

Competition in data markets

A final report on whether to declare certain ISDN services, and whether to amend declarations for the digital data access service and transmission capacity under Part XIC of the *Trade Practices Act 1974*

November 1998

Report by the Australian Competition and Consumer Commission



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Abbreviations

bps	bits per second
BT	British Telecom Australasia
DCCC	digital cross connect centre
DDAS	digital data access services
DDN	digital data network
Gbit	gigabit
ISDN	integrated services digital network
Kbit	kilobit
Kbps	kilobits per second
LTIE	long-term interests of end-users
Optus	Optus Communications Pty Limited
Mbit	megabit
Mbps	megabits per second
POI	point of interconnect or network boundary
PSTN	public switched telephone network
TAF	Telecommunications Access Forum
TDCC	time division cross connect
TP Act	<i>Trade Practices Act 1974</i>
TPOI	transmission point of interconnection

Glossary

Asymmetrical subscriber line (ADSL)	digital	This is essentially a dedicated line from customer premises to a network exchange which can provide access speeds over 2 Mbps.
Asynchronous mode (ATM)	transfer	ATM is a high speed packet switched networking technology that is designed to provide fast seamless integration of all types of information such as voice, video, data for applications such as multimedia. The information to be transported is fragmented into small fixed length packets known as 'cells' which can be switched and routed using fast packet switching principles. Access speeds can vary from 2 Mbps to 34 Mbps.
Cable modems		A digital device that provides high speed asymmetrical bandwidth over a HFC access network for a wide range of services including Internet access.
Commission		Australian Competition and Consumer Commission.
Digital data access service (DDS)		DDS supports dedicated digital private network services.
European Telecommunications Standards Institute (ETSI)	Telecommunications Standards	ETSI was set up by the Commission of the European Communities to determine and produce uniform Institute telecommunications standards for Europe. ETSI members include public network operators, service providers, manufacturers and users in the member states.
Frame relay		Frame relay is a high speed packet switched network which uses a standardised interface for the transmission of packets. This technology supports access via private digital leased lines and offers private network connectivity. Access rate can vary from 64 to 2048 kps, in multiples of 64 kps.
Hybrid (HFC)	fibre coaxial	A physical broadband network consisting of both fibre optic cabling and coaxial cabling. Fibre optic cable is used at the trunk level and may be used up to a 'service area' (possibly consisting of several hundred homes) or up to the curb (these are known as 'Fibre to the Service Area' or 'Fibre to the curb'). Coaxial cable is then run from either of these points into end-users' premises.
ISDN		Integrated services digital network.

ISDN circuits and permanent (X/SPCs)	semi-permanent and interim circuits	X/SPCs have been available as part of the overlay network ISDN service. SPCs are used to provide a 'nailed up' semi-connection between two end-users or between two premises of a single end-user (that is, A and B ends). This facility has been widely used by end-users to create private networks and by service providers to provide leased line access between their networks and the customer premises.
Local distribution (LMDS)	multipoint services	A broadband wireless network using radio as its principle technology (an alternative to MMDS). It is primarily used for the delivery of multichannel television. LMDS systems are point to multipoint distribution systems that operate in small service areas (typically five kilometres).
Multichannel multipoint services (MMDS)	distribution	A broadband wireless network using radio as its principle technology. At this stage it is used worldwide for the provision of multichannel television.
TAF		Telecommunications Access Forum.
Terminal adaptor		Terminal adaptors convert the ISDN signal to a signal that is recognisable and useable by non-ISDN devices such as PCs, facsimile machines, and analogue telephones.

Summary

On 22 December 1997 the Commission announced a public inquiry into competition in data markets. The purpose of the inquiry was to assist the Commission to determine whether to declare certain integrated services digital network (ISDN) services, and whether to amend declarations for transmission capacity and the digital data access service. The inquiry followed consideration of these matters by the Telecommunications Access Forum (TAF).

These services are inputs used in the supply of communications services to end-users.

Declaration constrains the ability of input suppliers to determine the conditions of supply, including price. This is because once a service is declared the Commission can arbitrate to resolve disputes about the conditions of supply where notified of an access dispute.

In May 1998 the Commission released a draft report on each of these topics to give interested parties an opportunity to comment.

This final report incorporates the Commission's reasons for deciding to declare certain ISDN services and to amend the service descriptions for transmission capacity and the digital data access service.

ISDN

The ISDN is a digital communications network service which uses the same copper wire lines used for standard (analogue) telephone services. ISDN services enable end-users to send and receive information at faster speeds and with greater reliability than is possible using the standard telephone service. ISDN services are used for the carriage of information such as voice, data, high quality sound, text, still images and video.

Telstra Corporation Ltd operates the only ISDN in Australia. Telstra is currently expanding its capacity in line with licence conditions under s.66 of the *Telecommunications Act 1997*.

For the purposes of this inquiry the relevant services were originating and terminating ISDN services. Before the inquiry there was consensus within the TAF that some form of ISDN should be declared, but it could not agree on the service description. The Commission therefore used the inquiry to explore and develop possible descriptions. The services developed by the Commission reflected those supported by the majority of the TAF. They are set out in Appendix 1.3.

Information received during the inquiry indicated that the originating and terminating ISDN services would be used by Telstra's competitors to supply 'leased line' services and switched digital services to end-users. It also appeared that effective competition in these markets would depend on supply of these or similar services by Telstra to its competitors.

After consideration the Commission's view is that declaration would be likely to promote competition in the markets for leased line and switched digital services. This is likely to lead to benefits for end-users primarily in terms of lower prices. This in turn should increase the accessibility of data communications services for end-users, along with improved access to services such as the Internet.

Declaration is also likely to result in more timely interconnection arrangements for communication between end-users connected to different networks. The impact of declaration on the efficient use of, and efficient investment in, infrastructure should not adversely affect end-users. While declaration is expected to impose more administrative costs on Telstra the Commission views those costs as reasonable. Furthermore, declaration is unlikely to deter efficient investment.

The Commission is therefore satisfied that declaring the originating and terminating ISDN services will promote the long-term interests of end-users of carriage services or of services supplied by means of carriage services.

Transmission capacity

The inquiry into transmission capacity followed previous consideration of this issue by the Telecommunications Access Forum (TAF). Members of the TAF were unable to reach agreement on whether amendments to the services declarations should be made.

A majority of members of the TAF proposed the following amendments to the declared transmission capacity service:

- that the transmission be amended to allow access providers and seekers to agree on transmission points of presence (TPOIs) at any technically feasible point on the access provider's network (currently the TPOI must be co-located with a PSTN gateway exchange);
- that the transmission service be amended to enable the points between which transmission capacity must be supplied to be any two points, only one of which may be a customer location and the other being either a TPOI, a point on the access seeker's network or a customer location (currently one of the points must be a TPOI);
- that the transmission service be amended to allow transmission capacity to be provided at 2 Mbps (or multiples thereof up to 8 Mbps) and at each of 34 Mbps, 45 Mbps, 140 Mbps and 155 Mbps (PDH or SDH as appropriate) (currently capacity is limited to 2 Mbps or multiples thereof);
- that inter-capital transmission be included in the declared service definition so that the exclusions for specific routes between Sydney, Melbourne, Brisbane, Adelaide, Perth and Canberra be removed.

Nature of location of TPOI

The current deemed service declaration requires co-location of a point of interconnection to which transmission capacity is provided (TPOI) with a PSTN gateway exchange of the access provider or access seeker. Under the proposed service description, access seekers and access providers would be able to agree on any network location for a TPOI, with no requirement with respect to PSTN gateway exchanges.

In addition a further issues put to the Commission is whether any declared transmission capacity service should include transmission between points where one or both ends of the transmission capacity service are points which comprise part of an access seeker's network, but are not customer locations.

Based on evidence gathered during the public inquiry the Commission considers that access providers should not be required to provide transmission capacity between points which do not connect with or intersect with their networks. It therefore considers that the proposed amendment would not be in the long-term interests of end-users.

The Commission does, however, consider that the LTIE would be promoted by removing the current requirement for the TPOI to be co-located with a PSTN gateway exchange. As a consequence, access providers will be required to provide access to transmission capacity at any agreed technically feasible point between the access provider's and the access seeker's network.

Inter-capital and high bandwidth transmission

Consistent with the legislative requirements, in undertaking the assessment of whether the proposed changes to the service declaration relating to inter-capital transmission capacity are in the long-term interests of end-users, the Commission looked at the following issues:

- the level of actual and potential competition in the inter-capital and higher bandwidth transmission market and downstream (retail) market;
- whether existing market conditions provide incentives for efficient use of infrastructure in the inter-capital transmission market; and
- whether the declaration of wholesale transmission services will impact on incentives for efficient investment in infrastructure.

Level of actual competition

Level of price competition

Based on the information received during this inquiry, the Commission considers that price competition between access providers for the supply of wholesale transmission services is greatest where access providers are competing for certain major wholesale customers and major corporates, where discounts of the order of 60–70 per cent of retail rates have been suggested.

Information was presented by Telstra and Optus in response to the Commission's draft report that indicating that the current pricing behaviour was indicative of an emerging (and increasingly competitive) market. Both Optus and Telstra provided further information which indicated that some price movement was beginning to occur in the supply of transmission capacity.

For example, Telstra presented pricing information which suggested that prices are tending to decline across all customer groups. Price reductions and pricing structures similar to those proposed by Telstra were introduced by Optus in early May.

These initiatives by both Optus and Telstra appear to be a response to new entry into the long-haul transmission market by Macrocom and Transgrid/GPU Powernet (see below). They may also be a response to the Commission's draft proposal to declare these services.

International benchmarks

The information presented by Global One, BT and Telecom NZ suggests that by international benchmarks, Australian wholesale prices for transmission services are in some cases significantly higher than those prevailing in competitive markets overseas.

However, the Commission also recognises the various limitations of drawing international comparisons. For example, one has to take into account the greater scale economies enjoyed in the US market. Nevertheless, the Commission would expect that over time, prices for transmission capacity should move towards international best practice, after accounting for differences in scale.

Bargaining power of access providers and access seekers

The information presented to the Commission by BT and Global One relating to the commercial negotiations between access providers and access seekers for the purchase of wholesale transmission capacity, suggests that most negotiating strength has to date rested with the suppliers of wholesale transmission services.

However, as noted above, the Commission has also been provided with new information which suggests that since the Commission began considering this issue as part of its data inquiry, both of the main access providers appear to be increasingly responding to the needs of access seekers.

Margins available to access providers

The evidence presented by access seekers indicates that the cost of providing wholesale transmission capacity is significantly below the retail charges being levied by access providers. Even with discounts off retail prices (such as those noted above) wholesale costs are still well below the wholesale prices being charged to access seekers.

This appears consistent with the transmission market being at an early stage of development. However, the Commission would expect that as the market develops and as further entry occurs, in part in response to such high margins, prices charged by access providers and corresponding margins should more closely reflect underlying costs, including a risk-adjusted commercial return.

Efficient use of and investment in infrastructure

Efficient investment

In considering the impact declaration may have on incentives for efficient investment in infrastructure, the Commission has examined the following issues:

- what impact will declaration have on existing suppliers decisions to invest in infrastructure;
- what impact will declaration have on incentives for investment by new entrants; and
- will declaration impact on decisions to invest in downstream markets.

Impact on existing suppliers

Existing suppliers have asserted that the high costs of their fixed investment, and the risk involved in recouping this in the market, require the promise of higher than normal profits if they are to be willing to invest in infrastructure. Further, access providers argued that if inter-capital transmission is declared, such that access providers are only allowed to price at competitive levels, this will remove the incentive for them to take the risk of investing in future infrastructure.

However, other submitters argued that access to possible current excess capacity at competitive prices is not a deterrent to further investment in infrastructure. Further, it was argued that ownership of infrastructure provides some important strategic and competitive benefits which make it unlikely that guaranteed access to such infrastructure would act as a deterrent to investment.

The real question for the Commission is whether the above noted effects in relation to pricing uncertainty stemming from declaration and its possible impact on investment, is sufficiently large to outweigh the benefits of greater competition in the wholesale transmission market and its consequent impact on both competition and investment in downstream markets. It should be noted that the key risk in distorting investment is not from greater competition and the consequent reductions in prices that would ensue, but rather from the perceived risk by investors that the regulator will mandate prices through arbitration that are materially below those that would prevail in a competitive environment.

Pricing

In response to the draft report a number of submitters presented their views on relevant pricing principles for wholesale transmission services. Issues that were raised included appropriate pricing where excess capacity is present, pricing which reflected differing economies of scale and scope and differing risk/return profiles between suppliers and the development of pricing structures reflecting length of commitment, volumes purchased and a ‘whole of business’ approach. The Commission considers that all these issues would be relevant were the Commission to be called to arbitrate prices or terms and conditions relating to transmission.

Declaration and the impact on new entry and investment

During the course of this inquiry, the Commission heard from a number of possible and actual new entrants into the transmission services market. From the information provided by these parties, the Commission considers that new entry into the transmission services market is occurring and will continue occurring over the next 12 to 18 months. This would indicate that, despite suggestions by some submitters to the contrary, barriers to entry into the wholesale transmission market are not high.

Evidence provided, however, also reflected concerns with the way the Commission may exercise its arbitration powers following declaration and whether this would unduly truncate their expected returns through forcing reductions in transmission prices by Telstra and Optus, beyond those which would otherwise have occurred as a result of new entry.

Information was also received following the draft report regarding new entrants into the wholesale transmission market. Specifically, Macrocom is investing in new microwave transmission technology to compete with the incumbents and is scheduled to commence offering services in October.

The entry of Macrocom should lead to more vigorous competition in this market, especially given its microwave technology's claimed cost superiority over fibre. In addition, since Macrocom will confine itself to the wholesale functional level, its pricing will not be impinged by strategic considerations of protecting its retail business downstream. These considerations lend support to Macrocom's claims that it will be the agent for reductions in transmission prices. The Commission would expect that the introduction of Macrocom as well as other new entrants into the market will provide incentives for both existing and new access providers to engage in more competitive conduct through the offering of enhanced price packages, more favourable terms and conditions and greater service delivery. As noted above, this has already become evident in recent weeks as Macrocom's entry draws near.

Conclusion

Selective declaration

The Commission considers that it would be appropriate to selectively declare only those intercapital transmission routes where it is considered that new entry is least likely to occur at least in the short to medium term, and not declare those routes where entry is occurring. Effectively this means that all routes, except the Melbourne — Canberra — Sydney route, which, is likely to be the focus of both actual and likely new entrants over the next 18 months to two years, would be declared.

Both these decisions would be reviewed after two years.

The amended service description for transmission services is set out in Appendix 3.

Monitoring program

To assist and facilitate the Commission's review of these decisions, the Commission proposes to institute a relatively detailed monitoring program over this period on both declared and non-declared routes. This monitoring program will be aimed at assessing

both market structure and market conduct to determine whether the Commission should change its decisions in relation to declaration or non-declaration, as appropriate.

The inclusion of an assessment of conduct, as well as of structure, is intended to provide greater information over an extended period on the extent to which incumbents are engaging in more rivalrous interaction, irrespective of whether or not there is entry.

The monitoring program will be aimed at determining whether:

- in respect of non-declared routes the benefits expected from new entry and the maturing of the market do in fact materialise so that continued non-declaration remains appropriate
- in respect of declared routes, the structure and/or conduct of the market changes to such an extent that declaration is no longer required

Such a review program may involve the Commission using its statutory powers in respect to tariff filing (which includes arrangements for the filing of standard tariffs — prices — and off-tariff deals to major customers) and record keeping to collect sufficiently disaggregated revenue, cost and pricing information specific to the intercapital transmission product (including the use of current COA/CAM provisions under which carriers are required to keep financial records). The Commission will also closely monitor the behaviour of both existing and new access providers to see whether:

- new access providers are responding effectively to the demands of customers
- both new and existing access providers engage in effective competition in the pricing of intercapital transmission and in the offering of terms and condition to customers as well as in service delivery

As part of such monitoring the Commission will undertake separate one-on-one discussions with existing suppliers, new entrants and wholesale customers to assess the development of competition in the market.

Digital data access

The digital data access service (DDAS) was deemed as a declared service by the Commission on 30 June 1997 under transitional provisions. The service provides for the domestic carriage of high speed data between an access seeker's network facility and a network terminating unit at a customer's premises, where the customer is directly connected to the access provider's digital data network.

The service enables access to a basic transport service to provide other services, such as high speed data services like ATM, frame relay and IP level services. The current deemed DDAS declaration includes a mandatory requirement that time division non-connect (TDCC) equipment be used by access seekers. Most access seekers, however, proposed this be removed as it was superfluous, inefficient and unnecessarily costly.

The Commission has concluded that the time division cross connect (TDCC)

mandatory requirement should be removed from the service declaration for the following reasons.

- The TDCC is not an essential requirement of the digital data access service (DDAS) and access seekers can provide alternative technologies that could perform the TDCC functionality just as efficiently and at a lower cost.
- Telstra architecture should not define the market or limit market growth. The mandatory TDCC requirement operates as a barrier to entry in regional areas which are adversely affected. Indeed, it is possible that the present low utilisation of the digital data network (DDN) in regional areas may be caused by the inability of competing service providers to offer products in those areas.
- The LTIE will benefit from removal of the TDCC mandatory requirement. Unnecessary costs currently incurred would be removed. This would increase efficiency and enable lower prices to be offered to end-users.
- The Commission, where practical, should not be defining what technology must be used as this can create barriers to entry and inefficiencies arising from placing limitations on market based solutions. Access providers and seekers should be free to negotiate about the most appropriate interconnection points and the level of functionality that is appropriate at any point. This would mean that while TDCC equipment may be used where it is appropriate, it should not be mandatory. The Commission takes the broad view that in respect to service declarations it is not appropriate to be defining particular technology unless there is a persuasive case that can be made on a case-by-case basis.
- Removal of the TDCC requirement was in the LTIE and would lead to more efficient investment in infrastructure while not impacting adversely, in any significant sense, on existing infrastructure providers.
- The TDCC requirement bundles unnecessary equipment restrictions on a bottleneck service which lowers the level of contestability and likely competition levels.

The Commission also concludes that the establishment of terms and conditions relating to quality and reliability should not be prescribed through a service description. Rather, such terms and conditions should be determined through commercial negotiation. Consequently the Commission's amended service description in Appendix 6 reflects this approach.

The Commission will monitor developments in data markets following the implementation of the new service description and may review the service declaration if circumstances warrant. The Commission would encourage the industry through the TAF to negotiate any further amendments to this service description rather than relying on the Commission's public inquiry process.

1. Introduction

On 22 December 1997 the Commission announced a public inquiry into competition in data markets. The purpose of the inquiry was to assist the Commission to determine whether to declare certain integrated services digital network (ISDN) services, and whether to amend declarations for transmission capacity and the digital data access service.

The inquiry followed consideration of these matters by the Telecommunications Access Forum (TAF). Under Part XIC of the *Trade Practices Act 1974* the TAF can recommend particular services to the Commission for declaration or can recommend that amendments be made to existing service declarations.

With respect to transmission capacity and the digital data access service, members of the TAF were unable to reach agreement on whether amendments to the service declarations should be made. As a consequence, the TAF provided the Commission with the proposed amended service descriptions together with correspondence from interested parties to the TAF discussions. With respect to ISDN services there was a broad consensus within the TAF that some form of ISDN should be declared. However, the TAF could not reach agreement on an appropriate service description.

The Commission used the public inquiry process which was conducted under Part 25 of the Telecommunications Act to consider how declaration of certain ISDN services as well as amendments to the current service descriptions relating to transmission capacity and the digital data access service might promote the long-term interests of end-users (LTIE). The Commission can declare particular services or amend service descriptions if it is satisfied that to do so would promote the long-term interests of end-users of communications carriage services or of services provided by means of communications carriage services.

As part of this process the Commission undertook public hearings in Sydney (12 February 1998) and Melbourne (17 February 1998) to provide an opportunity for interested parties to present their views and respond to other submissions.

In May 1998 the Commission released draft reports on ISDN services, transmission capacity and the digital data access service, to give interested parties the opportunity to comment on the Commission's proposed service descriptions and to provide additional information.

This final report incorporates the Commission's reasons for deciding to declare certain ISDN services and amending the service descriptions for transmission capacity and the digital data access service.

The structure of this report is as follows:

- **Chapter 2** outlines the access regime and relevant provisions governing the

declaration process, including details about the public inquiry;

- **Chapter 3** examines whether the Commission should declare certain ISDN services;
- **Chapter 4** examines whether the Commission should amend the service description for transmission capacity;
- **Chapter 5** examines whether the Commission should amend the service description for the digital data access service; and
- the **appendixes** set out, inter alia, the relevant service descriptions, background on technology and technical efficiency issues and a list of submissions.

During the course of the inquiry the Commission received independent technical and economic advice to assist with its consideration of the matters raised in this report. Copies of these reports are available on request.

2. The Commission's approach to declaration

2.1 The declaration process

The object of Part XIC of the TP Act is to promote the long-term interests of end-users through exposing telecommunications markets to greater competition. It does this by establishing a regime for regulated access to services which are important for competition in those markets. The services covered by this regime are communications carriage services and services which facilitate the supply of communications carriage services (eligible services). Declaration of these services constrains the manner in which the supplier can exercise its control over those services to inhibit the development of effective competition.

2.2 Declaration and regulated access

There is no general right of access to eligible services. The access rights under Part XIC only apply to those services which are 'declared' by the Commission.

The declaration decision is, in essence, a decision by the Commission to apply the rules and regulatory processes in Part XIC of the Act to the eligible service in question. Once an eligible service is declared, carriers and carriage service providers who provide the service either to themselves or to other persons are, unless otherwise exempt, required to comply with standard access obligations in relation to the service. In accordance with these obligations these carriers and carriage service providers must supply the service on such terms and conditions as are agreed with access seekers or, failing agreement, in accordance with an access undertaking given to the Commission or an arbitration determination by the Commission.

The emphasis of Part XIC is on encouraging access providers and service providers to negotiate access to declared services without recourse to further regulatory intervention. In this regard Part XIC provides for the industry to establish an access code and for access providers to give access undertakings to the Commission setting out the terms and conditions of access. Where, however, the parties are unable to reach agreement on the terms and conditions of access the Commission can conduct arbitration upon request from one of the parties.

2.3 How eligible services are declared

To ensure a smooth transition from the previous regulatory regime an initial list of eligible services were deemed to be declared services under Part XIC of the TP Act. These services are specified in the Commission's *Deeming of Telecommunications Services* statement published on 30 June 1997. They were derived from agreements registered under the *Telecommunications Act 1991*.

The deeming process was a transitional measure. Now that the Part XIC regime has commenced the Commission can declare other eligible services in one of two ways, namely:

- in accordance with a recommendation from the Telecommunications Access Forum (TAF); or
- after holding a public inquiry, if it is satisfied that making the declaration will promote the long-term interests of the end-users of communications carriage services or services provided by means of communications carriage services.

2.4 The LTIE test

Section 152AB of the TP Act provides that, in determining whether end-users' long-term interests will be promoted by declaring an eligible service, the Commission must consider the following objectives:

- of promoting competition in markets for carriage services and services supplied by means of carriage services;
- achieving any-to-any connectivity for carriage services involving communication between end-users; and
- encouraging the economically efficient use of, and economically efficient investment in, the infrastructure by which carriage services and services provided by means of carriage services are supplied.

In the Commission's view these objectives are essentially 'secondary objectives'. They are not ends in themselves but are the means by which the primary objective (of promoting the long-term interests of end-users) is to be realised. They are only relevant to the extent that they impact upon the primary objective.

Accordingly, in deciding whether to declare an eligible service, the Commission will undertake a two stage process.

- First, the Commission will consider the likely effects of declaration in terms of each secondary objective. This will lead to a conclusion as to the likely result of declaration on the achievement of each secondary objective.
- Second, the Commission will consider whether the likely result of declaration on each secondary objective would promote the long-term interests of end-users.

In considering the likely effects of declaration the Commission will apply a 'future with-and-without' test. That is, to test the effect of declaration on the achievement of each objective, the Commission will compare two future scenarios — one with declaration and the other without declaration. In doing this the Commission will be concerned with probable future events rather than with events based on speculation.

Further details on the Commission's approach to applying the long-term interests of end-users test are set out in its draft guide *Declaration of Telecommunications Services*.

3. ISDN

3.1 The ISDN services

The ISDN is used for the carriage of information such as voice, data, high quality sound, text, still images and video. It is a digital communications service which uses the same copper wire lines used for standard telephone services. ISDN services enable the end-user to send and receive information at faster speeds and with greater reliability than is possible using the analogue carriage service of the public switched telephone network (PSTN).

Telstra Corporation Ltd operates the only ISDN in Australia. Telstra is currently engaging in an expansion of its ISDN capacity in line with the licence conditions under s. 66 of the *Telecommunications Act 1997*. Specifically, the licence condition requires Telstra to be in a position to make available:

... within 90 days of a request, a carriage service that provides a digital data capability broadly comparable to that provided by a data channel with a transmission speed of 64 kilobits per second supplied to end-users as part of the designated basic rate ISDN service:

- (a) by 1 July 1997 – to at least 93.4 per cent of the Australian population; and
- (b) by 31 December 1998 – to at least 96 per cent of the Australian population.¹

3.1.1 The ISDN

Telstra's ISDN services are offered using two distinct 'networks' namely, the overlay network and the ETSI network. Each network is described below.

- The overlay network is based on a discrete network (separate from the PSTN). This network has been in operation since 1989 and, as at mid-1998, provided connections to over 400 000 basic-rate line equivalents. It is to be phased out in 2000.
- The ETSI network, on the other hand, is integrated with the existing PSTN infrastructure. It is designed according to the standards of the European Technical Standards Institute (ETSI) and was introduced in 1997 as 'OnRamp'.

With each network, terminal adaptors are located at customer premises in order to enable end-users to send and receive information over the network. As the overlay network is phased out, terminal adaptors which are not compatible with the ETSI network will need to be replaced.

¹ Clause 12 of the Carrier Licence Conditions (Telstra Corporation Limited) Declaration 1997.

3.1.2 Types of ISDN

There are two types of ISDN services currently available in Australia namely, Basic Rate Access (BRA) and Primary Rate Access (PRA). These services carry information in the form of binary digits (i.e. ones and zeros) and the speed or rate by which this information is transported is measured in terms of bits per second.

The BRA consists of two bearer channels (B channels) and one data channel (D channel) which in effect provides three signalling paths on the same line. The PRA, on the other hand, consists of up to 30 B channels and one D channel.

Each B channel can carry voice or data at a transmission rate of 64 kilobits per second (kbps). By having multiple B channels, the end-user can aggregate them or use each separately. For example, with two B channels, an end-user could use the Internet while having a telephone conversation at the same time. The D channel provides the signalling required to set up calls on the B channels. For the BRA, the D channel carries signals at 16 kbps whereas for the PRA, the D channel carries signals at 64 kbps. The D channel can support a wide variety of supplementary services (for example, call diversion).

3.1.3 The eligible services

Declaration decisions under Part XIC of the Act are framed in terms of a specified eligible service or services. It is these services which access providers must, upon request, supply to service providers.

In its draft guide entitled *Declaration of Telecommunications Services*, the Commission outlines its approach to service specification. Its preference is to specify services in terms which are as functional as possible. This assists to avoid the service specification distorting technological or innovative developments. It provides greater flexibility to the access provider in determining the most efficient way of supplying the declared service and flexibility to the access seeker in terms of the range of services that can be provided within the ambit of the declared service.

The Commission used the inquiry to assist in developing possible descriptions for ISDN services based on those presented to it by the TAF. Those services are divided into 'originating' and 'terminating' services. The originating service covers calls made from premises directly connected to the access provider's network. The terminating service covers calls received at premises directly connected to the access provider's network. This division of services into originating and terminating services is a common approach to describing telecommunications services and broadly underpins the declarations for the PSTN, GSM and AMPS services.

During the inquiry process it became apparent that the services developed by TAF members required further refinement in order to better describe the services to be considered by the Commission. Also, it appears that there is scope for the services to be described in more functional terms.

In addition it is noted that the service descriptions presented to the Commission by the TAF contained elements which may be more appropriately described as ‘terms and conditions’ of access rather than as a ‘specification’ of the service. In particular, those elements include the clauses governing:

- forecasting, ordering and provisioning arrangements;
- interconnection ordering requirements;
- operational and fault handling arrangements;
- billing frequency; and
- customer billing.

While similar terms and conditions were included in the services specified in the Commission’s ‘deeming’ statement of 30 June 1997, the Commission’s preference at that time was to fully adopt descriptions developed by the TAF. In its view, this was particularly important to managing the transitional process and ensuring that new carriers could obtain services which were similar to those provided to existing carriers.

Now that the new regime is operational, the Commission’s preference is to refine the material included in service descriptions. In its view, the service description should be concerned with identifying the service to which the standard access obligations will apply. Other aspects of the description (for example, terms and conditions concerning billing) might be more appropriately included in the access code and related documents.

Reflecting these observations, the Commission has developed two service descriptions based on those prepared and supported by the majority of the TAF — an originating service and a terminating service (the ‘eligible ISDN services’). These services are described in Appendix 1.

3.2 Applying the LTIE criteria to ISDN

To declare each eligible ISDN service the Commission must be satisfied that to do so would promote the long-term interests of end-users of communications carriage services or of other services provided by means of communications carriage services.

It does this through focusing on the impact of declaration on the:

- promotion of competition in markets for carriage services and services supplied by means of carriage services;
- achievement of any-to-any connectivity; and
- encouragement of economically efficient use of, and investment in, infrastructure.

3.2.1 Promoting competition

Consideration of whether declaration of the eligible ISDN services will achieve the objective of promoting competition commences with identification of the market (or markets) likely to be affected by declaration of the eligible service. Relevant markets generally will be the market in which the eligible ISDN services are supplied to service providers and, where there are separate functional markets, the downstream retail markets in which competition would be promoted. Once the markets have been identified, consideration will be then given to whether declaration of the eligible service is likely to constrain market power and thereby promote competition and, if so, the extent to which competition is likely to be promoted.

Relevant markets

Identification of the relevant markets provides the Commission with a field within which it can meaningfully analyse the effectiveness of competition with and without declaration.

Markets have four dimensions: product, geography, function and time. The process of market definition involves identifying the sellers and buyers which effectively constrain the price and output decisions in relation to the service under consideration.

