GRAVELROAD

thinking beyond consulting

DSLAM Voice Service Delivery Costs

Ver. Final 1.0

CONTENTS

List of Terms and Abbreviations

Access Network - The common term for the telecommunication network between the customer and the provider's network equipment. For DSL the access network is Telstra's existing metallic cables and for the NBN the access network will be comprised of fibre cable and equipment between the customer and the nominated NBN POIs.

ACCC - Australian Competition & Consumer Commission

AP - Access Provider

AS - Access Seeker

ATA - Analogue Telephone Adaptor

CAM - Customer Access Module, as defined in the current ULLS declared service description.

CAN - Customer Access Network

Cable Connection Frame - Assembly designed to allow the interconnection of two termination points via the installation of a jumper, typically located in an exchange building, roadside cabinet or large building.

Communication Wire - a pair of continuous metallic wires between the network equipment and customer location. Predominantly communication wire is copper.

DSL - Digital Subscriber Line

DSLAM - Digital Subscriber Local Access Module

ESA - Exchange Service Area

FTTH - Fibre to the Home.

FTTN - Fibre to the Node. For the purpose of this report this is defined as the network architecture used to deliver very high speed data service using xDSL technology. Data rates of up to 24 Mb/s are assumed. New nodes need to be created closer to the end delivery point, thereby shortening the length of metallic cable to enable the higher data speeds to be delivered.

IP - Internet Protocol

Joint - Junction point between two communication wires.

Jumper - a pair of wires used to provide connection between a cable termination and either another cable termination or an equipment termination.

LAS - Local Access Switch, narrowband interface to PSTN, includes Remote Switching Stages and Multiplexers.

LCS - Local Carriage Service (A service for the carriage of telephone calls from customer equipment at an end-user in the same standard zone, excluding ESAs located within a CBD)

LSS - Line Sharing Service

MSAN - Multi Service Access Node

NBN - National Broadband Network

NBNCo - The government corporation established to construct and operate the NBN.

POI - Point of Interconnection

POTS - Plain Old Telephone Service

PSTN - Public Switched Telephone Network, accessible by the public.

PSTN OA - PSTN Originating Access service (A service for the carriage of telephone calls from customer equipment at an end-user's premises to a POI located at a local switch and on the outgoing trunk side of the switch.)

SIP - Session Initiated Protocol

ULLS - Unconditioned Local Loop Service (The use of unconditioned communications wire between the boundary of a telecommunications network that is a potential POI located at or associated with a customer access module)

WLR - Wholesale Line Rental (Line rental telephone service which allows an end-user to connect to a carrier or carriage service provider's public switched telephone network)

INTRODUCTION

1.1. This report sets out my opinion in regard to the questions contained in a Mallesons Stephen Jaques brief dated 5 October 2011. The brief is included in Attachment 3.

1.2. The questions I have been asked to address are as follows:

a) *What are the ongoing costs of operating a DSLAM and a MSAN (excluding installation costs)?*

b) *What costs are likely to be incurred in expanding, and the infrastructure required in order to expand, the capacity of a DSLAM or a MSAN (for example, by adding a port or a voice card) in order for the DSLAM or MSAN to be used to provide PSTN switched voice services or carrier grade VoIP?*

c) *Are there any additional costs, other than those set out in your response to question 2 above, which are likely to be incurred in providing PSTN switched voice services or carrier grade VoIP?*

d) *Assuming a retail voice service (i.e. local calls, long distance calls, fixed to mobile calls etc) is provided by a service provider via DSLAM and ULLS to retail end customers, would the additional provision of a wholesale resale voice service by that service provider require the purchase and installation of additional equipment and the incurring of additional operating costs?*

e) *Could a billing system be implemented to service retail customers also be used to service wholesale customers without significant modification? If significant modification is required, what would be the additional cost?*

1.3. This report is limited to my opinions in relation to the delivery and use of telecommunication network equipment and systems.

1.4. This report assumes that an Access Seeker will be using ULLS, and if providing voice services, it will do so in addition to the delivery of internet services via DSL within the ESA.

1.5. The estimated costs provided within this report are offered as my view on the direct costs and the costs do not account for organisational overheads, funding costs, etc. All costs stated within this report exclude GST.

1.6. Included with the Mallesons Stephen Jaques brief were a number of documents supplied as listed within the brief document. In addition an extract of current Telstra TEBA pricing was supplied via email on the 19th September 2011.

AUTHORSHIP

2.1. I, Craig Lordan have compiled this document in response to the received questions. I am an Electrical Engineer having graduated from Central Queensland University in 1988. I have 22 years experience within the Australian telecommunications industry and my CV is at Attachment 2. Prior to my current role as a Senior Consultant with Gravelroad Consulting, I was a consultant and was engaged in a number of Access Network roles within Telstra from 1989 through to 2001.

2.2. During that period with Telstra, I specialised in urban and rural Customer Access Network infrastructure including the planning, design and construction of copper, fibre and radio networks. My experience extended from hands on responsibility for individual construction projects through to long term strategic planning and budgeting.

2.3. I also completed international roles while with Telstra. These included the planning and development of customer access networks within Vietnam. Later roles with Telstra included national responsibility for the development and application of Access Network design and construction practices.

2.4. During the past ten years as a consultant, I have provided advice and support to many organisations in relation to the development and implementation of telecommunication networks. Organisations which have implemented my advice include telecommunication carriers, electricity utilities and government organisations. I have contributed to the Queensland electricity industries' successful implementation of commercial telecommunication service supply. Other major projects in which I have played a key role include the completion of technical feasibility reports for the implementation of very high speed access networks on behalf of State and Local Governments, business case preparation for large network deployments and the project management of the construction of NBN's first release site in Townsville.

Craig Lordan

Senior Consultant

Gravelroad Consulting

BACKGROUND

VoIP

3.1. Before addressing the specific questions, I provide the following comments as background information.

3.2. Voice over Internet Protocol (VoIP) is a technical description of a transport protocol used to provide voice services and can be provided in a number of different ways.

3.3. Unlike legacy telephony networks which were based on a circuit switched solution, VoIP is provided using packet data and Internet Protocol (IP).

3.4. All VoIP services require the voice signal to be converted from an analogue signal to a digital bit stream[1]. The conversion can be completed by:

- a computer;
- analogue telephone adaptor (ATA), either standalone, integrated into a modem or in DSLAM; or,
- a purpose built IP Handset.

3.5. An end user may have a voice service provided by a DSLAM operator using ULLS in a number of different ways. The alternatives are listed below:

a) The voice service remains analogue from the end user premise using the low frequency component of the communication wire and terminated on a voice port in the DSLAM. Within the DSLAM the voice service is converted to digital and via TDM backhaul connected to a circuit voice switch. For the customer no change is required to telephony equipment that was used for a standard PSTN service. Figure 1 shows the major components used by an Access Seeker providing both circuit switch voice and internet via ULLS.

