Access to Customers and Facilities

The previous section discussed the conduct issues arising from market power. In this section, we discuss how the major source of market power can be countered through access policies.

Market power can be earned (eg by superior service or patented innovation) but in communications it often comes from control of an **essential facility**. Typically, the incumbent has a legacy access network which it is uneconomic to duplicate and for which there are no close substitutes (ie a natural monopoly). This market power is removed with mandated **open access**.

Specifically, this section will address:

• **Policy Issues** • **Key Concepts** • **Interconnection** • **Unbundling** • **Infrastructure Sharing Section 4** will look at the important question of the price for access.

2.3.1 POLICY ISSUES

The regulatory approach to **open access** has **evolved** as competitive business models have changed. Changes in technology have been a major catalyst for these changes. The deployment of next generation fixed and mobile access networks (NGNs) creates opportunities for cost savings and the creation of new services. It also creates challenges for traditional business models and for regulation.

In fixed networks, many incumbents are replacing copper with fibre to the street cabinet (FTTC) and then using VDSL technology over the copper sub-loop between the street cabinet and the customer's premises. Other operators, where the network architecture does not support this model, are planning for fibre to the home (FTTH). These NGN access models will result in a completely different local network architecture, where the 'central office' or 'main distribution frame' will eventually cease to exist.

Ideally, competition should extend to competing infrastructure investments. But where there is a natural monopoly in the provision of, say, a fixed customer access network it is uneconomic and unreasonable to expect duplication of such a network. The object of regulated access is to make such 'essential' or 'bottle-neck' facilities available to stimulate competition.

In the next two sub-sections, we explore how the focus of access policies has shifted with the evolution of competition (also discussed in more detail at **section 1.5.1**) and the emergence of digital communications.

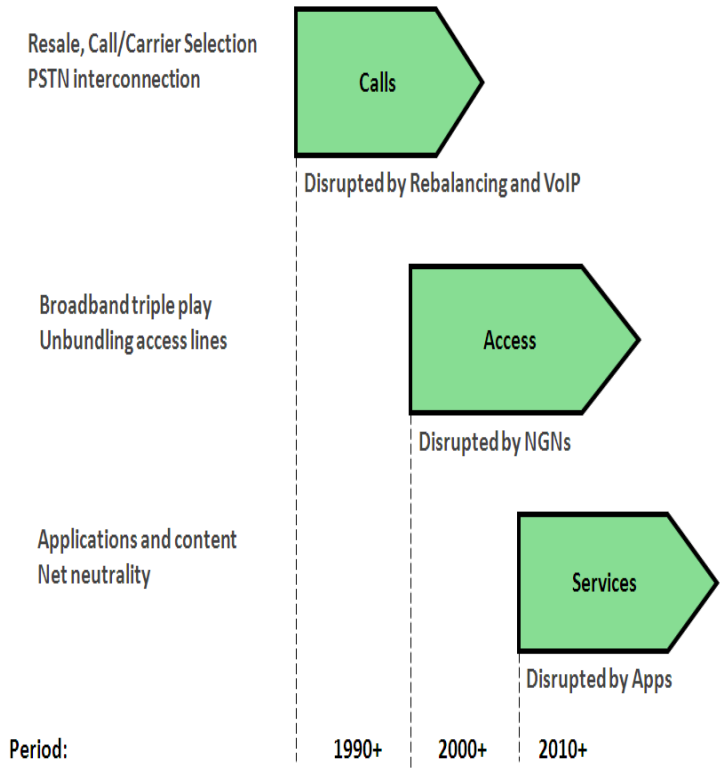
- **Evolution of competition**
- **IP interconnection**

Policy issues include infrastructure versus service competition, **universal service** (**Module 4**) and affordability.

2.3.1.1 EVOLUTION OF COMPETITION

Competitive business models and the focus of regulation continually evolve:

◂ Figure 3.1: Evolution of Competition and Regulation



Three distinct phases are identified [*]:

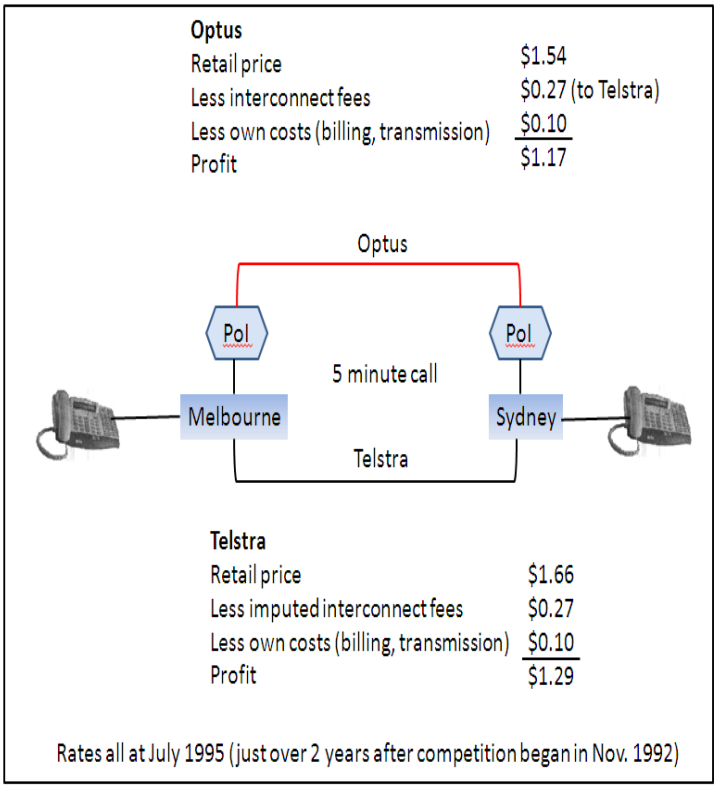
- **Calls:** When developed country fixed markets were liberalised in the early 1990s, incumbent pricing structures relied on subsidising take-up of fixed lines with high call tariffs; particularly for long-distance and international calls. Call markets were opened with Call Selection (dial a pre-fix to use a new entrant) and/or Carrier Pre-selection (all long-distance calls are automatically routed through the chosen service provider).

Bahrain introduced Call Selection (8-digit call over-ride) in 2004 and then carrier pre-selection (CPS or dial-tone) access for calls. These were introduced at considerable cost to provide customers with greater choice and convenience in the selection of which operator should bill them for calls. But, according to the TRA, although five operators offered CPS services, less than 1,000 of the 195,000 fixed lines subscribed to CPS (representing 1.2 per cent and 0.3 per cent of business and residential lines respectively).