To do this, determination of the market boundaries starts with the service. The service is described in product, geographic and functional terms. These market boundaries are then extended to include all other services which are actual or potential close substitutes. The resulting market is then the smallest area over which a profit maximising monopolist could impose a small but significant and non-transitory price increase. As noted by the High Court:

... The process of defining the market by substitution involves both including products which compete with the defendant's and excluding those which because of differentiating characteristics do not compete.²

In identifying relevant markets, Part XIC of the Act does not require the Commission to take a definitive stance on market definition. Furthermore, over time, declaration itself might affect the dimensions of these markets, particularly in relation to the functional dimension. Accordingly, market analysis under Part XIC should be seen in the context of shedding light on how declaration would promote competition rather than in the context of developing 'all purpose' market definitions.

ISDN services

Currently, there are two uses for ISDN services — as a 'leased' line (or private network) digital service and as a 'dial-up' (or switched) digital service.

2 *Queensland Wire Industries Pty Ltd v. BHP Ltd* (1989) ATPR ¶40–925 at page 50, 008 per Mason CJ and Wilson J.

As a leased line service, ISDN services are used to create a circuit or virtual circuit between two or more end-users, or between two or more premises of a single end-user, for the carriage of digital signals. Leased line services are commonly used to link a centrally located office with regional branches or with data entry points located in metropolitan and non-metropolitan areas. Leased line services are also used by Internet service providers to establish a permanent connection between their computer/router and the Internet Backbone. As a 'dial-up' service, ISDN is used to carry digital signals on a call-by-call basis.

There are a number of components to the pricing for ISDN services, including a connection charge, an annual access charge and call charges.³ The two distinct uses for ISDN services arise from the pricing of call charges. ISDN call charges are priced on both a timed basis and on a flat or capped price basis. With the flat price call charges (i.e. the Semi-Permanent Circuit and Interim Semi-Permanent Circuit services), customers pay a set price per annum irrespective of the length of time for which the service is used or amount of data which is transmitted. With the capped call charge (i.e. the OnRamp Xpress service), customers pay charges on a timed basis until a cap is reached, after which no further charges apply. All call charges are distance dependent, but they are not location specific. For instance, the Telstra price for a 12 km ISDN access tail is the same in Sydney as it is in Brisbane.

While there has been growth in use of ISDN services as a leased line and as a switched service, ISDN services in Australia seem to have a low level of penetration.⁴ Although, one user group suggested:

As the use of electronic commerce grows, more and more residential and small business users will move to ISDN.

Overtime ISDN and its circuit switched digital capability will become an essential element of the national communications network.⁵

During the public hearings, Telstra characterised the ISDN as a specialist service for which demand is concentrated with large corporate users and for which there is very limited residential and small business demand.⁶ This was disputed by both BT and Optus with BT claiming:

There is a very good reason for that and that is Telstra's own pricing policy and it is not true to say that ISDN are specialists. ... In the UK we cannot roll out ISDN fast enough ...

3 By way of analogy, the pricing for a basic telephone service has a similar structure with there being a connection charge, an annual access charge and call charges.

4 In terms of penetration level, Siemens states that the ratio of B channels to the total number of main lines in Australia is 0.61 per cent: Siemens, *1997 National Telephone Tariffs*, Munich November 1997. Telstra advises the Commission that the penetration rate is actually in the order of 5 per cent of total equivalent access lines.

5 Submission by Australian Telecommunications Users Group at p. 3.

6 Melbourne hearings at p. 52.

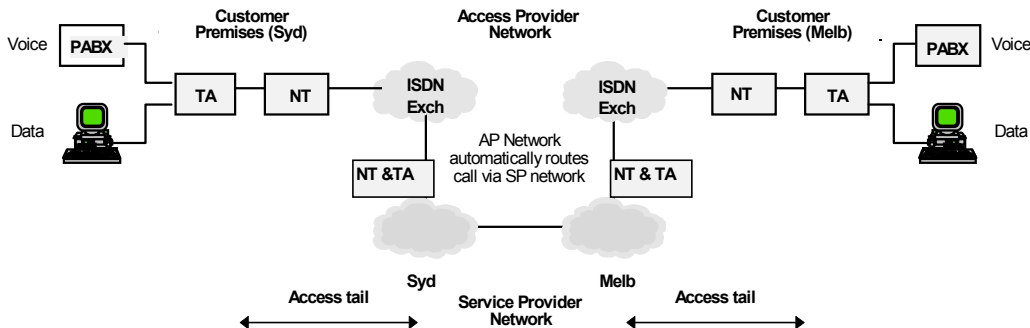
... ISDN is in fact a high level residential and small business market. It is one of the big growth areas for the product. It is really a high value version of the PSTN.⁷

Applications for ISDN services include:

- data transfer;
- telephony;
- Internet access;
- PABX networking;
- video conferencing; and
- telecommuting.

Telstra supplies ISDN services to both end-users and service providers. Where service providers have access to their own transmission networks, they purchase short distance ISDN services to use as customer 'access tails'. The access tail services supplied to service providers are similar to the eligible ISDN services. In essence, they are carriage services using that part of the network which connects end-users' premises to an exchange (that is, the customer access network). They are joined with the service providers' networks to create an end-to-end service as shown in Figure 3.1.

Figure 3.1. Access tails joined to a service provider's network



End-users of ISDN are located within central business districts, outer lying metropolitan and non-metropolitan areas.⁸ In accordance with Telstra's licence condition, ISDN services will be available throughout most parts of Australia. In this regard, the Commission understands that Telstra has allocated 13.8 million ISDN telephone numbers to metropolitan and non-metropolitan locations throughout Australia (which could be used for either leased line or switched ISDN services).

7 Melbourne hearings at pp. 58–59.

8 Optus letter dated 17 March 1998.

Suggested substitutes

The next step in market definition is to consider those services which sellers and buyers would regard as substitutes for ISDN services.

Service providers currently use ISDN services as a customer access tail input for retail frame relay leased line services where the customer is not directly connected to the service provider's frame relay network. As retail services, these frame relay services compete with Telstra's Accelerate Frame Relay service. They also compete with Telstra's ISDN flat rate and capped charge services (i.e. the Semi-Permanent Circuit and OnRamp Xpress services), although over longer distances, the Accelerate service is priced lower than the ISDN service.

In addition, the following services were suggested to the Commission as substitutes:

- digital data services;
- asynchronous transfer mode (ATM) services;
- wireless data network services;
- public switched telephone network (PSTN) services;
- hybrid fibre coax (HFC) cable network services; and
- digital services across electricity lines.⁹

Some of the suggested substitutes are used only as leased line services whereas others might be used for both leased line and dial-up services. Whether they can be regarded as substitutes for ISDN was examined at both the Sydney and Melbourne hearings. Subsequent to the hearings, the Commission undertook further inquiries to examine the substitutability of each service for ISDN services.

Digital data and ATM services

Digital data services are leased line services supplied by Telstra to end-users using its digital data network. These services have greater reliability, and can be used to carry digital signals at greater speeds, than ISDN services. Digital data services include services such as DDS Fastway which are supplied to end-users. Telstra also uses its digital data network to support other digital data services such as its frame relay service, Accelerate Frame Relay, which is supplied to end-users over its frame relay network. In addition, Telstra's digital data services include the Data Access Service which it offers to service providers as the 'digital data access service' declared under Part XIC of the TP Act.

The ATM service is a relatively new service with greater reliability than ISDN services and can be used to carry digital signals at speeds of 2 Mbps to 622 Mbps provided over optic fibre networks. It can be used solely as a transmission service in conjunction with other digital access tail services, or as an end-to-end digital service. ATM services are supplied by Telstra and other service providers (for example, Optus).

9 Telstra submission at pp. 32–35.

Digital subscriber line products (for example, HDSL) are also used to supply leased line services. These services involve the carriage of digital signals at higher speeds than ISDN.

From the perspective of service providers, no services are substitutable for ISDN services.¹⁰ Information received by the Commission indicates that the alternative customer access services (i.e. Telstra's Data Access Service and Frame Connect service) are priced at least 30 per cent more than ISDN services.¹¹ It was noted, however, that should the digital data access service declaration be amended as proposed by the TAF, then the service offered by Telstra in meeting its obligations under Part XIC of the TP Act may become a substitute for certain ISDN services currently used as an input for leased line services.

ATM services and other digital data services do not appear to be regarded by end-users as substitutes for ISDN services or for frame relay services (where ISDN services are used as customer access tails). They are high bandwidth, high reliability services which are accordingly, significantly more expensive than the ISDN and frame relay services over the same distance. To end-users for whom high quality digital services are critical (for example, banks and stock exchanges), lower quality ISDN and frame relay services are not an alternative from a functional perspective. For end-users not requiring high bandwidth, high reliability services, the lower price of ISDN and frame relay services suggests that ATM and other digital data services should not be viewed as substitutes.

The Commission understands that future developments in this area may include the roll-out of other digital subscriber line technologies (for example, ADSL) using the existing copper networks. These will provide a high speed, high quality data service. These services are currently in the developmental phase.

Wireless services

Wireless services carry digital signals using the radio frequency spectrum. They include the digital mobile telephony systems (i.e. GSM), multipoint channel distribution services (MMDS), local multipoint distribution services (LMDS), microwave and satellite. The speed at which the digital signals are carried depends on the type of wireless network. Not all wireless digital services are currently available; although, current and forthcoming auctions of spectrum by the Australian Communications Authority may increase the availability of these services.

The Commission understands that for wireless over the mobile telephony portion of the spectrum, speed and quality limitations in current generation mobile phone systems reduce its attractiveness to end-users as a substitute for ISDN services. Those wireless networks providing faster, higher quality transmission services typically involve high equipment costs. It is understood that these wireless products are being developed which may lead to wireless becoming a substitute customer access service for frame relay and ISDN services. The timeframe within which this will occur is, however,

10 See, for instance, AAPT submission at p. 10, and Optus submission at p. 9.

11 Optus submission at p. 8.

difficult to gauge suggesting that these services ought not be included within the relevant market.

PSTN and cable services

Telstra's standard telephony service (i.e. its PSTN service), together with a modem, can be used to convert signals from digital to analogue for transmission from the customer premises to a network exchange. The maximum speed available for transmission of analogue signals using the PSTN is 56 kbps. On average, however, it appears that transmission occurs at lower speeds. In addition, Telstra provides a cable service (for carriage of pay television) which is used for permanent Internet access.¹² Telstra claims its cable network can carry signals to end-users at up to 100 times analogue download speeds.¹³

Optus also provides a standard telephony service via its cable network. This network (in conjunction with a modem) can be used for data services on a switched basis.

The lower speeds associated with telephony services make them an unlikely substitute for leased line services, although it appears they ought to be regarded as a limited substitute for ISDN dial-up services. Optus submitted that PSTN and ISDN services are in two distinct markets due to pricing and functionality differences between the services. In Optus' view, there are a significant number of consumers who will not move away from PSTN services to ISDN services due to the pricing differentials for these services. Moreover, the Commission notes Telstra's advice that current growth in Internet data services is being met largely by telephony services (such as Telstra's PSTN service).¹⁴ This seems to be due to the lower charges for telephony services.¹⁵

In examining the issue of substitutability, the question for the Commission is whether the pricing of standard telephony services constrains the pricing of ISDN services to such an extent that they should be regarded as substitutes. Telstra's marketing material compares the price of ISDN services to the price of PSTN services indicating that PSTN services are likely to be regarded as substitutes by some end-users, particularly home office and small business users.

The Commission notes, however, the information provided by Optus suggests that the relationship may not be sufficiently strong to include standard telephony services in the same market as ISDN services. In addition, changeover costs may further limit the degree of substitutability. On balance, the Commission considers that standard

12 With this cable service, carriage and Internet access are provided as part of the one service package. The package currently offered by Telstra provides for a monthly access charge which is marginally more than the ISDN access charge but includes a permanent connection with up to 100 Mbytes of data transfer each month.

13 Telstra's web site (<http://bigpond.net/bpcable/index.htm>).

14 Telstra submission at p. 36.

15 By way of comparison, the annual access charge to business end-users for PSTN services is one-third of the ISDN annual access charge. Also, carriage charges tend to be lower. Calls to an Internet service provider are predominantly local calls which, using PSTN services are untimed, whereas calls using ISDN services are timed.

telephony services are likely to be regarded as substitutes by certain ISDN end-users (mainly home office and small business users), but notes that there will be many end-users for whom these telephony services are not substitutable.

Electricity services

Using electricity distribution networks to transmit digital signals from customer premises to transmission networks is a relatively new development. It is understood that, in the absence of switching equipment, the distribution network can be used to provide a leased line service. While there are plans to develop and market the technology in European and Asian countries,¹⁶ no information has been received by the Commission suggesting any proposal for the development of this technology in Australia. Any Australian roll-out of this technology may be complicated by the predominance of overhead electricity lines (which increases the level of interference). These factors suggest it ought not, at this stage, be regarded as a substitute for ISDN services.

Suggested markets

The pricing of ISDN services has contributed to two distinct uses for the service — a leased line service and a switched (dial-up) service — which, the Commission understands, are not regarded as substitutes from the perspective of customers. Accordingly, based on information received by the Commission, there would appear to be two types of market in respect of which the declaration of ISDN services could constrain market power and thereby promote competition — a leased line services market and a switched (dial-up) services market.

The leased line services market includes ISDN services and frame relay services (which use ISDN services for customer access). Other leased line data services (for example, the digital data services) which provide high bandwidth, high reliability carriage services appear to be within a separate market. ISDN services and frame relay services (which use ISDN services for customer access) are priced significantly lower than these other leased line services and are not regarded as an alternative from a functional perspective.

The switched services market includes ISDN services. In addition, it seems appropriate to include standard telephony services (Telstra's PSTN and Optus telephony service) because these telephony services are likely to be regarded as substitutes by certain end-users. The Commission notes, however, that there will be many ISDN end-users for whom these telephony services are not substitutable.

Reflecting the ubiquity of the ISDN service, and its national pricing, the geographic dimension of these markets would appear to be national.

16 News release, 'Joint Venture Formed to Market Digital PowerLine Technology Worldwide, Initial agreements reached — serving more than 35 million homes', 25 March 1998, <http://www.nortel.com/>.

With respect to the functional dimension the Commission considered whether there was a single leased line services market and a single switched services market, with each market containing both wholesale and retail levels, or whether the wholesale and retail activities should be represented as occurring in separate markets. Information received by the Commission did not definitively point in one particular direction. For instance, the ISDN services which are currently acquired by service providers and which would be acquired if the eligible ISDN services were declared are 'inputs' and thus could be described as wholesale services. The services currently acquired by service providers are, however, acquired from Telstra as retail services at a retail price. Furthermore, the market consists of vertically integrated suppliers of telecommunications services who source some inputs using their own networks and other inputs using Telstra's network.

Optus suggested that the Commission ought to focus on the potential for a separate wholesale market. On balance, the Commission recognises that it does not need to take a definitive stance on market definition. Accordingly, the Commission approached the matter on the basis that there was a single leased line market and a single switched services market, with each market containing distinct wholesale and retail levels.

Hence the two markets appear to be the following.

- A market for the supply of low bandwidth (up to around 2 Mbps) leased line services to service providers and end-users for the carriage of digital signals. This market is a national market including ISDN and frame relay services (which use ISDN services for customer access). This market is referred to as the 'leased line services market'.
- A market for the supply of switched (i.e. dial up) services to service providers and end-users for the carriage of digital signals. This market is a national market including ISDN services. It involves the carriage of digital signals at faster speeds than standard telephony services. Standard telephony services (such as Telstra's PSTN service and the Optus telephony service) are included within this market, although there will be many ISDN end-users for whom these telephony services are not substitutable. This market is referred to as the 'switched services market'.

3.2.2 Will declaration promote competition?

Declaration under Part XIC of the TP Act constrains the manner in which the supplier of network services can exercise its control over those services to inhibit the development of effective competition. Where declaration is likely to facilitate the entry of efficient competitors, or enable more efficient competitors the opportunity to win custom from less efficient competitors, then it will promote competition.

To consider whether declaration of a service is likely to promote competition in the relevant markets, the analysis commences by examining the effectiveness of competition in those markets without declaration. Then, the likely impact of declaration on competition is considered.

Leased line services market

Effective competition is inhibited where one or more firms have substantial market power. This power enables the firm (or firms) to profitably divert prices, quality, variety, service or innovation from competitive levels for a significant time in that market or in dependent markets. Accordingly, in the context of a declaration inquiry, assessing the effectiveness of competition is concerned with examining the market power of particular firms in relation to the relevant eligible services and considering the impact of this power on the development of competition.

In the leased line market Telstra supplies ISDN services directly to end-users, currently holding in excess of 40 per cent of the market at the retail level. Telstra also supplies certain ISDN services¹⁷ to service providers which they combine with their own network services in order to supply competing data services to end-users. The services Telstra supplies to its competitors are similar to the eligible ISDN services under consideration in this inquiry. They are essentially customer access services.

In considering whether Telstra has market power in relation to the supply of the eligible ISDN services, it is instructive to examine barriers to entry. This is because it is the ease of market entry which disciplines the conduct of existing firms.

To enter the leased line services market, firms need to access end-users. They can obtain access through using the infrastructure of existing market participants or by establishing alternative customer access infrastructure.

Submissions to the Commission suggest that it would not be viable to build an alternative infrastructure to supply the eligible ISDN services. For instance, Optus stated:

... It is not possible for a competitor to offer a stand-alone ISDN service without a developed network of direct connect customers due to the massive capital investment required to build such a network.¹⁸

Looking to evidence of the viability of rolling out alternative infrastructure, it is noted that this has occurred on a limited basis. Optus has rolled out an HFC network which passes approximately 2.2 million homes. It appears, however, that this network cannot provide the full range of services available with the ISDN. In addition, Optus states that it is not viable to configure the network for ISDN services starting from a zero market share.¹⁹ There also has been discrete roll-out of alternative networks by other service providers and it appears that this will continue. These discrete networks are being rolled out to supply services such as ATM and frame relay. They are not, however, being rolled out on a ubiquitous basis.

17 Namely, ISDN Semi-Permanent Circuit, Interim Semi-Permanent Circuit and OnRamp Xpress services.

18 Optus submission at p. 11.

19 *ibid.*, p. 11.

During the inquiry it was suggested that Optus has available to it the ability to offer ISDN over its optical fibre network. The Commission raised this matter with Optus. In response, Optus advised that it is likely to be capable of offering primary rate ISDN services through its optical fibre network in the central business districts of major capital cities. Optus would not, however, be able to offer this service on a ubiquitous basis. In its view, the ability to offer a ubiquitous service would be a key consideration affecting the viability of launching an ISDN service.

Accordingly, the development of effective competition in this market would appear to be dependent upon the supply of the eligible ISDN services or similar services by Telstra which enable service providers to access end-users. Control of the network used to supply the eligible ISDN services would seem to confer significant market power on Telstra which could be strategically used to raise barriers to entry by refusing supply or to limit effective competition through charging a monopoly price.

Telstra has not used its market power to refuse to supply existing and prospective entrants with ISDN services for customer access. It is understood, however, that market participants have been only able to purchase ISDN services at retail prices. Furthermore, Telstra has demonstrated the ability to raise the prices of these services to the detriment of competitors and entrants. In the latter half of 1997, in the context of phasing out its Semi-Permanent Circuit ISDN services, Telstra introduced its OnRamp Xpress ISDN service at prices which were substantially more than the Semi-Permanent Circuit prices. Following Commission intervention, Telstra revised the price for the OnRamp Xpress service to align it more closely with the existing price for the Semi-Permanent Circuit services.

The eligible ISDN services are intended to be used by service providers for the same purpose as ISDN Semi-permanent Circuit on OnRamp Xpress services (i.e. as customer access services to connect end-users to transmission networks) in order to supply leased line services to end-users. Declaration of the eligible ISDN services would accordingly constrain the manner in which Telstra can exercise market power in pricing customer access services. This would be expected to result in these services being priced lower than would be the case in the absence of declaration, thus promoting prospects for market entry and increased competition within the market.

Switched ISDN services market

In the switched services market, Telstra supplies ISDN services directly to end-users. This market also includes standard telephony services which are used for the carriage of digital data signals (i.e. Telstra's PSTN service and the Optus telephony service).

As with the leased line services market, the eligible ISDN services provide a means by which entrants can access end-users. While there has been some roll-out of alternative networks for other services, (for the reasons specified above) the roll-out of alternative infrastructure to supply the eligible ISDN services does not appear to be a viable entry strategy at the present time.

Accordingly the development of effective competition in this market also depends upon

the supply of the eligible ISDN services or similar services by Telstra. This control of the infrastructure used to supply the eligible ISDN services would appear to confer significant power on Telstra which could be strategically used to deter or limit market entry, thus limiting the effectiveness of competition.

While Telstra currently holds more than 99 per cent of the market at the retail level the Commission has not received information indicating that Telstra has used this power to actually refuse access or charge an inappropriate access price. It appears that negotiations to date have instead stalled on issues of technical feasibility or on developing an appropriate service description through TAF processes. Consequently, negotiations did not reach a stage where price issues could be addressed.

During the inquiry, service providers expressed a desire to supply long distance switched data services.²⁰ Declaration would be expected to constrain Telstra's market power by providing a regulatory framework within which outstanding technical issues can be resolved in a timely manner and within which service providers can negotiate access prices with Telstra against the backdrop of Commission arbitration should the parties be unable to agree. In the Commission's view, this is likely to promote the development of effective competition in this market.

3.2.3 The extent to which competition will be promoted

Leased line services market

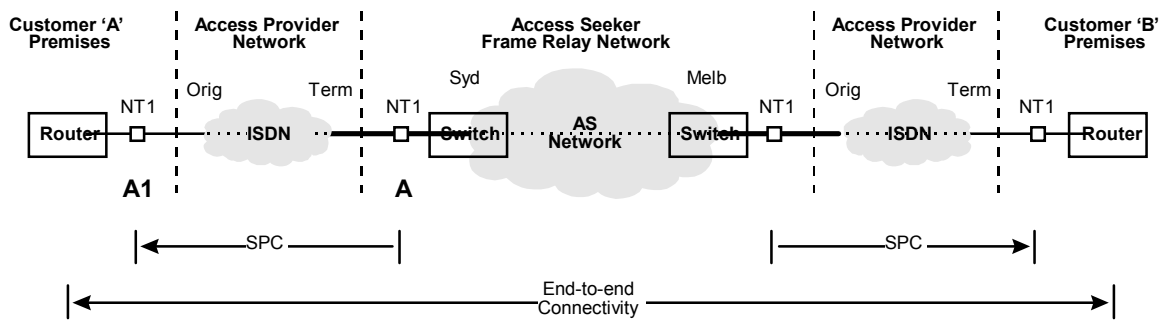
The extent to which competition would be promoted is likely to depend upon the terms on which access would be supplied in the absence of declaration. While it is difficult to reach definitive conclusions in this regard, it is instructive to consider the likely price relative to the price at which similar services (namely, the Semi-Permanent Circuit, Interim Semi-Permanent and OnRamp Xpress services) would be available. It is these services which service providers have been acquiring in the absence of declaration of the eligible ISDN services as input for their leased line services.

It would be expected that the eligible ISDN service, if declared, will be priced lower than the input services currently available, leading to declaration promoting competition in the leased line services market. Telstra has advised the Commission that they are different in one important respect and that this difference will impact upon the pricing of the eligible ISDN services.

More particularly, Telstra advises that the ISDN services currently supplied to its competitors are end-to-end services. That is, they involve the call being originated and terminated on Telstra's network. This is shown in Figure 3.2 where the call is originated at point 'A' and terminated at point 'A1'. Hence, for each leased line domestic circuit, a service provider acquires two end-to-end services.

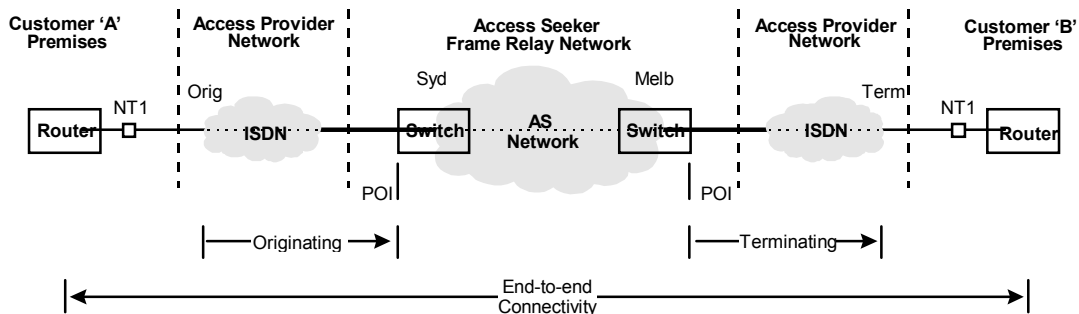
20 Melbourne hearing at pp. 46 and 58.

Figure 3.2. End-to-end ‘leased line’ service using SPC services



With originating and terminating services like the eligible ISDN services, the situation is different in that the call is originated by the end-user and handed over at a point of network interconnect, rather than terminated. The digitalised information is then carried on the service provider’s network. Where the call needs to be terminated on a network not controlled by the service provider, the call is then handed over at a point of interconnect to the appropriate terminating carrier. For instance, with domestic termination the call might be handed back to Telstra whereas, for international termination, the call would be handed over to another carrier. This is shown in Figure 3.3.

Figure 3.3. End-to-end ‘leased line’ service using ISDN originating and terminating access services



The services supplied by Telstra in Figure 3.3 are similar to those supplied by Telstra in Figure 3.2, except that in Figure 3.3 Telstra hands the call over at a point of interconnect rather than terminating the call. Despite these apparent similarities, Telstra advises the Commission that under the scenario depicted in Figure 3.3, the charge for ISDN services would be a timed charge whereas under the scenario in Figure 3.2, the charge would be a flat or capped charge. In Telstra’s view, this is because the charge for the services in Figure 3.3 would be based on the declared originating and terminating access charges (for PSTN services) which are timed charges.

The Commission understands that the practice is for leased line services to be provided

at a flat annual charge, rather than a timed per second charge, with the flat rate charge being lower than a timed per second charge over an equivalent period of time. Accordingly, should Telstra's views hold and the eligible ISDN services be priced only on a timed per second basis, then the eligible ISDN services may be unattractive for use as an input for frame relay leased line services. Consequently, declaration of the eligible ISDN services may be unlikely to promote competition to a significant extent.

In its draft report, the Commission stated that, given the similarities between the services in Figures 3.2 and 3.3, there would seem to be no reason why Telstra and service providers should not negotiate a flat or capped charge for the eligible ISDN services. In response, Telstra expressed 'fundamental concerns', suggesting that the Commission's view 'either ignores or indicates a lack of understanding of switched network efficiency principles'.

The Commission notes that time based charges may be an important rationing device where there are capacity constraints. Telstra has not, however, pointed to any existing capacity constraints or any constraints on the ability to extend capacity. Moreover, the Commission notes that Telstra currently supplies ISDN services to both end-users and service providers at a fixed or capped rate.

In any event, however, pricing matters are not matters about which the Commission must reach conclusive views in the context of a declaration decision. They are only relevant to the extent that they impact upon the promotion of competition and the encouragement of economic efficiency. Accordingly, in this context the Commission remains of the view that there would seem to be no reason why Telstra and service providers should not negotiate fixed or capped prices for the eligible ISDN services and that declaration would be expected to result in these services being priced lower than would be the case in the absence of declaration. Should they be unable to agree on access arrangements and one of them notify the Commission of an access dispute, then the Commission will explore the issue of pricing further at that stage.

The Commission understands that amendments to the current digital data access service declaration proposed by the Commission may lead to the service being used as a substitute for the eligible ISDN services. This will, however, be dependent upon the pricing of an amended service, along with the timing and extent of its availability. While this may limit the extent to which declaration promotes competition, the Commission did not receive information indicating that these amendments would neutralise the impact of declaration of the eligible ISDN services on competition.

Switched ISDN services market

The interest in using the eligible ISDN services for long distance competition suggests that declaration would promote competition in this market leading to lower priced carriage services for end-users.

In its draft report, the Commission noted that prices for ISDN services appear to be high by international standards. For instance, the Asia-Pacific Telecommunications Index 1998 ranks Telstra first for its IDD pricing but eighth for its ISDN pricing within

the region.²¹ Telstra took issue with the Commission's use of international comparisons, noting the difficulties associated with international comparisons.

In addition, the Commission received information indicating that the structure and level of pricing proposed for Telstra's OnRamp ISDN service departed from efficient levels, with prices being too high. Moreover, the penetration of ISDN services in Australia appears to be low. A 1997 study conducted by Siemens indicated that Australia has a penetration rate of 0.61 per cent, although Telstra advises that the rate is in the order of 5 per cent of total equivalent access lines.²² A sample of other countries' penetration rates from the Siemens report is presented in Table 3.1.

Table 3.1. Penetration rates for ISDN services (no. B channels/total no. main lines)²³

Country	Penetration level (%)
Australia	0.61
Belgium	2.12
Canada	0.17
Denmark	1.76
France	2.54
Germany	8.69
Japan	2.57
Malaysia	0.13
Netherlands	3.08
Sweden	1.28
Switzerland	5.30
UK	1.95

Accepting Telstra's penetration level would place Australia among the higher ranking countries in this table. In the Commission's view, 5 per cent is nevertheless still a low level of penetration when compared to other services available throughout Australia such as Telstra's PSTN service, but suggests that the benefits from declaration may be more widespread than initially anticipated. Moreover, the Commission expects that lower carriage prices would increase the level of penetration.

The OECD notes that Internet users are beginning to generate *'the first significant*

21 Centre for TeleMedia Strategy, National University of Singapore, *Asia Pacific Telecommunications Index 1998*, at p. 8.

22 Siemens, *1997 National Telephone Tariffs*, Munich November 1997.

23 This table provides a sample and accordingly, does not include all countries covered by the report. Furthermore, this table does not distinguish between leased line ISDN services and switched ISDN services.

growth in the use of ISDN by business and residential customers'.²⁴ Furthermore, it is expected that end-users' requirements for digital carriage services will expand from Internet access to other applications. In this regard, Telstra is marketing ISDN services as a 'small office, home office' product for small phone systems, remote access to networks and video conferencing.²⁵

Telstra submits that because it effectively ties its prices for ISDN calls to its long distance voice call prices, any reduction in ISDN call prices through declaration is likely to be small. In the Commission's view, however, direct competition through declaration is likely to be a more effective driver of lower call prices for ISDN services.

