yet reformed their telecoms markets). The USA viewed these outpayments as an unfairly extracted subsidy from US companies and consumers. Over time, with the spread of competition, market access liberalization under the World Trade Organization (WTO), technological innovations, as well as the persistent efforts of US carriers and administrations, international accounting rates have been driven downwards, closer to costs.

Most data traffic (e.g. intra-corporation communications, international financial and transport transactions, etc.) bypassed the public switched telephone network and the accounting rate regime, and was carried over leased lines to its destination or exchanged between carriers on the basis of commercial negotiations. With the widespread use of IP-based technologies and services by business and consumers (e.g. for e-mail, file transfers, World Wide Web and, increasingly, voice and streamed audio/video), data traffic now swamps all other telecommunications traffic flows.

Around the world there are now thousands of Internet service providers (ISPs) providing Internet access to hundreds of millions of residential and business users, by wireline and wireless means; millions of content providers; and dozens of major high-capacity, long-haul Internet data carriers known as Internet backbone providers (IBPs), that own and/or lease transport facilities[1]. Those IBPs that provide national, inter-regional and worldwide Internet connectivity are the largest carriers, known as Tier-1 backbones (Kende, 2000, p. 7). The next tier down are those that provide national and regional connectivity; then there are those IBPs that are purely national or sub-national in reach. Thus, Tier-1 backbones interconnect on a settlement-free basis with their Tier-1 peers; Tier-2 carriers peer with their counterparts, and so on own the line (see Figure 1).

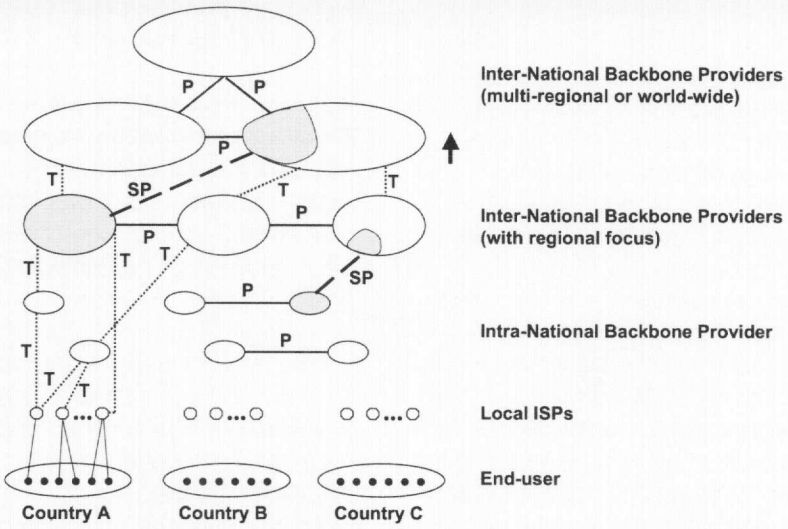
According to Kende (2000), there were only five Tier-1 IBPs in the industry in 2000: Cable & Wireless, UUNet (MCI Worldcom), Sprint, AT&T and Genuity (since taken over by Level 3). Other large IBPs include BT, France Télécom, NTT, SingTel, Teleglobe, Telia and Telstra.

The commercial terms on which traffic is relayed between ISPs and IBPs and amongst IBPs are negotiated on the basis of a number of factors, which include carriage capacity, geographic coverage, traffic volumes, ability to guarantee performance or other conditions of service (redundancy, outage repair times, security, upgrades to higher transmission speeds, as well as liability for information transported).

Generally, where two interconnecting ISPs or IBPs are roughly equal in terms of such valuation metrics, their bilateral arrangement will provide for the exchange of traffic on a settlement-free basis. This is known as peering. In a peering arrangement, each IBP covers its costs by billing its own customers, rather than by receiving compensation from IBP counter-parties. However, as Antelope (Consulting (2001a, p. 16) notes, "one peer will not allow traffic from another peer to transit its network to a third IBP" on a settlement-free basis. The customers of peers receive an advantage as well; namely, end-to-end connectivity, as far as each peer's network reaches. This reduces the number of "hops" from network to network and the risk of packet loss or other service degradation. While the "one-hop" interconnectivity of peering promises high quality of service, there are no performance guarantees in peering arrangements.

There are two types of peering arrangements, public and private. Public peering occurs at facilities known as network

Figure 1



Source: European Union Commission (2002, p. 5)

access points (NAPs) or Internet exchange points, which are major Internet interconnection points that are available to third persons generally. At NAPs, multiple IBPs and ISPs interconnect and exchange traffic on a settlement-free basis, no matter the difference in their valuation metrics; i.e. unless the facility is one where the users are its owners, the only money that changes hands at NAPs goes to the person (sometimes called a "third party administrator") that operates and maintains the facility for profit (Frieden, 1999, p. 235).

Where there are commercially significant disparities between two parties, the larger or more capable IBP will ask the smaller or less capable ISP or IBP to pay to interconnect. Such an arrangement (known as a transit agreement) puts the parties into a customer-supplier relationship[2]. In a transit arrangement, the smaller party agrees to pay the IBP to "deliver all Internet traffic that originates or terminates on the paying provider regardless of the destination or source of that traffic" (Antelope Consulting, 2001a, p. 17). In other words, there are performance guarantees in transit agreements, a feature that is not present in peering arrangements. The IBP providing the service will route traffic from the customer to its destination as far as possible over its own network and then via other IBPs and ISPs until the end-user. As Kende (2000, p. 21) puts it, "transit gives a backbone access to the entire Internet, not just the customers of the peering partner". Where a customer has a choice of backbone suppliers, it may choose to negotiate further transit agreements with other IBPs in order to achieve global access. But absent choice or given internal cost or resource considerations, a customer may find itself dealing with an IBP that needs, in turn, to work out transit arrangements with other IBPs so that those customers can have not merely national or regional, but global connectivity.