◂ Box 3.1: Call Selection in Bahrain

Source: Bahrain, TRA, Strategic and Retail Market Review, August 2007
http://www.tra.org.bh/en/pdf/Strategic_and_Retail_Market_Review_Consultation_Final.pd

Regulation in this era consisted of mandating Call and/or Carrier Selection and setting origination and terminating **interconnection** rates paid to the incumbent. These could be significantly lower than retail rates providing a significant margin for profit; as shown in Figure 3.2).



◂ **Figure 3.2: Call Selection in Australia**

Regulators spent a great deal of time on developing and setting interconnection rates and arbitrating access **disputes** and customer switching issues.

The calls-based competitive business model was disrupted by regulator-assisted rebalancing of line rentals and call tariffs, take-up of unbundled local loop and broadband enabled VoIP which reduced margins on long distance call services.

This form of market liberalisation has not been successful in developing countries because fixed networks present a smaller market opportunity than mobile networks and the margins between regulated fixed network interconnection rates and retail prices have been small. Rather than spending time on implementing fixed call selection on copper with a high non-adoption risk, regulators in developing countries should focus on prohibiting either fixed or mobile carriers blocking or degrading competing digital apps like VoIP [*].

- **Access:** The advent of broadband and VoIP services shifted the focus of competition to control of the access line and consequently all services provided over it. The fight for control of the access line led to major players launching triple play (bundling voice, broadband and IPTV services) or even quadruple play (adding mobiles as part of the package).

The focus of regulation shifted from interconnection to **unbundling** of part of all of the copper line. A key policy issue is preserving investment incentives with unbundled access pricing. Forcing open access [*] to incumbent copper access networks to create competition has worked in developed countries but it made incumbents reluctant to invest in major civil works programmes to replace the copper access network with optical fibre partially (FTTN) or completely (FTTH).

Deployment of NGNs raises complex challenges on how to maintain access for all competitors. Many incumbents are rolling out fibre to the node at the street cabinet (FTTN) and then using VDSL technology over the copper sub-loop between the street cabinet and the customer's premises. Other operators, where the network architecture does not support this model, are planning for fibre to the home (FTTH; removing all copper from the access network).

The fixed costs below are for items such as new street cabinets which do not vary with take-up. The variable costs are those that increase with the addition of each new line, and so include costs for active equipment and the final fibre connection to the premises which are only installed when a premises migrates to the new network. It can be seen that for all technologies the fixed costs associated with coverage are dominant, at over 70% of the total costs. The large proportion of fixed costs means that the costs per premises connected are particularly sensitive to the take-up assumptions.

◂ **Box 3.2: Relative costs of different fibre NGNs**

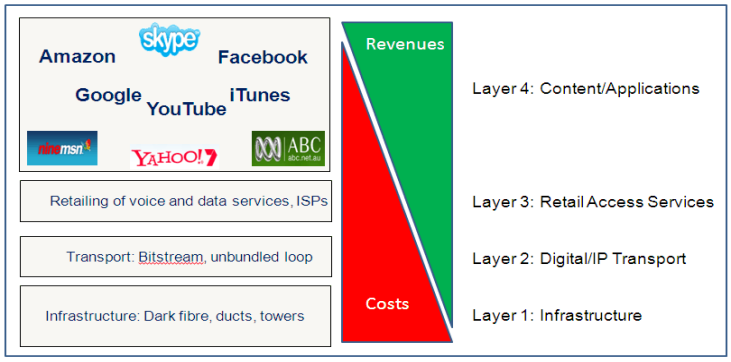
Source: Figure 1.7, The costs of deploying fibre-based next-generation broadband infrastructure, Analysys-Mason for Broadband Stakeholders Group, September 2008
http://www.broadbanduk.org/component/option,com_docman/task,doc_view/gid,1036/

According to the BSG report (Box 3.2), the costs of deploying FTTC/VDSL (fibre to the curb with VDSL from the node at the curb) in the UK are around GBP5.1 billion. This is around a fifth of the costs of deploying FTTH/GPON (GBP24.5 billion where GPON shares the fibre infrastructure at the node with around 32 homes), with FTTH/PTP costing around GBP28.8 billion (point-to-point costs 18% more than FTTH/GPON, but regulators like PTP fibre because it can be unbundled like copper).

The assumption of business models in the access competition era was that control of customer access also controlled revenues delivered over that infrastructure. With digitisation this assumption no longer holds leading to the era of service competition (eg from Skype).

- **Services:** The **de-layering** of the industry that has arrived with IP has broken the nexus between carriage and content. None of the content

providers at layer 4 in the figure below need to deal with the providers at the other levels.



◂ **Figure 3.3: Revenues and Costs**

With the shift of competition towards services on both fixed and mobile networks, the focus of regulation is on identifying new sources of market power and addressing new issues such as **network neutrality** and content regulation.

Broadcasting rights vary from country to country and even within countries. These rights govern the distribution of copyrighted content and media and allow the sole distribution of that content at any one time [*].

Broadcast television and telecommunications have been regulated differently. As IPTV allows broadcasting over IP networks new regulatory issues arise [*].

Netflix, based in California, began offering unlimited movie downloads in Canada for $7.99 a month in 2010. By August 2011, the service had signed up 10% of the broadband households; a feat that took six years in the United States.

Cable and satellite companies in Canada argue that Internet-based movie distributors like Netflix should fund Canadian broadcast content and face other regulations that cable and satellite distributors such as Rogers Communications Inc. must meet.

But in October 2011, the Canadian Radio-television Telecommunications Commission (CRTC) decided against regulating online-streaming companies such as Netflix Inc. that provide television and feature films over the Internet; noting there isn't "any clear evidence" that so-called over-the-top services (OTT) are negatively affecting the broadcast system.

◂ **Box 3.3: Canada and Video Regulation**

Source: Results of the fact-finding exercise on the over-the-top programming services, CRTC, October 2011
http://www.crtc.gc.ca/eng/publications/reports/rp1110.pdf

As an example of how technology can over-take regulation, copyright law often exempts copying for personal use and new technology has been used to stretch this permission to deliver services beyond what might have been anticipated (Box 3.4).