Of the eligible ISDN services the originating access service is available on calls made with pre-selection and over-ride dial codes in accordance with a pre-selection direction of the Australian Communication Authority. This would be expected to enhance the competitive benefits from declaration. In particular, with pre-selection and over-ride dial codes, end-users would not need to change numbers in order to acquire services from different service providers. This is likely to increase the level of competition and consequent benefits to end-users through increasing access by end-users to the range of competitive offerings, enabling end-users to thus enjoy the benefits of special tariff offers.

3.2.4 Achieving any-to-any connectivity for ISDN

Any-to-any connectivity enables end-users to communicate with each other, irrespective of the network to which they are connected. As the explanatory memorandum to the Trade Practices Amendment (Telecommunications) Bill 1996 noted, the concept of any-to-any connectivity is not always relevant in the declaration context. This appears to be the case with leased line services where the terminating points for communications must be set up on a 'permanent' basis in advance of the communication. It appears, however, to be more relevant to switched services where end-users will want to communicate with other end-users on a call-by-call basis.

Any-to-any connectivity is primarily concerned with terminating access; i.e. the ability of an end-user connected to one carrier's network to call end-users connected to other carriers' networks. Accordingly, were the Commission concerned solely with any-to-any connectivity, the services necessary for any-to-any connectivity would be more narrowly described than those in Appendix 1. However, because the Commission is also concerned with the objective of promoting competition through the declaration of ISDN services, it will consider the any-to-any objective in relation to the eligible ISDN services described in Appendix 1.

In considering whether declaration of the eligible ISDN services is likely to achieve the

24 OECD, *Communications Outlook '97*, Information, Computer and Telecommunications Policy, Paris.

25 See Telstra's Home Page, <http://www.telstra.com.au/prod-ser/isdn/uses.htm>. See also Telstra media release, 'Telstra extends OnRamp to cater for all Businesses', 3 September 1997.

any-to-any connectivity objective, the Commission applies the ‘with and without test’ to examine whether any-to-any connectivity will occur in the absence of declaration. Even where it is likely that any-to-any connectivity will occur in the absence of declaration, declaration may be nevertheless appropriate.

At the Sydney hearing, Telstra noted that while it was prepared to concede declaration of a limited terminating access service, it saw the case for declaration as being marginal.²⁶ Telstra did, however, note that declaration of a terminating service would provide an element of regulatory certainty. Furthermore, where the arrangements for any-to-any connectivity will involve negotiations between multiple parties, then declaration may also lead to a standard method of termination which enables these arrangements to be settled in a more timely and efficient manner.

While there appear to be incentives for Telstra to negotiate terminating access, declaration is likely to facilitate the timely resolution of negotiations through application of the standard access obligations. In addition, because there are likely to be several parties involved in negotiating any-to-any connectivity, declaration of the eligible ISDN services would be expected to assist this process by facilitating development of a standard approach. Timely resolution of these matters will enhance the ability of end-users to communicate with other end-users.

3.2.5 Encouraging efficiency

There are two components to this objective, namely, whether declaration would encourage the:

- economically efficient use of infrastructure; and
- economically efficient investment in infrastructure

used to supply communications carriage services, or content services supplied by means of communications carriage services. While the components are related, it helps to separate them for analytical purposes because declaration may have differing impacts on each.

3.2.6 Economically efficient use of ISDN infrastructure

In considering whether declaration will encourage the efficient use of infrastructure, the Commission must address technical feasibility issues. Where the Commission determines that it is technically feasible for the access provider to supply and charge for the service, it will be generally of the view that declaration will encourage the efficient use of infrastructure used to supply the services unless this would discourage efficient investment.

26. Sydney hearings at p. 53.

Feasibility

In order to examine whether it would be technically feasible for Telstra to supply and charge for an originating and a terminating ISDN service, the Commission engaged Cybercom Pty Ltd to undertake a technical feasibility study.

This study concluded that it is technically feasible for Telstra to supply and charge for the eligible ISDN services. Telstra advises that the CCS#7 protocol enables it to charge for ISDN originating and terminating access services.

With respect to the supply of the eligible ISDN services on calls made with pre-selection and over-ride dial codes, Telstra advises the Commission that its ETSI network does support pre-selection and over-ride dial code capability for voice calls and data over voice calls, but that the overlay network does not support pre-selection. For the overlay network, it appears that pre-selection would require the development of software to perform the task. As such, pre-selection appears to be technically feasible, but likely to involve a cost in terms of upgrading network switches.

Access costs

Telstra has advised the Commission that, in declaring the eligible ISDN services, it would be necessary to develop a protocol specifying the interworking capabilities for the services. Should both ISDN standards be covered by the declaration, then more than one protocol would be required.

These matters could be developed by the industry through self regulatory processes. In particular, this level of detail would appear to be more appropriately handled via an access code or undertaking. Development of these protocols is, however, likely to impose administrative costs on Telstra and accordingly, the Commission should consider whether the costs are reasonable.

In the Commission's view, these costs appear reasonable. They are expected to be similar to other costs incurred by Telstra in the provision of declared services. Further, the Commission understands that Telstra can draw on existing interconnection protocols.

With respect to supply of the service for ISDN calls made with pre-selection or over-ride dial codes, the Commission understands that, subject to the receipt of further information from Telstra, the Australian Communications Authority is currently considering whether to issue Telstra with an exemption from the current pre-selection determination under Part 17 of the *Telecommunications Act 1997*.²⁷ Given that it is the *Telecommunications Act* which would impose the requirement to provide pre-selection, the costs associated with upgrading overlay network switches as a result of that requirement would appear to be more appropriately considered in that context rather than in the context of Part XIC of the TP Act.

27 *Telecommunications (Provision of Pre-selection) Determination 1997*. This determination is issued pursuant to s. 349 of the *Telecommunications Act 1997*. Exemptions are granted under s. 352 of that Act.

Effect of access on telecommunications networks

The Commission must also consider whether access would affect the operation or performance of telecommunications networks. In its submission, Telstra claimed that:

The ISDN does not provide a cost-efficient means of supplying an access service for data networks. The ISDN is a circuit switched network. As such it is not the appropriate basis for supplying very long held connections, such as those typically required for access to data networks ...

... With the transition from the original Telecom Australia version to the internationally recognised ETSI standard, the case for using the ISDN network in this way no longer holds.

Rather, efficient investment is best served by a progressive move of long held data services away from circuit switched services.²⁸

Telstra did not, however, claim that using the ISDN for short distance long held calls (as is currently the case where ISDN is used by service providers as an access tail) would adversely affect the operation or performance of its network. Accordingly, the Commission has received no information indicating that the performance or operation of the network would be adversely affected by declaration of the eligible ISDN services.

3.2.7 Economically efficient investment in infrastructure

Efficient investment makes an important contribution to the promotion of the long-term interests of end-users. It can lead to more efficient methods of production, fostering increased competition and lower prices, as well as enhancing the level of diversity in the goods and services available to end-users.

In assessing the impact of declaration investment, the Commission will consider both negative and positive impacts. In some instances, the absence of declaration could lead to inefficient investment (such as duplication) or keep markets 'locked up' thus preventing innovation and investment. While, in other instances, declaration may deter efficient investment.

When considering the impact of declaration on investment, the Commission is mindful that the impacts may differ depending on the type of investment in question. For instance, the declaration of originating and terminating access is likely to affect investment in both local loop networks and in long distance transmission networks. Accordingly, the Commission separates out particular types of investment for analytical purposes. In this regard, the Commission will examine the likely impact of declaration on efficient investment in:

- infrastructure by which the eligible service is supplied; and
- infrastructure by which other communications carriage services, and services supplied by means of communications carriage services, are supplied.

Infrastructure used to supply the eligible service

28 Telstra submission at pp. 7–8.

Paragraph 152AB(6)(b) of the TP Act requires the Commission to consider the impact of declaration on the legitimate commercial interests of the potential access provider, including the ability of the provider to exploit economies of scale and scope. In the Commission's view, the concept 'legitimate commercial interests' has a number of dimensions. For instance, it covers the provider's interest in earning a commercial return on its investment, its interest in maintaining contractual commitments and its interest in using the network to meet its reasonably anticipated requirements.

Through its access pricing principles, the Commission recognises the legitimate commercial interests of the access provider by including provision for the provider to earn a normal commercial return on the investment.²⁹ Further, the Commission has not received information indicating that declaration of the eligible ISDN services would adversely impact upon Telstra's ability to maintain contractual commitments, to use the network to its own ends or to exploit economies of scale and scope.

Additionally, the Commission must consider the impact of declaration on the incentives for investment in the ISDN infrastructure — paragraph 152AB(6)(c) of the TP Act. In this regard, the Commission considers the impact of declaration on Telstra's maintenance, improvement and expansion decisions.

In its submission, Telstra suggested that the overlay network services should not be included within the scope of the eligible ISDN services because:

Including both the domestic and the ETSI standards in the ISDN service descriptions will encourage the continuance of the use of a form of ISDN which is being phased out and the continuance of a standard which is used only in Australia.³⁰

It was put to the Commission,³¹ however, that unless the overlay network services were covered by the declaration, the price of end-to-end services using overlay network services will remain high and the lack of effective competition will allow Telstra to maintain its pricing advantage on downstream services provided in this manner.

In responding to the draft report, Telstra again raised its concerns, submitting that:

Customers migrating from one technology to another may reconsider their source of supply, and would be a target for well-timed marketing campaigns by Telstra's competitors ... The declaration of domestic ISDN could have the effect of slowing migration, and thus the emergence of this market opportunity for service providers. With respect to migration, current demand figures indicate a higher rate of cancellations than demand for Basic Rate services on the domestic network.

The Commission understands that Telstra supplies over 400 000 ISDN basic rate line equivalents provided using the overlay network. Information provided by Telstra to the Commission shows that until May 1998, the number of basic rate lines was growing although, there was higher growth in the number of basic rate lines on the ETSI network. Nevertheless, as at May 1998, the number of basic rate lines on the overlay

29 ACCC, *Declaration of Telecommunications Services*, April 1998 at p. 28.

30 Telstra submission at p. 39.

31 Jtec submission at p. 3 and BT submission at p. 5.

network was almost six times the number of lines on the ETSI network. Accordingly, not covering the overlay network could limit the choices available to a significant proportion of end-users who would (currently) prefer to remain on the overlay network.

In the Commission's view, declaration may impose some costs on Telstra in relation to the phase out of its overlay network. However, it is not clear that these costs would justify exclusion of the overlay network from the service descriptions for the eligible ISDN services, particularly where most of the current ISDN lines are on the overlay network. The Commission is alert to Telstra's concerns about the impact of declaration on its migration strategy; however, based on the material considered during this inquiry, the Commission is not convinced that these concerns warrant excluding the overlay network.

The Commission notes that Telstra can seek an exemption from the standard access obligations under s. 152AT of the TP Act, which can be expressed to come into effect at a later date (paragraph 152AT(7)(b)). In the Commission's view, this exemption process could be used to phase out overlay services from a specified future date as part of a managed transition program where this would be in the long-term interests of end-users.

Declaration is not expected to reduce Telstra's incentives to expand its ETSI network. Telstra's licence requires it to roll-out the network to an extent which will enable ISDN services to be available to 96 per cent of Australians by 31 December 1998. Telstra claims, however, that declaration of ISDN services would reduce the incentive for others to invest in ISDN infrastructure.³²

The Commission is cognisant of these concerns and, in its draft guide entitled *Declaration of Telecommunications Services*, explains that this could occur in two ways. First, where access seekers can access existing infrastructure they may not construct their own networks. Second, where the services of new networks could be subject to declaration, then declaration may dim investment incentives.

To a large extent this concern is tied to the principles which the Commission would apply in determining the price for ISDN services should it be required to exercise arbitration responsibilities under Part XIC of the TP Act. While the Commission has not yet formed a view as to the relevant pricing principles, the principles would provide for a minimum of a normal risk adjusted return on investment. By providing for a normal risk adjusted return, declaration should not distort investment decisions, unless investors perceive there to be additional risk that declaration will inappropriately reduce their revenues.

Testing these assertions is difficult in the sense that it is difficult to reach a conclusive view. Nevertheless, to explore these matters the Commission sought to ascertain whether there are plans for roll-out of ISDN infrastructure by others. Inquiries to date have not revealed any plans for investment in ISDN infrastructure, although Optus noted that it is likely to be capable of offering primary rate ISDN services on its optic

32 Telstra submission at p. 37.

fibre infrastructure in central business district locations. Instead, the investment which is occurring or proposed relates to other data carriage services such as ATM or frame relay.

Furthermore, should this risk be material, the scope of Commission declaration decisions can be limited by granting a class or individual exemption from the standard access obligations under ss 152AS and 152AT of the Act. The Commission can grant exemptions where to do so would be in the long-term interests of end-users.

Infrastructure used to supply other services

In addition to considering the impact of declaration on incentives to invest in infrastructure used to supply ISDN services, the Commission will also consider the impact of declaration on investment in infrastructure used to supply other services. In this regard, Telstra submits:

Competition in data markets is strong and shows signs of innovation and dynamism. There are clear signs of new entry. A requirement to provide ISDN originating access on the broad basis is likely to dampen this innovation and dynamism and discourage investment ...

Any carriage service provider or carrier seeking to install and operate a new or innovative data service will be discouraged from doing so if there is substantial risk to its investment caused by over regulation in the market place.³³

To test these concerns the Commission raised these matters with investors in data carriage infrastructure. Information received by the Commission indicates that customer access infrastructure is being rolled out, or planned to be rolled out, on a discrete basis in business district locations of several capital cities. It is understood that this infrastructure will be used for digital services including frame relay and ATM services. Advice received by the Commission indicates that the roll-out of this infrastructure would be unaffected by the declaration of ISDN services.

3.3 Conclusion on ISDN

The Commission is of the view that declaration of the eligible ISDN services (that is, the services described in Appendix 1.3) would be likely to promote competition in the markets for leased line and switched digital services. This is likely to lead to benefits for end-users primarily in terms of lower prices for these services. Lower prices would be expected to increase the accessibility of data communications services for end-users, along with improved access to services such as the Internet.

Declaration is also likely to result in the achievement of communication between end-users connected to different networks through interconnection on a more timely basis. The impacts of declaration on the efficient use of, and efficient investment in, infrastructure are not expected to adversely affect end-users. While declaration is

33 Telstra submission at pp. 37–38.

expected to impose administrative costs on Telstra, those costs appear reasonable. Furthermore, it appears that declaration is unlikely to deter efficient investment.

Accordingly, the Commission is satisfied that declaring the eligible ISDN services will promote the long-term interests of end-users of carriage services or of service supplied by means of carriage services.

In its draft guide entitled *Declaration of Telecommunications Services*, the Commission notes that when making a declaration it may announce a proposed review date for the declaration. In its draft report, the Commission stated that it had not formed a view as to whether to include a review date. Subsequently, and in light of submissions received on this matter, the Commission has decided not to specify a proposed review date.

4. Transmission

4.1 Service description

Overview

Transmission capacity is a generic service which can be used for the carriage of voice, data or other communications. It is characterised by being wide — or broadband carriage (the minimum bandwidth is 2 Mbps) and therefore includes traffic such as aggregated voice or data channels used by carriage service providers to construct networks, or integrated data traffic permitting various forms of digital traffic — such as voice, video, data, etc. — to be combined to take advantage of economies of scale in transmission. There are a number of geographic and functional markets for the provision of transmission capacity. The geographic and functional characterisation of the markets in which transmission services are supplied are discussed in the following section.

The Commission deemed various types of transmission capacity as a declared service under the transitional provisions on 30 June 1997. The complete deemed service declaration for the transmission capacity service as set out in the Deeming Statement is at Appendix 2.

As the Commission noted in the Deeming Statement:

Transmission is a service for the supply by an access provider of transmission capacity to the access seeker pursuant to a range of different requirements including transmission links to the access provider's network, transmission links within the access seeker's network and transmission links between an access seeker's point of presence and the access seeker's customer premises ... There are a number of types of transmission capacity, which have differing degrees of contestability. These are:

- tail-end transmission;
- inter-exchange local transmission;
- inter-capital transmission; and
- other transmission.³⁴

Tail-end transmission refers to transmission between a point at a customer location and some point on the access seeker's network (that is, a point of interconnection). For example, in the case of a customer whose premises are located near an access provider's local exchange where there is a 'transmission point of interconnection', or TPOI, the transmission of traffic from that customer premise to the access provider's local exchange, and hence to the TPOI, would constitute 'tail-end transmission'.

³⁴ ACCC, *Deeming of Telecommunications Services*, 30 June 1997, p. 20.

Inter-exchange local transmission refers to transmission between POIs located at or virtually co-located with an access provider's local exchanges, both of which are within a single call charge area (CCA). In functional terms, these transmission links together with switching and network management functions constitute the 'inter-exchange network' or IEN which carries traffic within a CCA but where the transmission points are not linked to the same local exchange.

Inter-capital transmission and 'other transmission' refer to transmission between TPOIs which are located in different CCAs. 'Inter-capital' in this sense refers to transmission between the sites specified in the Deeming Statement (Brisbane, Sydney, Canberra, Melbourne, Adelaide and Perth). 'Other' refers to transmission to or from a TPOI not being a 'capital' site.

From this characterisation it should be apparent that the 'end-to-end' provision of transmission capacity — that is, provision of transmission capacity between two sites being customer locations — may be broken down into the composite components of:

- a 'tail-end' from each site to the nearest local exchange;
- the provision of either inter-exchange transmission, inter-CCA transmission or a combination of the two (dependent on whether the relevant exchange closest to the customer is the exchange from which inter-CCA traffic is routed on the access provider's network); and
- functionality contributed by the access seeker such as switching or traffic management.

Neither the current declared service nor the proposed amendments result in the declaration of this end-to-end service. Rather, both the current declared service and the proposed amendments require access providers to offer to access seekers the constituent service as an input to the provision of retail services, or who require transmission capacity to provide underlying network functionality (for example, transmission between points of presence on an access seeker's network) with that constituent service.

The current service description for bandwidth capacity is 2 Mbps. Currently, those wishing to use bandwidth of a capacity greater than 2 Mbps, may combine groupings of the declared capacity of 2 Mbps. For example, 17 x 2 Mbps would provide the access seeker with a 34 Mbps service.

Alternatively, access seekers may obtain a single higher bandwidth feed of, for example, 34 Mbps from an access provider. In this case, only a single 34 Mbps port would be required. From the access provider's perspective, less multiplexing is required, as the bandwidth does not have to be broken down to 2 Mbps.

4.2 Market definition

Relevant markets

Identification of the relevant markets provides the Commission with a field within which it can meaningfully analyse the effectiveness of competition and the effect of declaration or variations to declaration.

Markets have four dimensions: product, geography, function and time. The process of market definition involves identifying the sellers and buyers which effectively constrain the price and output decisions in relation to the service under consideration. To do this, determination of the market boundaries starts with the service. The service is described in product, geographic and functional terms. These market boundaries are then extended to include all other services which are actual or potential close substitutes.

The services were described in the previous section. As with DDAS, the services can be looked at in terms of two functional levels: the wholesale transmission service and the services which require transmission capacity as an input (downstream services). Similarly, transmission capacity has been declared because it embodied characteristics which were considered to be important in ensuring regulated access. Further, the specific variations to the existing service, in terms of the specification and location of TPOs, can be looked at more directly in terms of the LTIE tests. However, the question of inter-capital transmission should be viewed essentially as a new or additional service, where the issue of market definition and analysis will be particularly important.

Market participants

In its submission Telstra argued that the current range of high bandwidth transmission capacity suppliers are:

- Telstra through its fibre optic/radio network;
- Optus through its fibre optic/radio network;
- microwave and other radio links installed for AAPT, Northgate, Macrocom utilities, universities and others;
- fibre optic links installed by carriers and utilities in urban areas; and
- satellite (particularly broadcast video applications).

Table 4.1 on the following page shows Telstra estimates of metropolitan and inter-capital market shares (including video) held by high bandwidth suppliers.

However, by way of contrast other submitters stated that the only significant suppliers of high bandwidth capacity are Telstra and Optus. They argued that the substitutes referred to by Telstra are not viable. For instance, BT advised that:

- microwave is not as reliable as a cable connection, is of limited bandwidth application and as a result is infrequently used;

- satellite is too expensive to use; and
- there are no offers of high bandwidth supply from the power companies.

Some of the possible alternative sources of supply such as United Energy and Macrocom were considered by one submitter not *‘to be realistic alternatives in the next eighteen months’*.

Similarly, SITA submitted that:

... there has been some movement in regards to the provisioning of alternative transmission capacity such as microwave services, but this is of limited use when compared to fibre optic technology in the provisioning of either 34 Mbps connections or 155 Mbps connections [SITA submission, p. 3].

Table 4.1. Market shares held by high bandwidth suppliers

Market segment	
Metropolitan	Inter-capital
Telstra 5%	Telstra 15%
Optus 10%	Optus 20%
Microwave 80%	Microwave 5%
Other 5%	Satellite 60%

Source: Telstra submission p. 22.

Submitters stated the importance of reliability in the provision of higher bandwidth services. For example Optus referred to high quality transmission as being *‘critical in the provision of data related services’*.

Based on information provided, the Commission considers that the following geographic markets exist in the provision of transmission capacity greater than 2 Mbps:

- inter-capital;
- regional to capital;
- intra-regional;
- metropolitan; and
- CBD.

The main application of higher bandwidth capacity in these markets is as follows.

Inter-capital

High speed data/corporate network links; aggregated narrowband voice; video links; backbone networks for the provision of internet, frame relay and ATM.

Regional to capital

Regional Universities and Government site connections; internet backbone; and aggregated narrowband voice.

Intra-regional

University campus interconnection and regional utilities.

Metropolitan

High speed data/voice/video corporate networking and site connection.

CBD

Corporate offices in close proximity connected for data/voice/video transmission.

Analysis of the functional level of the market indicates transmission capacity is provided at both the wholesale and retail functional levels. At the wholesale level, it is provided to access seekers who utilise such capacity as an input into the production of downstream retail services. At the retail level, it is provided to large corporate customers wishing to connect sites in various locations across Australia in order to undertake voice and data communications. This paper focuses on the impact of declaration on wholesale transmission services at one market level and on the downstream services which use transmission as an input at the other market level. The paper is not directly concerned with retail transmission services as provided to end users, although such services form an interesting backdrop in terms of price comparisons with so called wholesale services, which is examined separately.

The Commission's view (supported by the Commission's independent technical consultant) is that the main suppliers of higher bandwidth and inter-capital transmission services are the following.

■ **Optus**

The Optus products available to access seekers are Datalink and Broadlink.

Datalink operates on a Nx2 Mbps basis. In other words, Datalink is used (typically at the retail level) by access seekers choosing to aggregate blocks of 2 Mbps.

Broadlink is used (typically at the wholesale level) by access seekers wishing to obtain access to dedicated bandwidth of Nx2 Mbps, 8 Mbps, 34 Mbps and 45 Mbps. These bandwidths are provided in a single feed, and are not comprised of aggregate blocks.

■ **Telstra**

The Telstra product available to access seekers is Megalink/DDS Fastway. This only supplies Nx2 Mbps bandwidth, and consequently access seekers using the Telstra product must aggregate the 2 Mbps blocks in order to obtain higher bandwidth.

In addition, Telstra offers an ATM product (LMB), where single high Mbps bandwidth is available, but is limited to 39 kilometres between the terminating exchanges.

4.2.1 The proposed amendments

The Commission has received a proposal to amend the service description of the transmission capacity service (refer Appendix 3). The proposal was put to the TAF, and the members of the TAF did not agree whether or not the proposal should be accepted.

Table 4.2 identifies the key features of the amendment proposals and those issues the Commission considers to be the key differences between the current deemed service declaration and the proposed declared service.

Table 4.2. Current deemed service declaration and the proposed declared service

Characteristic	Current service description	Proposed service description
What bandwidth is to be supplied?	2 Mbps	2 Mbps (or multiples thereof up to 8 Mbps) and each of 34 Mbps, 45 Mbps, 140 Mbps and 155 Mbps
What are the points between which transmission capacity must be supplied?	2 points, one of which must be a TPOI, and being either a TPOI, point on the access seeker's network or a customer location	2 points, only one of which may be a customer location, and being either a TPOI, point on the access seeker's network or a customer location
What are the characteristics of the TPOI?	Located at points as agreed between the parties, but must be co-located with a PSTN gateway exchange (of either party)	Located at points as agreed between the parties
Is inter-capital transmission included?	No, named inter-capital routes excluded from the service description	Yes, no exclusions for specific routes in the service description

The Commission has examined each of these proposed amendments to the current service declaration below. The next section deals with the characteristics of the TPOI and the points between which transmission capacity can be supplied. Following this, the issues of whether inter-capital transmission and higher bandwidth services should be declared are examined together in section 4.6.

4.3 The nature of the TPOI

The current deemed service declaration requires co-location of a point of interconnection to which transmission capacity is provided (TPOI) with a PSTN gateway exchange of the access provider or access seeker. Under the proposed service description, access seekers and access providers would be able to agree on any network location for a TPOI, with no requirement with respect to PSTN gateway exchanges.

The Commission understands a ‘PSTN gateway exchange’ in the deemed service declaration to mean an exchange at which interconnection for the purposes of obtaining PSTN terminating or originating access may or does occur. For example, a ‘Telstra Interconnect Gateway Exchange’ is defined as any exchange ‘*nominated by Telstra for the provision of interconnection of declared PSTN services*’.³⁵

4.3.1 Industry views on the nature of the TPOI

Telstra submitted that the requirement for the TPOI to be co-located with a PSTN Gateway is the most efficient means of providing transmission capacity. In addition, Telstra consider that co-location is also necessary for an access provider to meet its compliance obligations pursuant to section 152AR(3) of the *Telecommunications Act 1997*, to:

- (a) take all reasonable steps to ensure that the technical and operational quality of the active declared service supplied to the service provider is equivalent to that which the access provider provides itself; and
- (b) take all reasonable steps to ensure that the service provider receives, in relation to the active declared service supplied to the service provider, fault detection, handling and rectification of a technical and operational quality and timing that is equivalent to that which the access provider provides to itself.

This view is shared by Optus, which submitted that:

... the proposed amendments are inconsistent with the intention of the imposition of standard access obligations on Access Providers [Optus submission, p. 19].

Optus did, however, support a change to the definition of a ‘Transmission Point of Interconnection’ in the service description attached to the section 39 Deeming of Telecommunications Services Statement. Optus proposed that the wording ‘PSTN Gateway Exchange of the access seeker or the access provider’ in the service description be replaced with ‘network location of the access seeker via an access provider network location which is capable of monitoring performance of the service’.

Optus believe that this amendment would improve efficiency in the provision of transmission capacity and ‘*promote competition in areas where gateway exchanges are not located*’.³⁶

The removal of the requirement for co-location of a TPOI and a PSTN Gateway Exchange is also supported by the majority of inquiry participants. Based on a number of submissions received from industry, and on technical advice from an independent consultant engaged by the Commission, there does not appear to be any technical reasons to prevent interconnection at points outside a TPOI (as currently defined). The views of the majority of submissions are reflected in the following statement:

35 Telstra undertaking for the provision of PSTN originating and terminating access, Annex D, p. 18.

36 Optus submission, p. 20.

The location of a TPOI should be dependent on the technical feasibility of providing such connectivity (though there may be costs associated with this to be borne by the Access Seeker) rather than an arbitrary nomination on behalf of Telstra or any other Access Provider [SITA Telecommunications submission, p. 2].

4.4 Points between which transmission is supplied

Table 4.3 compares the permitted connections between transmission points under the current deemed service declaration and the proposed amended service description.

Table 4.3. Transmission points under the current and proposed declared service

	Is the service included in the current service declaration?			Is the service included in the proposed amended service declaration?		
	CL	ASN	TPOI	CL	ASN	TPOI
Transmission points at the A- and B-end of the circuit being a:						
Customer location (CL)	No	No	Yes	No	Yes	Yes
Access seeker network location other than a CL (ASN)	No	No	Yes	Yes	Yes	Yes
TPOI	Yes	Yes	Yes	Yes	Yes	Yes

As can be seen from Table 4.3 both the current and proposed service declaration reject the declaration of transmission capacity between two customer locations. ('Customer' in this situation refers to a customer of the access seeker). Both the current and proposed service declarations support the declaration of transmission capacity between a TPOI and any point (whether another TPOI, a point on an access seeker's network or a customer location).

Accordingly, the key issue is whether any declared transmission capacity service should include transmission between points where one or both ends of the transmission capacity service are points which comprise part of an access seeker's network, but are not customer locations.

Related to this issue is whether there exists any basis for distinguishing, from an access provider's point of view, end-points which are customer locations, and end-points which are locations forming part of an access seeker's network. In some cases, the Commission considers that this could lead to inappropriate distortions in the decisions made by access providers or seekers. For example, under circumstances described in Chapter 3 of the *Access Pricing Principles*, it would be inappropriate for the cost of transmission capacity between two points to be reflective, not of the underlying TSLRIC of providing that service, but of the classification of the equipment located at that site.

4.4.1 Industry views on points between which transmission is supplied

Optus submitted that the proposed amendments to the service description may result in a transmission service which does not connect to or in any way intersect with an access provider's network. Similar concerns were expressed by Telstra in its submission.

In addition Telstra argued that the proposed amendment, if adopted, may result in the declaration of an end-to-end service as:

... it is not always possible to draw a sensible distinction between a customer location and a point on the access seeker's network. For example, a switch may be located at the premises of an access seeker's customer [Telstra submission, p. 24].

Optus argued that the declaration of an end-to-end service is inconsistent with the LTIE.

In particular, it would not be an economically efficient use of infrastructure to require Access Providers to provide isolated bits of transmission capacity which are in no way linked to the telecommunications network of the Access Provider [Optus submission, p. 20].