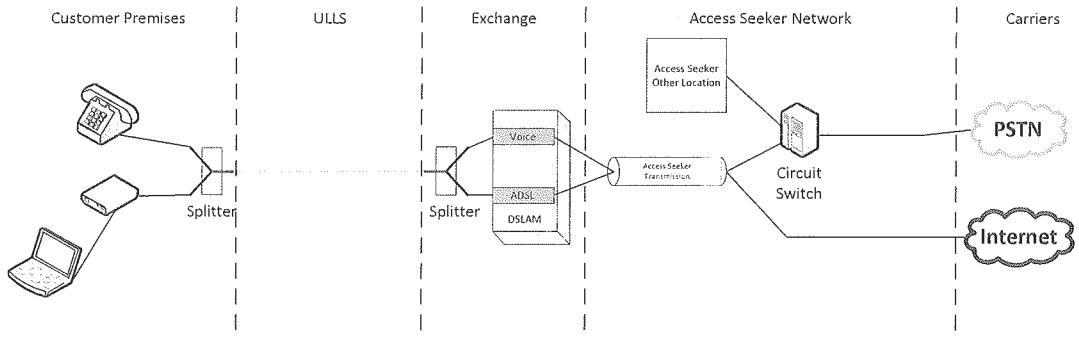


Figure 1 - Circuit switched voice provided as analogue by Access Seeker - *Option (a)*

[1] Circuit switched voice solutions normally convert the voice signal from analogue to digital at the exchange termination.

b) A second option is where the voice service remains analogue on the low frequency portion of the communication wire and also terminates on a voice port within a DSLAM. In this option the voice signal is converted to VoIP within the DSLAM and backhauled to an IP soft switch. For the customer no change is required to telephony equipment that was used for a standard PSTN service. Figure 2 shows the major components used by an Access Seeker providing both voice and internet via ULLS.

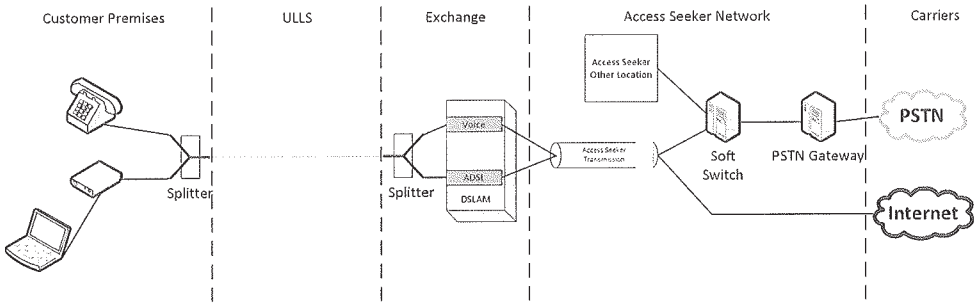


Figure 2 - VoIP provided as analogue over ULLS by Access Seeker - *Option (b)*

c) The voice service is provided using the DSL data link between the DSLAM and customer premises. The carrier provides a voice service converted by an ATA at the customer premises, but the voice and internet traffic are separated on the DSL data link. The provider's network communicates with the ATA to ensure that the VoIP traffic is not combined with the internet traffic and any congestion on the internet component is isolated from the voice service. Figure 3 shows the major components used by an Access Seeker providing both VoIP and internet via DSL.

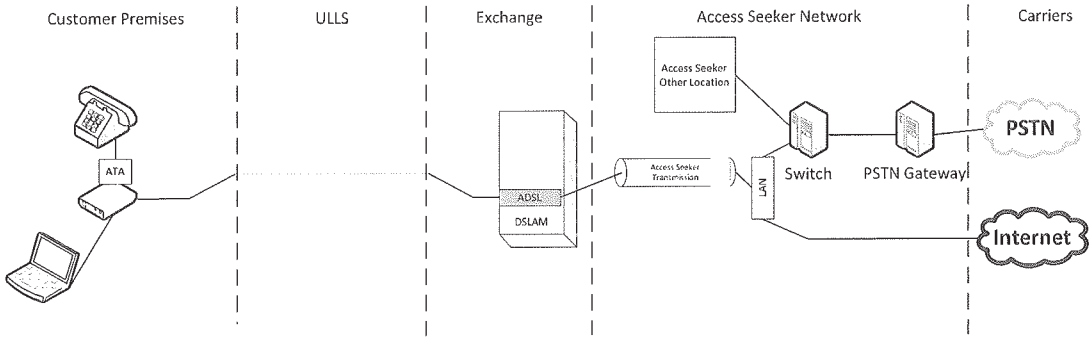


Figure 3 - Access Seeker VoIP on DSL - *Option (c)*

d) A voice service can also be provided by a standalone ATA using the internet service capacity. The voice component is transported over the top of the internet service and is subject to degradation if congestion occurs on the data link. Multiple providers offer VoIP services over the top of internet including well known providers such as Skype. Figure 4 shows the provision of VoIP over the internet.

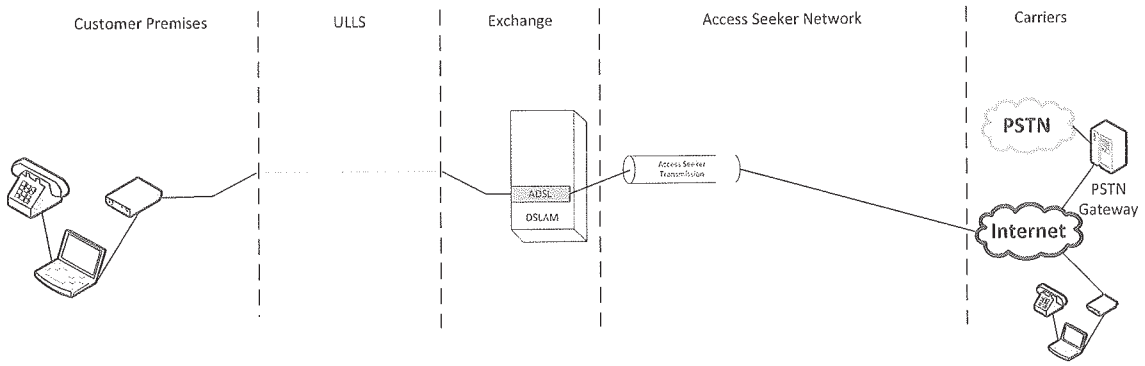


Figure 4 - Best Effort VoIP - *Option (d)*

3.6. Each of the four options exhibit certain characteristics as shown below:

i. Option (a) provides effectively the same technical solution as connection to a local exchange.

ii. Options (b) and (c) provide a high grade voice service using VoIP with the only difference being the location at which the voice service is converted to VoIP. In my opinion both options can be regarded as carrier grade VoIP.

iii. Option (d) provides VoIP within the internet service. The VoIP traffic is not prioritised within the network and is delivered on a best effort basis.