In Australia a mobile operator, Optus, has a cloud-storage service which enables customers to playback any of 15 free-to-air programs. It gives its mobile customers 45 minutes of free viewing for what it claims is just a time-shifting and format-shifting service. Optus argues that what it offers is equivalent to customers recording the content on their own hard drives for personal use, which does not breach copyright.

Key sporting organisations are concerned about the impact on revenues. The main mobile network operated by Telstra paid A$153m for the rights to stream matches live over the Internet over five years.

Optus won the first Federal Court case in February 2012, but this early decision was overturned by a full bench of the Federal Court in April 2012 with the High Court refusing leave to appeal in September 2012.

The same issue arose in the USA in 2006 when US pay TV operator Cablevision introduced a service that allowed customers to record, pause, and replay television content from servers located in Cablevision data centres rather than from hard drives in their living rooms.

Cablevision was challenged by Twentieth Century Fox and, in March 2007, a district court found in favour of the copyright owner but this decision was reversed in August 2008 by the Second Circuit Court of Appeal.

◂ **Box 3.4: Copyright for content**

Source:
http://en.wikipedia.org/wiki/Cartoon_Network,_LP_v._CSC_Holdings,_Inc.

Practice Notes

- **Network Neutrality**

Reference Documents

- **Bahrain: TRA, Strategic and Retail Market Review, August 2007**
- **Canada: Results of the fact-finding exercise on over-the-top programming services, 2011**

- Carrier Selection in Developing Countries: Dead on Arrival?, September, 2011
- United Kingdon: Analysys-Mason report on the costs of deploying fibre-based next-generation broadband infrastructure, September 2008

2.3.1.2 IP INTERCONNECTION

All next generation networks (NGNs) will be digital and existing fixed and mobile switched networks are migrating quickly to digital networks. So, switched interconnection is giving way to IP interconnection as networks become digital. The paradigms ruling each of these currently are very different (Table 3.4).

Switched (Telephony) Networks	Next Generation (IP) Networks
Circuits dimensioned for voice	Traffic types vary (different QOS needed)
Interconnection fee based on time	Packets have no time or distance dimensions
Fixed – Mobile interconnection asymmetric	Packets exchanged uniformly across platforms
Small but constant information delivery rate	Typically "bursty" traffic patterns
Little tolerance for delays and sound distortions	Handle time sensitive and delay tolerant traffic
Regulated interconnection at agreed POIs	Unregulated peering and transit
Traffic routed over a circuit to a dialed number	Connectionless, 'best efforts' routed on IP headers

◂ Table 3.4: Comparison of Legacy (PSTN) and Next Generation (IP) Networks

The good news for regulators is that IP interconnection removes the bottleneck in access. With switched networks, the access provider has a monopoly over the origination/termination of calls from/to customers on its fixed or mobile access network. With peering and transit, the access network does not have such control and there is no need to regulate; as shown in **Poland** (Box 3.5). Access regimes for switched telephony (PSTN) networks have been highly regulated while the **peering and transit** arrangements associated with the highly successful development of the internet are unregulated.

In 2010, the European Commission determined that peering and transit arrangements are demand side substitutes which should consequently be viewed as part of the same **market**. The case involved the Polish regulatory authority's proposal to regulate these services as separate markets.

The incumbent (TP) does not peer with any ISP in Poland and is the only provider of transit into the global internet for half of the country where no competitor has coverage. However, small ISPs can indirectly convey traffic to both TP and the global internet via international Tier 1 carriers present at public internet exchange points in Poland. The different options used by local ISPs persuaded the EC that direct and indirect traffic to TP are functionally substitutable on the demand side.

◂ Box 3.5: Poland and IP interconnection.

Source: European Commission, Commission **Decision of 3 March 2010**

Peering, also known as 'Sender Keep All' or 'Bill and Keep' is a zero compensation arrangement by which two ISPs agree to exchange traffic at no charge. Transit is an arrangement in which larger ISPs sell access to their networks, their customers, and other ISP networks with which they had negotiated access agreements.

Some argue that the peering and transit settlement regimes associated with the internet will not necessarily apply to all IP networks. They point out that although (managed) next generation networks (NGNs) and the (best-efforts) internet use IP as a common technology and are converging in the marketplace by offering similar or substitute services [*], they are organized differently and so remain separate and distinct, even though they share the same transmission infrastructure (such as fibre networks) [*]. That is, NGNs are a collection of 'closed' networks (i.e., packets are not allowed across the interconnection point unless they are authorized).

To 'authorise' packets requires 'deep packet inspection' which may violate **network neutrality** . For example, mobile operators who enjoy high termination rates for voice calls from fixed networks have blocked VoIP calls for which they receive no incremental revenue. This practice may become prohibited (see **Box 2.10** on KPN). This does not mean that with IP interconnection, a byte is a byte whatever it contains. It would not violate net neutrality to offer QOS on different types of traffic [*] and this would advantage carrier-grade IP networks over 'best efforts', '**over-the-top**' internet applications.

There is a regulatory issue with the transition from switched interconnection to IP interconnection because the different regimes offer arbitrage opportunities. But the arbitrage window between, say, fixed-to-mobile termination and VoIP closes as the difference in costs narrows [*]. Some other transitional issues include:

- Where there are service providers relying on **call selection**, they would get a windfall from not having to pay termination fees while network operators would lose termination revenue; unless fees for originating access are increased.
- If there is significant traffic with countries that continue to use CPNP, the operators in those countries will continue to enjoy termination revenues while the operators in BAK regimes do not; which means BAK provides a subsidy to the CPNP country.

- The speed at which terminating rates can be reduced under the CPNP regime before the step to BAK is made.

Since network operators cannot expect to make money from switched interconnection when they move to IP Interconnection, they have to remove cross-subsidy between high margin calls and low margin line rentals and move towards volume based charging (probably implemented as monthly data caps).

Practice Notes

- **Forms of Arbitrage**
- **Network Neutrality**
- **Peering and Transit**

Reference Documents

- **European Commission: Commission Decision on the wholesale market for IP traffic exchange in Poland**
- **European Union: BEREC, Next Generation Networks Future Charging Mechanisms / Long Term Termination Issues, June 2010**
- **infoDev: Broadband Strategies Handbook**
- **Internet Protocol (IP)**

2.3.2 KEY CONCEPTS

The vocabulary of access regulation is shifting with the move from switched to IP interconnection. Between these, unbundling became important.