In this regard, Telstra also raised the issue of an access provider's obligation under section 152AR(3) of the TP Act '*... to provide the service to the same standard as which it provides the service to itself if there is no interconnection between the transmission link provided to the access seeker and the access provider's network*'.³⁷

By contrast, Vodafone provided the following example of a transmission capacity requirement between a base station at Alice Springs and a base station at Uluru:

Under the deemed service description, the declared service would only be provided from each base station back to our (*Vodafone*) switching centre in Adelaide, since this is the location of the gateway exchange. Under the amended service description, capacity would be provided between the two base stations, with one being linked back to Adelaide. The former topology could not be construed to be in the long-term interest of end-users, both because it is inefficient use of infrastructure, and because it would undoubtable increase our underlying costs of providing mobile services in those areas [Vodafone submission, p. 3].

In support of the proposal, BT argued that where existing conditions do not already provide for the competitive supply of services, Part XIC aims to facilitate access to these services to encourage the efficient entry of firms and efficient competition in dependent upstream or downstream markets. BT further stated:

... the location of points of interconnection is vital to the creation of viable network topologies. Restricting the provision of these points in Access Provider's networks to (for example) sites co-located with PSTN point of connection, imposes a serious burden on competing networks [BT submission, p. 4].

In relation to the issue of any-to-any connectivity, AAPT stated in its submission that the proposed amendments to the service description '*... would neither enhance or diminish the achievement of any-to-any connectivity between end-users*'.³⁸

37 Telstra submission, p. 25.

38 AAPT submission, p. 7.

A number of other inquiry participants, however, considered the proposed amendments would improve the provision of any-to-any connectivity. For example, CITEC stated that:

Any-to-any connectivity would be enhanced by the proposed amendments as service providers would have access to greater capacity and wider availability of TPOI [CITEC submission, p. 14].

The only inquiry participant to address the issue of efficiency was Optus who stated that:

The effect of such a change [the proposed amendments] would be to reduce the inefficiencies which would be imposed upon Access Seekers if transmission capacity was always required to terminate at a gateway exchange [Optus submission, p. 20].

4.5 Applying the LTIE criteria

Based on evidence gathered during the public inquiry it is the Commission's view that access providers should not be required to provide transmission capacity between points which do not connect with or intersect with their networks. The Commission does, however, consider that the LTIE would be promoted by removing the current requirement for the TPOI to be co-located with a PSTN Gateway Exchange. As a consequence, access providers will be required to provide access to transmission capacity at any agreed point between the access provider's and the access seeker's network.

The Commission's consideration is in terms of the LTIE criteria of whether the changes will promote competition, achieve any-to-any-connectivity and encourage the efficient use and investment in infrastructure.

Promoting competition

The Commission considers that there are clearly cost savings associated with an access seeker being able to interconnect with an access provider's network at any point closer than a PSTN Gateway Exchange.

If the locations of TPOIs were ultimately to be limited to points nominated by the access provider, there is a question of the competitive impact of those nominations. In this regard, the Commission considers that an access provider should not be able to restrict the areas or forms of competition. In other words, the Commission believes that access providers should not be able to erect, or to leave in place, barriers to entry in some markets by excluding interconnection opportunities to access seekers which would otherwise be technically feasible because (for example) the sites have not been nominated as PSTN Gateway Exchanges.

Efficient use and investment in infrastructure

In the absence of arguments relating to any-to-any connectivity, a key issue in determining whether 'PSTN gateway exchanges' should be the only sites for TPOIs, or whether interconnection should be permitted elsewhere in a network, will be the impact of that decision on the efficient use of, and investment in, infrastructure. In particular,

whether it is technically feasible to permit such interconnection at points not being PSTN gateway exchanges. The Commission understands that the only major limitations which may exist are:

- the amount of fibre optic cable physically connected to the TPOI, nominated by the access seeker; and
- the availability of rack floor space, should additional multiplexing equipment be required.

In general the Commission considers that decisions of this type should not be unilaterally decided by an access provider and reflected in service descriptions, but rather the decision should be open to commercial negotiation.

In this context the Commission recognises that the allocation of any additional costs, associated with interconnecting at a point other than a TPOI, should be subject to commercial negotiation. As a consequence, the ability to negotiate terms and conditions of interconnection, including the point of interconnection, should result in efficient 'build or buy' decisions.

Failure by the parties to be able to agree as to the locations of TPOIs could ultimately lead the Commission to determine those locations; if it is required to adopt an arbitral role (this would form part of the 'terms and conditions' on which the declared service is supplied).

4.6 Inter-capital and higher bandwidth transmission services

Overview

The Commission's deeming statement of June 1997 determined that where existing market conditions provide for the competitive supply of services, then it may not be appropriate to declare those services. On this basis, the Commission argued that removal of prohibitions on infrastructure provision post July 1997 would likely have the effect of creating a contestable market for the provision of inter-capital and higher bandwidth transmission services. As a result, the Commission decided not to declare inter-capital and higher bandwidth transmission but observed that it may be appropriate to review the basis upon which that decision was made at a later date.

Following representations from TAF members, the Commission now considers it appropriate to undertake a detailed assessment of the development of competition in the inter-capital and higher bandwidth transmission market since July 1997 and of the potential for increased competition in the market in the future.

This section examines whether it would be in the LTIE to declare inter-capital transmission capacity higher than 2 Mbps.

4.6.1 Industry views on declaration of inter-capital transmission

Industry opinion on the need to declare inter-capital transmission is divided. On the one hand, both Optus and Telstra believe there is no need to declare the service; whilst many other service providers are strongly in favour of a declaration. In essence, the arguments can be seen to revolve around two main issue.

- Are there enough competitive pressures in the market for inter-capital transmission to ensure access seekers get access to transmission at competitive levels and what effect would declaration have in improving such pressures.
- Would declaring the service distort incentives for efficient levels of infrastructure usage and investment to such an extent that it would not be in the long-term interests of end users.

The arguments put to the Commission in relation to each of these issues is presented below.

Promoting competition

Industry submissions which dealt with the issue of whether inter-capital transmission was competitively supplied focussed on four main issues:

- the number of sellers in the market;
- prices for inter-capital transmission access;
- price trends; and
- the threat of potential entrants.

The number of sellers in the market

A key issue in many of the submissions presented to the Commission is whether or not having just two main suppliers of inter-capital transmission (that is, Telstra and Optus) is enough to exert competitive downward pressure on prices. In their respective submissions to the Commission, both Telstra and Optus believe that two suppliers of inter-capital transmission are sufficient to make the market contestable and ensure pressure is applied to prices. In particular, Telstra claimed that:

... with Optus' inter-capital network providing a competitive alternative to Telstra's on all segments
... there is already a very substantial diversity of supply [Telstra submission, p. 5].

Optus concurred, believing that both carriers exhibit competitive rivalry in the provision of this service. Further, they believe that given the service is contestable, there is no need to declare it. Optus argued that:

The provision of inter-capital city transmission is contestable and contestable services should not be declared, in accordance with the Explanatory Memorandum to Part XIC [Optus submission to TAF, p. 4].

A number of other carriers, however, considered that two suppliers were not enough to ensure effective competition. SITA, in particular, argued that:

... the provisioning of Transmission Capacity has constituted the operation of a duopoly rather than one of true competition and that unless this service is declared then this situation will not change [SITA letter to TAF].

Vodafone agreed stating that:

... there are only two suppliers on inter-capital routes, which does not constitute competitive supply [Vodafone letter to TAF].

Global One go even further, suggesting that:

There is strong anecdotal evidence that ICTC [inter-capital transmission capacity] still exhibits on average monopoly characteristics and bottleneck features [Global One letter to TAF, p. 2].

Telstra, however, argued that the market for inter-capital transmission capacity is competitive as it comprises suppliers of microwave and satellite capacity as well as AAPT, Optus and Telstra. In addition, Telstra believe that the threat of market entry 'is a real competitive constraint'.³⁹

Telstra maintain that satellite, which is extensively used by television networks for inter-capital transmission, is more efficient than terrestrial transmission for point-to-multi-point communications. In addition, Telstra believe that satellite provides a more efficient and effective means of providing transmission capacity on point-to-point routes for occasional use traffic (for example, a satellite linking two different cities one day could be used to link another city pair the next day and so on). As a result, Telstra believe that there a substantial cost savings which arise from the use of satellite transponder capacity as 'the cost of replicating these links using terrestrial transmission systems would be prohibitive'.

In addition Telstra submitted that while microwave is mainly used in metropolitan and country areas, it is equally suited for inter-capital transmission, 'as demonstrated by Macrocom and United Energy's deployments'.⁴⁰

Prices for inter-capital transmission access

A second major point of conjecture is whether or not Telstra and Optus provide access to inter-capital transmission at a competitive price. Optus and Telstra argued that wholesale prices are highly competitive, as they are engaged in extensive price competition; Telstra, for example, suggested that it:

... has been subject to substantial price competition in a number of recent tenders for inter-capital transmission services [Telstra submission, p. 27].

Optus, for their part, argued that the confidential nature of their dealings with access seekers prevents them from fully divulging the prices they charge. However, they do state that they offer significant discounts off their retail rates.

39 Telstra Submission, 5 June 1998, p. 6.

40 *ibid.*, p. 7.

A number of other carriers, however, disagreed. In discussions with the Commission, reference has been made to a lack of price competition existing in access price negotiations with Optus and Telstra. In particular, BT argued that it is being given access to inter-capital transmission at prices little better than retail levels. BT stated that:

... despite requests for quotes for access to transmission capacity, to date neither carrier has made any formal offers to Service Providers at other than retail rates [BT Discussion Paper, p. 26].

These claims were supported by AAPT who argued that:

Presently, Telstra and Optus offer inter-capital transmission at retail rates, or at small discounts on retail rates [AAPT submission, p. 6].

Price trends

In a related fashion, some carriers argued that the introduction of a second supplier of transmission has had little impact on pushing prices downwards. For example, AAPT argued that:

Optus' duplication of transmission capacity on inter-capital routes formerly supplied only by Telstra has not improved, in any way, terms of access to this service, including access price from either provider. ... This is evidenced by the fact that Optus has not attempted to reduce its pricing much below Telstra's [AAPT submission, p. 6].

In support, Global One asserted that their:

... preliminary analysis of Telstra's external wholesale prices indicate that overall there has been either no or only upward movement in these prices over the last two or three years, with Optus closely tracking these prices [Global One submission to TAF, p. 2].

Optus strongly denied, however, that this could be due to any improper collusion between themselves and Telstra in stating:

Optus does not accept any suggestion that Telstra and Optus are acting in an oligopolistic fashion or have otherwise participated in any form of signalling to each other on prices for inter-capital city transmission [Optus submission, p. 20].

The threat of potential entrants

In its submission, Optus argued that there are other potential entrants in the market for inter-capital transmission which should ensure that existing suppliers price competitively. Optus presented as evidence of the case of potential entry into the market the observation that:

... Primus Telecommunications is planning to spend \$420 million up to 2000 in expanding its network and increasing its point of presence [Optus submission, p. 21].

Further, Optus argued that there is potential for a number of alternative substitute ways of providing inter-capital transmission through the advent of satellite and microwave technologies. For instance, Optus pointed to the fact that it has been reported that Macrocom, which has already been granted a carrier license, is intending to offer wholesale transmission services using microwave facilities that provide hub to hub services and point to point links along the east coast.

In addition Optus argued that barriers to entry are very low for a number of utility providers because they:

... have existing (mostly fibre-based) telecommunications networks that can easily be adapted to provide high-capacity transmission services over wide regions [Optus submission, p. 21].

Telstra supported these arguments noting that the lack of regulatory barriers to entry; the unrestricted access new entrants have to Telstra ducts; the ease with which microwave facilities can be constructed and the low costs of capital relative to potential returns on investment, all provide low barriers to entry for additional suppliers.⁴¹ In support of this assertion, Telstra cited instances of rival companies who plan to roll-out optic fibre and other cable. In essence, both Optus and Telstra argued there is no need to declare the service because the abundant sources of potential entry into the inter-capital transmission market continue to apply competitive pressures on Optus and Telstra.

This point is contested, however, by AAPT who argued:

... aspirant infrastructure providers face significant legal and commercial barriers to entry. Legally, a new entrant wishing to install infrastructure under the reduced scope and powers and immunities contained in the Telecommunications Act 1997 faces a more expensive, time-consuming and indeterminate process [AAPT submission, p. 8].

Promoting economically efficient use of, and economically investment in infrastructure

Submitters also presented extensive arguments on whether declaration of the service will increase efficiency in the use of, and investment in, infrastructure.

Efficient use of infrastructure

With regard to the efficient use of infrastructure, AAPT argued the service should be declared as:

Existing inter-capital networks contain massive transmission capacity and no further construction is likely to be required in order to service user needs well into the next century. Infrastructure efficiency is therefore best achieved by the exploitation of capacity in existing networks [AAPT submission, p. 7].

AAPT complained, however, that effective access to this spare capacity is prevented because of the high prices they are being charged, as:

... artificially high costs for transmission capacity (imposed by Optus and Telstra) will operate as a disincentive to the objective of efficient use of infrastructure [AAPT submission, p. 7].

Efficient investment in infrastructure

Related to this is the second issue of efficient *investment* in infrastructure as access seekers argued the ‘artificially’ high prices of transmission Optus and Telstra are charging:

41 Telstra submission, p. 27.

... operate as an incentive for access seekers to construct their own infrastructure [AAPT submission, p. 7].

Thus, high prices are altering the build-buy decisions of access seekers and forcing them to undertake their own investment. Given the spare capacity available, however, BT argued that:

Any further investment in inter-capital capacity would be an economically inefficient use of (existing) infrastructure [BT submission, p. 55].

Against this, however, Telstra argued that declaring the service takes away all incentive for carriers to invest in infrastructure. The underlying reason for this is that they'll bare all the costs of investment, whilst every other service provider will be able to 'piggy back' off their transmission investment. By declaring the service:

Any carrier seeking to install and operate a transmission facility will be discouraged from undertaking such a substantial investment (and risk) if it knows that all other access seekers will reap the benefit of the new facility at regulated prices ... as soon as the facility is constructed [Telstra submission p. 28].

Not only will this lead to under-investment in today's technologies, Telstra also argued that these incentives may lead to under-investment in new technologies. Specifically, they point to:

... reports of existing developments in using power cables for the provision of transmission capacity. Australia could miss out on the benefits of this technology if those considering deploying the developments are not assured of reasonable profits through a light-handed regulatory approach to the provision of transmission capacity [Telstra Comments to TAF, p. 4].

This line of argument would seem to be supported by the claims of potential investors, such as, TransGrid who stated that:

Further amendments of the service declarations would in my view create uncertainty and may discourage new entrants and hence competition [TransGrid submission, p. 1].

4.6.2 Industry views on declaration of higher capacity transmission

Industry submissions dealing with whether or not the existing service declaration should be amended to include higher capacity transmission services focused on the three criteria of the LTIE test. The arguments raised under each of these criteria are presented below.

Promoting competition

Arguments submitted opposing the proposed amendments, chiefly focused on the 'absence' of evidence that the current service description is detrimental to downstream competition. In support of this view, it was stated that there are currently a number of factors which indicate thriving competition in downstream markets. In summary, it was argued that:

- the service is already contestable, and that the access regime intends that regulated access not be imposed where existing market conditions already provide for the competitive supply of services. Examples of such contestability were given by naming existing suppliers of high bandwidth capacity, such as Optus, AAPT, Northgate, and microwave or satellite technology. It was submitted that these suppliers already have a significant degree of market share; and
- there are low barriers to entry in the market for higher bandwidth, due to the fact that there are no regulatory barriers to entry, there is relatively low investment required and microwave systems already exist which have significant capacity to provide high bandwidth services. It was submitted that these factors have led to significant price competition in the market for high bandwidth capacity, with the supporting example of the price competition in high bandwidth between Telstra and Optus.

In contrast it was strongly argued that high bandwidth is essential for allowing access seekers to offer new value-added products such as ATM carriage services. The importance of these products was emphasised by all access seekers, and the majority of submitters referred to the difficulty in obtaining them.

Access seekers argued that having declared access to higher bandwidth is essential for promoting competition in downstream markets. As broadband applications and other services requiring higher bandwidth requirements become more widespread, demand for services of at least 8 Mbps will grow. For instance, AAPT argued that:

A host of new and emerging retail services require higher bandwidth capacity. These include multi-media services such as video-on-demand and videoconferencing as well as other high speed, high volume data services. As the business community's understanding of the potential offered by broadband services increases it will inevitably change the way it uses information and structures its operations.

Australia's commercial exploitation of electronic technology is an essential precondition of the ability of other industry sectors, particularly those heavily reliant on telecommunications, to compete more effectively. However these possibilities cannot be exploited until the telecommunications industry is able to offer broadband service on demand, and to do so at reasonable prices [AAPT submission, p. 5].

Similarly, Optus submitted that:

... declaration of higher bandwidth would promote competition in downstream markets. As broadband applications and other high bandwidth requirements become more widespread and most everyday applications become bandwidth hungry, the demand for higher bandwidth services (of at least 8 Mbps) will increase significantly. The provision of higher bandwidth services which constitute a bottleneck will clearly promote competition and remove obstacles to end-users obtaining access to higher bandwidth services provided over these transmission services [Optus submission, p. 17].

CITEC agreed with this view and argued that the unavailability of high speed transmission capacity (34 Mbps and above) as a wholesale service at TSLRIC process prevents an access seeker from competitively offering ATM services such as Telstra's Accelerate-ATM or Optus' MultiNet.

In CITEC's view, the present service description for transmission capacity prevents it from accessing the downstream services when they are made available. As a result, CITEC would not be able to offer services on a competitive basis with the owners of transmission capacity. CITEC concluded that the LTIE would not be served by restricting competition this way.

Global One also supported the proposed amendments to the service description for transmission capacity on the grounds that 2 Mbps transmission capacity is insufficient for the range of services which will increasingly be demanded in the future. Global One submitted that:

The explosive increase in the demand for bandwidth sensitive applications has meant....that current and potential bottleneck power has been intensified by the derived demand for higher, dynamic bandwidth, but only regulated supply of 2 Mbps. Global One therefore supports the amended declaration to include incremental/scalable (with associated economy savings) 2 Mbps links and also links of larger than 2 Mbps bandwidth [Global One submission, p. 4].

And the ABC stated that:

The 2 Mbps capacity is well below what the ABC requires to deliver programming either for program compilation purposes, or to deliver programming to transmission sites [ABC submission, p. 2].

Industry participants argued that the proposed service description would promote competition, mainly focus on the addition costs which, it is submitted, necessarily arise when access seekers are compelled to aggregate multiples of 2 Mbps.

It was argued that the main impediments faced by access seekers is Telstra and Optus' refusal to provide access seekers with blocks of 8 Mbps or higher, capacity. Instead access seekers obtain capacity in multiples of 2 Mbps blocks which they aggregate into larger blocks according to customer needs.

It is submitted that additional costs arise from such aggregation for a range of reasons. Such costs, it is argued, make competition for higher bandwidth services difficult.

For instance, AAPT submitted that:

... there are no volume-related discounts. This means that 34 Mbps capacity is equal in price to 17x2 Mbps streams. This is at odds both with domestic retail prices and with access prices in other jurisdictions, which incorporate substantial volume-related discounts. ... (In addition), the aggregation of a number of 2 Mbps requires the use of bandwidth aggregators and adds significantly to an access seekers costs. These costs must either be borne by access seekers or passed on to end-users [AAPT submission, p. 6].

Similarly, CITEC argued that:

A single 34 Mbps service has different performance characteristics than (say) 17x2 Mbps services being driven in parallel. There are significantly greater costs in providing 17x2 Mbps interfaces to a node, than one 34 Mbps interface. The increased complexity in the node required to aggregate and manage the 17 individual 2 Mbps would incur significant unnecessary costs [CITEC submission, p. 12].

Promoting any-to-any connectivity

Arguments submitted opposing the proposed amendments state that there is no evidence that non-declaration is detrimental to any to any connectivity, which is about communication irrespective of the network used to communicate on. This any-to-any connectivity, it is submitted, is available irrespective of bandwidth. On a similar note, it is added by the submitter that there is no evidence to suggest that declaration of higher bandwidth will promote competition.

However, other submitters argued that to declare higher bandwidth would enhance any-to-any connectivity. For example, CITEC stated that:

Any-to-any connectivity would be enhanced by the proposed amendments as service providers would have access to greater capacity [CITEC submission, p. 14].

Promoting economically efficient use of, and economically efficient investment in, the infrastructure

A number of arguments were presented to the Commission to the effect that declaring higher bandwidth would act as a disincentive to facilities based competition.

Telstra, for example, submitted that if facilities based competition is encouraged by the Commission, then it is not in the LTIE to declare high bandwidth in a way that may discourage carriers from investing in their own transmission facilities. Telstra added that carriers seeking to install their own transmission facility will be discouraged from investment if they know that other access seekers will reap the benefits of this investment, at regulated prices, as soon as it is built.

In addition it is argued by Telstra that to declare 8 Mbps, 34 Mbps and 140 Mbps will encourage use of a digital transmission protocol that is being phased out. Telstra also stated that industry will be discouraged from investing in new facilities if there is a requirement to continue providing an outmoded technology as a declared service.

The Commission sought information from industry participants on this point, and understands that both PDH and SDH are digital transmission technologies. PDH is an older system; SDH is approximately 15 years in advance of PDH. Submitters have advised that due to the age of PDH, certain deficiencies have been identified in its operation. It is submitted that these are:

- PDH is non-standard, making international interconnection more difficult;
- use of PDH requires more multiplex equipment; and
- PDH was not designed with the functions which are necessary for centralised control.

PDH capacities are 2 Mbps, 8 Mbps, 34 Mbps and 140 Mbps. SDH capacities are 2 Mbps, 45 Mbps and 155 Mbps. Currently both Optus and Telstra provide capacity in both PDH and SDH. The majority of the transmission services purchased by Optus from Telstra have been PDH.

Most industry participants agreed that PDH is an outmoded protocol, and SDH is a preferable option, as it offers a higher quality service. However, it is strongly argued that PDH is still widely used.

In general, the majority of submitters (for example, CITEC, AAPT, Optus) stated that there are no technical constraints on declaring higher bandwidth. It was emphasised that carriers provide transmission services of 34 Mbps or greater to themselves, and therefore must be able to provide such services to access seekers. For instance, SITA submitted that:

Telstra has been utilising E3 (34 Mbps) capacity to provide its own Internet capacity both domestically between Sydney and Melbourne, and internationally to the US (and is promoting its use of same, despite its past refusals to supply some Access Seekers with similar capacity). So there should be no technical reason for it not being able to supply equivalent bandwidth to customers of access seekers [SITA submission, p. 3].

Similarly, Global One argued that:

... broadband carriage is ... being used by access providers for retail provisioning, but is otherwise effectively not available. ... For some years Telstra has been exclusively using a 34 Mbps link for Internet traffic between Sydney and Melbourne [Global One submission, p. 4].

Optus argued that the declaration of only 2 Mbps services and its increments rather than higher bandwidth is an inefficient use of infrastructure. According to Optus, the same economies of scale cannot be achieved when multiples of 2 Mbps transmission services are required to be ordered and delivered rather than higher bandwidths, particularly as the demand for higher bandwidth services such as Frame Relay, LAN interconnection, Intranet and Internet applications (which all benefit from having a single high trunk) increases.

However, Optus submitted that:

... there needs to be some caution given to the declaration of higher bandwidth transmission services on the basis that it may be economical for access seekers to construct links of high bandwidth. However Optus does not consider that the bottleneck power of Telstra has been sufficiently constrained to warrant the non-declaration of these services at this time [Optus submission, p. 18].

SITA also argued that applications are becoming increasingly bandwidth hungry especially with the development of ATM, videoconferencing and multi-media applications. As a result, there will increasingly be a much higher demand for broadband services (34 Mbps to 155 Mbps). According to SITA, this cannot be economically or technically provided in an efficient manner by the use of multiples of 2 Mbps.

Similarly, Vodafone argued that:

Restricting the declared service to 2 Mbps bandwidth will be detrimental to the long-term interest of end-users... Where an access seeker requires higher bandwidth there will be unnecessary multiplexing/demultiplexing which is certainly inefficient use of infrastructure and will add unnecessary costs to the provision of services in downstream markets [Vodafone submission, pp. 2–3].

4.7 The Commission's analysis

As noted in the discussion on market definition, the focus of the Commission's analysis is on two key markets: the wholesale transmission market and the market for retail services which require transmission capacity as an input, the dependant market. The effect on competition, any-to-any connectivity and efficient use and investment in infrastructure needs to be assessed with reference to the impact on both these markets.

Accordingly, in undertaking this assessment, the Commission focused on the following issues:

- the level of actual competition in the inter-capital and higher bandwidth transmission market and downstream (retail) market;
- the level of potential competition in the inter-capital and higher bandwidth transmission market and downstream markets;
- whether existing market conditions provide incentives for efficient use of infrastructure in the inter-capital transmission market; and
- whether existing market conditions provide incentives for efficient investment in infrastructure.

Each of these issues will be examined in the following sections.

The level of competition in the inter-capital and transmission services market

The Commission has sought independent economic advice on whether the current structure of the wholesale transmission market is conducive to the promotion of effective and sustainable competition. The analysis provided to the Commission suggests that under oligopoly conditions, two main access suppliers, by themselves, are unlikely to provide a high degree of competition in the market. The reasons for this include the following.

The ongoing interaction between the two main access providers over a range of markets and the possibility of retaliatory action in such markets

Optus relies on Telstra for a significant number of the inputs it uses to produce final telecommunications products. If Optus offered transmission services to an access seeker at a competitive price then this may undermine the ongoing relationship between Optus and Telstra in a number of markets.

As the relationship between Optus and Telstra is fundamental to Optus, this suggests that Optus may be reluctant to create competitive pressure in a market that is shared mainly by the two firms. From Telstra's perspective as the major firm in most telecommunications markets in Australia, it is unlikely there would be much gain in offering competitive access prices so long as Telstra believes that Optus will also refrain from offering these prices.

The difficulty in profitably deviating from a situation of tacit high pricing in order to instigate more competitive prices

It is likely that access seekers would only require a relatively small amount of access, at least in the short term. This makes it difficult for a firm to profitably deviate from a situation of tacit high pricing and to instigate more competitive prices. Even if, for example, new seekers of Optus transmission services produced retail services which only reduced Telstra's and not Optus' share of the retail market, Optus would find it difficult to sell enough transmission access in the short term to make a competitive deviation worthwhile.

The ease of detection of any access offers at competitive rates

The existence of only two major access providers and the need for service providers to publicise any new product that uses transmission access means that, if either Optus or Telstra sold transmission access at a price significantly below current levels, then the other firm would quickly find out about this sale.

This ease of detection, together with the relatively small amounts of access likely to be sold in the short term, means that any unilateral move to drop access prices will likely be swiftly detected and matched by a competitor. Any short-term gain in profits is likely to be small and the spillover of competition to other markets is likely to lead to a net loss of profits overall.

The danger that an access provider will undermine its own profits in downstream markets by lowering transmission access prices

Given Telstra's strong position in the telecommunications market, it has relatively little incentive to offer lower transmission access prices. While Telstra does not have to fear retaliation from Optus, any lowering of transmission prices is likely to feed into lower prices in the market for retail telecommunications products. Telstra may undermine its own profits in these markets by lowering transmission access prices.

The fact that rapid growth of demand for transmission services will minimise the incentive to reduce access prices in the short term

The rapid growth of the telecommunications markets will minimise the incentive to reduce access prices in the short term. Even if such a reduction in prices was profitable in the short-term, the risk of lower long-term transmission prices is likely to outweigh any short-term gains. As the market for services using transmission grows, so too will the profits of the transmission companies if they can retain relatively high prices.

Telstra refute the advice by independent economic advisers which concluded that suppliers in the inter-capital transmission market do not have strong incentives to compete vigorously. Telstra argue that the reasons underlying this conclusion are weak and not supported by empirical evidence.

In response to the Commission's views on the promotion of competition, Optus generally contended that any short term benefits for competition, themselves unlikely,

will be outweighed by the short term detriments for investment in new capacity, and hence the long-term effects on competition in wholesale and dependent markets.

Fundamentally, Optus disagreed with the Commission's conceptual framework for analysing the state of competition in the market. In particular, Optus disagreed with the Commission's advice from Professors Gans and King which argues that Optus would be reluctant to create competitive pressure on Telstra for fear of retribution by Telstra in other markets. Optus contended that this assessment overlooks the fact that Optus and Telstra already compete vigorously in other markets, with or without any such 'fear'. Therefore, Optus argued, the draft report's inference is erroneous, since Optus should have the same incentive in other markets not to compete strongly with Telstra.

In response to Gans and King's inference that there is a potent disincentive to engage in price cutting due to the resultant increase in competition downstream, Optus countered that this relies on the mistaken premise that only Optus and Telstra compete in the wholesale functional market. According to Optus, this inference overlooks the competitive presence of capacity aggregators who then act as discount resellers to small access seekers. Optus argued that this effectively re-balances the balance of market power away from access providers towards access seekers.

Optus also disagreed with Gans and King's assertion that the cooperative oligopoly conditions are bolstered by the detectability of price deviations. Optus argued that because transmission capacity represents only some proportion of input costs in related markets, price falls in these markets cannot be confidently attributed to market share pursuits by upstream providers. Moreover, as transmission is used an input to a range of services of a given service provider, price falls in one of their services could be due to a number of factors.

In essence Optus believed that declaration is an unnecessary and harmful step to enhance the level of competition. Alternatively, Optus considered that any anti-competitive behaviour in the transmission capacity market should be addressed with the use of the Act's Part XIB powers, as the alleged issue is one of conduct, rather than structure.

The Commission has considered Optus' comments in relation to the conceptual framework for the analysis of the inter-capital transmission market. The Commission considers that, ultimately, there is no one clear framework with which to assess issues of rivalry and strategy, and that both the Commission's analysis and Optus' response are grounded in sound analytical principles.

Empirical evidence

In assessing the current level of competition in the market for inter-capital transmission and higher bandwidth (from here on referred to as wholesale transmission services), the Commission examined the following indicators:

- the level of price competition in the provision of wholesale transmission services to access seekers;

- comparisons of the prices of wholesale transmission services in Australia and overseas;
- the bargaining power of suppliers and of buyers of wholesale transmission services; and
- the margins available to suppliers of wholesale transmission services

Each of these indicators is discussed below.

Level of price competition

The Commission sought information from inquiry participants on the level of price competition currently prevailing in the market for the supply of wholesale transmission services.