ULLS Access Seeker Voice

3.7. In my opinion, carrier grade voice service means that when you dial a number, you get through to the number you dialled. It means that when you finish dialling, the phone at the other end starts ringing within two to three seconds and when the conversation takes place, the speech quality is very high, without any perceptible echo, noticeable delay, or annoying noise.

3.8. An Access Seeker (AS) who wishes to add carrier grade voice services to the existing supply of internet using ULLS has two technical alternatives, either to use the lower frequency capacity of the communication wire {as described in paragraphs 3.5.a) and 3.5.b)} or to combine the voice into the DSL broadband capacity {as described in 3.5.c)}.

3.9. In my opinion, options (a), (b) and (c) all deliver carrier grade voice service, providing the equivalent of 3.1 kHz of bandwidth, a phone number from the National Numbering Plan and the ability to make and receive local, national, to mobiles and international calls. However, Option (d) does not provide carrier grade voice as it does not allow the carrier to guarantee any performance attributes.

Centralisation

3.10. Over time the location of the switching infrastructure or network intelligence to interconnect customers making a voice call has changed. When metallic pair telecommunication networks were established, connectivity between exchanges was

expensive and the capacity limited, which encouraged the development of concentration points (exchanges) relatively close to customers. As technology such as optic fibre has developed, the relative cost of connection between sites compared to traffic concentration at local switching locations has shifted to remove the requirement to have many switching locations, and so allowing for centralised infrastructure solutions to be provided.

OPINIONS

4. What are the ongoing costs of operating a DSLAM and a MSAN (excluding installation costs)?

4.1. The cost of operating a DSLAM or MSAN, subsequent to the initial investment to purchase and install the equipment, is comprised of equipment maintenance and support, lease costs for the use of Telstra exchange space for hosting of equipment, and network management.

4.2. Naming conventions observed for integrated equipment solutions vary between manufacturers, but common terms include DSLAM, Multi Service Access Node (MSAN), Intelligent Services Access Manager (ISAM) and Next Generation Digital Loop Carrier (NGDLC). Many equipment solutions offer significantly greater capability than DSL and voice, such as optic fibre service termination.

4.3. Backhaul costs are not included within the operating costs within this section. Due to the variability of cost of backhaul depending on location, provider delivery model in terms of contention, and whether the provider builds or leases backhaul, it is beyond the scope of this report. In my opinion the contribution to the total backhaul bandwidth requirement of voice services is relatively small in comparison to the provision of internet services.

4.4. The service provisioning costs to move, add or change customers is not included in the cost to operate a DSLAM or MSAN equipment as it is my experience that this would normally be costed within the sales process.

4.5. This section presents my opinion of the annual cost to operate DSLAM equipment on a per port basis, assuming a fully equipped frame of equipment is installed. The costing excludes the service delivery and customer management costs which are associated with the services provided.

4.6. If a modular DSLAM is to provide both DSL and analogue voice service termination functionality, some DSL port cards must be replaced with voice port cards. If both analogue voice termination and DSL services {as described in 3.5.a) and 3.5.b)} are provided, two ports of the DSLAM will used.

4.7. The purchase cost of DSLAM equipment is dependent on numerous factors including the number of ports, location of the installation, commercial terms, type of existing backhaul transmission and network equipment and the network operator's architecture.

4.8. The cost of telecommunication equipment purchased by network owners is highly confidential and not publicly available. Sourcing is normally completed through tender and negotiation processes with final prices protected by confidentiality provisions.

4.9. In a previous report "Technical Feasibility of using ADSL Networks to Supply Voice Services that Replicate PSTN Services 30th October 2007" I set out my view on an acceptable benchmark per port cost for the supply of DSLAM voice capability and xDSL. In a subsequent report "Update of expert opinion on the cost of DSL Infrastructure-30 May 2011" I reviewed the benchmark costing and updated my view on the estimated cost to provide and install DSLAM equipment as $39 to $45 per port for voice and xDSL

capability. This cost was comprised of $30 per port for material supply plus a cost between $9 and $15 for the installation of the equipment excluding TEBA charges.

4.10. I have not observed a significant change in the market price to warrant an adjustment of the previously calculated price. Although, as all DSLAM equipment is imported, it may be reasonable to assume there has been an impact due to the recent strength of the Australian Dollar in the short term, the cost is considered to be the same.

4.11. The actual cost for the supply of DSLAM equipment will be dependent on the supplier and features which are included. For example DSL devices are often extended to provide additional service termination options such as fibre by the addition of different cards. However, although the actual cost may vary, for the purpose of this analysis I believe a cost of $40 per port is representative for the supply and installation of DSL and voice termination equipment.

4.12. In my experience, DSLAMs are not prone to general deterioration through use, although faults can still occur with equipment. As with the majority of telecommunication equipment, suppliers generally charge an ongoing support fee for replacement of faulty equipment, providing updates to operating systems, additional technical support and providing fixes to issues identified. Although the exact charge will be dependent on the commercial terms agreed between the parties, my experience is that 8 % of the purchase cost is an appropriate amount for the ongoing support charge. Based on the supply of DSLAM equipment estimated material cost of $30 per port, the annual supplier support charge is expected to be $2.40 per port.

4.13. In addition, the cost of having a field technician visit a site for repair of faulty equipment should be considered. It is reasonable to assume that the number of technician visits to service equipment issues will be proportional to the number of ports installed. For each year I believe an assumption of one visit per 300 installed ports is valid and this is expected to cost $250 for a technician to visit a site and complete any activity. This equates to approximate annual cost of $0.85 per port.

4.14. Excluding the costs for rack and environment my estimation of the operating cost for a DSLAM is, as the sum of supply support and maintenance activity, to be approximately $3.25 per port per annum.

4.15. DSLAMs need to be located adjacent to the metallic cables used to provide service, and therefore have to be installed at the Telstra exchange. The provision of space for Access Seekers to locate their equipment includes charges for Telstra Exchange Building Access (TEBA).

4.16.

4.17. DSLAM equipment development has seen an increase in the number of ports per card and the overall density of ports within a rack. The exact number of ports which can be installed per rack is dependent on the manufacturer and the equipment model selected.

A review of current supplier equipment options reveals densities of up to 2000 ports per rack are available.

4.18. Although higher densities may be available for current installations, I believe it is more realistic to assume a conservative maximum of 1200 ports per rack to reflect the varying age of installations for calculation of costs to operate a DSLAM.