In the switched interconnection world, key concepts include:

- **Originating and terminating access** – This refers to exchange of voice traffic and the interconnection rates are usually timed.
- **Fixed-mobile termination** – The rates for terminating calls on mobile networks have been high, encouraging the growth of mobiles, but are being reduced quickly to facilitate the transition to **IP Interconnection**.
- **Call selection and carrier pre-selection** – These were used to provide call services to the incumbent's customers. They are being replaced by unbundled copper loop and by apps on digital networks.
- **Number portability** – This can be mandated for either fixed and/or mobile numbers to reduce barriers to switching providers. Numbering plans are being reconsidered with VoIP services.
- **Points of interconnect** – These are the physical locations where traffic aggregated from either exchange service or fibre serving areas is exchanged between the owner of the access network and the providers of services to the customers in those areas.
- **Resale** – This is an extreme form of mandated access in which the incumbent operator is required to allow others to resell its services under their own brands. It is important part of the switched interconnection world because reselling retail access allows entrants to provide 'full service'.

As competition **evolved** from calls to access, new concepts emerged such as,

- **Full and partial unbundling of the copper local loop**
- **Infrastructure sharing** - Co-location and facilities access takes a number of forms.
- **Inter-modal or platform competition** – the USA relied on competition between cable and telephone networks. There is some evidence that wireless and mobile broadband networks could provide competition for fixed networks.

And, with the migration to all digital networks, came:

- **Next generation networks (NGNs)**
- **Bitstream access and dark fibre**
- **Peering and transit** - Peering, also known as 'Sender Keeps All' or 'Bill and Keep' is a zero compensation arrangement by which two ISPs agree to exchange traffic at no charge. Transit is an arrangement in which larger ISPs sell access to their networks, their customers, and other ISP networks with which they had negotiated access agreements.
- **Internet exchange points** (IXPs) – these are physical locations where several ISPs and content providers can exchange traffic more cheaply than paying transit fees [*].
- **IP interconnection**
- **Net neutrality**
- **Applications** (Apps)

Across all these stages, there are some constant principles and concepts such as:

- **Essential or bottleneck facilities** - are network elements or services that are provided exclusively or predominantly by a monopolist and are critical inputs to retail service. Also, it is not feasible, either economically or technologically, for retail competitors to duplicate the essential facility or develop a substitute for it.
- **Open access** - defined by InfoDev as "*the creation of competition in all layers of the network, allowing a wide variety of physical networks and applications to interact in an open architecture. Simply put, anyone can connect to anyone in a technology-neutral framework that encourages innovative, low-cost delivery to users. It encourages market entry from smaller, local companies and seeks to prevent any single entity from becoming dominant. Open*

access requires transparency to ensure fair trading within and between the layers, based on clear, comparative information on market prices and services." [Spintrack AB. 2005. Open Access Models: Options for Improving Backbone Access in Developing Countries, for infoDev/World Bank. **http://www.infodev.org/en/document/10**

- **Reference interconnection offer** (RIO)- this defines the price and non-price terms of the services for access or **interconnection** with the expectation that this will minimise **disputes**.

Practice Notes

- **Issues dealt with in Interconnection Agreements**
- **Peering and Transit**

Reference Documents

- **Open Access Models**

2.3.3 INTERCONNECTION

Interconnection is what allows users on each network to communicate with users on any other network. One of the ITU's most notable achievement has been the agreement of standards that allows a seamless, global telephone network. International two-way interconnection to allow exchange of traffic is relatively easy to achieve as there are mutual benefits.

The WTO Reference Paper defines "interconnection" as: *"linking with suppliers providing public telecommunications transport networks or services in order to allow the users of one supplier to communicate with users of another supplier and to access services provided by another supplier, where specific commitments are undertaken.*

◂ Box 3.6 The World Trade Organization: Definition of Interconection

Source: Section 2, WTO Regulatory Reference Paper being the Annex to the Fourth Protocol to the GATS Agreement, the "Agreement on Basic Telecommunications", February 1997, in effect on 1 January 1998. **World Trade Organization - Reference Paper**

Interconnection can be cooperative (eg calls between countries) or competitive. In the case of competitive interconnection, incumbents provide originating and/or terminating interconnection which they are reluctant to do because it is a 'zero-sum' game: new entrants make money at the expense of the incumbent.

Telecommunications operators will interconnect voluntarily in some circumstances. If two operators are not in direct competition with each other, then generally they will have an incentive to interconnect. This is because interconnection increases the value of a network to subscribers by increasing the number of people they can call and the range of ICT services they can access.

Regulators become involved where incumbent operators have little incentive to allow access to their network, or to allow access on reasonable terms. Where the interconnection seeker is a potential competitor, an incumbent may seek to limit competition, and preserve its market power, by:

-
    - Refusing to interconnect
    - Offering interconnection at a price, or on other terms, that make it difficult for an efficient entrant to compete, or
    - Seeking to 'sabotage' the entrant by providing a lower quality interconnection service to the entrant than the incumbent provides itself.

In these cases regulatory intervention can lead to a more efficient outcome. The motivation for interconnection regulation is that efficient competition in downstream markets would be difficult, or even impossible, unless entrants can access the incumbent's network at appropriate prices, terms and conditions.

Interconnection regulation can apply equally to all telecommunications carriers (symmetric regulation) or to incumbent carriers only (asymmetric regulation). However, the need for asymmetric regulation should be kept under regular review. As market conditions change, new firms enter the market and new competitive services emerge, market power can be eroded. Where this occurs, regulators need to reconsider the justification for asymmetric regulation and, if market power is no longer a concern, remove the additional requirements.

Price differences between regulated and unregulated interconnection services result in arbitrage opportunities and potential market distortions.

With new networks (both fixed and mobile) based on Internet Protocols (IP), switched interconnection is becoming a thing of the past. IP interconnection is becoming the new standard; although the rules have not yet been agreed.

Practice Notes

- **United States-Mexico Telecommunications WTO Dispute**

2.3.3.1 FORMS OF INTERCONNECTION

One-way interconnection occurs when payment goes only one-way (eg when rail operators seek access to rail networks). Two-way interconnection occurs with reciprocal payments (eg between networks with customers who communicate across networks). One-way and two-way interconnection can co-exist. For example, new entrants often obtain parts of their networks from the incumbent carrier (one-way interconnection), and then exchange traffic with the incumbent (two-way interconnection). There are several approaches to structuring interconnection payments which are

discussed at 4.3

The distinction between one-way and two-way interconnection is less important than whether the parties concerned compete or cooperate.