The mechanics of charging for transit services are as follows: The smaller ISP/IBP pays the larger IBP network access charges, known as "port charges", for the physical interconnection of their two networks. The smaller party then leases from the larger IBP the carriage capacity that it needs to transport data to and from its customers; the fee for transport is based on the amount of capacity leased, not on the volume of traffic. Smaller parties that are transit customers are required to pay the IBP for full-circuit cost (i.e. the whole connection with the other country, rather than merely the half-circuit as in the accounting rate regime), plus the cost of network access. In this manner, the IBP connects local, regional and national ISPs and IBPs, as well as Web hosts and other content providers, that do not have the geographic coverage necessary to reach all their actual or potential customers. The IBP is essentially a middleman, a network intermediary, providing a commodity service (network access, transmission, bulk interconnectivity), rather

than value-added. However, as Kende notes, there is a growing trend to IBP differentiation based on new services that rely on quality of service (QoS) standards and guarantees[3].

Peering and transit are complementary and substitutable functions. The arrangements are worked out on a "commercial basis"; i.e. without observance of government-imposed rules or regulations. While transit provides end-to-end connectivity with contractual guarantees of service quality and performance for a fee, peering provides connectivity as far as each peer's own network extends, without formal guarantees, on a settlement-free basis. There are advantages and disadvantages to each arrangement. There are incentives to build out one's network as far as possible, so as to minimize internal costs, as well as payments to other IBPs, and so as to guarantee service performance by keeping traffic on one's own network or by reducing the number of "hops" between one's customers and their counterparts. However, an ISP/IBP that evolves from a peering to a transit arrangement faces a rise in costs, which may or may not be mitigated by reduced internal costs and the value of the performance guarantees that it receives[4].

Complaints and counter-arguments

The complaints against IIS feature mainly developing versus developed countries, and the polarization of rich and poor is another expression for the digital divide. The principal exception to that generalization is Australia (with moderate support from Mexico and Singapore) whose authorities are concerned that large IIS settlement outpayments by other operators are having a deleterious impact on the domestic market for Internet-based services. Developing countries, of which China is the most active at this time (People's Republic of China, 2002), argue that the reversal of fortunes from Net international settlement inflows to net outflows is an impediment to the development of the Internet and of their economies in general. Thus, they say that they are deprived of revenue for investment in telecommunications and other government-funded activities. Stemming from this situation, developing country critiques of IIS fall into two categories:

(1) the arrangements are inequitable; and
(2) the arrangements are either themselves anti-competitive or they nurture an environment in which anti-competitive behaviour can occur without regulation or other disciplines.

On the side of the "complacents", the USA is the principal advocate of the status quo (i.e. *laissez-faire* in Internet-related matters). The USA are largely supported by Europe, Japan, Canada and the OECD. They argue that the present situation provides incentives to build infrastructure to compete with and bypass North American IBPs, but that if there is a problem, it is the high cost of Internet access in developing countries, due to the monopoly pricing behaviour of incumbent PTOs, a problem that is within their power to resolve by liberalizing their markets (OECD, 2002a; Antelope Consulting, 2001b)).

Are existing IIS inequitable?

Reversal of fortunes – negative impact on development

The principal complaint of unfairness that developing countries have about IIS is that the USA does not recognize as a problem what other countries now experience. When the USA made net outpayments to other countries under the old accounting rate regime, US carriers and officials argued that this was an unfairly extracted subsidy from US citizens and consumers. The USA fought hard to overturn circumstances that were not in their favour. Now that payments apparently flow from developing countries to the USA, the latter refuses to recognize the plight of other, less prosperous countries. To developing countries, this smacks of hypocrisy, double-standards and "pay-back time".

Developing countries argue that IIS settlement payments "drain wealth", raise costs to local users and prevent the development of an efficient ICT sector. As China puts it, "ISPs and Internet users outside North America are significantly subsidizing US ISPs and their customers" (People's Republic of China, 2002, pp. 7-8).

Reports indicate that IIS are a not insignificant cost to developing country ISPs, which then have to charge their domestic customers correspondingly more in Internet access fees. For example, Colombia calculates that IIS represent "an important percentage (nearly 33 percent) of the total cost of the service paid by users" (CITEL, 2001a, p. 1). A Mexican survey shows that "the average percentage of the costs representing international rates is 23 percent of the overall rates for access to Internet" by ISPs in that country (CITEL, 2001b, p. 3). Antelope found among the developing countries covered by its study that "international connectivity is generally in the range of 20 percent to 35 percent of ISP costs", and that "global connectivity usually accounts for less than 10 percent of the total price"; the rest being the cost of international private leased circuits (Antelope Consulting, 2001b, p. 3). It is uncertain whether these statements are based on the same statistical methodology, and it remains unclear for most countries what proportion of the purported international costs is paid to the incumbent PTO, as opposed to the foreign IBP.

China asserts that the costs of IIS have a negative impact, particular in terms of the uneven growth of the Internet, inability to achieve economies of scale, and reduced service quality:

> The trend to promote the dominance of Internet Tier-1 carriers based in North America, and the concentration of content and capacity at the centre, prevents the Internet from growing evenly in the world (People's Republic of China, 2002, p. 8).

> The current payment system means economy of scale cannot be obtained, and the development of interrelated industries (such as e-commerce) [is] hindered. Service provision may be degraded because some operators want to reduce the costs and to do this there will be a need to cut back on circuit provision and standards (People's Republic of China, 2002, p. 8).

China's allegations could be of serious concern, but they have not been demonstrated to be true. Further, it stretches somewhat the imagination to believe that China's top three PTOs, which must inevitably rank amongst the largest carriers in the world, could not achieve economies of scale because of IIS. However, such concerns would appear more plausible in the case of poorer developing countries.