4.19. In my opinion it is unlikely that an Access Seeker will install less than one sub rack of DSLAM equipment in an initial installation. As the Access Seeker will need to lease a rack within the Telstra Exchange any smaller installation significantly increases the cost per port.

4.20.

4.21.

4.22.

4.23.

4.24. Network management is required to operate and manage elements of a telecommunication network. The effort required to manage an individual network element is generally relative to the complexity and function of the element. In my experience DSLAMs are a relatively simple telecommunication network device, and the share of network management resources allocated to a DSLAM element is expected to be low in comparison to other components. For the purpose of this exercise, due to the expected very small cost per port, no network management cost has been included.

4.25. My opinion of the cost to operate a DSLAM is summarised in Table 1 below.

Component	CBD Per Port Cost (annual)	Urban Per Port Cost (annual)	Country Per Port Cost (annual)
Support and Maintenance	$3.25	$3.25	$3.25

Table 1 - Costs to Operate a DSLAM

4.26. In my opinion, the estimated cost for a provider to support, maintain and locate a DSLAM within a Telstra exchange is in the range of port per annum. The presented cost range is very dependent on the level of rack occupancy, with some components of the access rental attracting the same fee irrespective of whether a rack is partially or completely utilised.

5. What costs are likely to be incurred in expanding, and the infrastructure required in order to expand, the capacity of a DSLAM or a MSAN (for example, by adding a port or a voice card) in order for the DSLAM or MSAN to be used to provide PSTN switched voice services or carrier grade VoIP?

5.1. In my opinion, as summarised in the background information within Section 3, there are three ways a carrier grade voice service can be provided by an Access Seeker using a DSLAM and ULLS. The three options are ULLS analogue voice converted to TDM within DSLAM, ULLS analogue voice converted to IP with DSLAM, and VoIP from the customer's premises.

5.2. In my response to this question I have assumed that an Access Seeker is currently using ULLS for the delivery of internet services via DSL within the ESA and voice services are to be provided in addition.

5.3. Option 1 is to terminate the standard analogue voice service, isolated by splitters, on a separate port within the DSLAM. Within the DSLAM, the analogue voice signal is converted to digital. In this option, the voice service will be either a switched voice service or if the DSLAM is connected to IP based backhaul, a carrier grade VoIP service.

5.4. Option 2 is to provide carrier grade VoIP by converting the telephone signal to digital at the customer premises either by the use of an analogue telephone adaptor (standalone or within an ADSL modem), or by using a digital output telephone handset.

5.5. The first option, shown in Figure 1 and Figure 2, is the simplest for the end user customer as the voice service requires no additional equipment. The voice service is still provided as analogue using the low frequency bandwidth on the communication wire. A standard telephone is used and if broadband is provided a splitter and DSL modem will also be required.

5.6. However to deliver a voice service using the low frequency bandwidth of the communication wire requires a voice port to be available on the DSLAM/MSAN. In my experience the majority of equipment suppliers now offer DSLAM/MSANs which are based on shelf architecture with different cards inserted for management and control, backhaul termination, xDSL and voice services. Depending on the equipment chosen, voice service cards will either convert the voice to TDM for connection to a voice circuit switch or convert the voice to IP for connection to an IP switch. In any case the voice port will emulate a standard telephone service termination including the supply of line voltage to power a phone device at the customer's premise.

5.7. For xDSL and voice terminations the number of ports per card varies between manufacturers. Typical port counts per card range from 24 to 64. As an example, some current DSLAM/MSAN equipment has capacity for 16 line cards, each with 48 ports, providing a total of 768 available ports.

5.8. For voice services to be provided a voice ports must be made available. For a provider this is achieved by installing a voice port card instead of an xDSL card. By installing voice cards the capacity of the installed equipment to provide xDSL services is reduced

accordingly. Generally, in my experience the cost per port and density per card does not vary significantly between voice cards and xDSL cards.

5.9. As the service delivery option using the lower frequency component of the communication wire requires an additional DSLAM/MSAN port it is reasonable to consider the additional cost to provide voice services with this method as the cost of providing a port within the DSLAM/MSAN.

5.10. If an operator has existing spare capacity within DSLAM/MSAN equipment a voice port card can either be inserted or an existing xDSL card can be substituted. To perform this work a technician would need to be sent to the exchange.

5.11. For the basis of calculation I have assumed a 24 port voice card (circuit switch or VoIP) is to be installed. A reasonable estimation of the cost to supply a 24 port card is $500. Although the installation of a card into a frame is relatively simple exercise, a special visit is typically required plus the cost to coordinate the activity. I believe a reasonable estimation of the cost to complete the activity is $400 per visit.

5.12. In my opinion, a reasonable cost to install a typical voice port line card is $900 within a DSLAM/MSAN, which equates to $37.50 per port.

5.13. The cost to install a voice port card assumes that the existing equipment has sufficient space to accommodate the additional card, either through substitution or into a spare slot. If a new DSLAM shelf is required, additional costs which may include charges for an additional rack will apply.

5.14. For option 2, additional equipment is required at the customer premise and the DSLAM operator must provide network equipment to extract the voice component from the data stream prior to the broadband connection to the internet. For carrier grade VoIP, the additional customer equipment (conversion to digital) must be configured to use a protocol, typically Session Initiation Protocol (SIP) to manage the call establishment and maintain the call. In addition the network operator will need to use Quality of Service (QoS) tagging to prioritise the voice traffic packets through the Access Seeker's network.

5.15. Generally, in my experience, access seekers transfer the cost of the analogue to digital conversion at the customer premises to the customer, either through the customer having to purchase their own ATA (standalone or integrated within a DSL modem) or by providing an integrated ATA or IP handset and DSL modem via a rental agreement. IINet's "BoB" is an example of a provider's integrated IP Handset and DSL modem.

5.16. A review of the current market indicates that ATA's are available for a range of pricing from $50 to $70. For the purpose of this report I have assumed the average price of $60 for the supply of an ATA.

5.17. If a network operator chooses to provide voice services using the low frequency component of the communication wire an additional port will be required within the DSLAM. In my opinion a benchmark cost to supply and install additional voice ports to a DSLAM is $37.50 per port.

5.18. If the service is provided using carrier grade VoIP by conversion at the customer's premises, no additional ports are required in the DSLAM. The voice service will be

converted to IP at the customer's premise by an ATA or directly within an IP handset. In my experience the equipment at the customer premises will be either provided by, or funded by, the end user customer.

5.19. Irrespective of the chosen access solution, discussed in paragraphs 5.1 to 5.15, the operator will require shared core network infrastructure to enable, manage and charge for the delivery of voice services. The cost of providing the core network infrastructure, in addition to the DSLAM infrastructure is discussed further in paragraphs 6.1 to 6.34.