International calls between countries do not compete with each other (subject to arbitrage). The accounting rate system was developed as a way to allocate revenue for international telephone services. The system is a series of arrangements between national operators in which the operators jointly provide international calls and divide the revenues from such calls between them.

For many less-developed countries, traffic on international routes is unbalanced — more calls are terminated in these countries than originate from them. As a result, the accounting rate system produced considerable revenue inflows to many less-developed countries. This regime has been undermined by markets and regulation. Carriers exploit numerous arbitrage opportunities to offer customers rates that are well below international accounting rates. The system has also come under regulatory pressure [*].

The accounting rate system has now been largely replaced by cross-border interconnection. Carriers directly negotiate rates to terminate traffic, in some cases with long-term contracts, in other cases on a short-term or spot basis [*].

2.3.3.2 INTERCONNECTION AGREEMENTS AND DISPUTE RESOLUTION

Often a regulator will require the development of a Reference Interconnection Offer (RIO) as part of opening the sector to competition. The RIO sets out the terms and conditions for interconnection services that a competing operator can choose to accept without further negotiations. The purpose of the RIO is to avoid disputes and to shorten the entry time for a new competitor. Or, a regulatory tool that accomplishes similar results is a 'most favoured nation' or non-discrimination requirement, whereby any operator can choose to accept the terms and conditions that have previously been agreed or ordered to be in place for another competitor. Many countries have adopted either or both of these measures. One example is described in the **practice note on Jamaica's RIO**.

However, disputes about access and interconnection are common in the telecommunications sector. Reliance on the courts to resolve disputes between telecommunications firms is costly and can involve substantial delays. Without a mechanism to resolve interconnection disputes quickly and effectively, innovation and competition in the sector will be threatened. Entrants will not commit resources unless they have confidence that their business will be viable and that they will be able to resolve any disputes in a timely fashion.

Advantages	Technique	Disadvantages
Flexible, consensual, encourages parties to find common interests and 'win-win' solutions	Negotiation & Mediation	A party to the dispute may delay an expected adverse resolution
Confidentiality, legally enforceable, quicker than alternatives	Arbitration	
Structured process Subject to review	Regulatory Adjudication	Delay 'gaming' of the process Lack of expertise in regulator
Finality and enforceability	Court Adjudication	Cost, time, and lack of telecoms expertise

◂ **Table 3.5: Techniques for Dispute Resolution**

Source: ITU, Dispute Resolution in the Telecommunications Sector: Current Practices and Future Directions **/en/document/3032**

The **World Trade Organization - Reference Paper** includes obligations relating to dispute resolution. Under the Agreement, Member countries must establish an independent domestic dispute resolution body, so that interconnection disputes can be settled within a reasonable period of time. This need not be the regulator, but it often is.

Dispute resolution presents a number of challenges for regulators, including:

- **Access to information:** Operators usually have better information than the regulator on the details of interconnection disputes. This makes it difficult for the regulator to come to a decision and be confident that it is the best one.
- **'Gaming' of the process:** Either party may engage in anti-competitive gaming of the dispute resolution process. For example, an incumbent may use delaying tactics to draw out the proceedings, in order to delay competitive entry. Or an entrant may not accept a reasonable interconnection offer from the incumbent if it believes that it can persuade the regulator (or dispute resolution authority) to mandate more favourable terms.
- **Capacity:** Many countries face a shortage of people with the necessary legal, economic, and technical expertise to resolve interconnection disputes.

There are several ways of tackling these challenges such as:

- **Improve information available to the regulator** – to enable the regulator to base its decision on better information.

o Ask parties to define areas of agreement and dispute and to provide information to clarify disputed issues;

o Require written submissions from operators on areas of dispute, supported by facts and research if necessary; and

o Allow others (for example customer groups and other service providers) to comment on areas of dispute.

- **Obtain expert assistance** – to supplement the regulator's in-house capability by drawing on external expertise.

o Use external advisors (for example an experienced interconnection expert) to assist in resolving the dispute. The expert's role could include

clarifying areas of agreement and dispute, identifying information needs, and providing advice.

o Consider appointing an independent mediator (or, if the parties agree, an arbitrator).

o Consult with other regulators on their approach in similar cases.

o Review decisions and interconnection agreements approved by other regulators.

o Use outside parties for informal mediation, arbitration, information gathering or other assistance. This can be particularly useful in countries where the regulator lacks the legal authority to resolve the dispute

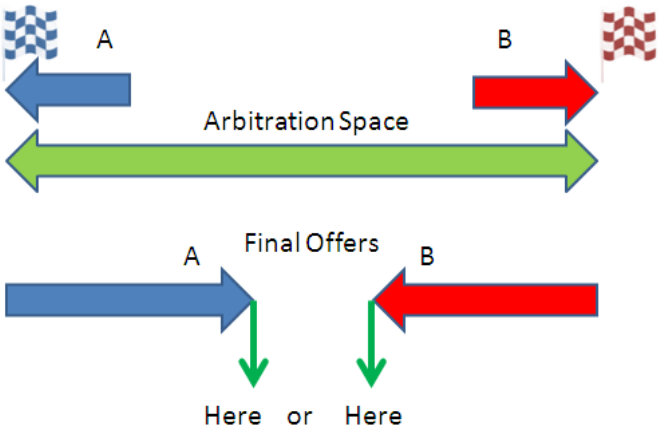
- **Improve transparency** – making more information publicly available should cause parties to consider their positions more carefully.

o Make parties' submissions available for comment by other parties and the public, with summaries to protect confidential information; and

o Publish a draft decision and give parties to the dispute and others an opportunity to make written submissions on it.

The problem with 'negotiate/arbitrate' regimes is that the two parties to the dispute exaggerate their differences hoping to draw any middle ground resolution towards their end of the arbitration spectrum. The problems with this for the regulator were discussed above. The solutions above still require the regulator to find the right spot on the arbitration spectrum to set a price; and they take time and are costly.

The Australian response to these problems was to dump the negotiate/arbitrate framework in 2011 [*]. The regulator (the ACCC) now has to set prices for all regulated ('declared') access services. It still has to use its own resources to find the right spot on a spectrum which is not bounded by previous commercial negotiations. Its interim finding is subject to consultation before it issues a final set of prices.