The Australian Competition and Consumer Commission (ACCC) presents a scenario from Australia which may illustrate how the IIS business model impacts developing country ISPs:

> Under the present unilateral model of the download volume charge . . . , an ISP can generate economies of scale if its retail customer base typically consists of low volume users. On the whole, however, as applications and Web pages become more sophisticated, every user will increase his/her received volume per "hit". This means that a retail ISP will face download charges from the upstream provider that progressively erodes whatever economy of scale the ISP has developed – unless the download charge fails . . . Under this circumstance, the individual subscriber can become a liability (ACCC, 2000, pp. 66-7).

ISPs in developing countries will charge most where the price elasticity of demand is least; and that would tend to be Internet end-users, who would tend to be from amongst the relatively more prosperous segments of society.

Representatives from developed countries believe that high Internet access fees in developing countries are largely attributable to monopoly pricing on the part of incumbent operators facing little or no competition, and that the solution therefore lies with increasing competition and lower Internet access prices at the retail level.

IBP representatives feel that, while payment outflows may hold back development in complainant countries, the problem should not be resolved at their expense: the old days of using telecommunications carriers to provide subsidies to developing countries are over. Indeed, the low levels of infrastructure investment and competition in developing countries reflect the low incomes in those countries. But this is a development issue, not a telecommunications-specific problem.

While high Internet access fees charged by monopoly incumbents would seem to be a real problem, they may be only part of the IIS story. The business model imposed "unilaterally" by foreign IBPs, whereby ISPs/IBPs lease full circuits all the way through to the USA or Europe, may not be healthy for developing country ISPs and their low-income customers.

At a more macro level, Kelly (2001, p. 7) of the ITU observes that, in the "Telecom World, cash flows from core to periphery of network", whereas in the "Internet World, cash flows from periphery to core of network". Clearly this appears inequitable to those on the periphery of economic development, when the core is so much richer. Consequently, as Kelly (2001, p. 2) also points out, the least developed countries are falling further behind in the context of the digital divide. This core/periphery analysis has been made before, notably by Raoul Prebisch in the 1950s, and earlier by Harold Innis (see, for example, Prebisch (1959) and Innis (1930)). However, while wealth flows to the core, some of it also flows back to the periphery, particularly if countries at the edge adopt appropriate macro- and micro-economic policies. Singapore, South Korea and Taiwan are outstanding examples of such development, but not the only ones. Indeed as Innis demonstrated, Canada's early economic development as a European colony was attributable almost entirely to that phenomenon. The challenge is to move up in both the international division of labour and the value chain of production and distribution of goods, services, capital and intellectual property, so that one's efforts to create wealth are better rewarded.

The hierarchical model of peering and transit

A large number of developing countries are of the view that the existing model with its either/or peering/transit arrangements (or more specifically, the refusal of large IBPs to peer with smaller IBPs/ISPs) is inequitable, because it establishes, without adequate justification in their eyes, a hierarchy that differentiates among large and small operators and requires large and growing payments from developing country IBPs/ISPs to developed countries' IBPs.

There appear to be conflicting interpretations of the word "hierarchical", and whether it applies to IIS. Frieden (1999, p. 236) believes that the Internet has become "more hierarchical in the sense that the Tier-1 ISPs have reduced the number of ISPs with which they peer on [a] . . . cost-free basis"[5]. In contrast, the OECD believe that "the Internet is becoming less hierarchical" (OECD, 2002a, p. 4), and it draws, *inter alia*, on a Telstra presentation. This shows that lower tier IBPs and ISPs are increasingly interconnecting amongst themselves, rather than relying on higher tier networks to route their traffic (Huston, 2001, pp. 33-8). The presentation also shows fewer and fewer layers to the pyramid and that the top layer is becoming more concentrated among fewer operators (Huston, 2001, p. 39). It would therefore appear that, while the number of layers may be diminishing, the Internet is becoming more clearly stratified so that one can identify more clearly what tiers the different players fit into. It would be material to know whether Tier-1 IBPs have increased their "distance" from other IBPs and are increasingly relegating them to transit status and

whether the growing interconnections among lower tier operators are equivalent (i.e. whether the potentially reduced financial costs compensate for the reduced technical quality of multiple hops between different networks).

As to the alleged unfairness of the "refusal to peer", as discussed above, there are advantages and disadvantages to both settlement-free peering and paid transit. The relevant questions are: On what basis are demands for paid transit made? And is the cost of transit offset by reduced internal costs and the value of the performance guarantees received? Unfortunately, the empirical data needed to answer these questions are not available.

Bearing all the costs of transmission and access

In a transit arrangement, the smaller operator pays for transmission in both directions, say to and from North America, as well as network access. As China puts it:

> ... Chinese Internet backbone providers are wholesale customers of North American backbones and have to pay the full costs of circuit and network access. Chinese providers undertake the total cost of overseas fibers, interconnection equipment and some satellite transmission equipment by paying for the circuit access. The network access fee is the cost of using American networks (People's Republic of China, 2002, p. 7).
>
> North American backbones also charge double interconnection fees by transferring traffic between other countries. This situation has resulted in increased prices for Internet services for non-North American customers (People's Republic of China, 2002, p. 8).

Large IBPs do not deny this. Rather, they justify it on the grounds that historically most international connectivity was only available over routes through the USA and most Internet content was based there as well. Since the traffic flows were caused by users in other countries, not by US users, and the beneficiaries of these flows are foreign as well, those foreigners should pay for transmission in both directions.

The OECD secretariat believes that this problem is temporary and will disappear with "more extensive use of peering" (OECD, 2002a, p. 4). The question is whether this is in fact happening and whether there is any disadvantage inherent in top tier IBPs' insistence on transit arrangements with smaller IBPs/ISPs.