6. **Are there any additional costs, other than those set out in your response to question 2 above, which are likely to be incurred in providing PSTN switched voice services or carrier grade VoIP?**

6.1. To provide voice services a network provider will need infrastructure to manage the switching of calls between parties. Voice service switching can be either circuit switched or routing of IP traffic. Some Australian network operators operate circuit switch infrastructure whilst others operate IP based voice switching.

6.2. In my opinion, the industry standard for the establishment of new voice service core infrastructure providing call management functionality will be based on packet switching rather than circuit switching technology. In my experience operators, that do not have legacy systems to support, will pursue IP solutions as a common platform for all service types.

6.3. To establish an indicative value for the costs to provide voice switching capability, I have developed a core network representative of what a network operator would install to provide voice switching and management. Further detail of the representative network is provided in Attachment 1.

6.4. The core infrastructure of an Access Seeker intending to provide carrier grade voice services will be comprised of hardware and software to enable the establishment of a connection between two voice devices, either on the Access Seeker's network or via interconnection with other provider's networks.

6.5. The provision of core network infrastructure is dependent on how many services the infrastructure is to be capable of supplying. For the purpose of this report I have considered three example total service numbers of 25000, 50000 and 100000 to represent the impact on the core infrastructure cost.

6.6. Along with the infrastructure to provide the connection, information about the call, including the originating and receiving service, locations and the duration, must be collected to enable billing for the service provided.

6.7. The major components of the system will include servers, switches and PSTN gateway routers. To ensure a high level of availability, a voice service provider will require redundancy and will duplicate critical network elements. The core network equipment to provide voice service functionality can be centrally located, typically in the same location as the equipment to manage internet services, and remote from the DSLAMs and other access infrastructure.

6.8. Backhaul capacity is required between an Access Seeker's DSLAMs and the core network locations for the provision of both internet capacity and voice connectivity. In my experience, the accepted industry standard for minimum bandwidth to deliver a quality voice service is 32 kb/s. The carrier grade VoIP service is combined with the provision of an internet service which in my experience of the market would include a minimum download rate of 512 kb/s and often much higher. The relative capacity required for a carrier grade voice (32 kb/s) link is a small proportion of the overall capacity requirement. On this basis, it is my opinion that the backhaul provided for the Access Seeker's provision of internet capacity will have sufficient capacity to accommodate the

voice requirements and I have not included any additional cost for backhaul within the estimated cost.

6.9. To establish an estimate of the cost for a network owner to provide voice services that bypass the existing voice switch infrastructure at an exchange, I have developed an example core network. The example network reflects my knowledge of the current industry approach to providing voice service functionality. Attachment 1 contains further detail of the equipment considered.

6.10. The network components have been defined on the basis that voice services will be provided nationally and to a high level of availability. The estimation assumes that voice services are provided as an addition to DSL services and regulatory requirements are satisfied including access to emergency service numbers.

6.11. I have considered the provision of voice services to be in addition to an existing broadband service and the infrastructure allowing interconnection to other carriers and I have assumed backhaul is available. Where required, I have made allowance for additional equipment interfaces.

6.12. Based on my industry experience, I have assumed that the core network will be established in multiple locations to provide a high level of redundancy and service availability. In the sample network, I have assumed three locations, and any failure of core network equipment will not cause a loss of service to customers.

6.13. At each core network location, a cluster of infrastructure would be installed to provide the call establishment, management and PSTN gateway functionality. The infrastructure will include a LAN switch, application servers, session border controller and voice gateways.

6.14. Rather than depending on hardware for the switching functionality, software switches, as the name suggests, rely on purpose built software to manage authentication, call establishment, recording of call data, and deliver value added functions such as call diversion, message bank and conference calls.

6.15. For the development of the cost estimate I have assumed a Broadsoft software solution. This is not the only option, but Broadsoft is a major participant in the voice service market and in my experience the cost and functionality of this software is typical for the market at this time.

6.16. Each cluster (server, switch, session border controller and gateway) provides the switch and gateway functionality. The infrastructure is established in multiple locations to provide multiple points of interconnection with other providers and redundancy in the case of equipment failure. If any cluster fails, the network would be configured to transfer the management of calls to an alternative cluster until the preferred location is restored.

6.17. Interconnection to other provider's voice services may be provided via IP (SIP) or via TDM to the PSTN. Technical standards are defined for the interface of voice services to the PSTN via 2 Mb/s TDM interface. A gateway device is used to convert IP voice services to TDM voice circuits connected via the 2 Mb/s interface.

6.18. The estimated cost for the example core network infrastructure and software to provide up to 25,000 services is $1,055,500 or $42 / service. If the capability of the core network is increased to 100,000 services the estimated initial cost becomes $2,305,500 or $23 / service.

6.19. Further details of the equipment considered for the estimation of cost to deliver a carrier grade voice core network can be found in Attachment 1.

Billing

6.20. In contrast to the delivery of internet services the provision of voice services exhibits greater complexity in data gathering and bill presentation to the customer.

6.21. Typically an internet only service is charged a constant monthly fee plus an additional rate for downloads which exceed the contracted limit. Many Australian internet service contracts now eliminate the charging for downloads which exceed the limit and when the contracted amount is reached the download speed is reduced for the remainder of the billing period.

6.22. For voice services, charges are calculated on usage, comprised of duration, type of number called and often the time of day the call is made. All of this data must be collected for every call and then presented in a customer bill. A system which caters for the added complexity and functionality for voice service billing is a direct incremental cost, both initial and ongoing for a service provider who wishes to add voice services.

6.23. Based on my industry experience the cost of implementing a billing system capable of providing voice service customer billing will be comprised of software, hardware and the integration of the interface with the soft switch solution.

6.24. In my experience a reasonable cost to implement a billing system capable of servicing 100,000 voice service customers would require an investment of $700,000 for system, hardware and integration. In my opinion the investment will be very similar to service 25,000 customers.

6.25. The cost per service made available is approximately $27 per service for 25,000 service capability and $7 per service for 100,000 service capability.

6.26. Although I have assumed that the service provider will have management systems in place, additional resources will be required to manage the voice service process. I have allowed an additional annual cost of $250,000 for the ongoing management of the billing process within the service provider. For 25000 service capability this equates to $10 per service and $2.50 per service for 100000 service capability.

6.27. There is also a significant ongoing cost to print and issue invoices to customers. In my experience the general industry rates are $1.20 per annum for printing of a two page monthly invoice and $5.40 per annum for Australia Post costs. In my opinion it is reasonable to assume that the service provider would send the invoices for voice and internet service in a single envelope eliminating the incremental cost of the postage for the voice service provision.