◂ Figure 3.4: Final Offer Arbitration

Another approach which solves some of the problems identified above and could work well for countries with limited resources is **'final offer arbitration'** (FOA). The regulator lays down the criteria by which the final offer brought to each party will be judged and chooses one. There is no compromise between the proposals of the parties. The regulator does not have to build its own cost models or justify its choice. This provides powerful incentives for parties to reach agreement rather than risk the other's proposal being accepted at arbitration. It also encourages each party to be reasonable and narrow their differences.

Practice Notes

- Anguilla: Disapproval of Proposed Interconnection Agreement
- Botswana: Interconnection Dispute Resolution
- Final Offer Arbitration [1]
- Interconnection Principles Contained in the WTO Regulation Reference Paper
- Issues dealt with in Interconnection Agreements
- Jamaica: Cable & Wireless Reference Interconnection Offer

Reference Documents

- Barbados: Equal Access and Indirect Access Policy
- Canada: Structuring the "Final Offer" Arbitration process for use in proceedings before the CRTC, November 2009
- Dispute Resolution in the Telecommunications Sector: Current Practices and Future Directions
- Jamaica: Reference Interconnection Offer: Tariff Schedule, 2009
- Jordan Mini-Case Study 2003: Dispute Resolution and Consensus Building in Interconnection
- Saudi Arabia -- Saudi Telecom Company Reference Interconnection Offer
- Singapore -- Advisory Guidelines Governing Requests for Dispute Resolution Between Licensees Under Sub-section 11.3 of the Code of Practice for Competition in the Provision of Telecommunications Services 2005

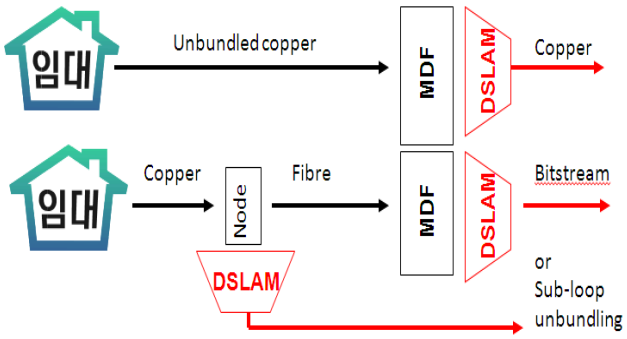
2.3.4 UNBUNDLING

Unbundling requires the incumbent to allow entrants to lease certain individual building blocks that make up a telecommunications network. Unbundling can be an enormous task for regulators. The administrative costs of defining, and setting prices for, a range of network elements can be high. In addition, unbundling can impose high compliance costs on incumbent carriers. Regulators should carefully consider the merits of unbundling on a case-by-case basis, with a thorough assessment of the likely costs and benefits. The main forms of unbundling are:

o **Resale** is often mandated as the first rung on the '**ladder of investment'** (1.5.1). Resale obligations require the vertically integrated firm to make its retail services available for resale by any competitor. This approach is used in many markets including the USA, UK and Australia.

o **Leased lines** are an important access product through all stages of competition except service competition. They may be long-distance transmission links on 'thin' routes [*]. Or, they may be data 'tails' providing originating/terminating access for data services. These have tended to be displaced by unbundled local loop where the entrant has more control over the service specification.

o **Line-sharing** (or partial line unbundling) where incumbent must provide access to the non-voice frequencies of a local loop and/or access to space within a main distribution frame where *DSLAMs* and similar types of equipment can be interconnected to the local loop. Where entrants use line sharing to provide broadband service, they can also buy resold local service (line rental and calls) to provide a more complete bundle of services.

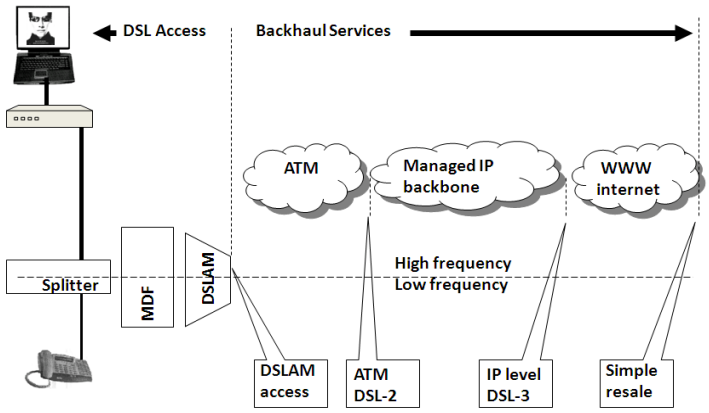


◂ Figure 3.5: Unbundled Copper Access

o **Local loop unbundling** is also known as full unbundling and occurs when the raw (unconditioned) copper pair is used by the entrant to provide both voice and data services over ADSL).

o **Sub-loop unbundling.** With FTTN, sub-loop copper between the node and the final customer may be mandated but it is unlikely to be commercially viable.

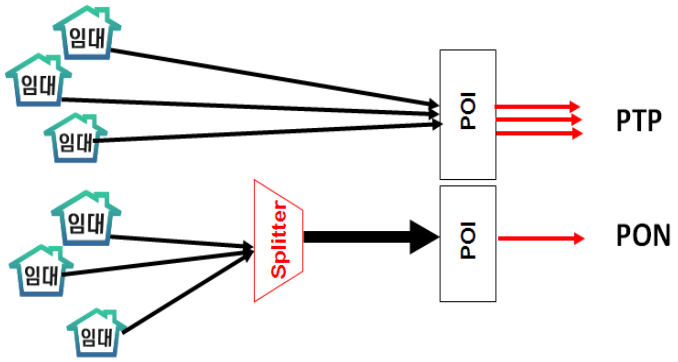
o **Bitstream** access was used in New Zealand as an alternative way of unbundling copper lines. Where fibre replaces part of the copper access network (Fibre to the Node) or all of (Fibre to the Home), Bitstream is the most common form of unbundling in fibre networks. It can be at Layer 2 (ATM or Ethernet, in most fibre networks) or Layer 3 (IP, as with New Zealand's copper bitstream service).



◂ Figure 3.6: Bitstream Access Options

o **Dark fibre** (unlit optical fibre) is another form which may be constrained by the architecture of the FTTH access network (Figure 3.7). It is possible with point-to-point (PTP) fibre where there is one fibre for each end customer back to the point of interconnect (POI). But it is cheaper to build FTTH with a passive optical network (PON) in which a fibre line is connected to a passive optical splitter, which splits the incoming light from the POI over typically 32 (but up to 128) fibres going to end customers.