Growing outpayments despite increased in-region hubbing and falling bandwidth prices

While facilities for intra-regional hubbing have become increasingly available, and thus less intra-regional Internet traffic is routed via the USA[6], the bone of contention is inter-regional connectivity. The cost of inter-continental communications (Asia-North America, as well as Asia-Europe via North America) is said to be large and growing. In other words, the problem is not going away, despite the claims of officials from the US State Department, the Federal Communications Commission (FCC) and the OECD, and despite declining prices on a per-unit basis.

China states that "[t]raffic between North America and some countries [is] becoming balanced as more non-US network access points are established and traffic is staying within regions" (People's Republic of China, 2002, p. 6), but still those countries are required to pay full-circuit cost and network access. Further, China charges that "[the] issue of IP network charging is [becoming] much more important" (People's Republic of China, 2002, p. 8). This same complaint is shared by other governments outside North America, Europe and Japan. Moreover, predictions from Ovum (2001) and Telstra[7] also support these complaints, but the methodologies underlying their predictions are questionable.

The magnitude of outpayments, their rate of growth, etc. are not clearly documented, for no reliable data is available. Absent reliable information and methodologies, it is not possible to know what is really happening.

Are existing IIS anti-competitive?

Lack of transparency

Many IBPs have corporate policies on peering and transit, some of which are published[8]. Consequently, the various factors used to determine who pays for transit and how much, and who receives settlement-free peering, are generally known. In addition, as Antelope demonstrates, some of the language that may be used in the agreements is also known. But what is not known are the actual "metrics" for calculating the weighting of the different factors, the fees that flow from those calculations, and other behaviour in the market. The agreements that parties enter into contain non-disclosure clauses to keep them secret, and no regulatory agency requires them to be filed or formally collects data, even on a confidential basis.

Telstra (Huston, 2001, p. 4) concedes that "there are no objective metrics that determine any particular bilateral relationship. Each outcome is individually negotiated". In other words, the result comes down to negotiating skill, experience, power and other non-quantified qualities.

Antelope is of the view that the lack of a requirement to file IIS agreements with a regulator favours anti-competitive conduct (Antelope Consulting, 2001a, p. 44). While Antelope catalogues numerous theoretically possible problems[12] and provides a long list of anti-competitive practices (Antelope Consulting, 2001a, p. 44) identified in the laws of a number of countries, Antelope is not able to demonstrate actual anti-competitive behaviour.

The General Accounting Office (GAO) pointed out in its study of the Internet backbone market, that the US FCC's information gathering is limited to "informal and experimental methods of data collection" (GAO, 2001, p. 29). Therefore, the FCC does not and cannot know whether there is any

anti-competitive conduct amongst IBPs and ISPs. Accordingly, the GAO (2001, p. 2) concluded:

> No publicly available data exist to allow a precise economic evaluation of the competitiveness of the Internet backbone market.

The Cook Report (2002, pp. 5-9) on Internet claims that the lack of regulation and current financial strictures have led to the Internet backbone industry becoming a non-transparent, customer-unfriendly oligopoly:

> Because the ISP and backbone industry is unregulated, what knowledge we have is sketchy and largely subject to the willingness of folk who both know and will take the risks of speaking up. Given the state of the industry such folk are few and far between. Over the past five weeks we have had conversations with a dozen or so people who are closely involved. Some of these suggest that the oligopoly is engaging in behavior that could blow up in a manner similar to the capacity swaps that blew up early this year. ... [E]ither in bankruptcy or in dire financial difficulty, Internet core behavior is not likely to become customer friendly.

This critique is from a US source, and it concerns conditions in the US market foremost.

The absence of transparent transactions and sector-specific regulation, and the refusal to peer, need not mean the absence of effective competition and efficient outcomes. The descriptions of bargaining behaviour between IBPs and ISPs on high-density routes (Kende, 2000; OECD, 1998), other than those in *The Cook Report*, appear to be consistent with behaviour in most competitive intermediate product markets, where contracts are not made public to competitors and there is a lack of rules other than the basic framework laws (e.g. competition, consumer protection, bankruptcy). But absent the public availability of transit agreements, or at least monitoring by a competent regulatory authority, IBPs can constantly raise the bar in negotiations so that fewer and fewer parties qualify for peering and so that transit fees are kept artificially high.

Such a scenario can only work when there is little or no choice of alternative suppliers, and developing country routes are not as competitive as those in the US market. Thus, where there is little choice, the lack of transparency can mask behaviour that restricts competition and saps economic efficiency and consumer welfare. Moreover, when many IBPs have been tottering on the brink of bankruptcy, there is an incentive to over-charge and engage in anti-competitive behaviour, and the lack of transparency and the modest competitive pressures on developing country routes create an environment propitious to such conduct. Thus, it is not surprising that the little information that is forthcoming is insufficient to convince complainants that their suspicions are unfounded.

Dominance

The concept of dominance[10] in the "Reference paper" is expressed in terms of the definition of "a major supplier". There are two parts to this definition. The first relates to control over essential facilities (i.e. facilities that are provided by a single supplier or a limited number of suppliers, and cannot easily be substituted for technical or economic reasons). The second relates to the supplier's ability to use its position in the market (i.e. "to materially affect the terms of participation[,] having regard to price and supply[,] in the relevant market"), such that the supplier can act in effect free of competitive constraint. A company that meets either of these conditions is a "major supplier" according to the Reference Paper.

Australia (n.d.) tries to make a case that Tier-1 backbone providers collectively meet the "Reference paper" definitions of major supplier:

> Tier-1 [IBPs] operating together are in a strong market position, both because of their high number of subscribers in the market and their ownership of the infrastructure. It is possible that they could be classified jointly as a "major supplier".