Existing transmission access providers argued, in their submissions, that there was a high degree of competitive rivalry between them and that this was manifested through deep price discounting and ‘one-off’ deals to major corporate clients and some access seekers. The Commission has been provided with evidence that suggests that at least one access provider is offering substantial discounts (in the order of 60 per cent to 70 per cent) off its published retail tariffs to some access seekers. The Commission has also been told by another access provider that even though this access provider is offering significant discounts off its retail tariffs, it is nevertheless losing business to its competitors.

However, the Commission was also provided with information from other inquiry participants suggesting that:

- very minor discounts off retail prices or solely retail prices were being offered to many access seekers; and
- access providers were essentially ‘shadow pricing’ with differences between them on the pricing of, for example, E1 transmission capacity on the major routes being, on average, between around 5 per cent to 10 per cent (see Table 4.4)

Table 4.4. Comparison of Telstra vs Optus wholesale prices to one access seeker

Distance	Percentage difference between Telstra average and Optus*
SYD-MEL	9.0
SYD-BRIS	5.0
SYD-PER	-15.0
SYD-ADL	5.0
SYD-CANB	-3.0
SYD-GOLDCST	-7.0

* Negative implies Telstra price is lower.

Indeed, a number of access seekers pointed to the fact that they have continued using the end-to-end National Access product for the carriage of their long distance traffic rather than seek access to wholesale transmission as evidence of their inability to acquire transmission services at anything other than retail rates. Table 4.5 below shows that the price for an E1 link between Sydney and Melbourne under the National Connect/National Access product has not changed since 1995.

Table 4.5. National connect/national access wholesale transmission pricing

Date of amendment	National connect (wholesale)
Dec 94	\$153 048
Oct 95	\$186 160
Feb 96	\$186 160
Sep 96	\$186 160
Feb 97	\$186 160
May 98	\$186 160
Feb 97	\$186 160

Source: Global One submission.

This information tends to indicate that price competition between access providers for the supply of wholesale transmission services is limited to certain major wholesale customers and major corporates. This is evidenced by the limited price differentiation for the supply of wholesale transmission services to the majority of access seekers. Similarly, discounts off retail prices being offered to wholesale access seekers appear to be limited to major customers with most access seekers being charged prices for wholesale transmission services which are close or equal to volume discounted retail prices being offered to most corporate users.

Telstra denies that inefficient pricing exists in the inter-capital transmission market, as empirical evidence does not support such a finding. Telstra argue that this conclusion relies on price being higher than the cost of provision. Telstra submitted that:

The costs of provisioning small customers are higher than those for large customers (e.g. because of search, contracting, billing and other transaction costs). [Telstra submission, 5 June 1998 p. 12].

Moreover, Telstra maintain that because the majority of the demand for inter-capital transmission capacity is confined to ‘certain wholesale and major customers’, there is intense competition to gain these customers. Consequently, prices approach marginal costs. Telstra argue that this notion is supported by the level of discounts off retail prices (60–70 per cent). As a result, Telstra believe that:

...current prices are not likely to be far from those that would prevail in a competitive market. [Telstra submission, 5 June 1998, p. 12].

In response to the draft report Optus presented the Commission with empirical information which purports to be reflective of the true state of competition and pricing between incumbents. Optus re-iterated that:

- the number of sellers in the market is greater than just two due to competing technological alternatives;
- prices of wholesale transmission capacity have been significantly reduced; and
- there is a very real threat of entry which acts to constrain current pricing behaviour.

Both Telstra and Optus argued that the current pricing behaviour can be understood as indicative of an emerging (and increasingly competitive) market. Specifically, access providers argued that the pricing behaviour observed in the market is consistent with the transition from a legislated duopoly in the provision of infrastructure services to one of open entry. In this situation, access providers argued, it was normal for competition to occur in a segmented fashion, beginning with those segments of the market which were most profitable — the large wholesalers and large corporates — and progressively spreading to other segments.

Both Optus and Telstra provided further information which indicated that some price movement was beginning to occur in the supply of smaller quantities of transmission capacity. For example, Telstra presented pricing information which suggested that prices are tending to decline across all customer groups. Telstra's new pricing framework is structured on a disaggregated point-to-point basis and provides discounts based on various tiers. These include discounts based on volume, term of commitment, and the extent to which Telstra is the customer's main supplier. Similarly, regional leased transmission discounts vary in accordance with the prevalence of scale economies in provision. Price reductions and pricing structures similar to those proposed by Telstra were introduced by Optus in early May.

International comparisons

From the information provided during the course of this inquiry, the Commission has undertaken a comparison of wholesale transmission prices in Australia with prices for similar services in Europe, the US and New Zealand. The information provided to the Commission suggests that:

- wholesale prices in Australia are similar to retail prices charged by monopoly providers for similar services in France and Germany and retail prices charged by various providers in the UK (see Table 4.6);
- wholesale prices charged by access providers in Australia to one particular access seeker for the supply of wholesale transmission services between Sydney and Melbourne are almost identical to the highest retail prices charged by Sprint in the US and between 74 per cent and 91 per cent higher than the best retail prices charged by Sprint for an equivalent distance. Generally, for most of the distances between Australian capital cities, Sprint's highest retail prices are more favourable than Australian access providers' wholesale prices to this access seeker (see Tables 4.7 and 4.8); and

- wholesale prices charged by one of the two main access providers of wholesale transmission services in Australia is four times higher than equivalent transmission prices paid by that access provider for similar services in New Zealand.

Table 4.6. International prices for transmission capacity¹

Country	E1 price (\$US)	E3 price (\$US)
Germany ²	9 916	na
France ²	10 240	117 581
United Kingdom ²	17 364 ³	105 380
Italy ²	11 745	na
Australia ⁴	8 700	125 751

Notes:

- 1 For 3-year term, 1000 km distance
- 2 Retail rates
- 3 1000 km distance expensive and generally unavailable
- 4 Wholesale rates

Table 4.7. Sprint's highest retail price versus Telstra and Optus wholesale

Equivalent distance	Sprint's highest retail versus	
	Average Telstra wholesale (%)	Optus wholesale (%)
SYD-MEL	5.0	-4.0
SYD-BRIS	4.0	-1.0
SYD-PER	-55.0	-47.0
SYD-ADL	-11.0	-15.0
SYD-CANB	-21.0	-18.0
SYD-GOLDCST	35.0	46.0

Table 4.8. Sprint's best retail price versus Telstra and Optus wholesale

Equivalent distance	Sprint's best retail versus	
	Average Telstra (%)	Optus (%)
SYD-MEL	91.0	74.0
SYD-BRIS	88.0	79.0
SYD-PER	-19.0	-4.0
SYD-ADL	60.0	53.0
SYD-CANB	43.0	47.0
SYD-GOLDCST	144.0	164.0

On the basis of the information contained in these tables, the Commission notes that, by international benchmarks, Australian wholesale prices for transmission services are significantly higher than those prevailing in some markets overseas. However the Commission also recognises the various limitations of drawing international comparisons. For example, one has to take into account the greater scale economies enjoyed in the US market. This point was also raised by Optus which argued that international comparisons fail to account for the greater economies of scale and scope enjoyed in those markets, and resultant inherent cost advantages. Nevertheless the Commission would expect that over time, prices for transmission capacity should move towards international best practice, after accounting for differences in scale. The Commission would be concerned if such price differentials were to remain even after the market reaches a more mature stage of development.

Bargaining power of suppliers and buyers

The information presented to the Commission relating to the commercial negotiations between access providers and access seekers for the purchase of wholesale transmission capacity, suggests that, until recently, most negotiating strength has rested with the suppliers of wholesale transmission services.

The Commission has been provided with information that indicates that despite repeated requests by access seekers, Telstra has, to date, refused to provide anything other than 2 Mbit and Nx2 Mbit transmission services to access seekers. As already discussed, such transmission services are significantly more expensive than clear 8 Mbit, 34 Mbit, 45 Mbit and 144 Mbit services. The Commission understands that Telstra does provide such clear high bandwidth services to itself and to its corporate customers.

However, the Commission has received new information which shows that as part of Telstra's proposals for the pricing and delivery of transmission services to access seekers, Telstra will be providing higher bandwidth services to those that request them.

Margins available to access providers

The Commission has attempted to estimate the margins available to access providers on the sale of wholesale transmission services by examining financial information provided under the Chart of Accounts/Cost Allocation Manual (COA/CAM) regulatory accounting framework and by taking into account publicly available information issued by existing access providers. An assessment of the information contained in regulatory accounts confirms that margins on transmission services are quite healthy, which would, in part, be a reflection of attempts to recover large fixed costs.

Using publicly available information issued by one access provider recently, the Commission estimated the approximate cost of providing wholesale transmission services. In March 1998, one access provider announced the construction of a Sydney to Brisbane transmission link at a cost of \$30m. The Commission estimates that the cost of making this transmission link fully operational (by including the cost of the electronic equipment required for the provision of transmission capacity and of the commissioning of such equipment) would be approximately three times the construction cost or approximately \$100m.

The cable has a stated capacity of 2.4 Gbits which is approximately equivalent to 1200 E1 transmission links. This provides a cost per fully functional E1 link of \$83 000; which capitalised over the approximate life of the cable (that is, between 10 and 20 years) gives an annual cost per year of between \$4000 and \$8000 (this ignores the cost of maintaining the cable which the Commission understands is relatively minor). Even if it is assumed that only 25 per cent of the available capacity on the cable is currently used (and therefore costs are only spread over currently employed rather than total available capacity) the annualised cost of E1 transmission capacity is between \$33 000 and \$66 000.

The results of the analysis are also supported by information provided by an existing access provider who argued that the:

... annualised capital cost [of providing transport over all thick routes are] well below 5 % of the current annual revenues associated with long distance transmission [Telstra supplementary information to ACCC].

The Commission recognises that this analysis⁴² is influenced to some extent by the significant reduction in the cost of high capacity cables over the past several years and that the construction and resulting annual cost of previous cables would have been higher. Notwithstanding this, the Commission considers that access providers are currently enjoying significant margins. This is consistent with the transmission market being at its early stage of development. However, the Commission does not consider that above-normal margins should continue to be the norm in this market. The Commission would expect that as the market develops, margins available to access providers should reflect underlying costs, including a risk-adjusted commercial return.

Competition in related markets

The Commission considers that to the extent that the provision of wholesale transmission capacity is provided on more competitive terms, this is likely to have a direct impact on competition in dependant markets which rely on the use of wholesale transmission capacity. These markets particularly include long-distance and international services, data-related services and IP-based services.

In response to the draft report, Telstra maintained that declaration of inter-capital transmission capacity will not lead to greater efficiency in the supply of wholesale transmission. In fact, Telstra argue that the dependant markets 'are among the most competitive in Australia'⁴³. With regard to the inter-capital market, Telstra submitted that the bulk of the traffic is long-distance PSTN and video.

Telstra submitted that the long distance PSTN market is highly competitive with a number of firms currently contesting the market. Telstra also submitted that it was 'declared non-dominant in the market for international services in mid 1997' and there

42 It should be noted, however, that the above analysis is intended to provide an illustration of possible costs and is not to be interpreted as representing the Commission's preferred incremental cost methodology.

43 Telstra Submission, 5 June 1998, p. 23.

is evidence of substantial price competition with some competitors claiming savings of up to 60 per cent on Telstra prices. As a result of competition, Telstra advised that its:

... share of the long-distance market has dropped to about 77 per cent nationally, and to approximately 73 per cent in capital cities where competition has been more focussed. Market share of some inter-capital key routes, such as Sydney-Melbourne, is estimated to be as low as 63 per cent ... [and] its share is significantly lower in the business market (estimated at 74 per cent and is very low in the wholesale market (estimated 29 per cent). [Telstra submission, 5 June 1998, p. 23].

In the video market segment Telstra submitted that it ‘competes vigorously with Optus satellite transmission’.⁴⁴

Telstra also submitted that there was growing competition in retail data markets, particularly in the domestic frame relay market and the market for internet access services.

At present the structure of the market and the extent of competition in such services, while improving, cannot be said to be fully reflective of a competitive market. In structural terms, the main players are increasingly vertically integrated and have a large retail market share. Since the opening of competition, there have been dozens of new participants, both carriers and service providers, who are starting to make in-roads, particularly in relation to national and international long-distance services. However, as compared to other countries with more competitive transmission services, price gains made in Australia are not significant and this seems most apparent for data and IP-based services — services which most require high capacity long-distance transmission.

As users have noted in submissions, broadband applications and other high bandwidth requirements are becoming more widespread and so the need for high speed long-distance transmission by such applications will continue to grow strongly. It is therefore considered that a more competitive wholesale transmission market will have a significant effect on a large array of new and innovative retail services.

Existing market conditions and the efficient use of infrastructure

In deciding whether existing market conditions are providing incentives for the efficient use of infrastructure, the Commission has considered the following issues:

- what should be included in considerations of efficient use of infrastructure;
- does excess capacity still exist in the market for inter-capital transmission;
- do uncertainties regarding future demand provide a justification for maintaining some spare capacity; and
- do current arrangements provide for technically efficient use of infrastructure.

Each of these issues are discussed below.

44 *ibid.*, p. 23.

Considerations in assessing efficient use of infrastructure

There has been some argument during the course of the inquiry into inter-capital transmission, that the Commission should only consider whether it is technically feasible to provide access when considering issues of efficient use of infrastructure. In particular, it has been put to the Commission that it should only be concerned with whether or not supply is feasible in an engineering sense, and whether access will have adverse effects on the operation and performance of telecommunications networks.

The Commission considers, however, that in the case of inter-capital transmission, economically efficient use of infrastructure has far broader connotations. Specifically, economically efficient use of infrastructure should focus on whether or not current use of wholesale transmission capacity results in both technical and allocative efficiency.

Allocative efficiency is generally achieved by ensuring resources get directed toward those who value them most. For example, a purely wholesale provider operating in a competitive environment would tend to sell additional output provided excess capacity existed, and that prices were above incremental costs.

The Commission recognises, however, that in the current context access providers' decisions may be affected by other considerations where they are vertically integrated, since they are not only operating in the wholesale market but also in retail markets. Under these conditions, and where a wholesale service is an essential input to the supply of retail services, an access provider's strategic response may be to restrict the supply of a wholesale service even though it could sell the service at a price above incremental cost in order to gain a competitive advantage in the retail market. This may be a rational strategic decision for a vertically integrated firm but will not contribute to economically efficient use of infrastructure. However, the Commission understands the presence of these kinds of incentives in complex markets such as this, and would therefore not expect a perfect correspondence with the outcomes of a purely wholesale market. Notwithstanding this, the Commission would expect that over time, and as more wholesale access providers enter the market, resulting price structures and capacity utilisation will reflect allocatively efficient outcomes.

The extent of excess capacity

The next question at issue is whether existing infrastructure owners have large levels of excess capacity available for providing transmission services. Some submitters argue that large amounts of excess capacity are indicative of both high charges and the need for regulatory intervention to act as a catalyst for more competition.

Submissions to the Commission by access seekers have argued that, for at least one of the access providers, capacity in use represents at best 10 per cent of total capacity. This is based on estimates of one access provider's network that it consists of 18 pairs of laid fibres. Of these 18 fibres, only four have been lit with three having 2.5 Gbps capacity, and the other having 10 Gbps capacity for a total of 17.5 Gbps. Given industry opinion that the three 2.5 Gbps fibres can be upgraded to at least 10 Gbps at a relatively small cost, the total potential capacity of the network is estimated at

180 Gbps (that is, 18 fibres x 10 Gbps). The existing usage of only 17.5 Gbps, therefore, represents approximately only 10 per cent of this potential 180 Gbps.

Access providers, on the other hand, argued that they are near to full capacity already, with one claiming that its current total reserves will be exhausted by estimated growth in the next year. Further, that demand is growing at an exponential rate. The combination of a high elasticity of demand for data services and expected price reductions resulting from increased competition in the future, should ensure that even if current excess capacity exists, it will soon be fully utilised.

In addition, Telstra submitted that consideration of excess inter-capital transmission capacity should take into account a number of key issues, including:

- the need for provisioning of optic fibre (which may be ahead of demand); using a planned, economically efficient and cost justified manner;
- the deployment of associated electronics in the transmission path, which is required to utilise spare optical fibres already installed in ducts;
- the rate of capacity-enhancing technological change; and
- the assessment of the impact of new technologies on the likely supply-demand balance.⁴⁵

Notwithstanding the need to provision fibre to cater for anticipated demand, Telstra submitted that there are substantial costs associated with lighting and upgrading unlit optic fibre on the inter-capital network. Telstra stated that:

... this upgrade would involve replacement of transmit laser cards in the transmission equipment, which are the most expensive component of the transmission electronics. (Currently the laser cards are around 60 per cent of the total system electronic cost). This upgrade would be required at both the system end-point locations and at intermediate regeneration sites. As a result of Australia's long distances in the inter-capital network, a large number of regeneration points are required, each of which would have to be equipped with new transmit laser cards. [Telstra submission, 5 June 1998, p. 17].

The Commission's independent advice suggests that the major inter-capital routes (for example, Sydney — Melbourne) are provided with multiple fibre core cables, typically 30 to 48 fibres or 15 to 24 fibre pairs. Exchanges in the CBDs are typically interconnected with 48 fibre cables. Each fibre pair is capable of carrying the maximum amount of capacity as allowed by current technology used in the electronic and optical interfaces. It is further claimed that Telstra are currently running these fibre pairs at 2.5 Gbps. A 48 pair fibre cable is capable of supporting 60 Gbps of data using existing deployed technology.

The Commission's advice also indicates that Telstra has an extensive meshed network of optical fibre cabling between all capital cities. The major capitals have duplicated redundant paths, typically a coastal route and an inland route. These duplicated paths form a fault tolerant self-healing SDH ring. This means that if one route is lost, through

45 *ibid.*, p. 14.

damage or failure, the other path assumes the full load. SDH multiplexers allow bandwidth to be ‘filtered’ off at intermediate points between major centres.

It is not known how many of the installed fibre pairs are actually in use and how many of the unused or ‘dark’ fibres are available and capable of carrying the maximum bandwidth. However, independent advice suggests that it would be prudent to assume that a number of these fibre pairs are currently unused. Assuming there are spare fibre pairs, it is not a difficult task to ‘light up’ these fibres by installing additional interface equipment at each end of the optical fibre cable route.

The Commission’s technical advice suggests that there are two main technologies being deployed today to increase the useable bandwidth of the installed optical fibre cabling — erbium doping and wave division multiplexing. These are discussed in more detail in Appendix 4.

With these two technologies alone, there is little likelihood that the existing installed optical fibre infrastructure will run out of capacity in the near future. At this stage, with these new and future technologies and taking into account the costs of deployment, it is a distinct possibility that the existing fibre capacity will be sufficient for some time to come. If this is the case, then the concerns over whether the existing level of transmission prices is leading to inefficient duplication of infrastructure would appear to have some force.

Telstra disagrees with the Commission’s assumption that the deployment of capacity-enhancing technologies can be done quickly and cheaply. Telstra submitted that it:

... is moving to deploy the first 8 channel system over the next financial year and is investigating the use of higher capacity 16 channel systems with its supplier for the medium term, but no trial for these systems is currently occurring. There are certainly no trial involving 40 or 80 channel systems. [Telstra submission, 5 June 1998, p. 18].

In addition Telstra advised that while 40 and 80 channel WDM systems are being produced, shorter distances between regenerators is required for these systems to operate. As a consequence, Telstra believe that the application of these higher capacity systems over long distance routes would be expensive.

Given the lack of detailed, verifiable information from current transmission providers, however, it is not possible for the Commission to form definitive views about the precise extent of any excess capacity. However, it would note that this is essentially an empirical issue and the existence or otherwise of excess capacity and its extent are matters that ultimately become relevant in any consideration of efficient pricing.

Provisions for spare capacity

One argument that might be advanced in favour of not making available all capacity to access seekers is that some spare capacity may be required by access providers in the advent of unexpected increases in demand. Accordingly, it might be prudent for an access provider not to make available all existing capacity lest they face a sudden increase in demand themselves.

For example, Optus argued that it is difficult to assess the level of capacity required in the Optus network and that the provision of capacity is consistent with current and foreseeable growing demand conditions. Optus noted that the future high growth in demand reflects international trends. While such an argument may hold some weight for some proportion of existing capacity, the Commission considers that if the estimates of large excess capacity are accurate, this is likely to exceed the requirements for such contingencies. However, information on the actual extent of excess capacity is, as yet, unclear. The Commission also recognises the uncertainty involved in the returns to capacity investment, and that given the lumpy nature of transmission infrastructure, technically efficient investment strategies may result in excess capacity in the short term.

Technically efficient use of infrastructure

The Commission considers that current arrangements for the supply of higher bandwidth (that is, greater than 2 Mbps) inter and intra capital transmission services by one of the main access providers results in technically inefficient use of infrastructure. These inefficiencies arise through the need to provide 17 or 77 discrete interface ports (34 Mbps or 155 Mbps respectively) both on the transmission multiplexers and on access seeker's ATM nodes, for example. Also, the muxing/demuxing equipment requirements are generally higher when breaking bandwidth down to multiples of 2 Mbps. These issues are further discussed in Appendix 5.

However, Telstra argue that:

... transient demands are not optimally satisfied by building new capacity, until a sufficiently large aggregation of such demand makes it statistically likely that newly-constructed bandwidth will be efficiently used. [Telstra submission, 5 June 1998, p. 5].

As a consequence Telstra argued that the current arrangements for the supply of high bandwidth transmission services (that is, supplying multiple 2 Mbps transmission links) do not result in technically inefficient use of infrastructure.

In addition Telstra also believe any allegations of inefficiencies, due to the supply of multiple 2 Mbps transmission links, is not relevant to the declaration decision. Telstra maintain that where the market is competitive and entry is relatively easy, declaration should not be necessary.

However, as already indicated, the Commission has received new information which shows that as part of Telstra's proposals for the pricing and delivery of inter capital transmission services to access seekers, Telstra has decided to provide multiples of 2 Mbps as well as 8, 34, 45, 144 and 145 Mbps higher bandwidth services to those that request them.

A further issue presented to the Commission concerning technically efficient use of infrastructure related to whether or not the PDH transmission protocol is still an appropriate means for the delivery of transmission services. Arguments were presented that indicated that the PDH protocol is being progressively phased out in favour of the more technically advanced SDH protocol. The Commission is not judging the suitability of any particular transmission protocol, nor the desirability of phasing out

one standard in favour of another. However, the Commission considers that while the PDH protocol continues to be widely used by both corporate customers and existing access providers, it should, for competitive neutrality reasons, also be provided to access seekers when requested.

Existing market conditions and incentives for efficient investment in infrastructure

In considering the impact declaration may have on incentives for efficient investment in infrastructure, the Commission has examined the following issues:

- what impact will declaration have on existing suppliers decisions to invest in infrastructure;
- what impact will declaration have on incentives for investment by new entrants; and
- will declaration impact on decisions to invest in downstream markets.

Existing suppliers investment decisions

Throughout the course of the inquiry, the Commission has heard numerous arguments regarding the impact possible declaration may have on efficient investment in infrastructure. Existing suppliers have been forthright in asserting that the high costs of their fixed investment, and the risk involved in recouping this in the market, require the promise of supernormal profits if they are to be willing to invest in infrastructure. Hence, they argue that if inter-capital transmission is declared, such that access providers are only allowed to price at competitive levels, this will remove the incentive for them to take the risk of investing in future infrastructure.

The major reason why this would occur, it is argued, is because the telecommunications industry is characterised by economies of scale in infrastructure provision. That is, once the fixed costs of investment have been incurred in providing infrastructure in order to satisfy current demand (such as, digging up the ground for laying cables), it is generally efficient to allow some excess capacity to satisfy expected future demand.

It was put to the Commission, during the inquiry, that there is a danger that such economies of scale would disappear in the face of a declaration. The basic rationale is that once a service is declared it would be subject to TSLRIC pricing. This implies that fixed costs of infrastructure would be spread evenly across all units of capacity when determining a price for a single unit of capacity. However, if an access provider carries spare capacity to cater for future demand, it will only be receiving compensation on those units currently being sold. Hence, if it is many years before the access provider utilised the spare capacity, it will not recover the full fixed costs of the investment for many years. This, in turn, will give access seekers a competitive advantage in the sale of capacity, as they will only be bearing the fixed cost in access prices for the small proportion of capacity they are using; whilst access providers will have to bear the fixed cost for not just that proportion they currently use themselves, but also for all unused spare capacity.

It is argued, therefore, that this will distort incentives in a number of ways. First, it may discourage access providers from carrying spare capacity, as it will give their competitors a short term cost advantage in the provision of retail services in which the wholesale service is an input. Secondly, there will be a temptation for potential access providers not to invest themselves, but rather wait for their competitors to invest, and then purchase capacity from them.

In this regard Telstra consider that ‘real option theory’ should be used to assess the impact of declaration on potential investment. Telstra argue that the results of analyses using real option theory lead to the conclusion that declaration:

... reduces expected price and widens the band of uncertainty around price [which] must reduce the incentive to invest ... The impact is ... likely to be especially great on investment by new players. [Telstra submission, 5 June 1998, p. 25].

However, other submitters argued that access to possible current excess capacity at competitive prices is not a deterrent to further investment in infrastructure. The Commission has been provided with evidence from the US which indicated that despite current excess capacity in transmission infrastructure, and the operation of a competitive market for the provision of such capacity, the US has experienced continuing high rates of investment in additional transmission capacity to meet growing demand.

Further, it was argued that ownership of infrastructure provides significant strategic and competitive benefits which make it highly unlikely that guaranteed access to such infrastructure would act as a deterrent to investment. Such strategic and competitive advantages according to some inquiry participants include:

- the benefits to infrastructure owners of having full control and certainty over access to essential inputs;
- brand recognition and marketing benefits associated with being a major owner and supplier of key inputs to the production of telecommunications services; and
- the high level of bargaining power in commercial negotiations

The real question for the Commission is whether the above noted effects in relation to pricing uncertainty stemming from declaration and its possible impact on investment, are sufficiently large to outweigh the benefits of greater competition in the wholesale transmission market and its consequent impact on both competition and investment in downstream markets. It should be noted that the key risk in distorting investment is not from greater competition and the consequent reductions in prices that would ensue, but rather from the perceived risk by investors that the regulator will mandate prices through arbitration that are materially below those that would prevail in a competitive environment.

If the Commission applied its access pricing principles, prices would be set so that they are consistent with the levels that would occur if the access provider faced effective

competition.⁴⁶ Prices would be cost based and would incorporate commercial, risk-adjusted returns as appropriate. There is a risk, however, that the regulator may either not apply these principles correctly or may understate the relevant costs or the required return or risk that is relevant.

Pricing issues

The Commission is of the view that the primary mechanism through which terms and conditions of access to declared services should be determined is commercial negotiation. In this context the Commission has identified in Appendix 8 various broad categories of terms and conditions which would need to be negotiated as part of any access agreement. However, the Commission recognises that it may be required to determine prices more directly, either in its assessment of an undertaking or in making an arbitration determination.

The Commission is concerned to ensure that regulation is used appropriately and in a measured way to promote outcomes which are in the long-term interests of end users. That is, to use regulation where this would promote competition that is of benefit to end users and ensure that any intervention does not discourage efficient use or investment in transmission capacity. Both the promotion of competition and the efficient use and investment of infrastructure are ultimately related to whether the price of access to a declared service would be consistent with that which would be observed in a competitive market. Accordingly, the Commission considers it would be appropriate to provide some further guidance on its views on the pricing of inter-capital transmission.

Consistent with its *Access Pricing Principles Telecommunications — a guide*, the starting point in the consideration of the price of access to inter-city transmission is the total service long-run incremental cost (TSLRIC) of supplying the service. As indicated in the Access Pricing Principles, estimating TSLRIC requires a number of decisions which ultimately can have a large effect on the price. Of particular importance for inter-city transmission is the treatment of excess capacity. Prices based on TSLRIC should allow current and potential investors in inter-city transmission to achieve at least a normal, risk adjusted commercial return on efficient investment. As well, given the rather lumpy nature of investment in transmission capacity, prices should encourage investors to increase capacity in efficient increments (even if this results in relatively large amounts of excess capacity in the short term).

Optus responded to the draft report's request for submissions relating to the issue of access pricing principles. The central thrust of Optus in this regard was the inappropriateness and harmfulness of the imposition of the Commission's Access Pricing Principles and particularly, of TSLRIC. Optus argued that if Optus infrastructure was subject to TSLRIC pricing, this would be the first instance anywhere in the world of price regulation of a new entrant's infrastructure. Application of this principle would also reflect a disregard for the cost advantage held by Telstra by virtue of its more developed economies of scale and scope, and resultant differing risk/return profile.

46 *Access Pricing Principles — A Guide*, ACCC, July 1997, p. 14.

Optus also argued that the Commission would need to account for the inherent risks in providing capacity within short-term contracts when developing its pricing regime. This heightened risk is due to the sunk nature of the costs for providers as opposed to seekers who, with short term contracts, can ‘free ride’ on the investment without bearing the risk of the sunk investment. Accordingly, Optus argues that there is a resultant need for risk-sharing mark-ups in addition to TSLRIC pricing in order to adequately share the risk between access providers and seekers.

Optus also considered that application of TSLRIC to Optus infrastructure would amount to an inconsistency with the Pricing Principles. In particular, Optus pointed out that, according to the pricing principles, TSLRIC will only be applied to declared services that are: necessary for competition in dependent markets; where the forces of competition work poorly; that are well developed. Optus contended that the market for transmission capacity could not be characterised by these criteria.

Optus argued that the Pricing Principles state that TSLRIC may not be as appropriate for new services for which there is a high degree of risk associated with uncertainty about demand. Optus believes that, whilst demand is forecast to grow, there is still a significant risk that Optus will fail to capture this business, given the homogeneity of the product.

Optus submitted that if TSLRIC is to be imposed, then the Commission must take into account the fixed costs associated with the full capacity, fully lit, and fully installed. Optus believes that this is the only way in which adequate regard is had to the economies of scale and scope of providing additional increments of capacity. Accordingly, Optus states that the ‘total service’ concept must incorporate the total fixed cost of capacity, but having regard only to existing demand. Otherwise it will give seekers a competitive advantage in the sale of capacity as they will only be bearing the fixed cost in access prices for a small proportion of capacity they are using.

The Commission notes the issues raised by various submitters in relation to among other things:

- appropriate pricing where excess capacity is present;
- pricing which reflected differing economies of scale and scope;
- pricing which reflected differing risk/return profiles between suppliers; and
- the development of pricing structures reflecting length of commitment, volumes purchased and a ‘whole of business’ approach.