◂ Figure 3.7: FTTH Design Options



o **Wavelengths** are likely to be unbundled on PONs in future but the standards do not yet exist for this solution [*]. With wave length multiplexing (WDM), the end-user is accessed by using a separate wavelength f not shared by other users.

◂ Box 3.7: New Zealand SLES dispute

Source: New Zealand, Commerce Commission Decision No. 731, Final Review of the Standard Terms Determination for the designated service Telecom's unbundled bitstream access, September 2011
http://www.comcom.govt.nz/1st-competition-test-for-uba-std/

Before unbundled local loop (ULL) was made available, entrants could buy unbundled bitstream access (UBA) and re-sell voice services (POTS, 'plain old telephone service') or buy UBA without POTS ('Naked' UBA; perhaps relying on their own VoIP or mobile service to provide voice). The Basic UBA price is $20.66 but Naked UBA is $44.59 per month where the difference ('uplift') is equal to the ULL price to cover loop costs (September 2011 prices). With ULL, entrants could provide their own voice and broadband services.

Telecom New Zealand (TNZ) is in the process of deploying fibre to the node ('cabinetisation'). Where this happens, copper is not available to provide broadband and POTS over ULL. The entrant has three options:

First: unbundling the sub-loop (SLU) at the cabinet and using their own or leased fibre backhaul ('sub-loop backhaul'; at about 60 per cent of ULL cost); but this is uneconomic with cabinets typically serving only 300-350 customers.

Second: basic UBA can be bought with resold POTS. The wholesale operator, Chorus, provides these from the cabinet to the exchange over fibre and copper respectively for entrants and Telstra Retail. When copper is no longer available, POTS will be carried over fibre.

Third: where copper between the cabinet and exchange has not been de-commissioned, it can be bought as the un-regulated (and unpublished) sub-loop extension service (SLES) which together with sub-loop access provides a copper path for POTS. Naked UBA provides broadband. Entrants claimed that they should only pay the Basic UBA price or they would be paying contributions to the cost of the loop twice; unlike Telecom Retail.

The Commerce Commission agreed and noted that Telecom had breached it separation undertakings because option three did not provide access on the same terms as Telecom Retail. Because TNZ moved to address this issue promptly, the Commerce Commission agreed to limit compensation to NZ$31.6m; the commercial gain it estimated TNZ to have made. This was distributed between the five new entrants affected.

Unbundling usually requires **facilities sharing** (3.5) or **collocation**, where the incumbent operator houses the communications equipment of competing operators to facilitate connectivity, or permits entrants to share infrastructure such as cell-site masts, cable ducts, or telephone poles.

Because unbundling copper has been so successful in stimulating competition, regulators have looked for fibre analogues to the unbundled local loop (ULL) and line sharing service (LSS) found in copper networks. Unbundling of copper loop is not easy with fibre-to-the-node (FTTN) and impossible with fibre-to-the-home (FTTH). Regulators are still struggling to determine both what access products are appropriate in the new environment and how they should be priced without discouraging further investment in next generation networks (NGNs).

Ofcom's new regulatory model rests on the following core elements:

Virtual Unbundled Local Access ('VULA'), which will allow competitors to deliver services over BT's new NGA network, with a degree of control that is similar to that achieved when taking over the physical line to the customer;

Physical Infrastructure Access ('PIA'), which will allow competitors to deploy their own NGA infrastructure between the customer and the local exchange, using BT's duct and pole infrastructure, to provide broadband and telephony; and

Local Loop Unbundling ('LLU') which Ofcom expects will continue to provide a basis for competition in current (copper) generation services, allowing competitors to physically take over (or share) BT's copper lines between the customer and the local exchange.

Ofcom concluded that prices for LLU, PIA and SLU must be related to the cost of providing them. However, it decided **not** to regulate the prices of the product(s) that BT provides under its VULA obligation. It considered that this approach will give BT the flexibility to price its VULA services according to emerging information on the demand for, and supply costs of, NGA services. At the same time, the prices of these services will be constrained by the availability of current generation broadband services and by competition from services provided over cable TV network infrastructure.

◂ **Box 3.8: UK Approach to NGN Access Products**

Source: Review of the wholesale local access market – Statement, Ofcom, October 2010
http://stakeholders.ofcom.org.uk/consultations/wla/statement

In developing countries, unbundling copper is not a useful option for creating competition because copper networks are not extensive. In developed countries, incumbents have been slow to roll-out fibre networks because they could not see a business case or they felt that regulated access prices would be too low. The fact that broadband is increasingly expected to be delivered over wireless networks in developing countries brings to question the importance of focussing on local loop unbundling where the copper local loop is less important relative to wireless penetration.

Practice Notes

- **United States: Unbundling**

Reference Documents

- **European Union: BEREC, Next Generation Access – Implementation Issues and Wholesale Products, March 2010**
- **New Zealand: Commerce Commission Decision on unbundled bitstream access**
- **UK: Ofcom Review of the wholesale local access market – Statement, October 2010**

2.3.5 INFRASTRUCTURE SHARING AND COLOCATION

One of the most important policy concerns underlying the growing regulatory interest in sharing is the promotion of rapid and efficient network deployment. In many developing countries, the network in question is the mobile network, which is increasingly becoming the dominant form of infrastructure in these countries, as well as the backbone for the provision of universal access. In more developed and industrialized countries, the emphasis is on national broadband core and access networks and Next-Generation-Networks (NGNs). Although the modes of sharing differ and although each network raises particular policy concerns, broadly speaking, sharing facilitates a rapid, less costly and less disruptive deployment of networks, whether the network is mobile, fixed broadband, or NGN [*].

Sharing helps to address three obstacles to efficient and timely network deployment:

- the high costs of network roll-out;
- restricted access to bottleneck facilities and
- poor investment incentives, particularly in un-served or under-served areas.

Due to competition in Vietnam's telecommunications market (there are around a dozen enterprises providing telecommunications infrastructure), providers have a common need in sharing, but sharing telecommunications infrastructure is difficult, leading to overlap in investment in the access network. This causes problems of wasted resources, difficulties for users, visual pollution, etc. There are too many businesses providing infrastructure development making it difficult for interconnection because every operator applies different technology. This does not lead to harmonization in national telecommunications infrastructure and is not sustainable to meet the development needs of the country in the future. The service providers are now trying to develop a shared co-operation network infrastructure but so far no specific measures have been implemented due to disagreement on the benefits as well as a lack of appropriate regulatory guidelines.