Antelope sees the potential for anti-competitive behaviour residing primarily in the relative dominance of larger IBPs *vis-à-vis* smaller IBPs and ISPs:

> The larger the market share of an IBP, the more important it will be for any ISP to interconnect with the IBP so as to reach the latter's customers. IBPs can therefore hold a dominant position in the relevant market for backbone connectivity (Antelope Consulting, 2001a, p. 9).

Thus, if a large IBP refuses to peer or offers unfavourable transit terms, the smaller party will need to find another IBP – if there is one – with which to enter into a transit agreement.

The ACCC sees the risk of smaller operators being exhausted financially and otherwise before they have negotiated all the transit agreements they require:

> ... if the trend of [IBPs] refusing to peer at the commercial NAPs becomes widespread, small ISPs will have no access to backbone infrastructure unless they can negotiate individual arrangements with each [IBP]. The Australian experience indicates that this is unlikely to be a short process, unless the small ISP is prepared to accept an inequitable arrangement to stay in business (ACCC, 2000, pp. 82-3).

Gareiss (1999) pointed out the disadvantages for smaller ISPs in dealing with what she called "the old boys' network":

> The upshot is that the players with the biggest networks get to call the shots. The largest and oldest ISPs set up direct peering links with one another and share the cost. But smaller ISPs either have to buy their way in to this old boys' club, at an exorbitant price, or send their traffic through congested public peering points.

Therefore, ISPs will prefer to negotiate with IBPs offering one-hop connectivity, in order to conserve and focus their resources on business development, instead of on the negotiation of transit agreements.

Kende, the GAO and the OECD reported that Internet backbone markets in the USA (and the UK) are competitive, but that they would be concerned by the emergence of a dominant backbone (Kende, 2000, pp. 13-15; GAO, 2001, p. 2; OECD, 2002a, p. 4). Both the GAO and the OECD

reported concerns that the telecom industry downturn could lead to such a development. More than two years after the telecom investment bubble burst, there remains great uncertainty about the market share and prospects for survival of the top-tier IBPs, not to mention numerous lower-tier carriers.

These concerns must apply *a fortiori* to developing countries, where far fewer IBPs offer their services and which would be more vulnerable to sharp practices by firms seeking income to stave off liquidity crises at home.

Regarding IBPs serving developing countries, the OECD notes (2002a, p. 25):

> British, Canadian and French companies advertise the greatest number of routes to networks in countries with fewer than five ISPs. Leading the way was France Telecom, which provided connectivity to 29 networks in the 110 countries or territories at the end of 2000. A close second was Cable & Wireless connecting networks in 23 countries, followed by Teleglobe connecting networks in 15 countries. It should be noted that around one-third of the countries had ISPs that were connected via more than one foreign backbone provider. ... [N]etworks that might be said to be USA networks had a relatively lower ranking than might have been expected.

The draft report, of December 2002, prepared by Svend Kraemer, an EU official, as chair of the ITU rapporteur group on "international Internet connectivity" specifically mentions Teleglobe as the provider of the "single dedicated communication link to an Internet backbone network" for Burkina Faso (Kraemer, 2002, para. 14) Kraemer (2002, para. 15) also states that if a case like Burkina Faso were to occur in the EU, then:

> ... the European approach ... would mean the application of regulatory tools such as cost orientation of prices, non-discrimination, transparency or accounting separation.

This is unofficial recognition that, if some developed countries faced the same conditions as many developing countries, there would be a determined effort to mitigate the risk of monopoly pricing and other anti-competitive behaviour.

Antelope notes that, while developed countries oppose action on a matter of concern to developing countries, mere fear of an abuse of dominance sufficed in the past to bring forth action by US and EU regulators in the Internet backbone market:

> ... fear that a large IBP or a number of IBPs could abuse their dominance in the market for backbone services" [was recognized as a legitimate concern and] proved to be effective in helping block the WorldCom/Sprint merger (Antelope Consulting, 2001a, p. 9).

Antelope also points out that in some parts of the world, where few top-tier IBPs are present, they demand exclusive rights to provide transit[11]. One must ask why the governments in these countries allow such exclusive arrangements:

- Do they know what is going on?
- Why is there no alternative?
- What benefits do they receive in return for these exclusive rights?

Certainly many developing countries are not paragons of transparency, and their policy and legal environments will favour exclusive operators to the detriment of consumer welfare.

Leaving aside the question of dominant IBPs from developed countries, the OECD notes that the monopoly telecommunications companies that many developing countries maintain are significant barriers to the development of the Internet and competitive markets for Internet traffic exchange (OECD, 2002a, p. 11). High Internet access charges in developing countries (together with low incomes) suppress the demand for and penetration of Internet services. Otherwise, perhaps, there would be more ISPs, and these ISPs could generate more traffic, which in turn could be aggregated so as to negotiate better transit terms (e.g. lower costs per unit of traffic exchanged, and perhaps other conditions) and perhaps even be able to peer at some point. As things stand, these countries do not generate much traffic and what little traffic there is would not sustain multiple competing ISPs and IBPs.

While arguments for the existence of dominant backbones may be easier to demonstrate on developing country routes, there is the possibility that the market for IBPs has the characteristics of a natural monopoly, and that those characteristics favour operators that offer one-hop connectivity (between networks). After all, the ability to offer one-hop global connectivity, instead of four or five hops via smaller IBPs
(i.e. a single technology platform enables technically superior connectivity), confers a real competitive advantage on top-tier IBPs. Smaller ISPs would appear to have a preference for negotiating fewer transit agreements, so as to conserve resources and focus on business development. An agreement with a single Tier-1 IBP that can offer one-hop connectivity to instant world-wide access would therefore be highly desirable in the eyes of an ISP. Also in favour of industry concentration are the high fixed costs of backbones, with increasing returns to scale. The larger a backbone's network, the greater its ability to internalize costs, minimize payments to other IBPs and increase fees from other IBPs and ISPs.