The Commission considers that all these issues would be relevant in a regulatory context.

Declaration and the investment decisions of potential entrants

In assessing the impact of declaration on the entry and investment decisions of potential new entrants, the Commission focused on the following issues:

- the likelihood of new suppliers entering the wholesale transmission market; and
- the influence of regulatory decisions on entry considerations.

During the course of the inquiry various arguments were raised to the effect that there are major risks associated with new entry into the wholesale transmission services market and that such risks make it extremely unlikely that new entry will occur. It was claimed, for example, that some of the risks to a potential new supplier considering entering the transmission market include:

- the possibility that new capacity would not be sold because of the high level of existing unused capacity; and
- the possibility that existing access providers would engage in pricing to drive new competitors out of the market, again made easier as a result of the high level of excess capacity currently available.
- The possibility that if wholesale (inter-capital) transmission capacity was declared, this would provide a disincentive for new infrastructure providers who would be concerned that regulated pricing may not take adequate account of the large sunk costs that would be involved.

On the other hand some participants claimed that the barriers to entry into the wholesale transmission market were relatively low. One submitter, for example, argued that up-front costs in building transmission infrastructure are relatively low and, as a result, there is always a threat of potential competition.

Optus maintained that in the presence of high sunk costs, a maintenance of excess capacity as an entry deterrence is not a credible strategy, and therefore would be unlikely in this market. Optus substantiated this general conclusion by arguing that with growing demand, entry is naturally encouraged. According to Optus, the sunk costs of the facilities means that new entrants cannot shift their supply capability to alternative uses, and will therefore remain in the market. These new entrants will find market conditions quite favourable upon entry, as their extra supply can be absorbed by the growing demand. Optus argued that as a result, the optimal strategy of incumbents will not be to start a profit-consuming price war in an effort to mortally damage new competition.

One inquiry participant argued that there are a number of alternative sources of supply of transmission capacity. These include:

- provision of transmission via Optus Satellites;
- provision of transmission via PanAmSat and INTELSAT Satellites;
- establishment of fibre optic links by new operators;
- provision of transmission via terrestrial microwave links; and
- provision of transmission via existing railways infrastructure.

Optus noted that Primus, Macrocom, PowerNet/Transgrid and AAPT have all announced plans to build infrastructure along the Eastern seaboard. Optus' main

contention was that some or all of these plans may well be shelved in the face of declaration and consequent price regulation.

During the course of this inquiry, the Commission heard from a number of possible and actual new entrants into the transmission services market. From the information provided by these parties, the Commission considers that new entry into the transmission services market is occurring and will continue occurring over the next 12 to 18 months.

The Commission received detailed information from several electricity utilities which indicated that the development of business plans by these companies for the construction and operation of telecommunications transmission networks in New South Wales and Victoria are well advanced. These potential entrants argued that the technical and operational issues of using the existing electricity network to carry telecommunications cables have been resolved. Information was provided that indicates that such networks are already in operation in various parts of the world.

The Commission notes that, based on the information presented, there are no major technical constraints preventing electricity utilities from offering wholesale transmission services over their existing networks.

Evidence provided by these groups, however, also reflected concerns with the way the Commission may exercise its arbitration powers following declaration and whether this would unduly truncate their expected returns through forcing reductions in transmission prices by Telstra and Optus, beyond those which would otherwise have occurred as a result of new entry.

Information was also received by the Commission following the draft report regarding other new entrants into the wholesale transmission market. Specifically, the Commission is now aware that Macrocom is investing in new microwave transmission technology to compete with the incumbents, Telstra and Optus, in this market.

Macrocom is a wholesale trunk communications service carrier that will begin operations in mid-September 1998, initially providing high-bandwidth services between the key Sydney to Melbourne route with a breakout in Canberra. Subsequently, Macrocom will expand its network to service regional areas along the route. The company has plans for further expansion around Australia. Over the next five years, Macrocom will invest a total of almost \$45 million in infrastructure development, and R & D Macrocom will sell capacity in 2Mps increments on a cost-based formulation. This means that customers will purchase access to their dedicated E1 links in return for a recurring charge regardless of the way in which these links are used. It will operate primarily as a wholesale carrier supplying specialist services to companies that require large-scale transmission services, its major customers being emerging carriers, government, and ISPs.

The entry of Macrocom augurs well for more vigorous competition in this market, especially given its Microwave technology's claimed cost superiority over fibre. In addition, since Macrocom will confine itself to the wholesale functional level, its pricing will not be impinged by strategic considerations of protecting its retail business downstream. These considerations lend support to Macrocom's claims that it will be

the agent for reductions in transmission prices. The Commission would expect that the introduction of Macrocom as well as other new entrants into the market will provide incentives for both existing and new access providers to engage in more competitive conduct through the offering of enhanced price packages, more favourable terms and conditions and greater service delivery.

Discussions between Macrocom and the Commission, however, reflected concerns with the market uncertainty which may be created as a result of declaration and how this could impact on network rollout strategies, marketing plans and buyer behaviour.

Investment decisions in downstream markets

The Commission has also considered whether efficient prices and more reasonable terms and conditions would potentially have any impact on the investment decisions of participants in downstream markets. The Commission's view is that more efficient prices and more reasonable terms and conditions in the provision of wholesale transmission services will have a positive impact on efficient investment in downstream markets. That is, if upstream access providers make access to wholesale transmission services physically difficult — through quantity constraints or high prices — then this would most likely prevent efficient investment levels downstream.

During the inquiry the Commission received submissions from a number of telecommunications service providers claiming their ability to enter downstream markets had been inhibited by access prices which were well above the costs of providing transmission to them. In particular, one access seeker claimed that the high price of access made their plans to invest in the internet service provider (ISP) market uneconomic.

The Commission is also mindful of the incentives access providers may have for reducing competition in those downstream markets in which they themselves are competing. By limiting access to downstream competitors, access providers would be able to limit competition and thereby ensure they are able to price above competitive levels.

Further, if access prices are prohibitively high, this could result in downstream competitors being forced to construct their own network facilities in order to have guaranteed access to the required level of transmission capacity or the required route.

The Commission considers that such investment could very well represent an inefficient allocation of society's resources since it would result in costly and perhaps wasteful duplication of infrastructure arising not from economically rational choice but from distortion to the build/buy decision of access seekers.

In summary, therefore, the Commission considers that more efficient pricing and ease of access to required transmission infrastructure will encourage economically efficient investment in downstream markets. The Commission believes that such outcomes are likely to be achieved either through market processes in those transmission routes where new entry will occur or is occurring, or through declaration where it is considered that the probability of entry is low in the short to medium term.

Conclusion

In response to the draft report, the Commission received arguments concerning the state of actual and potential competition in the market from a number of parties. These have been set out in previous sections of this report.

Essentially, it was argued that declaration of intercapital transmission would not be in the LTIE because it would stifle investment in transmission infrastructure, discourage new entry and create uncertainty in the minds of customers as to the eventual pricing of intercapital transmission services. It was also argued that the current structural characteristics of the market and the behaviour of current market participants were fully consistent with those that should be expected in a market which is in a state of transition from legislated duopoly to open entry and competition.

The Commission also heard from several actual and potential new entrants into the intercapital transmission market who argued that their entry would promote competitive outcomes in the form of lower prices, greater range of transmission services including higher bandwidth services and greater customer choice. These new entrants presented evidence to the Commission which indicated that their pricing strategies were:

- designed to reflect the significantly lower capital costs of providing transmission services over alternative delivery methods
- aimed at inducing wholesale and corporate customers to move away from the established transmission providers by offering significantly lower prices and a greater range of transmission bandwidths.

These new entrants argued however that declaration of intercapital transmission services would severely impact on their network rollout strategies and marketing plans as it would create uncertainty in the minds of customers as to the eventual pricing of transmission services. Declaration of intercapital transmission, it was argued, would mean that customers would put off making long-term buying decisions until the level and structure of prices had been determined, possibly through the regulatory process.

The Commission has considered in detail the arguments of new entrants. The Commission has some sympathy for these arguments, particularly now the actual and likely new entrants have provided significantly more information on their business plans and marketing strategies.

As a result the Commission considers that it would be more appropriate to selectively declare only those intercapital transmission routes where it is considered that new entry is least likely to occur at least in the short to medium term, and not declare those routes where entry is occurring. Effectively this means that all routes, except the Melbourne–Sydney route which, as far as the Commission is aware is the focus of both actual and likely new entrants over the next several years, would be declared.

Concurrently with this, the Commission proposes to institute a relatively detailed monitoring program on both declared and non-declared routes. This monitoring program will be aimed at assessing both market structure and market conduct.

The inclusion of an assessment of conduct, as well as of structure, will induce incumbents into more rivalrous interaction, irrespective of whether or not there is entry. The Commission considers that the inclusion of an assessment of market behaviour clearly indicates that, in the Commission's view, further entry is not, *per se*, sufficient for the achievement of a competitive market.

The monitoring program will be aimed at ensuring that:

- in respect of non-declared routes the benefits expected from new entry and the maturing of the market do in fact materialise
- in respect of declared routes, the Commission can review its declaration decision where the structure and conduct of the market change

Such a review program may inter alia involve the Commission using its statutory powers in respect to tariff filing and record keeping to collect sufficiently disaggregated revenue, cost and pricing information specific to the intercapital transmission product. The Commission will also closely monitor the behaviour of both existing and new access providers to ensure that:

- new access providers are responding effectively to the demands of customers
- both new and existing access providers engage in effective competition in the pricing of intercapital transmission and in the offering of terms and condition to customers as well as in service delivery

The Commission will be discussing in detail the nature and extent of this monitoring program with existing and new access providers.

5. Digital data access

5.1 Service description

5.1.1 Overview

The digital data access service is an access service for the domestic carriage of high-speed data between an access seeker's exchange or network facility and a network terminating unit (NTU) or unimux or modem located at the customer's premises, where the customer is directly connected to the access provider's network. The service differs to the Telstra DDS Fastway and Flexnet retail services in that it is a tail-end service between a unimux at an access seeker's exchange or network facility and NTU at a customer's premises. It is not an end-to-end retail service between two end-customer premises.

The service can combine the use of a customer access line with management to ensure high quality data transmission. The service involves the provision of dedicated transmission capacity from 1200 bit/s to 1984 Kbit/s. The service currently includes a number of options, including the provision of higher level customer management facilities and network control. The service would enable access to a basic transport service which could be used in conjunction with an access seeker's own services to enable the provision of other carriage services, such as asynchronous transfer mode (ATM), Frame Relay and internet access services.

DDAS requires the use of a customer access line and exhibits similar bottleneck characteristics to that of the local network. Given the low degree of contestability of the service, regulated access to the service was considered to have a significant impact on competition in the provision of data services, which are becoming increasingly important in the future provision of innovative telecommunications services. At the same time, as the service was already being provided to Optus pursuant to its pre-1997 access agreement, there did not appear to be any substantive concerns in relation to efficient use and investment in infrastructure. Accordingly, the Commission considered that declaring the service would promote the long-term interests of end-users and deemed the service as a declared service under the transitional provisions on 30 June 1997.

5.1.2 Declaration proposal

The current deemed digital data access service declaration includes a mandatory requirement that time division cross connect (TDCC) equipment be used by access seekers when using the digital data access service (DDAS). Most members of the TAF proposed that this requirement be removed from the declared service description. The TAF, however, was unable to achieve consensus as to whether this mandatory requirement should be maintained in the service declaration and referred the issue to the Commission for determination.

In determining whether the TDCC mandatory requirement should be removed from the digital data access service declaration the Commission examined the following:

- the functions performed by the TDCC and whether the functions were contestable and should be open to competition;
- the rationale for maintaining the TDCC requirement and its impact on competition and the long-term interests of end-users;
- the rationale for the withdrawal of the TDCC requirement and its resultant impact on competition and the long-term interests of end-users;
- whether the Commission should unbundle those elements of a service that are not inherent within a bottleneck service; and
- whether the Commission should remove technical requirements from service descriptions where possible.

Before considering these TDCC issues in detail, the next section looks at the overall market in which data services are supplied and Telstra's Digital Data Network (DDN) which is used to supply the DDAS.

5.2 Market characteristics of DDN access

5.2.1 Relevant markets

Identification of the relevant markets provides the Commission with a field within which it can meaningfully analyse the effectiveness of competition with and without declaration.

Markets have four dimensions — product, geography, function and time. The process of market definition involves identifying the sellers and buyers which effectively constrain the price and output decisions in relation to the service under consideration.

To do this, determination of the market boundaries starts with the service. The service is described in product, geographic and functional terms. These market boundaries are then extended to include all other services which are actual or potential close substitutes. The resulting market is then the smallest area over which a profit maximising monopolist could impose a small but significant and non-transitory price increase. As noted by the High Court:

... The process of defining the market by substitution involves both including products which compete with the defendant's and excluding those which because of differentiating characteristics do not compete.⁴⁷

47 *Queensland Wire Industries Pty Ltd v. BHP Ltd* (1989) ATPR ¶40–925 at page 50, 008 per Mason CJ and Wilson J.

In identifying relevant markets Part XIC of the TP Act does not require the Commission to take a definitive stance on market definition. Furthermore, over time, declaration itself might affect the dimensions of these markets, particularly in relation to the functional dimension. Accordingly, market analysis under Part XIC should be seen in the context of shedding light on how declaration would promote competition rather than in the context of developing ‘all purpose’ market definitions.

The declared service was described in the previous section as being a digital access service that can be used by service providers to supply a variety of data-related services and products (downstream services). This is distinct from the digital data service which is supplied by Telstra to final customers (typically large corporates) as an end to end service. The Commission considers that there are at least two functional levels, the DDAS (wholesale) service and the downstream data services which use DDAS as an access service to deliver data-related products to customers.

Telstra owns and operates the largest data access network, the digital data network (DDN). This provides digital leased line services collectively known as digital data services (DDS) between customer premises running at speeds from 1200 bps to 48 Kbps (DDS) and from 64 Kbps to 1984 Kbps (DDS Fastway).

5.2.2 Demand characteristics

Telstra and its competitors use the DDN as a backbone network that enables services such as Frame Relay, microwave and satellite services to be provided.

Data services can also be provided via a number of other delivery methods. These additional delivery methods include:

- ATM;
- large megabit bearers;
- broadband applications;
- GSM data services;
- ISDN;
- xDSL technologies;
- microwave links; and
- satellite services.

As noted in Appendix 7, these services represent only partial alternatives to the DDAS. The critical feature of the DDAS is its extremely high quality and reliability for data transmission. As Optus stated:

Guaranteed high quality of service is critical in the provision of data related services because loss or the corruption of data information in, for example, an automatic teller machine or lottery transaction could result in very serious business errors [Optus submission, p. 4].

As a result of this requirement on the demand side for high quality transmission of data, digital data services attract a premium price.

End users mainly utilise the DDN to establish private data networks. These networks connect local area networks and allow businesses to connect their branch computer facilities to their central main frame computer centres. The banking industry is a typical example of such end users. Bank branch teller machines, automatic teller machines and back office administrative and accounting machines are connected via the DDN to the main central office main frame computer facilities. Retailers with many outlets, such as supermarket chains, use the DDN for eftpos transactions and inventory control through the bar code system. Other main users include the insurance, gaming and transport industries.

5.2.3 Supply characteristics

On the supply side, digital data services are provided using separate and specialised network and switching technology which cannot be used to provide any other services. Many submitters stated, and the Commission accepts, that there is unlikely to be any significant degree of substitutability between these services and other services in the near future.

The Commission considered whether viable alternative data access networks are accessible or could potentially become available in the near future. The Cable TV networks have significant access to residential premises via their fibre-optic/coax networks, although the technologies utilised and service offerings are limited at present. The Commission concluded that, to date, there are no real viable (technical or economic) alternatives to gaining customer access for data services. Wireless local loop, digital subscriber loop and satellite are shaping up as potential alternatives for certain applications. Their use, however, will still be limited geographically and economically for some time to come. xDSL technologies are another alternative, however the Commission understands that error rates and service reliability standards are markedly lower than the premium DDAS.

A more detailed discussion of the potential for alternative technologies and services to act as substitutes for the DDS is set out in Appendix 7.

The lack of adequate substitutes in the provision of digital data services was a significant factor in the Commission's decision to deem DDAS as a declared service in June 1997.

5.2.4 Functions of time division cross connect

The TDCC is a multiplexer(s) associated with Telstra's digital data network (DDN) and is sometimes referred to as a digital cross connect centre (DCCC) which is the physical location of the TDCC equipment. The primary functions of the TDCC include switching, bandwidth aggregation, interconnections between access services and transmission services, management of link redundancy and network management activities (such as, access testing and monitoring capabilities).

There are 21 DCCCs in the Telstra network where the TDCCs are provisioned and are located in each state and territory capital city, and in the following regional locations — Rockhampton, Townsville, Newcastle, and Launceston.

The mandatory use of TDCCs creates a constrained architecture of Telstra’s DDN which access seekers maintain creates a significant number of inefficiencies. It creates an economic hindrance to an access seeker wishing to provide services to its customers outside the capitals and the above four major regional centres. The following issues arise:

- an access seeker is forced to co-locate its point of interconnect (POI) with the access provider’s DCCC. This may reduce the opportunity for the access seeker to provide more cost effective transmission from non-DCCC locations by aggregating bandwidth; and
- by moving the POI further from the regional customer the access seeker is forced to pay higher access charges to the access provider as it must pay for the transmission component back to the DCCC. In order to connect a regional customer to another regional customer, double trunking (also known as tromboning) must be used. This means paying approximately 1.6 times the cost of a regional to DCCC access charge.

5.3 Industry views

Most industry participants that provided comment on the issue requested that the TDCC mandatory requirement be removed from the service declaration.

The Commission received evidence from only one industry participant, Telstra, which advocated the retention of the mandatory TDCC requirement in the service declaration. In summary, Telstra submitted that it did not believe that an adequate case had been made to support the alteration of the current service description which would lead to the promotion of the LTIE. Telstra stated that the changes outlined in the discussion paper are not needed to promote competition, and would materially reduce efficiency.⁴⁸

Telstra submitted that there is no evidence that the DDAS is in any respect inadequate in meeting the legislative objectives. Telstra stated that the service has only recently been launched, making it difficult to assess market-place reaction, and that it had generally received a positive reaction from the service providers to whom it has presented the new service. Moreover, Telstra’s view, based on market-place trends, is that considerable entry is occurring into markets for data services. Telstra maintained that the positive case for modifying the current data access arrangements is, at best, uncertain.

48 Telstra submission, p. 5.

At the public hearings both Optus and AAPT provided evidence⁴⁹ that the service had been effectively declared for at least four years and that negotiations to overcome routing difficulties had been proceeding for 18 months or more. Accordingly, they argued that it is now appropriate to examine whether the service description should be changed.

Further, access seekers did not confirm Telstra's view that they have responded positively to Telstra's DDS, for example BT stated that:

The service description has come under considerable scrutiny from other players in the industry as it is not seen as meeting their requirements and implies unnecessary costs in its implementation [BT submission to TAF, p. 1].

Telstra also submitted that withdrawing the TDCC requirement would unnecessarily broaden the service description and allow other services to be developed. At the Melbourne hearings Telstra stated:

The basic problem with that is if you lock it in through regulation that you will be dictating certain activities on certain players in terms of what they may or may not do, and you may encourage a whole lot of additional services, new services that Telstra might be providing, or new services that other people may be providing will be captured in the declaration net. Leaving the TDCC in there gives a fair level of certainty into the future as to what the declared service is [Melbourne Transcript of Proceedings, p. 11].

Industry participants primarily focused on whether the proposed amendments would be in the LTIE. Their arguments in relation to each of the criteria of the LTIE test are presented below.

5.3.1 Promoting competition

Submissions focused on the following issues when assessing whether the proposed amendments to the service description would have the effect of promoting competition:

- whether the bundling of a bottleneck and other services is appropriate; and
- whether the proposed amendment would lead to increased competition.

5.3.1.1 Bundling of bottleneck services

Optus submitted that the DDAS is a bottleneck service and that the removal of the TDCC requirement would increase the ubiquity and availability of the service, without materially affecting the efficient use of the Telstra digital data network (DDN). Optus considered that the critical feature of the DDS is its extremely high quality and reliability for data transmission, and that there is significant demand in downstream markets for these essential functions and submitted that:

49 Melbourne transcript of proceedings, p. 7.

... the ‘decentralising’ effect of the removal of the DCCC illustrates the promotion of competition through the increased likelihood of contestability in downstream markets for which Digital Data Services are an essential input [*Optus submission*, p. 25].

The view that the DDAS is a bottleneck service was supported by Global One which stated that:

... Telstra continues to be the dominant, bottleneck supplier of the DDAS input. Contestability and substitutability for DDAS is correspondingly minimal. ... Access seekers require access to unbundled wholesale elements and not resale of bundled retail products [*Global One submission*, pp. 1-2].

AAPT submitted that it is not necessary to route calls through a TDCC in order to provide the requisite level of functionality required by frame relay operators. BT supported the above views and, in its submission, stated that supply of the basic service at an economic cost creates large opportunities for the development of a variety of novel services based on the underlying service. At the Melbourne public hearing, BT added that:

... the generic service description is really what we want here and the technology only defined insofar as is absolutely necessary. As far as possible it should be left flexible so that as time evolves the most flexible and technically efficient way of delivering this service can then evolve with it [*Melbourne Transcript of Proceedings*, pp. 9–10].

5.3.1.2 Increased competition arising from the removal of the TDCC

Optus believed that the proposed amendments to the DDS description will promote competition in downstream markets. Optus submitted that competition will be promoted through the increased likelihood of contestability in downstream markets for which digital data services are an essential input. Optus maintained that smaller carriage service providers will be in a better position to compete with Telstra in relation to services such as frame relay, without being required to perform inefficient double trunking. Furthermore, the removal of the TDCC would enable all carriage service providers, including Optus, to address customer needs without being dependent on Telstra’s network architecture requirements. This would enable Optus, for example, to provide downstream services to customers either on the existing basis (that is, through the TDCC) or through the new basis (that is, without going through a TDCC) depending on the customer’s requirements and the efficiencies obtained through the use of the TDCC or otherwise.

Optus also stated that, any loss in economic efficiency from the supplier’s perspective which may occur as a result of the removal of the TDCC in a particular case (for example, a decrease in the economies of scale as a result of the removal of switching/aggregation functionality from the service), must be weighed up against the benefits obtained on a wider scale — such as the increased ubiquity of the service and the ability of niche or smaller players to compete for the provision of downstream services.

SITA maintained that the current mandating of the TDCC limits the ability for the implementation of innovative solutions and introduction of new technology in the area of digital data services. SITA argued that the need to aggregate bandwidth back to one

of the TDCC facilities inhibits service providers from providing cost effective solutions to customers outside CBD areas. SITA believes the removal of the requirement can only assist in the development of competition and delivery of new services to major regional centres throughout Australia.

ATUG submitted that the pressure to remove the TDCC is clearly to avoid having it as a necessary part of a digital data access service. ATUG suggested that it seems to be a reasonable argument that the end-user is able to seek an appropriate level of service which suits his business and to be able to obtain services from different providers. ATUG stated that:

The exclusion of the DCCC will open up, as I see it, an opportunity for basic digital data services to be used by appropriate people. It seems to me, therefore, that going down that path is eminently sensible in meeting the first objectives that is in the long-term interests of end-users [*Sydney Transcript of Proceedings, p. 24*].

Global One submitted that broadening the technically feasible service description of the deemed digital data service will enhance the already acknowledged long-term end-user benefits by removing arbitrary Telstra interconnection requirements. An amended service declaration would improve the availability of DDAS, as access seekers could provision DDAS independently of Telstra's TDCCs.

AAPT stated that because the current DDAS service description requires that all calls originating and terminating in regional areas (other than Rockhampton, Townsville, Newcastle and Launceston) must be double trunked through a capital city, the costs of these services make it commercially unviable for AAPT to compete for business in these areas.

AAPT concluded that the removal of a mandated TDCC from the service description would reduce the costs of providing retail services in non-CBD areas to levels which would make the data market contestable, because the distance-based charges for DDAS would more closely reflect the direct distance between customer locations. Further, at the Melbourne public hearing AAPT stated:

... the use of the TDCC is very limiting. It is anti-competitive. It is not in the long-term interests of end-users because it limits competition and therefore limits our ability to reduce prices to end-users [*Melbourne Transcript of Proceedings, p. 15*].

BT stated that the automatic inclusion of certain features, such as the mandated use of a TDCC as a network element, creates excessive costs which ensures that some services and competitors will at the least be greatly hindered, and in some cases never make it to the marketplace.⁵⁰

5.3.2 Promoting any-to-any connectivity

Telstra submitted that the proposed amendments would not promote any-to-any connectivity, and stated:

50 BT submission to TAF, p. 3.

To the extent to which any-to-any connectivity is related to the DDAS, the relevant needs have been met by Telstra's existing access service [*Telstra submission, p. 16*].

AAPT's view was that the proposed amendments would neither enhance nor diminish the achievement of any-to-any connectivity between end-users.

BT submitted that the proposed amendments will directly improve any-to-any connectivity. This is because the proposed amendments will aid in the provision of services to customers in the same town, without forcing the need for tromboning via a remote POI or the enforced siting of competitor's switches and facilities remote from their intended markets.

Global One indicated that connectivity will be enhanced by reducing the costs to establish DDAS input services outside of Telstra's TDCC sites.

5.3.3 Promoting economically efficient use of infrastructure

In relation to whether the proposed change to the DDAS service description would promote the economically efficient use of infrastructure, submitters focused on the following issues:

- current network topology;
- impact of withdrawal on network management; and
- double trunking.

Current network topology

Telstra stated that the proposals would impose substantial costs and reduce efficiency in the use and provision of telecommunications services. Telstra maintained that the central point is that the proposals seem to be based on a substantial misunderstanding of the current situation. Further, Telstra commented that in contrast to what is implied by the proposed changes, the architecture and topology of Telstra's data service network reflects efficiency considerations. In particular, the concentration of traffic through digital cross connect points, and the location of these points at places of high traffic density, allows economies of scale in transmission. Telstra maintained there is a close concordance between the geographical pattern of traffic and the location of Telstra's cross connect points and it was simply inaccurate to claim that transport costs for material volumes of traffic are increased by the location of these points or by the requirement to interconnect at those points.

Telstra considered that, at least in the immediate term, it could not economically provide data transmission to meet the current level of service standards without requiring transmission arrangements to be aligned with the location of its cross connect points. Telstra stated that, were it required to route transport or supply interconnection at lower levels in the transmission hierarchy, it would either have to provide that transport or interconnection at a lower level of service or would have to incur substantial outlays to alter the structure of its network management.

Telstra maintained that the result of altering the DDAS service description would be to increase costs to end-users, and that there is no visible benefit accompanying these costs, or those of the other proposed changes.

Impact of withdrawal on network management

Telstra submitted that the mandatory use of TDCCs is essential for Telstra's management of the DDN and stated that the TDCCs were essential for the end-to-end management of Telstra's DDN system.

Telstra also stated that the removal of the TDCC mandatory requirement would result in Telstra not being able to guarantee the proposed service reliability standards contained in the proposed service description.

Double trunking

Telstra's present arrangements require all DDAS to be trunked through a TDCC. Because the existing service description requires that all data links pass through a TDCC, a connection between two end-users who may be located near to one another, but relatively distant from a TDCC, must therefore be double trunked or tromboned, frequently over distances far greater than the geographical distance separating them.

For example, AAPT provided the following description of the routing problem:

... a call made between customer locations in Bendigo and Ballarat using Telstra's DDN must be carried from Ballarat to Melbourne (the nearest DCCC), then back to Bendigo; rather than direct from Bendigo to Ballarat. The distance from Bendigo to Melbourne is approximately 133 kms and from Ballarat to Melbourne approximately 102 kms. Because charges for the Digital Data Access Service are distance-based, an access seeker using the service to provide a retail service linking these towns must pay as if the distance between these towns was 235 kms and not the direct distance of 97 kms [*AAPT submission, p. 2*].

Optus advised it purchases sufficient volumes of the digital data services in most places for it to be efficient for it to purchase digital data services via this centralised approach. Optus acknowledged that this may not be the case, however, where, for example, a smaller number of digital data services are required by an access seeker or where a TDCC is not located close to the customer or a particular access seeker. Optus submitted that, in these circumstances, it may be an inefficient use of network resources to transmit data via a TDCC rather than to simply provide the digital data service directly from the customer premises to the access seeker location via an access provider's multiplexing equipment.

Optus stated that it does not believe that it will always be the most efficient method of providing a digital data service by providing it through a TDCC. Given that there will be many different users of the infrastructure required to support the provision of digital data services, efficiency of use must have regard to these differences.

BT submitted that the mandated use of TDCCs acts via excessive costs to ensure that some services and competitors will be greatly hindered, and in some cases never make

it to the marketplace.

5.3.4 Impact on infrastructure investment

Telstra stated that they can only efficiently provide the DDAS through digital cross connect points and that to provide service through alternative arrangements would impose substantial costs. Further, Telstra submitted that to price the access service as if it were being provided through an alternative architecture would distort signals for resource allocation.

Telstra advised the Commission that:

New alternative access technologies are currently being developed. These alternatives require large scale investments to be viable and to meet demand growth. Inappropriate use of regulatory powers will discourage such large scale investment [*Telstra submission, p. 16*].

Optus, however, stated that it strongly believes the removal of the TDCC will encourage the economically efficient use of infrastructure by which listed services are supplied, and stated that:

In many cases, the removal of the DCCC will have a neutral effect, from the supplier's perspective, on the most economically efficient method of supplying the Digital Data Service. However, the removal of the DCCC will have a very significant impact on the supply of the Digital Data Service from the Access Seeker's perspective [*Optus submission, p. 26*].

AAPT concluded that the mandated use of a TDCC to supply DDAS does not reflect the costs an efficient operator would incur in providing the service required by access seekers because:

- the use of a TDCC rather than a considerably less expensive multiplexer adds unnecessarily to the costs of the components required to provide the service; and
- the trunking of all calls through TDCCs adds unnecessarily to the length of the links and, since the charges for these are distanced based, therefore to the cost of transmission required to provide the service.