6.28. In my experience it is possible that, rather than investing in an internal billing system a service provider will engage the services of a Billing Service Provider (BSP) that completes the data processing and invoice production. This would typically be charged per invoice page produced. My understanding of current industry rates are that the first page of an invoice will cost approximately $0.17, which includes data processing and management with subsequent pages costing $0.05 each.

6.29. The cost per potential service for core network is dependent on the capability to be installed with my estimated cost to cater for 25,000 potential services of $40 per potential service. If investment is made in a solution for 100,000 potential services the cost per service decreases to $23 per potential service.

6.30. For the provision of a billing system my opinion is that the costs also vary depending on the number of services which capability if provided for. For a billing system established to provide 25,000 potential voice service bills my estimated cost per service provided is $27. If the system was enabled for 100,000 potential services my opinion of the cost per service reduces to $9 per service.

6.31. The initial costs described in paragraphs 6.29 and 6.30 represent the cost per service for the capacity of the system provided.

6.32. The cost of providing voice on a DSLAM is comprised of several components. Table 2 represents my opinion on the costs which would be incurred by an Access Seeker to make voice services available via a DSLAM. Three options are included, representing the options of VoIP differentiated by who contributes to the cost of the ATA and the use of the low frequency capacity of the communication wire.

Component	Reference Paragraph	VoIP Customer funded ATA	VoIP Provider funded ATA	Low Frequency Voice
DSLAM	5.17			$37.50
Customer ATA	5.16		$60	
Core Network #	6.18	$42	$42	$42
Billing ^	6.25	$27	$27	$27
Total		$69	$129	$106.50
# - assumes an installation of 25 k customers. Increases in core network size allowance decrease this number to $23 for 100,000 service provision option. ^ - assumes 25k units of billing, if 100k services provided the initial cost per service reduces to $9 per service.				

Table 2 - Costs Per Voice Service made available on DSLAM

6.33. The up-front costs presented in Table 2 are for the cost per service made available for use, and does not account for the cost per connected service if the utilisation is less than 100%.

6.34. In my opinion, the estimated additional initial costs of providing voice services by a network operator, comprised of the core network infrastructure and billing system, will range from $32 to $67 per enabled service.

7. **Assuming a retail voice service (i.e. local calls, long distance calls, fixed to mobile calls etc) is provided by a service provider via DSLAM and ULLS to retail end customers, would the additional provision of a wholesale resale voice service by that service provider require the purchase and installation of additional equipment and the incurring of additional operating costs?**

7.1. As discussed in paragraph 5.1 of this report, a service provider may choose to deliver carrier grade voice services via a DSLAM using either the low frequency portion of the communication wire {option (a) and option (b)} or use some of the capacity within the data link {option (c)}.

7.2. My response to this question is limited to the purchase, installation and operating costs of network equipment. Any impacts on customer service costs, product delivery or billing are not addressed within this section.

7.3. I have assumed that a service provider offering retail voice services will have existing connections to the PSTN to allow customers to call other parties beyond the service provider's network.

7.4. I have also assumed that the addition of wholesale voice services to existing retail voice services does not increase total call traffic volume to such an extent as to impact on the existing switching infrastructure and PSTN interfaces (i.e. I have assumed that the existing core infrastructure would be able to satisfy the requirements of additional wholesale traffic).

7.5. In my opinion, there is no additional network equipment required to supply the service provider's carrier grade voice services as wholesale resale of voice services. The equipment already available to provide retail voice services will be used for the wholesale service.

7.6. I have not identified any additional network infrastructure operating costs if a retail voice service is to be provided as a wholesale voice service.

8. Could a billing system be implemented to service retail customers also be used to service wholesale customers without significant modification? If significant modification is required, what would be the additional cost?

8.1. Although billing systems vary in the capacity and functionality offered, in my experience the information which must be gathered and analysed is similar for retail or wholesale services.

8.2. I have assumed that the Service Provider has established a billing system to service retail voice requirements similar to that described in paragraphs 6.20 to 6.30.

8.3. The system will need to be updated to include additional tariffs for the wholesale services. In my opinion the effort to add new tariffs to the billing system for calculating wholesale service charges for provision is minor provided the wholesale charging model uses the same units of measure as the retail voice service.

8.4. A variation to the standard billing system requirements will be the transfer of call record data to the wholesale service provider. The call data records are required for the validation of the bill by the wholesaler and also the production of the wholesale retail bills.

8.5. The transfer of data of any significant quantity between the wholesale service provider and user will require the establishment of business to business interfaces. In my opinion, system changes to allow the transfer of data directly to a third party are the only significant modifications of the billing system identified for the delivery of wholesale services.

8.6. Although the cost of modifying an existing billing system is dependent on each systems structure and existing functionality, in my opinion assuming 10 days of effort at $1,500 per day (total $15,000) is reasonable for provision of a business to business interface to enable the delivery of wholesale services. This cost would be applicable for each third party wholesaler that uses wholesale services.

CONCLUSIONS AND SUMMARY

9.1. My responses to the questions in the brief are summarised in the following paragraphs.

a) *What are the ongoing costs of operating a DSLAM and a MSAN (excluding installation costs)?*

9.2. In my opinion, the estimated cost for a provider to support, maintain and locate a DSLAM within a Telstra exchange is in the range of per port per annum. The presented cost range is very dependent on the level of rack occupancy, with some components of the access rental attracting the same fee irrespective of whether a rack is partially or completely utilised.

b) *What costs are likely to be incurred in expanding, and the infrastructure required in order to expand, the capacity of a DSLAM or a MSAN (for example, by adding a port or a voice card) in order for the DSLAM or MSAN to be used to provide PSTN switched voice services or carrier grade VoIP?*

9.3. If a network operator chooses to provide voice services using the low frequency component of the communication wire an additional port will be required within the DSLAM. In my opinion a benchmark cost to supply and install additional voice ports to a DSLAM is $37.50 per port.