Kende (2000, p. 39) would appear to disagree that there is this pressure toward concentration in the Internet backbone market, which was one of the reasons for regulation of the telecommunications industry:

> ... this paper shows how the market outcomes of a competitive Internet backbone market can differ from the network industries

characterized by market power that historically warranted interconnection regulations.

But is it really different?

Moreover, Kende (2000, p. 29) acknowledged a risk of a "balkanization" resulting from IBPs offering new services based on QoS guarantees and specific technology with which others cannot easily interconnect:

> Thus any balkanization of the Internet would result in a classic example of network externalities; the specific backbone choice of each consumer would influence the choices of other consumers.

QoS and technology developments can reinforce the advantages of one-hop connectivity via top-tier IBPs and help build a position of dominance in the market. They could result in the facilities of some IBPs becoming "essential facilities" through which content must pass if customers are to have access to it and if content-providers are to have access to customers.

It is possible that the pressures toward concentration and the risks of market failure are even greater than in the telecommunications industry of old. The common IP technology underlying so many disparate applications (therefore economies of both scale and scope), and the WTO Agreement on Basic Telecommunications which has opened borders to international trade and investment in IP networks and services, have created the opportunity to exploit potential economies of scale and scope over a much greater geographic area than in purely national markets. Combine this situation with the low incomes and limited options of many developing countries, and it seems clear that IBPs from developed countries face few competitive pressures when negotiating transit arrangements with developing country IBPs.

Monopoly pricing and collusion

Whereas Kende was confident that five Tier-1 IBPs provided for a competitive market in 2000, Graham (2000, p. 10) considers possible implicit collusion, instead of oligopolistic competition, among a group of five players or less, especially if they are able to "punish" participants that deviate from the group's norms:

> ... if there are significant barriers to entry (or equivalently, there are incumbency advantages), such that [fixed costs] for a new entrant [are] significantly higher than for an incumbent, then ... [i]nstead of competing, firms could act collusively to charge the monopoly price and agree to split profits among them ... every firm would be better off to collude rather than to engage in oligopolistic competition. As is widely noted, however, for firms to collude and share profits does not achieve a Nash equilibrium, because there is an incentive for each firm to cheat on the collusion by undercutting the monopoly price and taking market share away from rival firms ... However, if firms explicitly realize that collusion creates an incentive to cheat and that this leads to a Pareto-inferior outcome, they might then agree to "punish" any price-cutter ....

Perhaps a downgrading from peering to transit status is a form of punishment among IBPs. For those that adhere to certain norms of behaviour, payment-free settlement and the prospect of profit maximization are available.

Australia (2000, p. 3) sees Tier-1 backbones colluding explicitly, like a cartel:

> ... denying usage-oriented arrangements and demanding geographically matching infrastructure, creates the anomaly that only direct competitors get favoured treatment. The effect appears to be very similar to a collusive buying cartel.

China asserts, without using the word "collusion", that IIS pricing attests to market failure:

> ... there appears to be conformity in pricing that suggests a lack of market competition. This disadvantages countries outside North America (People's Republic of China, 2002, p. 8).
>
> ... the commonality of current pricing policies and actual price implemented by the North American Internet service providers shows all the characteristics of market failure which can affect competition, raise prices and harm the interest of Internet providers in other countries and regions (People's Republic of China, 2002, p. 15).

The researchers who wrote China's submission to SG3 are ultimately employees of the Ministry of Information Industries (MII), which is the principal shareholder in and regulator of China's telecommunications companies. Assuming that these researchers received access to all or parts of the transit agreements that these companies have entered into, then they may have a factual basis for these statements. However, given the weak data that they present in support of their arguments, and given the non-disclosure provisions in transit agreements, these claims may be based merely on anecdotal evidence, or indeed be hypothetical. Another possibility is that foreign IBPs may assume that the terms of their transit agreements will be divulged to MII, and consequently they give their Chinese counterparts the same terms and conditions – so as to avoid accusations of price discrimination, which is not anti-competitive *per se*, but which could be expected to irritate the Chinese who are seen to be sensitive about any forms of discrimination. The "conformity" or "commonality" would relate to the agreements entered into by each foreign IBP individually; not that all IBPs would give China's operators the same terms collectively, unless there really is collusion. However, in the absence of facts, this is all mere speculation.

Kende's (2000, p. 36) position is that:

> no indication has been provided by [complainants] that prove that the interconnection agreements to which they object reflect anti-competitive actions on the part of US backbones.

For its part, the OECD allows that there may have been monopoly pricing of Internet access and transport in the early days of the Internet simply because, other than in a few countries like the USA and UK, monopolies prevailed (OECD, 2002a, p. 5). While the OECD finds no evidence to support allegations of anti-competitive behaviour today,

theirs is a frank and realistic assessment of how telecom markets would have functioned as they evolved from the old ITU-sanctioned gentlemen's club into a "dog-eat-dog" world of competition. However, on many routes, particularly to developing countries, monopolies continue to reign on the developing country end, few international carriers provide services from the developed country end, and many IBPs insist on exclusive interconnection arrangements. Therefore, there is a strong probability of continuing monopoly pricing, abuse of dominance and perhaps collusion.

Telstra provides support for the view that IBPs engage in monopolistic pricing on underserved developing country routes: "The first system to connect bandwidth-starved points may capture sales at a much higher price than when the rest of the bandwidth barons ... join in" (Huston, 2001, p. 21). If these "bandwidth barons" do not join in, the first mover retains a monopoly advantage.