AAPT stated it was at a loss to understand why Telstra configures its network in this manner and that it is certainly at odds with the approach taken in other countries and does not reflect the manner in which AAPT would configure a similar network. In the absence of relevant information, AAPT concluded that this present method of data service delivery reflects technical and operational limitations in Telstra's network, the consequences of which should not be imposed on access seekers.

AAPT also stated that removal of the mandatory TDCC requirement would promote efficient decision making about infrastructure use by access seekers. In particular, it would assist in lowering the already considerable barriers to entry in markets for switched data services, such as frame relay or ATM. Removal of the requirement would make it feasible for new entrants to invest in certain network components (such as, switching facilities in regional areas). The requirement creates an artificial barrier to

entry which effectively makes such investment unviable.

BT submitted that routing all data traffic via these facilities means that competitors are faced with locating their switches and other facilities relatively close to a TDCC to avoid paying for the mandated costs of double trunking. In other words, service providers would be limited in the roll-out of their facilities because they would be unable to locate them in the immediate vicinity of their target markets. What is required is the ability to locate data switches and other facilities wherever it makes economic sense to do so, free of an artificial constraint from arbitrary features of the Telstra network.⁵¹

BT concluded that it was difficult to see how a service description which mandates the unnecessary carriage of data traffic over sometimes hundreds of kilometres, and pricing accordingly, achieves the aim of efficient use of, and investment in, infrastructure.

5.4 Applying the LTIE criteria to the DDAS

The Commission considered Telstra's view that it was inappropriate to review the DDAS because it had only recently been launched and Telstra's belief that service providers had reacted positively to the service. In contrast, access seekers submitted that there were considerable problems associated with the DDAS that negotiation had failed to resolve. Given this divergence of views, the Commission considered it was appropriate to review the service declaration.

The Commission in assessing whether the TDCC mandatory requirement should be removed from the service declaration examined the following three options:

- leave the TDCC as a mandatory requirement;
- remove the TDCC as a mandatory requirement with no other related adjustments to the service declaration; or
- remove the TDCC as a mandatory requirement with Telstra suggested adjustments (or some combination of) to the service declaration (such as, reliability guarantees, fault management, link redundancy etc).

The Commission considers that the removal of the TDCC mandatory requirement from the service declaration will promote the long-term interests of end-users. The reasons for this conclusion by the Commission are detailed below.

5.4.1 Promoting competition

The Commission believes that the proposed removal of the mandatory use of TDCCs will promote competition in downstream markets through increased contestability in those markets for which digital data services are an essential input. Access seekers will be in a better position to compete with Telstra in relation to downstream services such as Frame Relay and ATM without incurring the additional costs associated with inefficient double trunking.

51 BT submission to TAF, p. 3.

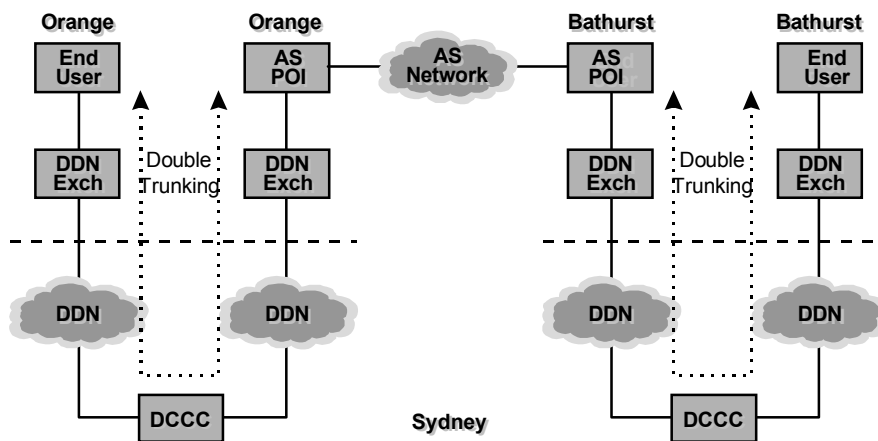
Evidence was submitted that the current pricing of DDAS makes it commercially unviable for access seekers to supply data services to customers located more than 12 kms from a TDCC. The Commission believes that removing the TDCC requirement will free access seekers from the restrictions created by Telstra’s network architecture. This should enable access seekers greater flexibility to meet customer needs in the most economically efficient manner.

The proponents of the amendment believe that the effect of this proposal will be that the points of interconnection (POI, or in the deemed service declaration, the ‘Network Boundary’) will no longer be restricted by cost factors associated with routing traffic through a TDCC. As a consequence, the areas within which carriage services (and services provided by means of carriage services), which require for their production the digital data access service, may be offered will be increased. For example, BT argued that:

... the mandated use of a Time Division Cross Connect (TDCC) [equivalent to the DCCC] as a network element will act via excessive costs to ensure that some services and competitors will be ... greatly hindered, and in such cases never make it to the marketplace ... Routing all data traffic via these facilities means that competitors are faced with locating their switches and other facilities relatively close to a TDCC to avoid the costs of ‘double routing’ [BT submission to TAF, p. 3].

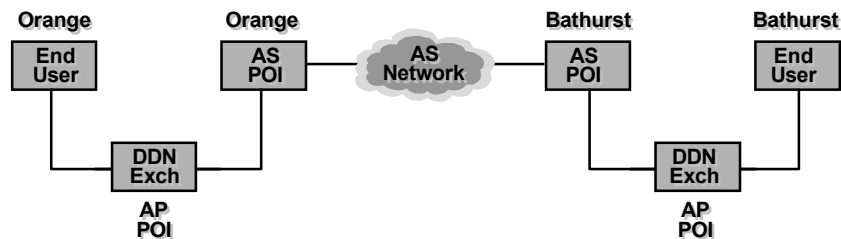
Figure 5.1 illustrates the manner in which DDS services must be provided and costed to access seekers wishing to connect a local regional customer to a service provider’s switch.

Figure 5.1. Double trunking caused by TDCCs



Access seekers requested a more cost-effective solution to the double trunking problem. Figure 5.2 provides a conceptual overview of what access seekers consider is the desired solution.

Figure 5.2. Bypassing of TDCCs



The Commission considers service declarations, where possible, should not mandate technology requirements. Further, the Commission considers that, where possible, bundling of services or functionality with a natural monopoly element should be avoided. This enables either access seekers or consumers the choice to self-provide or buy the elements separately. The effect of this unbundling should promote competition and provide a flexible framework that is in the long-term interests of end-users.

5.4.2 Promoting economically efficient use of infrastructure

In determining whether the withdrawal of the TDCC mandatory requirement will lead to efficient use of infrastructure, the Commission has focused on the following issues:

- substitutability of the TDCC;
- double trunking;
- impact on network topology; and
- impact on network management.

Each of these is examined below.

Substitutability of the TDCC

Several submitters argued that they did not believe that it will always be the most efficient method of providing a digital data service by providing it through a TDCC. Given that there will be many different users of the infrastructure required to support the provision of digital data services, efficiency of use must have regard to these differences.

Access seekers submitted that routing all traffic via these facilities means that competitors are faced with locating their switches and other facilities relatively close to a TDCC to avoid paying for the mandated costs of double trunking. In other words, service providers would be limited in the roll-out of their facilities because they would be unable to locate them in the immediate vicinity of their target markets. The Commission considered that access seekers require the ability to locate data switches and other facilities wherever it makes economic sense to do so free of an artificial constraint derived from arbitrary features of the Telstra network.

Evidence was provided that it was technically feasible to offer DDS without using a TDCC and all that is required is a device capable of aggregating a number of 64 Kbs (or other) access circuits into a 2 Mbs stream. Submitters to the inquiry indicated that the two alternatives are:

- using a sub 2 Mb multiplexer; or
- using an ATM platform with Circuit Emulation interface.

The Commission's independent technical advice suggests that the following functionality can be provided by the mux equipment:

- Bandwidth Aggregation — aggregation of 64 Kbps customer access circuits onto the 2 Mbps SP access circuit;
- Switching — switching of the individual 64 Kbps channels onto the 2 Mbps circuit;
- Link Redundancy — mux equipment can provide duplicated access paths to the SP or duplicated paths to the TDCC;
- Network Management — *JNA Network Management System*⁵² and Telstra *MACS-CAF*⁵³ network management provide full management and control of all elements of this service.

As a result the Commission accepts the evidence provided by access seekers that there is no technical limitation for the de-coupling of POIs from TDCCs. The Commission notes that the TDCC possesses additional functions to that of a multiplexer, but that these additional functions are not needed to provide the DDAS.

Double trunking

The Commission considers that the double trunking that results from the use of TDCCs (as discussed in the previous section) is not consistent with efficient use of infrastructure. Such operational inefficiencies could be avoided through withdrawing the TDCC mandatory requirement from the service declaration.

Impact on network topology

Telstra argued that the architecture and topology of Telstra's data service network reflects efficiency considerations and that the concentration of traffic through digital cross connect points, and the location of these points at places of high traffic density, allows economies of scale in transmission.

Other submitters, however, stated that any loss in efficiency from the supplier's

52 JNA NMS — Proprietary network management system designed exclusively to manage and control JNA mux equipment such as the Unimux (Telstra brand name for the JNA AS200).

53 Management & Control System/Customer Access Facility — Telstra's overall DDN network management system. A subset of its functionality can be provided to customers in order to better manage and reconfigure private DDS networks.

perspective which may occur as a result of the removal of the TDCC in a particular case (for example, a decrease in the economies of scale as a result of the removal of switching/aggregation functionality from the service), must be weighed up against the benefits obtained on a wider scale. Such benefits include the increased ubiquity of the service and the ability of niche or smaller players to compete for the provision of downstream services.

The Commission considers that even if Telstra's view on economies of scale effects is true, the benefits likely to be achieved by access seekers and end users as a result of greater service coverage and more efficient provision of downstream services would outweigh these concerns.

Impact on network management

In its submission, Telstra argued that the use of TDCCs is essential for the end-to-end management of Telstra's DDN system.

In response to this view, the Commission sought from Telstra an indication of which service reliability standards could not be guaranteed without the mandatory TDCC requirement. Telstra proposed a service description which makes it clear that each party is responsible for maintenance of its own network on either side of the ITP, and that the access provider will be responsible for delivery of the end-to-end DDAS. Telstra noted that it does not currently provide 24 hour fault handling for this service in regional areas, even to its regional customers.

The Commission has considered whether it is appropriate for terms and conditions regarding service guarantee levels to be included in the service description relating to the DDAS. In general, the Commission believes that the establishment of terms and conditions relating to quality and reliability should not be mandated through a service description. Rather, such terms and conditions should be determined through commercial negotiation. In this context, the Commission proposes that terms and conditions relating to quality of service or reliability standards should not be specified as part of the service description to the DDAS service. This would also enable access seekers to negotiate their required level of network management functionality and be charged accordingly. Consequently, the Commission has developed, at Appendix 6, an amended service description reflecting this view.

5.4.3 Promoting economically efficient infrastructure investment

The Commission agrees with those arguments put by access seekers that the removal of the TDCC mandatory requirement will promote efficient investment in infrastructure, particularly by access seekers. The Commission considers that the use of a considerably less expensive multiplexer rather than a TDCC will enable access seekers to avoid unnecessarily high costs currently incurred in providing the service. Further, the current trunking of all calls through TDCCs adds unnecessarily to the length of links and, since the charges for these are distanced based, to the cost of transmission

required to provide the service.

The Commission also considers that the mandatory TDCC requirement does not encourage efficient decision making about infrastructure use and investment by access seekers. In particular, removal of the requirement would assist in lowering barriers to entry into markets for switched data services (such as Frame Relay or ATM) and encourage new entrants to invest in new infrastructure, such as switching facilities in regional areas.

Against this is the possible effect on the incentives of existing infrastructure (DDN) owners to make further investments into the future. Telstra noted in this respect that changes to the network architecture, as reflected in removal of mandatory TDCC requirements, was likely to distort the signals for efficient resource allocation. Similarly, there was concern about whether the proposed change represented overarching regulation which would discourage large scale investment. There was a dearth, however, of detailed evidence to support the specific proposition that removal of the mandatory TDCC requirement would have such a significant impact on investment incentives that it would outweigh any other effects in terms of efficient use in infrastructure and in promoting competition and investment by others.

5.5 Conclusion on the DDAS

The Commission has concluded that the TDCC mandatory requirement should be removed from the service declaration for the following reasons.

- The TDCC is not an essential requirement of the DDAS and access seekers can provide alternative technologies that could perform the TDCC functionality just as efficiently and at a lower cost.
- Telstra architecture should not define the market or limit market growth. The mandatory TDCC requirement operates as a barrier to entry in regional areas which are adversely affected. Indeed, it is possible that the present low utilisation of the DDN in regional areas may be caused by the inability of competing service providers to offer products in those areas.
- The LTIE will benefit from removal of the TDCC mandatory requirement. Unnecessary costs currently incurred would be removed. This would increase efficiency and enable lower prices to be offered to end-users.
- The Commission, where practical, should not be defining what technology must be used as this can create barriers to entry and inefficiencies arising from placing limitations on market based solutions. Access providers and seekers should be free to negotiate about the most appropriate interconnection points and the level of functionality that is appropriate at any point. This would mean that while TDCC equipment may be used where it is appropriate, it should not be mandatory. The Commission takes the broad view that in respect to service declarations, it is not appropriate to be defining particular technology unless there is a persuasive case that can be made on a case-by-case basis.

- Removal of the TDCC requirement was in the LTIE and would lead to more efficient investment in infrastructure while not impacting adversely, in any significant sense, on existing infrastructure providers.
- The TDCC requirement bundles unnecessary equipment restrictions on a bottleneck service which lowers the level of contestability and likely competition levels.

The Commission also concludes that the establishment of terms and conditions relating to quality and reliability should not be prescribed through a service description. Rather, such terms and conditions should be determined through commercial negotiation. Consequently, the Commission's amended service description in Appendix 6 reflects this approach.

The Commission will monitor developments in data markets following the implementation of the new service description and may review the service declaration if circumstances warrant. The Commission also would encourage the industry through the TAF to negotiate any further amendments to this service description rather than relying on the Commission's public inquiry process.

Appendix 1 ISDN service specification

The service concept is a flexible one where several specifications are possible. Rather than develop all possible specifications, the Commission developed two eligible services. These services are an ISDN originating service and an ISDN terminating service. They are based on those presented to the Commission and supported by the majority of the TAF. For each service, this Appendix presents the issues as the Commission saw them, along with the reasons behind each service description developed by the Commission. A copy of the description for each service follows.

1.1 ISDN originating service

The originating service enables end-users directly connected to an access provider's network to access the network services of other service providers.

The major issues to be addressed in developing a specification for the service are:

- the types of ISDN calls covered;
- the types of bearer services covered;
- whether the service should cover services provided by means of both the overlay network and the ETSI network;
- the types of supplementary services which ought to be supported; and
- the signalling protocol.

1.1.1 ISDN calls

The service description supported by the majority of the TAF provided for the supply of ISDN originating services on calls made with:

- **Access seeker specific codes** — These are a range of telephone numbers within the Australian Numbering Plan which are allocated to a service provider who in turn allocates the numbers to its own customers. Access providers' exchanges are programmed to automatically route all traffic to the service provider owning the number range.
- **Pre-selection** — The access provider's exchange to which the end-user is connected is programmed to automatically route all traffic to a pre-determined service provider's network.
- **14xy over-ride dial codes** — The end-user manually over-rides any preselection or number range routing by prefixing called numbers with the relevant service provider over-ride dial code.

Submissions received by the Commission

The majority of the TAF sought to include all three types of calls within the service specification, whereas the minority sought to limit the service to calls made with access seeker specific codes which could be used for the purposes of any-to-any connectivity. Submissions received by the Commission affirmed these views.

Technical view

The Commission understands that ETSI networks can be used to supply the originating service on all three types of calls where the call is a voice call or a data over voice call. Telstra advises that the overlay network is not able to provide pre-selection. It would appear that the software for the switches on this network would need to be upgraded. However, Telstra advises that the switch vendors no longer wish to support these switches and hence, have not planned any developments to the switch hardware or software.

Commission view

Provision of pre-selection and over-ride dial codes are matters covered by Part 17 of the *Telecommunications Act 1997*. Under that Part, the Australian Communications Authority can issue a pre-selection determination requiring a carrier or carriage service provider to provide pre-selection in favour of specified carriers or carriage service providers. The Commission understands that the Australian Communications Authority is currently considering whether to issue Telstra with an exemption from the current pre-selection determination⁵⁴.

In the Commission's view it would appear to be technically feasible for Telstra to provide the originating service on all three types of ISDN calls, although for services supplied by means of the overlay network, the software for the switches would need to be upgraded. Should the Australian Communications Authority not issue an exemption, then the service description ought to enable this method of activation to be covered by the declared service. Accordingly the service description should reflect that supported by the majority of the TAF.

1.1.2 Bearer services

Bearer services are particular capabilities which are possible with ISDN B channels. They are:

- **Speech** — This is used for voice calls and allows the network to switch the call via different paths and to activate voice-specific facilities such as voice compression or echo cancellation.
- **3.1kHz Audio** — This is used for certain audio applications requiring out-of-band signalling where an unrestricted (clear) 64kbps data stream is required to prevent the network from interfering with the signalling elements. It prevents a call being

54 Telecommunications (Provision of Pre-selection) Determination 1997.

switched via voice compression or echo cancellation circuitry.

- **64kbps unrestricted digital** — This provides an unrestricted (clear) 64kbps data stream from A to B. It is used for data calls.
- **Aggregated 192kbps and 384kbps** — This involves ‘informing’ the network to aggregate multiple ISDN 64kbps channels (3 or 6) into a higher speed end-to-end circuit.

Through using these bearer services, it is possible for access seekers to offer the following features:

- least cost routing;
- voice compression;
- echo control; and
- applications requiring higher bandwidth.

Least cost routing allows an end-user device or a network operator to determine the network path which will minimise delays, congestion or be the most cost-effective. It can only be performed on the ISDN if the call type is specified by the CPE setting the ‘bearer capability’ element contained in the call setup message. By way of example, if a particular service provider is offering a special tariff for data (or voice) calls between Sydney and Melbourne, the end-user can use least cost routing to route all such calls via that particular service provider.

The detection of a voice call also allows the carrier to carry the call using voice compression. This maximises the use of bandwidth by allowing a standard 64kbps voice channel to be reduced to 32kbps, 16kbps or lower. For voice compression to work, it is important that the bearer capability element be passed from the access provider’s network to the access seeker’s network.

Echo control is required on some voice calls to minimise the effect of signals being echoed back to the person speaking. In order for the network to enable the echo control circuitry on a call-by-call basis, the network must determine that the call content is voice. The use of echo control circuitry on data calls will invariably cause errors on the transmitted data or complete loss of functionality.

The standard ISDN bearer channel capability is 64kbps unrestricted (or clear). These channels can be aggregated for applications requiring higher bandwidth. Typical uses are video conferencing or ‘bursty’ transmissions (e.g. LAN-to-LAN) where traffic volume fluctuations during the course of a day may require additional bandwidth on demand. Aggregation can be provided by means of customer premises equipment or by means of the network as is demonstrated in Figures 1.1 and 1.2.

Figure 1.1. Aggregation by means of customer premises equipment

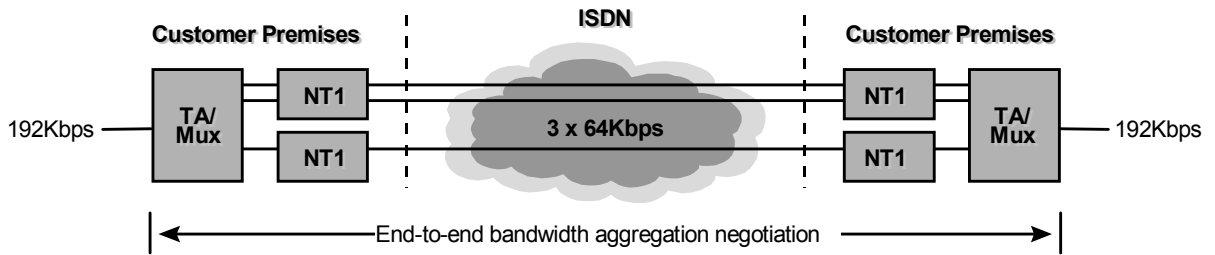
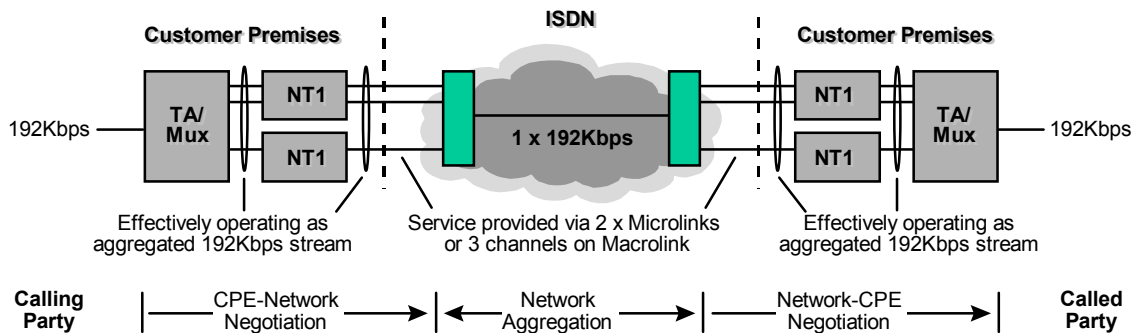


Figure 1.2. Aggregation by means of the network



Submissions received by the Commission

The majority of the TAF seeks to include all bearer services within the service specification. Telstra, on the other hand, claims that speech and 3.1kHz audio do not need to be included in ISDN service specifications because they are covered by the service specifications for domestic PSTN originating and terminating access. Others have submitted that excluding voice from the service description would create confusion if different declarations applied to the provision of data, rather than voice, over ISDN networks.⁵⁵

Moreover, it was submitted that Telstra’s proposal does not recognise that ISDN is inherently an integrated service for voice and data. In this regard, the preamble to the CCITT I series recommendations defines ISDN as follows:

An ISDN is a network, generally evolving from telephone Integrated Digital Network (IDN), that provides end-to-end digital connectivity to support a wide range of services including voice and non-voice services, to which users have access by a limited number of standard multi-purpose user-network interfaces.

55 Attachment D of the TAF proposal — statement prepared by Optus in support of the BT proposal and service descriptions.

With respect to services requiring higher bandwidth, Telstra advises the Commission that its ISDN service does not include network aggregation. It submits that network established multi-rate services are not implemented in the majority of other ISDN countries. Aggregation is currently provided by means of customer premises equipment.

Technical view

Bearer capabilities are provided on both the overlay and ETSI networks, although Telstra has suggested that the overlay network does not support all bearer capabilities. It is understood that Telstra's network distinguishes between speech, 3.1kHz audio and 64kbps unrestricted bearer capabilities. However, the interconnection protocol for the overlay ISDN (i.e. ATUP interconnection protocol) defaults to 3.1kHz audio and accordingly, a protocol will need to be developed for supporting other bearer services.

With respect to aggregated services, multiplexing equipment would be required throughout the network to provide this capability. Moreover, interaction by the customer premises equipment would be required in any event in order to realign each channel to compensate for transmission delays.

Commission view

Inclusion of the speech, 3.1kHz audio and 64 kbps bearer capabilities within a service specification would not require the access provider to supply those services, but rather to support them when they are being provided by others. Support involves carrying the relevant signals which contain the information about the way in which the transmission is to be treated.

Given that ISDN is an integrated service, it would be preferable to include speech and 3.1kHz audio within the service specification. Furthermore, it would be undesirable to distinguish between the content of digital transmissions where each uses the same carriage service over the originating and terminating components of the network. Additionally, there would appear to be no detriment associated with including these bearer services within the service specifications.

On the basis that Telstra currently does not, nor does it propose to, provide network established aggregation, it would seem that the service specification should not cover network established aggregation. Accordingly, aggregation will be provided by means of customer premises equipment.

1.1.3 Overlay/ETSI networks

The issue here is whether the service specification ought to cover both the overlay and ETSI network services. There are three options.

- Specifically cover both the overlay and ETSI network services.
- Specify no network in the service specification, in which case both would be covered, along with any other type of ISDN service introduced in the future.
- Specifically cover only the ETSI network services.

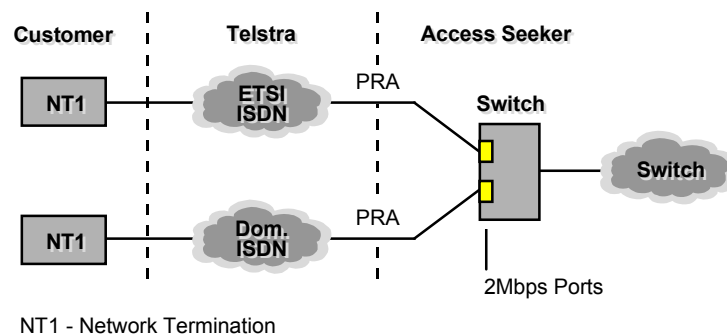
Submissions received by the Commission

In Telstra's view, because it is phasing out the overlay network service, the service specifications should only cover ETSI network services. Other service providers, however, want both services to be covered by the specification. There appears to be some support for an approach where the service specification does not state the type of infrastructure used to supply the service so long as it is understood that both ETSI and overlay network services are covered.

Technical view

Maintaining the two networks means that duplicated POIs would be required by both the access provider and access seekers. This may not impose any technical constraints as these interfaces are defined by standards (Technical Standards 013 and 014, and the ETSI standards). There may, however, be some associated financial and network management issues. Figure 1.3 illustrates these interconnections:

Figure 1.3. Duplicated ISDN points of interconnect



Commission view

The Commission's preference, as stated in its draft guide entitled *Declaration of Telecommunications Services*, is to specify services in terms which are as functional as possible. Accordingly, the preferred approach would be to not specify the type of ISDN within the service specification. This minimises distorting technological or innovative developments and the need to constantly update the service declaration as standards are modified. Reflecting this approach, the service descriptions do not state the type of network by which the service is supplied. This means that both the overlay and ETSI networks are covered by the service description.

1.1.4 Supplementary services

Supplementary services provide features which enhance the communications service (for example, call waiting, calling line identification and conference calls). They can be provided in three ways:

- through interaction between the customer premises equipment of the calling and called parties;
- through interaction between the customer premises equipment of calling party and the access provider's network; and
- within the network of calling party's carrier.

Submissions received by the Commission

Telstra opposes the inclusion of all but a limited number of supplementary services (namely, calling line identification presentation, calling line identification restriction, malicious call identification and subaddressing). In its view, 'none are reasonably required by an Access Seeker to establish competitive ISDN services with a Telstra service'. This is because these services are either features of the customer premises equipment or unsupported by the current interconnection protocol.⁵⁶

The Commission explored these matters at the public hearings in both Sydney and Melbourne. From comments at these hearings it appears that what potential access seekers are requesting is not that the access provider supply them with supplementary services, but rather that the access provider 'support' the provision of supplementary services. It is understood that support involves the access provider recognising and transmitting supplementary service signals, as well as providing the 'underlying functionality' to the access seeker which enables the supplementary service to be activated.

In relation to support, at the Melbourne hearing Telstra stated:

... We have no problem with support of those services being incorporated into the ISUP protocols that have been developed or the I-ISUP protocols that have been developed by the [ACIF] ... support of those services is not the issue, but the declaration of those services has quite a different effect in terms of the incentives to provide and develop new services.⁵⁷

Technical view

The current interconnection arrangement (I-ISUP) provides for the support of a limited range of supplementary services and accordingly, it seems that the support of those services is technically feasible. It is understood that a future version of the interconnection arrangement will include additional supplementary services.

Commission view

It is proposed to include reference to the support of supplementary services within the service descriptions. Rather than list all supplementary services, which would inevitably lead to the need to regularly update the description, it is proposed to instead refer to those services which are capable of being supported by the access provider's network using a common signalling protocol.

56 Telstra submission at p. 41.

57 Melbourne hearings at p. 71.

1.1.5 Signalling protocol

For networks to interconnect, each must recognise the others' signals. The signalling protocol defines the gateway between the two networks. It provides a common path between the networks for all call establishment and termination functions as well as the passing of supplementary services information. CCS#7 has been suggested as the appropriate signalling protocol.

Submissions received by the Commission

It has been suggested that the use of CCS#7 may limit the number of access seekers who would be able to use the declared service because CCS#7 is not compatible with the vast majority of non-voice switching equipment used in data transmission networks. The Commission understands that most data communications equipment (frame relay/ATM switches, Internet access servers, etc) does not support CCS#7 signalling.

One solution suggested to the Commission is for the service description to include an alternative signalling method namely, the inherent ISDN common channel signalling standard (ITU I.451) which is supported by most voice and non-voice switches. Telstra advises, however, that utilising I.451 may result in difficulties in respect of the security of data and the provision of billing information.

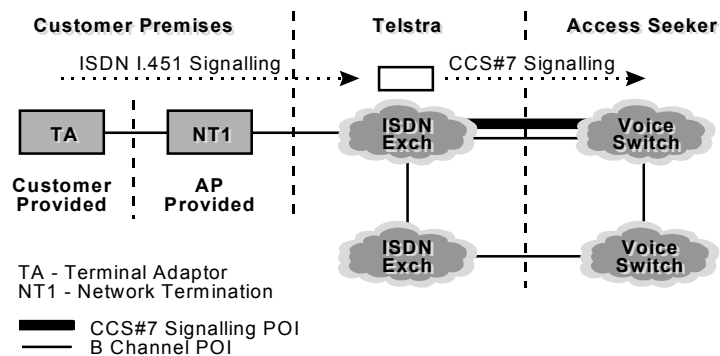
In response to its draft report where CCS#7 was specified as a 'fall back' signalling protocol, the Commission received submissions from service providers and others advocating the inclusion of I.451 or the removal of the provisions regarding signalling protocol. In their view, the ISDN common channel signalling standard (I.451) is feasible and does not present any difficulties in respect of security of data or billing information.

Submissions also suggested that the provisions about the point of interconnect be amended so that interconnection could occur at any technically feasible point and so that interconnection is not limited to those points specified by the Access Provider.

Technical view

CCS#7 is a standardised signalling protocol originally implemented for the interconnection of voice networks (e.g. PSTNs) using carrier-grade voice switches. Figure 1.4 on the following page illustrates how the proposed method of signalling interconnection could be used between CCS#7 compatible voice switches.