9.4. If the service is provided using carrier grade VoIP by conversion at the customer's premises, no additional ports are required in the DSLAM. The voice service will be converted to IP at the customer's premise by an ATA or directly within an IP handset. In my experience the equipment at the customer premises will be either provided by, or funded by, the end user customer. Irrespective of the chosen access solution, discussed in paragraphs 5.1 to 5.15, the operator will require shared core network infrastructure to enable, manage and charge for the delivery of voice services. The cost of providing the core network infrastructure, in addition to the DSLAM infrastructure is discussed further in paragraphs 6.1 to 6.34.

c) *Are there any additional costs, other than those set out in your response to question 2 above, which are likely to be incurred in providing PSTN switched voice services or carrier grade VoIP?*

9.5. In my opinion, the estimated additional initial costs of providing voice services by a network operator, comprised of the core network infrastructure and billing system, will range from $32 to $67 per enabled service.

d) *Assuming a retail voice service (i.e. local calls, long distance calls, fixed to mobile calls etc) is provided by a service provider via DSLAM and ULLS to retail end customers, would the additional provision of a wholesale resale voice service by that service provider require the purchase and installation of additional equipment and the incurring of additional operating costs?*

9.6. In my opinion, there is no additional network equipment required to supply the service provider's carrier grade voice services as wholesale resale of voice services. The equipment already available to provide retail voice services will be used for the wholesale service. I have not identified any additional network infrastructure operating costs if a retail voice service is to be provided as a wholesale voice service.

e) *Could a billing system be implemented to service retail customers also be used to service wholesale customers without significant modification? If significant modification is required, what would be the additional cost?*

9.7. Although the cost of modifying an existing billing system is dependent on each systems structure and existing functionality, in my opinion assuming 10 days of effort at $1,500 per day (total $15,000) is reasonable for provision of a business to business interface to enable the delivery of wholesale services. This cost would be applicable for each third party wholesaler that uses wholesale services.

ATTACHMENTS

Attachment 1 - Calculations and Descriptions of Core Network Infrastructure

Attachment 2 - Craig Lordan CV

Attachment 3 - Brief received from Mallesons Stephen Jaques 5 October 2011

1. ATTACHMENT 1 – CALCULATIONS AND DESCRIPTIONS OF CORE NETWORK ARCHITECTURE

Estimate of the hardware and software costs for the establishment, by a service provider to provide voice services.

The assumed network configuration is shown in Figure 1.

1.1 Assumptions

In order to ensure a degree of resiliency and redundancy, the solution will be comprised of three identical clusters. The clusters will be geographically diversely located, - ideally in different cities or urban centres, the location will also be dictated by the location of the majority of the end users.

The technology solution is based upon Broadsoft. This company provides the software platform that delivers the VoIP based telephony and voice services (such as voicemail, conference calling, etc) for many service providers in Australia and as such can be considered to be a benchmark in terms of cost and capability.

Interconnection to the PSTN will be via two technology solutions. The primary form of interconnection will be via a Session Initiated Protocol (SIP) Trunk(s) to a Tier 2 carrier. This Tier 2 carrier will have an interconnection agreement with the Tier 1 Telcos. SIP Trunking offers a more scalable, cost effective (both in terms of hardware and access charges) and a feature rich solution when compared to legacy Primary Rate trunk accesses.

Interconnection to the Tier 1 Telco will be via Primary Rate ISDN Trunks (PRA). These will provide overflow for calls to emergency services and also priority services in the event of the connectivity to the Second Tier Telco failing.

Operational aspects such as service management, MACs, downstream billing systems have not been scoped as part of this solution.

1.2 Main Elements

Per cluster key devices	**Quantity**
Session Border Controller	1
LAN Switch	1
Softswitch Server (e.g. HP DL380)	2
Gateway Router	1

Session Border Controller – Cisco ASR1001 performs the critical functions of telephony call control and signalling, security, Quality of Service (QoS) and demarcation between the Broadsoft application

and the end users (who communicate with the SIP protocol) and SIP Trunks. This element will also fulfil regulatory requirements such as lawful interception and prioritisation of emergency calls.

LAN Switch – Cisco 3750 switch provides Ethernet connectivity between the network devices and servers that are co-located. This switch may also be used to connect additional Ethernet devices such as management and billing systems.

Servers – HP DL380 servers house the Broadsoft VoIP application as well as Media that is required to provide VoIP services (eg: music for music on hold), Conferencing Resources and Front End Management functionality.

Gateway Router – Cisco 2851 Routers that provide the necessary hardware to interface to two PRA circuits. The gateway routers are currently scaled to provide 60 simultaneous voice calls per router.

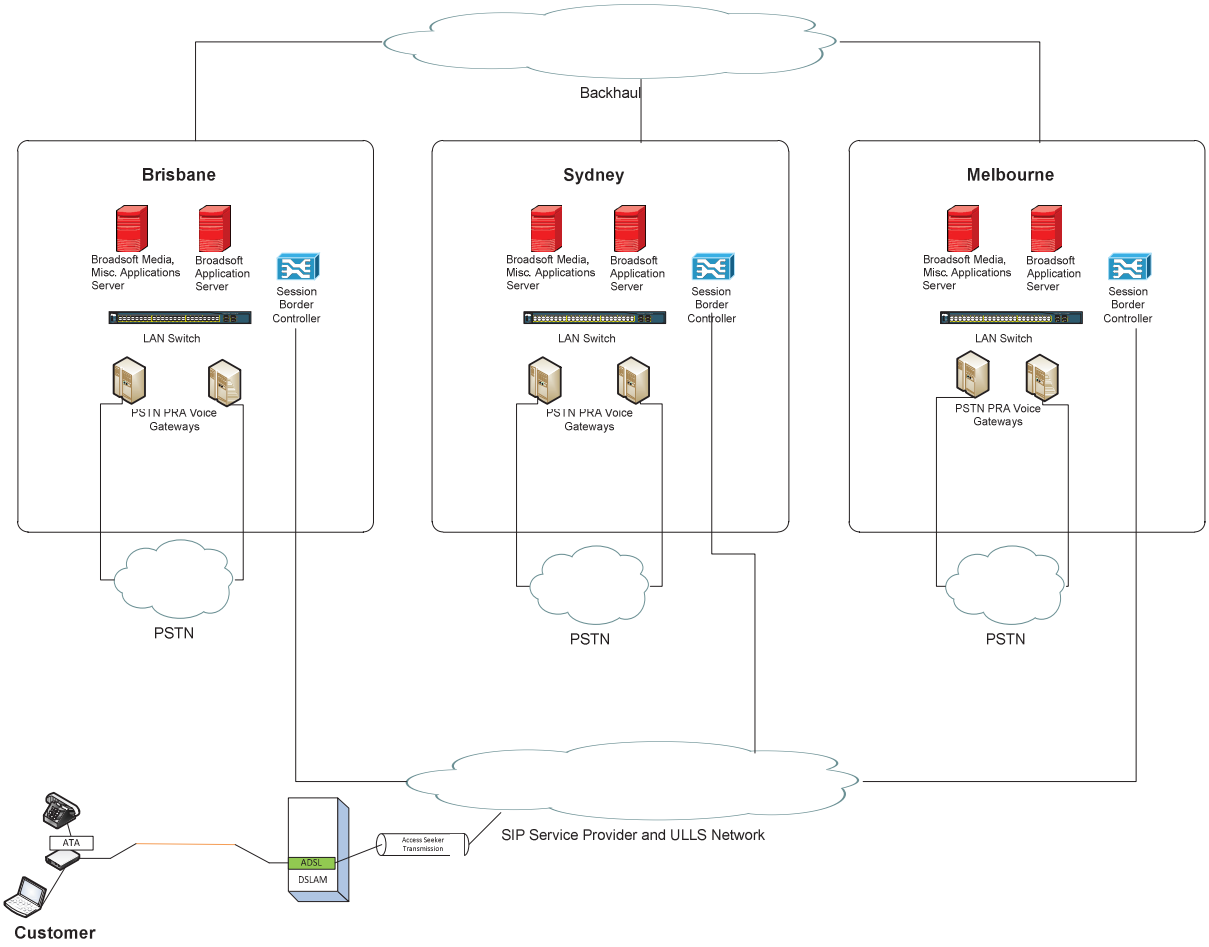


Figure 1 - Network configuration used in the development of core network costing

Initial Costs

The estimated costs to establish voice service capability are shown in Table 1.