China asserts that interconnection "fees are not cost-oriented" (People's Republic of China, 2002, p. 8), and Antelope Consulting (2001a, p. 12) believes that "the possibility remains of an artificially high floor for transit prices that does not reflect actual cost". There is every reason to believe that IBPs do not charge cost-oriented fees: after all cost-oriented interconnection is a regulatory concept and IBPs are unregulated.

IBP pricing may be consistent with Ramsey pricing, which is considered to be an economically efficient form of price discrimination, whereby the price charged is highest on those products for which demand is least elastic. However, while Ramsey pricing may have the potential to be more efficient than cost-based pricing, it can be abused in the context of a monopoly or cartel. As Laffont and Tirole (quoted in Jeon, 2002, p. 8) say: "Ramsey-Boiteux prices are the same as those of an unregulated monopolist, just a notch down".

Nevertheless, it would be difficult to identify either Ramsey pricing or anti-competitive price discrimination or monopoly pricing, without detailed information on circuit costs and the prices charged to other ISPs.

Further, IP networks have no standardized usage detail records. Thus, a larger IBP can miscount traffic flows and overcharge for its service, and the smaller IBP/ISP may have no choice but to grin and bear it, and pass it on to its customers. This happens frequently in business and residential telephone billing, but in many countries the customer has redress through an independent regulator. In an industry rife with accounting irregularities, one should not be surprised if IBPs seek to strengthen their financials at the expense of clients whose demand is relatively price inelastic and who do not have recourse to an independent and competent regulator.

In addition, Antelope Consulting (Appendix, 2001a, p. 12) identifies a "not unlikely" scenario whereby:

> developing country backbone providers, and smaller developed country ISPs, obtain [...] terms for transit that are not as favourable as those provided to the global IBP's own affiliate ISPs. Commercial reality dictates that preferential terms for peering and transit for global IBP affiliates exist, in the absence of any legislation that would impose an obligation on global IBPs to transparent and non-discriminatory access to their networks.

Where there is a choice of IBPs, there are commercial disciplines against abuse, in that an ISP can shop around for better terms from other IBPs. However, it is not clear in this non-transparent market that such disciplines are effective, especially if there is collusion among Tier-1 IBPs. The problem is greater for developing countries in that little competition provides a lot of scope for anti-competitive behaviour, especially when behaviour is unmonitored and unregulated.

Sundry restrictive business practices

Antelope also identifies several potentially restrictive practices that IBPs reputedly like to include in transit agreements, but regarding the impact of which smaller, inexperienced parties may not be aware. For example, there are said to exist in transit agreements, certain "provisions dealing with operational matters", that allow the more powerful IBP to "degrade the quality of interconnection", implement "slow-roll increases in capacity", agree to interconnect only "at congested network access points", or be "very slow in installing the interconnect link in the first place" (Antelope Consulting, 2001a, p. 45) with impunity. Further, Antelope points out that there are sometimes in peering agreements provisions on "packet loss" that allow one peering partner to impose penalties on the other "if its network sustains a packet loss of say 5 percent over a period of one to three months. The penalty might be to purchase transit from the peering partner instead of peering on a settlement-free basis" (Antelope Consulting, 2001a, pp. 47-8)[12]. The provision denies the allegedly delinquent party the opportunity to terminate the relationship and seek an alternative arrangement with a provider of its own choice.

Antelope Consulting (2001a, p. 45) says that "[t]he smaller ISP will try to guard against such anti-competitive behaviour by seeking specific provisions on operational matters". But the smaller party may not have the negotiating leverage to obtain such QoS guarantees, or even know that it needs to include such guarantees in the agreement, if its management or legal advisors are inexperienced in these matters. With peering and transit agreements subject to non-disclosure agreements, it is difficult for new entrants to be well informed of the issues they will face in a negotiation with an IBP, without retaining expensive legal counsel.

Antelope also identifies a number of content-related provisions that are not anti-competitive *per se*, but that may constrain a customer's business plans. One example would be "restrictions on monitoring or capturing customer data" (Antelope Consulting, 2001a, p. 45) for marketing or business development purposes. However, since some practices may entail the violation of privacy, this may be a good thing. Another example would be provisions that make the other party "liab[le] for content of information passing across the [points of interconnection]" (Antelope Consulting, 2001a, p. 45)[13]. Such provisions raise the question whether ISPs and carriers should have any control over or liability for the content that they transmit. Because the laws in certain jurisdictions do impose liability on carriers and ISPs:

> [a] global backbone will quite often seek an unlimited liability indemnity from its customers that will include smaller backbones, ISPs and transit providers. ... Whether the smaller backbones will accept such an onerous condition depends entirely on the commercial value of the agreement and the bargaining positions of the parties concerned (Antelope Consulting, 2001a, p. 46).

It is in this context that Antelope sees the potential for anti-competitive behaviour in content-related provisions.

The ACCC also identified problems in Australia's content market due to transit charges. Specifically, if the backbone service provider had a different reading of traffic flows, such that the IBP "did not accept that the ISP inbound to outbound ratio was the result of hosting content", then the IBP raised its fees.

> The result of this was for some content providers to have their sites hosted in the US to keep their costs down. If this movement of content providers offshore becomes a trend, it seems reasonable to expect that the traffic ratio of inbound to outbound with the US would move back further in favour of US ISPs. This may result in a reduced incentive for US providers to share the cost of interconnection with Australian providers. The ultimate effect may be permanent damage to efficient network investment in this country. Australia may then find itself with an inadequate and second rate Internet capability. Given the theories of positive feedback, the flow-on effect may be that Australian firms may find it extremely difficult to compete in global markets delivered by Internet (ACCC, 2000, pp. 84-5).