Figure 1.4. Proposed CCS#7 signalling POI



It may be possible for a service provider to develop a ‘workaround’ by routing the signals via a voice switch. This, however, could introduce degradation of service levels, functionality and network management and control.

Commission view

Inquiries by the Commission indicated that signalling using the I.451 protocol is possible in some circumstances but may give rise to problems in other circumstances. Rather than seek to specify the circumstances in which particular signalling protocols should be used the Commission considers this to be a matter which, in the first instance, is best progressed at the industry level.

Moreover, the Commission’s preferred approach is to avoid specifying the technical means by which services are supplied and instead leave these matters to negotiation between access providers and access seekers. Accordingly, the Commission has removed the reference to the signalling protocol.

The reference to interconnection at a technically feasible point was in the draft service description provided to the Commission by the TAF. It was deleted because it formed part of a clause containing terms and conditions of access.

1.2 ISDN terminating service

The terminating service enables the customers of a service provider to communicate with end-users directly connected to an access provider’s network.

Similarly to the originating service, the major issues to be addressed in developing a specification for the service are:

- the types of bearer services covered;
- whether the service should cover services provided by means of both the overlay network and the ETSI network;

- the types of supplementary services which ought to be supported; and
- the signalling protocol.

For the terminating service, it is proposed that these issues be addressed in the same manner as for the originating service.

1.3 Service description

The **Integrated Services Digital Network Originating Service** is a service for the carriage of certain communications, being ISDN calls, by way of an integrated services digital network from customer equipment at an end-user's premises in Australia to an exchange, being a service which is capable of supporting:

- a) the carriage of:
 - i) 64 kilobits per second unrestricted; and
 - ii) speech; and
 - iii) 3.1 kilohertz audio,on a bearer channel; and
- b) the carriage of signals for supplementary services, including (without limitation):
 - i) calling line identification; and
 - ii) subaddressing; and
 - iii) malicious call identification; and
 - iv) conference call; and
 - v) call hold and call waiting; and
 - vi) any service provided using a common signalling protocol,by way of a channel capable of being used for signalling.

The **Integrated Services Digital Network Terminating Service** is a service for the carriage of certain communications, being ISDN calls, by way of an integrated services digital network from an exchange to customer equipment at an end-user's premises in Australia, being a service which is capable of supporting:

- a) the carriage of:
 - i) 64 kilobits per second unrestricted; and
 - ii) speech; and
 - iii) 3.1 kilohertz audio,on a bearer channel; and

- b) the carriage of signals for supplementary services, including (without limitation):
 - i) calling line identification; and
 - ii) subaddressing; and
 - iii) malicious call identification; and
 - iv) conference call; and
 - v) call hold and call waiting; and
- vi) any service provided using a common signalling protocol, by way of a channel capable of being used for signalling.

Definitions

Where words or phrases used in this Annexure are defined in the *Trade Practices Act 1974* or the *Telecommunications Act 1997*, they have the meaning as given in the relevant Act.

In this Annexure:

calls made with ***access seeker specific codes*** are calls to numbers, including special service numbers and geographic numbers, within the numbering plan which are allocated to service providers; and

an ***exchange*** is an exchange in Australia at which a point of interconnection is able to be located; and

an ***integrated services digital network*** is a network based on digital technology capable of carrying communications by way of:

- a) two 64 kilobits per second bearer channels plus one channel capable of being used for signalling (which is known as Basic Rate Access); or
- b) up to thirty 64 kilobits per second channels plus one channel capable of being used for signalling (which is known as Primary Rate Access); and

ISDN calls are communications carried by way of an integrated services digital network and include calls made with any of the following:

- a) access seeker specific codes;
- b) pre-selection in accordance with any instrument made by the Australian Communications Authority from time to time under Part 17 of the *Telecommunications Act 1997*;
- c) over-ride dial codes in accordance with any instrument made by the Australian Communications Authority from time to time under Part 17 of the *Telecommunications Act 1997*; and

a ***point of interconnection*** is a physical point of connection between an integrated services digital network operated by a carrier or a carriage service provider and another network operated by a service provider.

Appendix 2 Current transmission capacity service description

Transmission capacity

The following service description is provided for the provision of Domestic Transmission Capacity by any AP to any AS.

The service as described comprises a number of different elements as follows:

- (a) the provision of transmission capacity at 2.048 Mbit/s between defined Transmission Points (TPs), at least one of which must be a Transmission Point of Interconnection (TPOI);
- (b) TPOI locations;
- (c) Fault handling; and
- (d) Inter C/CSP billing.

Restrictions on availability and others factors relating to the provision of access are further described below.

In accordance with the TP Act Part XIC, these elements:

- may not be available from all APs, and
- may have restrictions in their availability.

Domestic Transmission Capacity means a service for the provision of media independent transmission capacity at 2.048 Mbit/s between defined TPs, at least one of which must be a TPOI, except for capacity on major inter-capital routes, ie the routes between Brisbane, Sydney, Canberra, Melbourne, Adelaide and Perth.

7.1 Availability

7.1.1 The service will be available nationally subject to paragraph 7.1.2, except for capacity on the routes between Brisbane, Sydney, Canberra, Melbourne, Adelaide and Perth.

7.1.2 The availability of the services may vary depending on the geographic and technical capability of the AP's network at the time at which a request for the service is made or the service is delivered.

7.1.3 The AP will make available to the AS documents describing the availability of this service on its network. See 7.3 and 7.4

7.2 Channel capacity

The service will be delivered at the standard bit rate of 2.048 Mbit/s.

7.3 Service

7.3.1 The service is provided on a permanent basis between two TPs, at least one of which must be a TPOI.

7.4 Handover arrangements

The AP and the AS are each responsible for the provision, installation, testing, making operational and monitoring of all the network on their respective sides of the POI.

7.4.1 TPs

Transmission Point or **TP** means an agreed location which:

- (a) is a TPOI; or
- (b) is located at any point in the AS network other than a customer location; or
- (c) is located at a customer location.

7.4.2.1 TPOI

Transmission Point of Interconnection or **TPOI** means an agreed location which:

- (a) is a physical point of demarcation between the networks nominated by the AS and the AP; and
- (b) is co-located with a PSTN gateway exchange of the AS or of the AP.

7.4.2.2 TPOI locations

The AP will provide a table (Table TXCAP1) listing of TPOIs where this service may be provided. This listing will be updated at least annually. The AS may request a point of interconnect with the AP's network at a location other than one specified by the AP. The AP must, to the extent technically and operationally feasible, permit the location of a point of interconnect at that location.

7.4.2.2 TPOI locations for this service defined in terms of the AS's network.

7.4.3 Blank

7.4.4 Nature of the interface

At TPOIs the connection interface will be at 2.048 Mbit/sec. The interface will operate at 2.048 Mbit/sec in accordance with the ITU Recommendations G.703, G.704 and G.732 (Blue Book).

7.5 Forecasting, ordering and provisioning arrangements

7.5.1 Forecasting requirements

7.5.1.1 Forecast of transmission capacity requirements

For each TPOI the AS should provide forecasts, at least half yearly, of transmission capacity requirements for 6, 12, 18, 24, 30 and 36 months from the time of the forecast. Forecasts should be provided on dates to be agreed between the AP and the AS and forecast the transmission capacity requirements on 31 December and 30 June. Forecasts will be discussed by the AP and the AS with a view to agreement within 30 Business Days.

7.5.1.2 The AP will accept orders for transmission capacity up to the level of the agreed forecasts for each TPOI.

7.6 Ordering requirements

7.6.1 Compliance testing

If requested by the AS, the AP will take reasonable steps to facilitate tests by the AS of the interfaces for this service. These tests will be at the expense of the AS.

7.7 Operational and fault handling arrangements

The AP will provide a contact point for the operation and maintenance of the service. Faults may be reported to this centre which will manage the clearance of these faults.

7.8 Inter C/CSP billing frequency

The AP will invoice the AS on a monthly basis for this service.

7.9 Blank

7.10 Blank

7.11 Customer billing

Customer billing should be in accordance with an approved telecommunications access code.

Appendix 3 Amended transmission capacity service description

The **Domestic Transmission Capacity Service** is a service for the carriage of certain communications from one transmission point to another transmission point via network interfaces at a designated rate on a permanent basis by means of guided and/or unguided electromagnetic energy, except communications between:

- a) one customer transmission point and another customer transmission point; and
- b) a transmission point in Sydney and a transmission point in Melbourne; and
- c) a transmission point in Melbourne to a transmission point in Canberra; and
- d) a transmission point in Sydney and a transmission point in Canberra; and
- e) a transmission point in a State or Territory capital city and a transmission point in another State or Territory capital city, where the communications would entail communications of the type described in one or more of paragraphs (b), (c) and (d) if the capacity was routed via a continuous cable running from Brisbane to Perth through each of the capital cities; and
- f) one access seeker network location and another access seeker network location.

For the purposes of e), a State or Territory capital city will be taken to include any associated secondary centre.

Definitions

Where words or phrases used in this Annexure are defined in the *Trade Practices Act 1974* or the *Telecommunications Act 1997*, they have the meaning as given in the relevant Act.

In this appendix:

an ***access seeker network location*** is a point in a network operated by a service provider that is not a point of interconnection or a customer transmission point; and

an ***associated secondary centre*** means, in the case of Brisbane, the Gold Coast, in the case of Sydney, Newcastle and Wollongong, and in the case of Melbourne, Geelong; and

a ***customer transmission point*** is a point located at customer equipment at a service provider's customer's premises in Australia (for the avoidance of doubt, a customer in this context may be another service provider); and

a ***designated rate*** is a transmission rate of 2.048 megabits per second, 4.096 megabits per second, 6.144 megabits per second, 8.192 megabits per second, 34/45 megabits per second, 140/155 megabits per second (or higher orders agreed between a carrier or carriage service provider and another service provider) and

a *point of interconnection* is a physical point of connection in Australia agreed between a network operated by a carrier or a carriage service provider and another network operated by a service provider; and

a *transmission point* is any of the following agreed between a carrier or carriage service provider and another service provider:

- a) a point of interconnection;
- b) a customer transmission point;
- c) an access seeker network location.

Appendix 4 Technologies to increase useable bandwidth

Erbium doping is a means of increasing the bandwidth capacity of a single fibre pair by up to ten-fold. It involves the insertion of a short length of ‘erbium doped’ (erbium atoms embedded in the silicon) optical fibre cable into the existing optical fibre cable. This provides a form of optical signal amplification and results in a maximum bandwidth of about 20 Mbps (up from 2.5 Gbps) and the need for significantly less repeaters⁵⁸ along the length of the optical fibre run. Telstra’s optical fibre network currently has repeaters every 100 kilometres or so, however, using erbium doping this distance could increase to several hundred kilometres.

In converting from 2.5 Gbps to 10 Gbps, Telstra submitted that a number of other costs would be involved. These include the installation of dispersion compensators at regeneration points along the cable and the distance between regeneration points would need to be reduced. As a result, additional regeneration housing locations would need to be acquired (which require power and air conditioning). As a consequence, Telstra argue that there are a number of practical considerations which need to be addressed before an upgrading decision is made, ‘not the least of which is the need to continue carrying the existing 2.5 Gbps traffic while upgrading’.⁵⁹

Wavelength Division Multiplexing (WDM) is a process of multiplexing different wavelengths (or colours) of light onto the same fibre pairs. This allows 8, 16 or even 40 and 80 discrete channels of light *each* capable of carrying 2.5 Gbps. Therefore, a single fibre pair is capable of carrying from 20–200 Gbps of bandwidth as opposed to the current 2.5 Gbps. Thus a 48 pair fibre cable could potentially carry 4.8 Tbps.⁶⁰ This is even without combining WDM technology with erbium doping.

Both erbium doping and WDM are currently in limited use around the world. It is known that Telstra is currently trialing 8 and 16 channel WDM, however, it has been reported that they are also trialing 40 and 80 channel systems.

58 Repeater are placed at regular intervals along the optical fibre cable and regenerate the weakened light signal. This allows optical signals to travel thousands of kilometres as opposed to hundreds.

59 Telstra Submission, 5 June 1998, p. 17.

60 Terabits per second — 1 000 000 000 000 bits per second

Appendix 5 Technical efficiency issues

The following diagrams illustrate the points raised in the body of the report relating to technically efficient use of infrastructure.

Figure 5.1. Additional Telstra multiplexing equipment (discrete 2 Mbps channels)

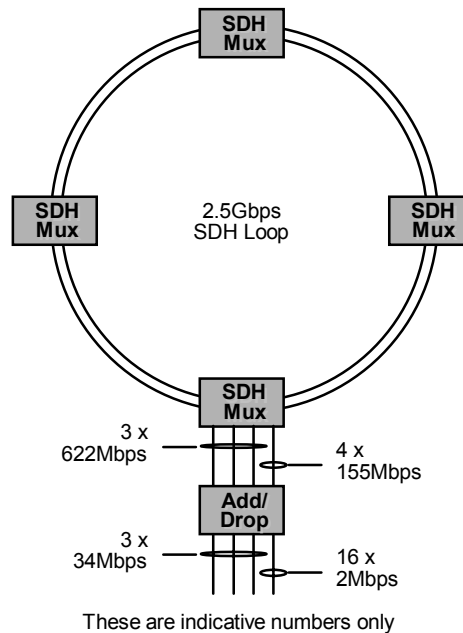
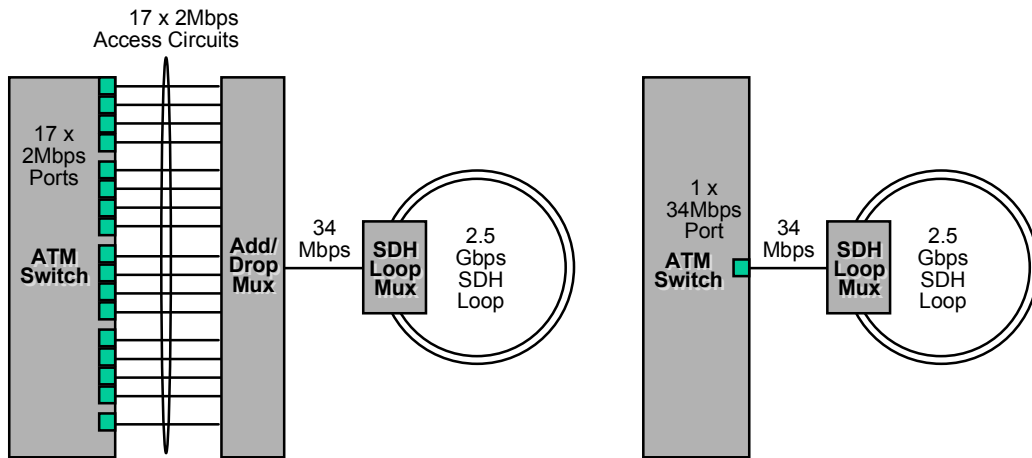


Figure 5.1 illustrates how more cost-effective it is for a transmission access provider to provide higher bandwidths (for example, 34 Mbps) than it is for smaller bandwidths (for example, 2 Mbps). As can be seen, additional multiplexers may be required to provide 17 discrete 2 Mbps channels, the equivalent of 34 Mbps. These 2 Mbps feeds also have to be delivered to the access seeker premises which would require 17 discrete 2 Mbps access services. Obviously, the situation worsens if 155 Mbps or higher is required. Simply finding the 154 (2 pairs required for a 2 Mbps access circuit) copper cable pairs into the customer's premises may prove impossible.

Figure 5.2 illustrates how much more inefficient and less cost-effective the provisioning of discrete 2 Mbps services is to an access seeker in terms of the number of access circuits and switch ports required:

Figure 5.2. Inefficiencies of providing discrete 2 Mbps channels



In this scenario an access seeker must provide multiple individual ports on its switch in order to achieve the necessary aggregate bandwidth of 34 Mbps. This could be achieved with a single 34 Mbps port if such a feed was available from an access provider. The capital and ongoing costs of these additional ports would significantly increase the cost of the service to an access seeker. Additionally, 17 discrete 2 Mbps access services into the access seeker premises would be required which would also create a highly inefficient use of network infrastructure.

Appendix 6 Amended DDAS service description

The **Digital Data Service** is a service for the carriage of certain communications, being data in digital form, between customer equipment at an end-user's premises in Australia and a point of interconnection, where:

- a) the customer equipment is directly connected to a carrier's or carriage service provider's network; and
- b) the carriage is capable of occurring at:
 - i) an X.50 rate using X.50 interfaces; or
 - ii) an nx64 rate using nx64 interfaces; and
- c) the carriage interworks with higher management facilities and network controls.

Definitions

Where words or phrases used in this Annexure are defined in the *Trade Practices Act 1974* or the *Telecommunications Act 1997*, they have the meaning as given in the relevant Act.

In this appendix:

nx64 interfaces are X.21, V.35 and G.703/G.704 interfaces, with up to 8 service interfaces per customer access; and

an **nx64 rate** is a rate of transmission equal to (n times 64 kilobits per second), where 'n' is a whole number between 1 and 31 (both inclusive); and

a **point of interconnection** is a physical point of connection in Australia between the network to which the relevant customer equipment is directly connected and a network operated by another service provider; and

X.50 interfaces are X.21, X.21bis and V.35(48 kilobits per second) interfaces, with one service interface per customer access; and

an **X.50 rate** is a rate of transmission equal to 1200 bits per second, 2400 bits per second, 4800 bits per second, 9600 bits per second, 19.2 kilobits per second or 48 kilobits per second.

Appendix 7 Alternative supply

This appendix provides a brief summary of the technical characteristics of data, ISDN and transmission services and compares the features and functionality of each.

There are a number of technologies, some of which have been released as end user products, available for the carriage of digital data. Many of these technologies are suitable for the carriage of data (or indeed other services such as voice, video or multimedia), however, none to date are able to provide equal functionality to that available with ISDN or DDS. These differences may include the inability to utilise circuit switching, voice compression or supplementary services offered by Telstra's Domestic and ETSI ISDN networks.

The following describes the substitutability of the alternative technologies for the above services.

a) **Digital data service (DDS)**

DDS provides high quality digital data circuits with a high degree of end-to-end network management and redundancy. As such, it is tarified at a premium which makes it unsuitable for many applications. It does not provide circuit switching capabilities and therefore is limited to providing point-to-point circuits between customer premises. None of the supplementary services offered by ISDN are possible with DDS.

DDS services offer speeds in the range of 1200 bps – 48 Kbps (DDS low speed) and 64 Kbps – 1984 Kbps (DDS Fastway). Services are delivered to customer premises via twisted pair cable and terminated on Network Termination Units (NTU) or Unimuxes.

DDS is used extensively by end-users for building high quality private data networks. Its inherent reliability makes it ideal for the delivery of non-error corrected⁶¹ networking protocols such as Frame Relay. Service Providers make use of DDS for the high speed interconnection of their network nodes or, in some cases, the delivery into customer premises of high quality national or international data services.

b) **PSTN originating access**

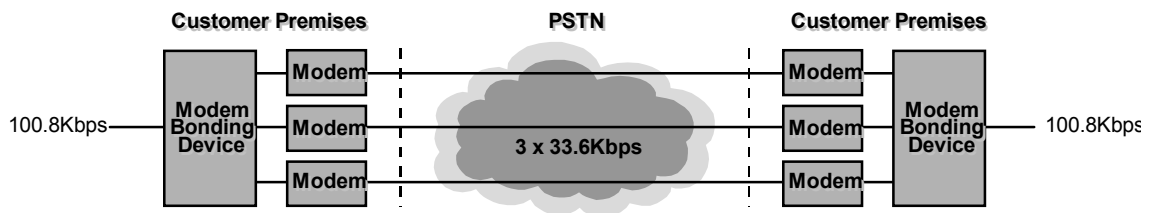
The PSTN provides analogue customer access into the mostly digital PSTN backbone infrastructure. Being analogue and delivered via twisted pair cable, it is very susceptible to noise and interference and is considerably less reliable than an end-to-end digital service such as DDAS or ISDN.

61 The Frame Relay and ATM protocols remove the error correction layer leaving this to the higher layers (for example, applications) to manage. It is ideally suited to low error access circuits such as DDS.

PSTN dialup services are currently capable of supporting analogue modems which can operate at speeds up to 33.6 Kbps or, if the terminating service is delivered via ISDN, 56 Kbps. An end-to-end PSTN connection, therefore, is capable of 33.6 Kbps, approximately half the speed of a single ISDN channel or quarter of the total bandwidth of an ISDN Basic Rate Access.

New technology enables the use of ‘bonded’ modems. These bonding devices allow multiple modems (of any supported speed) to be aggregated together (in much the same way as CPE-provided Multi-Rate ISDN) and are thus able to provide higher end-to-end speeds. At this stage there is limited utilisation of such devices although their popularity may grow in certain areas such as Internet access.

Figure 7.1. Bonded PSTN modems



PSTN services do not offer the richness of features as that provided by ISDN although Telstra’s PSTN *EasyCall* features provide facilities such as Call Wait, Call Hold and Conferencing. PSTN calls are not inherently capable of providing voice and data integration although this function can be provided by SVD (Simultaneous Voice and Data⁶²) customer equipment.

PSTN services are utilised extensively by ISPs for dial-in access from residential and small business customers. PSTN services are not suitable for mission-critical applications requiring a high degree of reliability (low error rates) and availability. Owing to these limitations, PSTN is not suitable for customer access into SP networks such as Frame Relay.

PSTN is not a sufficiently reliable alternative to ISDN or DDS for business applications requiring a high degree of reliability and availability. Likewise, PSTN is not a suitable substitute for long distance transmission capacity.

c) Optical fibre networks

Optical fibre networks provide the basic physical transport mechanism for end-to-end voice and data services. As such, they should not be regarded as substitutes for ISDN or DDS. They are used as the underlying method of delivering the majority of today’s transmission capacity.

62 Simultaneous Voice and Data allows a telephony call to utilise part of the bandwidth of a PSTN call for voice at the same time as data is transferred on the remaining bandwidth. Voice quality is lower than standard PSTN as it requires compression.

Services running over optical fibre networks such as Optus' Datalink are premium point-to-point digital data services functionally equivalent to Telstra's DDS (refer above).

Optus (or other providers such as United Energy) optical fibre networks do not (and are unlikely to) have the extensive geographic coverage provided by Telstra's optic fibre network.

d) Asynchronous transfer mode (ATM)

ATM networks provide high speed digital data transmission services allowing voice, data, video and multimedia applications to be integrated onto a common access circuit. Proponents of this technology argue that ATM networks will ultimately (5–10 year horizon) provide all networking services for medium to large organisations.

ATM networks will provide very high speed (typically 34 Mbps and above although lower speeds are under development) customer access circuits and will be able to carry the entire wide area networking requirements of an organisation. Individual lower speed (for example, 64 Kbps) channels will be able to be switched in a similar fashion to ISDN (once ATM switched virtual circuits are standardised). Owing to the high speed requirements of ATM, downward scaleability of individual low speed circuits makes ATM unsuitable as an ISDN or DDS substitute for small business or residential customers.

ATM will form the underlying backbone transmission platform for higher level services such as telephony, Frame Relay and Internet services.

e) Hybrid fibre coax (HFC)

As with optical fibre networks, this technology refers solely to the physical network delivering higher level services. These services could, with additional infrastructure, provide an overlay ISDN network.

HFC technology is used by the Optus (formerly OptusVision) and Telstra Multimedia cable TV networks. These networks provide high speed access via optical fibre and coaxial cable into predominantly residential premises for the delivery of Pay TV and other services. Both Optus and Telstra Multimedia are providing (or plan to) high speed data access services via these networks. Telstra currently provide access to their Internet service (Big Pond) via their HFC network. Optus are providing a very geographically limited telephony service via their HFC network to a relatively small number of customers.

It is possible for the HFC networks to be utilised for ISDN or DDS delivery, however, neither carrier has indicated that this is proposed. Significant investment would be required to roll-out the necessary ISDN switching infrastructure. If ISDN via HFC is provided, this would simply become another platform for the provisioning of ISDN. This means of delivery would only apply to residential premises.

f) Frame relay

Frame Relay networks are very similar to ATM networks with the main difference in functionality being the speed of access circuits. Frame Relay networks are capable of carrying integrated voice and data, however unlike ATM networks, are generally unsuited for video applications owing to the inherent variable delays⁶³ introduced by the Frame Relay protocols.

Standards for switched low speed circuit capability over Frame Relay networks are being finalised so this functionality provided by ISDN will be able to be replicated. Switched Frame Relay circuits cannot provide additional functionality such as Call Wait and Supplementary Services. These could potentially be provided at a higher level by a carrier or SP switch.

Frame Relay customer access circuits can be from 64 Kbps to a maximum of 2 Mbps. These access circuits are ideally DDS, however, it has been claimed during the course of the inquiry that SPs are unable to cost-effectively utilise DDS access circuits and must resort to ISDN for this purpose. The use of a network requiring ISDN access does not then appear to be a very efficient means of providing a substitute for ISDN services. Frame Relay provides a close substitute for replicating DDS functionality between customer locations, however, is still dependent on gaining access to the customer premises via some form of DDAS services (that is, DDS or ISDN).

g) Wireless data networks

Existing networks such as the three GSM mobile networks are able to provide switched data circuits and are currently being utilised on a small scale, predominantly by roaming staff.

The current maximum speed of 9600 bps makes the usefulness of this data service very limited. It can be utilised for low bandwidth applications such as electronic mail or central host access, however, its use for multimedia or Internet access is extremely limited by the low speed.

Packet radio systems are able to offer low speed data access which may be suited to certain applications, however, their use is very limited to date.

Satellite based systems such as VSAT⁶⁴ are able to offer switched or point-to-point data access at speeds typically up to 128 Kbps, however, the economics of this solution have to date precluded their general use except in certain geographic locations or for specific applications.

63 Variable delays — packets of information sent are received at different times owing to differing paths through the network. These delays vary according to network load and routing and can cause jerky or disjointed speech or video.

64 Very Small Aperture Terminal — a compact satellite earth station providing voice and data access.

Microwave systems provide only point-to-point services. They typically provide analogue or digital connections at speeds from 2 Mbps up to 34 Mbps, 155 Mbps and higher. This makes them less than ideal as suitable cost-effective substitutes for DDS or switched ISDN access.

None of these wireless solutions offer the range of features or bandwidth as that available with ISDN or DDS.

Satellite or microwave can provide acceptable alternatives to optical fibre for transmission capacity with some limitations. In the case of satellite, increased signal delays cause problems with speech and video and certain time-sensitive data applications. Microwave systems are unable to provide the extremely high bandwidth as that available of optical fibre.

h) Data transfer over power lines

This is a physical networking solution and should not be confused with higher level services such as ISDN or DDS.

The existing and proposed communications networks utilising the electricity grid infrastructure are able to provide long distance transmission capacity (for example inter-capital, to the electricity utilities in order that they can resell this capacity to others). It is not proposed that, in the short term, the electricity networks be utilised to provide access into customer premises. This would require significant additional switching infrastructure and customer premises equipment to provide an ISDN or DDS overlay network.

i) xDSL technologies

Digital Subscriber Loop technologies have been under development for a number of years and have matured to the point of deployment in many parts of the world.

The main technologies involved are HDSL (High data rate Digital Subscriber Line) and ADSL (Asymmetric Digital Subscriber Line) which are currently in use today and VDSL (Very high data rate Digital Subscriber Line) evolving as a future potentially viable and higher speed solution.

HDSL allows the transmission of data up to 2 Mbps in both directions (symmetrical) up to a distance of about 12 000 feet (3.8 km). It requires three unloaded copper pairs with DC-continuity for each 2 Mbps circuit.

ADSL allows considerably higher speeds although with a corresponding reduction in maximum transmission distances. Typically, ADSL can provide up to 9 Mbps over a distance of 9000 feet (2.8 km) or up to 2 Mbps over a distance of 16 000 feet (5.1 km). These speeds are only achievable in the downstream direction, i.e. towards the customer, and the upstream bandwidth is generally limited to a maximum of about 640 Kbps. This difference in downstream and upstream speeds is referred to as asymmetrical.

VDSL will provide downstream transmission speeds in the range of 12.96 Mbps to 51.84 Mbps over distances of 4500 feet (1.4 km) to 1000 feet (300 m) respectively. Upstream rates will be in the range of 1.6 Mbps to 2.3 Mbps. The short maximum distances possible will allow VDSL deployment in small community areas such as campuses or as a local distribution from a concentrated distribution point.

All of these technologies require access to basic copper cable pairs with no loading circuitry or other equipment (such as multiplexers) which removes the DC continuity. Until such time as the existing copper cable infrastructure deteriorates to such a degree that it cannot reliably carry such transmission speeds there are no other limiting factors in its use. The one exception to this is the actual availability of copper into premises; however, this should improve over time as Telstra convert from copper to fibre optic delivery. However, the xDSL technologies have higher error rates and lower service reliability standards compared to the DDAS.

Appendix 8 Negotiated terms and conditions of access

The Commission considers that access seekers and access providers will need to negotiate various terms and conditions associated with the declared services. The Commission believes the starting point for these negotiations should be the model terms and conditions developed by the TAF and reflected in the access code.

With regard to transmission capacity the following broad categories of terms and conditions would need to be negotiated by access seekers and access providers. These include:

- availability of the service, including any agreed variations to such availability;
- channel capacity, including bit rate requirements;
- handover arrangements, including arrangements for the provision, installation, testing and monitoring of the network;
- forecasting requirements, including the forecast periods and lodgment dates;
- ordering and provisioning requirements, including the agreed construction costs/responsibilities and testing expenses;
- operational and fault handling requirements, including any agreed performance measures and reporting requirements; and
- inter C/CSP billing frequency, including the invoicing period and customers' billing arrangements.

Appendix 9 Submissions

AAPT Ltd**
ABC
American Express International Inc.
Australian Telecommunications Users Group Limited
BT Australasia
CITEC*
Digi-Tech Software Pty Ltd
The Federation of Australian Radio Broadcasters Limited
Global One Communications Pty Ltd
GPU PowerNet Pty Ltd
Jtec Pty Ltd
Optus Communications Pty Ltd
SITA
Telstra Corporation Limited
The Federation of Australian Radio Broadcasters Limited
TransGrid
Vodafone Pty Ltd
Worldcom Asia Pacific Limited
Mr N. Wyatt

* confidential

** partially confidential