◂ **Box 3.9: Vietnam**

Source: Vietnam, Broadband in Vietnam: Forging Its Own Path, Tran Minh Truan, InfoDev, Nov 2011
http://www.infodev.org/en/document/1127

There is a distinction between passive and active infrastructure sharing:

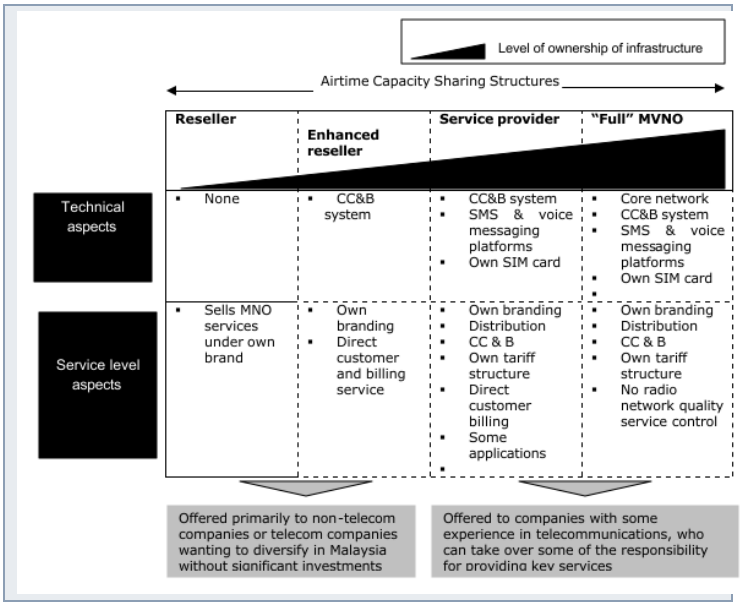
- Passive infrastructure includes all the civil engineering and non-electronic elements of infrastructure, such as physical sites, poles and ducts (and also power supplies).
- Active infrastructure covers all the electronic telecommunication elements of infrastructure like lit fibre, access node switches, and

broadband remote access servers.

Infrastructure sharing is particularly important to the building of broadband networks where the cost of civil works (eg digging trenches) is significant. The Fibre-to-the-Home Council identifies four business models used in the FTTH market [*]:

- Vertically integrated – one major player covering passive, active and service layers, who offers services directly to their customers, conveys traffic on their networking equipment and uses their own passive infrastructure (exclusively or with wholesale to other communications providers).
- Passive sharing – in this model, the infrastructure owner deploys the passive infrastructure and provides passive access to other players, who concentrate on the active and service layers.
- Active sharing – the vertical infrastructure provider deploys both active and passive infrastructure, and opens it up to service providers, with each service provider taking care of its base of subscribers.
- Fully separated – in some countries the fully separated model has emerged, featuring an infrastructure owner, a network operator and a series of service providers.

Active infrastructure sharing can be a matter of degree. Mobile Virtual Network Operators (MVNOs) do not own their own spectrum but may rely to a greater or lesser extent on components provided by the incumbent.



◂ **Box 3.10: MVNO Options**

Source: Telekom Malaysia Berhard business plan reported by the Malaysian Communications and Multimedia Commission, February 2005

The policy issues related to competition and sharing are complex. Sharing offers both the possibility of enhancing competition and the risk of hindering competition.

On the one hand, sharing policies can help to increase competition in the ICT sector. One of the greatest impediments to market entry in the sector is the cost of network deployment. Sharing allows operators to enter the market at a much lower cost than what they would encounter if they were required to construct their own network infrastructure. Sharing also helps to overcome barriers to competition such as the control of bottleneck facilities by dominant operators.

On the other hand, too much sharing undermines the incentives for investment in infrastructure-based competition. In the early days of liberalisation, some regulators prohibited facilities sharing. A very permissive sharing regime makes it possible for operators to become active without investing in their own infrastructure. If most operators rely on the same underlying infrastructure providers, it is likely that there will be little ultimate differentiation in their services. The benefits of competition like lower prices and consumer choice are reduced as a result.

Ultimately, there is an inevitable tension between the equally important goals of reducing barriers to market entry and stimulating investment in infrastructure. Both of these goals are relevant to maintaining healthy competition in the ICT sector. Striking the appropriate balance between these goals is a delicate matter for policy makers and regulators.

In India the regulator, TRAI, proposed sharing rules for the mobile sector in 2007, both for active and passive components. Since then, Bharti Group, Vodafone Group, and Aditya Birla Telecom (Idea Cellular) have created Indus Towers, a joint venture that controls over 100,000 towers and provides passive infrastructure service to its shareholders and others.

In order to raise capital for 3G auctions and deployment, 2010 saw significant divestment of mobile towers to independent companies that operate them on an open access basis. For example, in January 2010 an Indian tower company, GTL Infrastructure, acquired 17,500 towers from Aircel, making GTL one of the largest independent tower companies in the world. GTL was subsequently in negotiations with Reliance Communications to acquire 50,000 additional towers, but those negotiations fell through in the middle of 2010.

But there are limits. India has 22 service areas with Bharti Airtel, Idea Cellular and Vodafone Group present in 13, 11 and 9 areas respectively. In July 2011 they made an agreement (in apparent breach of their licence conditions) to allow customers to roam across each other's networks. Roaming was allowed on 2G networks but in late September 2012 it was reported that these companies would shortly be issued with notices forbidding these pacts with immediate effect.

◂ **Box 3.11: India**

Source: TMG, Broadband Strategies report for ITU and http://www.totaltele.com/view.aspx?ID=469845&mail=662&C=0

Practice Notes

- Cost Analysis for FTTH

Reference Documents

- Backbone networks: Extending Open Access to National Fibre Backbones in Developing Countries, Feb 2008
- Bangladesh -- Guidelines for Infrastructure Sharing
- GSR 2008 - Mobile Network Sharing,
- infoDev: Broadband Strategies Handbook
- Malaysia: Guidelines on Regulatory Framework for 3G Mobile Virtual Network Operators, February 2005
- Vietnam: Broadband in Vietnam case study, Nov 2011

Next: 2.4 Regulating Access Prices ➔