The coming on stream of new facilities (e.g. the specific availability of capacity on the Southern Cross submarine cable for Australian ISPs and IBPs) would mitigate the cost factors mentioned here. But to the extent these problems are not eliminated, they would continue to exercise a negative impact on the competitiveness of on-line content providers and e-commerce firms (Australian and other).

The OECD also observed a tendency for developing country Web sites frequently to be located in other countries. However, the OECD attributed this to high local access pricing by monopoly incumbents at one end and to better service and lower telecommunications costs at the other end:

> In some developing countries, business users cannot get leased lines because the monopoly telecommunication carrier does not provide that service. In other countries, the high price of domestic leased lines makes it more economical for business to provide services and content offshore. This tendency is well documented in a case study of Thailand undertaken for the ITU. This study reported that, of the leading 100 Thai Internet sites (in the Thai language) only 21 percent were hosted in Thailand. By way of contrast 69 percent were hosted in the United States, 5 percent in Singapore and 5 percent in Europe (OECD, 2002a, p. 27).

The OECD goes on to mention that these offshore sites end up costing domestic suppliers and users more in terms of fees to foreign IBPs and inferior response times for downloads (OECD, 2002a, p. 27). One could also mention foregone jobs for programmers and Web site designers, as well as fees to local ISPs and IBPs that might otherwise stay and help develop the local economy.

The fact that the ACCC and OECD have contrasting explanations for the movement of content sites offshore underlines the reality that there are several factors at play in determining where content providers will locate their sites. While the Australian and Thai cases appear to be documented, more empirical data and other case studies would be needed to come to some more definitive determinations as to the causes of particular developments.

Conclusion

Commercial arrangements may be working in developed country markets, where there is competition, but there is little competition on developing country routes. The only way to know whether IIS are inequitable or anti-competitive with respect to developing countries, and whether the broad public interest calls for some form of regulation, is to monitor developments and assemble reliable empirical data.

In the meanwhile, based on the information available, there are grounds for a presumption of anti-competitive behaviour on routes served by one or, at best, a few IBPs. For these IBPs are dominant, and in the absence of any monitoring whatsoever they have the opportunity to engage in anti-competitive conduct, especially where they have secured an exclusive supplier relationship as a condition of providing service to developing country markets. ■

Notes

1. Antelope Consulting (2001a, p. 15), "Very roughly ... 60+ IBPs".
2. An additional factor for consideration in commercial negotiations is the proportion of content providers among two IBPs' customers. For example, the FCC found in 2000 that "backbones may ... refuse to peer with backbones hosting a high proportion of content providers on the grounds that they are bearing the expense for more capacity than the backbone that is actually hosting the content that utilizes this capacity" (FCC, 2001). Antelope Consulting (2001a) makes a similar finding, at p. 9: " ... peering may not be offered to other ISPs or IBPs hosting a high proportion of content providers, on the ground that the expense of providing capacity will fall inequitably upon the other partner".

3 Kende (2000, p. 27), "UUNet announced a Service Level Agreement (SLA), that guarantees, among other things, the delivery speed (latency), of customers' traffic on its network. This guarantee does not extend to traffic that leaves UUNet's network, however, which encourages customers to keep traffic on-net".

4 Norton (2002) contains an interesting discussion of breakeven points for calculating the relative financial advantages of peering and transit arrangements when using different technologies.

5 It is incorrect to say that peering is "cost-free", as in a peering relationship, each IBP bears its own costs and the incremental costs of handling the other IBP's traffic. "Settlement-free" is the correct description.

6 See, for example, TeleGeography and Ovum.

7 Telstra official at OECD workshop on the Internet, Osaka, June 1998, quoted by Singapore (Minister Yeo Cheow Tong) (2000), "Speech at the 4th APEC Telecommunications Ministerial Meeting", Cancun, May.

8 See, for example, Level 3's "Policy for Settlement Free 10 Interconnection", at www.level3.com/1511.html

9 Antelope Consulting (2001a, p. 10), lists, at p. 10:

- "A 'refusal to deal', which is an attempt to drive a competitor out of business or to raise the costs of doing business".
- "A price squeeze, i.e. an attempt to raise competitors' costs by increasing the cost of an essential facility, bottleneck or service element needed by the smaller ISP to provide a complete end-to-end service".
- "Predatory pricing and/or using deliberate below cost rates".
- "Extracting from smaller ISPs agreements not to compete in certain service or geographical markets".
- "Setting a price floor on the service offered by the smaller ISP".
- "Linking the smaller ISP's access to a desired service to purchase of another services; e.g. long-haul backbone trunks".
- "Forcing a commitment to buy or lease less desirable and/or less competitively provisioned services".

10 The "Reference paper" that resulted from the WTO negotiations on basic telecommunications is the reference point for this discussion of dominance. The "Reference paper" was adopted by many WTO members as part of their commitments under the Agreement on Basic Telecommunications. The text of the "Reference paper" can be found at: http://www.wto.org/english/tratop_e/serv_e/telecom_e/tel23_e.htm.

11 Antelope Consulting (2001a, p. 44) identifies one technique by which IBPs obtain exclusivity: " ... some backbones may attempt to restrict an ISP's dealings with third party operators in order either to restrict the territorial coverage of that ISP's operations or to prevent competitors from contracting with the ISP – in other words, using a transit traffic clause to create an exclusive dealing arrangement or a restrictive trade practice, both of which could fall foul of conventional competition law principles".

12 To underline the potentially anti-competitive nature of such punishment, Antelope states that "[p]enalties can give rise to competition concerns in the EU".

13 Antelope Consulting (2001a, p. 47) notes that the "Acceptable Use Policy (AUP)" of a global backbone provider or the "Acceptable codes of practice" of the public Internet exchanges can be used to create liability for "damaging material, such as viruses, ... spamming ...".

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