Equipment Total Purchase	Quantity	Cost	Total
Session Border Controller	3	$ 23,500	$ 70,500
LAN Switch	3	$ 2,500	$ 7,500
Server (e.g. HP DL380)	6	$ 7,500	$ 45,000
Gateway Router	3	$ 12,500	$ 37,500
Equipment Total			$ 99,000
Design, installation, testing and commissioning			$ 120,000
Total Core Infrastructure			**$ 280,500**

Table 1 – Hardware Supply and Installation Costs

The cost of sourcing and installing Voice Application management software is shown in Table 2. The cost per subscriber reduces with increasing numbers of subscribers. The purchase of software can be deferred to align with the growth in services.

VoIP Application Software			Total
25 k subscribers			$ 775,000
50 k subscribers			$ 1,275,000
100 k subscribers			$ 2,025,000

Table 2 - Application Software costs for different user numbers.

1.3 Recurring Costs

Table 3 shows the estimated annual charges applied by equipment suppliers for the support of hardware.

Equipment Support	Quantity	Annual Cost	Total
Session Border Controller	3	$ 2,222	$ 6,667
LAN Switch	3	$ 208	$ 625
Softswitch Server (e.g. HP DL380)	6	$ 1,333	$ 8,000
Gateway Router	3	$ 1,083	$ 3,250
Equipment Total			**$ 18,542**

Table 3 - Annual costs for the support of installed hardware

The estimated charges for interconnection of the network to other voice service operators are shown in Table 4. Although equipment may be located at the service providers premises a cost equivalent to external hosting has been included to represent the cost.

Interconnection Services		Annual Cost	Total
PSTN Trunk connection (PRA)	6	$ 3,600	$ 21,600
SIP Trunks	3	$ 4,800	$ 14,400
Hosting Charges for Equipment (0.5 rack)	3	$ 12,000	$ 36,000
Annual Costs excluding Application Software			**$ 72,000**

Table 4 - Interconnection and Hosting Charges

The suppliers of voice application software apply ongoing support charges as shown in Table 5.

VoIP Application Software			Annual Cost
25 k subscribers			$ 135,000
50 k subscribers			$ 225,000
100 k subscribers			$ 360,000

Table 5 - Application software annual support charges

Craig Lordan

Qualifications: B.E. (Electrical), Central Queensland University
Graduate Certificate Management, Southern Cross University

Present Position: Senior Consultant, Gravelroad Consulting

Career Summary:

Craig Lordan is an Electrical Engineer who graduated from Central Queensland University in 1988, and now has 22 years of experience in the telecommunications industry. Prior to consulting roles, Craig was engaged in a number of roles within Telstra from 1989 through to 2001.

During the period with Telstra, he specialised in urban and rural Customer Access Network infrastructure, including the planning, design and construction of copper, fibre and radio networks. His experience extends from hands on responsibility for individual construction projects through to long term strategic planning and budgeting.

Craig also completed international roles with Telstra, including the planning and development of networks within Vietnam. Later roles with Telstra included national responsibility for the development and application of network design and construction practices.

During the past seven years as a consultant, he has provided advice, expert opinion and support to many organisations in relation to the development and implementation of telecommunication networks. Organisations that have received and implemented advice include existing telecommunication carriers, electricity utilities and government organisations. Craig has contributed to the Queensland electricity industries' successful implementation of commercial telecommunication service supply, delivered expert reports in relation to specific matters and the completion of technical feasibility reports for the implementation of very high speed access networks on behalf of State and Local Governments. Craig has extensive experience in the design, operation and maintenance of fibre optic transmission networks.

Overview of Consulting Experience:

Specialist consulting assignments in Telecommunications and Infrastructure fields, including assessment of commercial issues, procurement, bidding strategies and strategic advice.

Highlights:

- Managed the design of the Townsville NBN First Release Site optic fibre cable network.
- Development of Business Case for Ergon Energy introduction of state wide telecommunication network for monitoring and control of electricity network.
- Feasibility Analysis for the construction of a capital city wide very high speed open access fibre optic telecommunications system;
- Published expert statements in relation to DSLAM installation and fibre cable installation;
- Procurement of telecommunication capacity for major corporate users;
- Establishment of telecommunications network and commercial operation for Queensland Government Owned Corporations;
- Technology application strategy advice and customer engagement policy formulation for major local government body;
- Cause Analysis of failed mobile network rollout for legal proceedings;
- Activity pricing analysis for prominent telecommunications constructor during contract negotiation;
- Facilitation of Post Implementation Review for a major Intelligent Traffic System installation project; and
- Strategic advice to a Queensland Government GOC Utility regarding the commercial opportunity to enter the telecommunications industry.
- Provision of network advice to several large government owned organisations in PNG.

Confidential and Privileged

Mr Craig Lordan
Senior Consultant
Gravelroad
By email
craig.lordan@gravelroad.com.au

5 October 2011

Dear Mr Lordan,

Australian Competition and Consumer Commission's "Inquiry into varying the exemption provisions in the final access determinations for the WLR, LCS and PSTN OA services - Issues paper": Expert Report

We act for Telstra Corporation Limited ("**Telstra**").

We are instructed to request that you provide your expert opinion on the questions set out in section 3 of this letter.

1 Background

General

1.1 Following regulatory consultation by the Commission, and proceedings brought before the Australian Competition Tribunal ("**Tribunal**") and the Full Court of the Federal Court of Australia, the Tribunal handed down orders exempting WLR and LCS (on 24 August 2009) and PSTN OA (on 9 September 2009) in particular Exchange Service Areas ("**ESAs**") which were the subject of the respective Applications ("**Attachment A ESAs**") before the Tribunal ("**the Tribunal's Metropolitan Orders**").

1.2 The Tribunal's threshold test for exemption was in the following general form:

(a) An 'Attachment A' ESA will become exempt (referred to in those orders as an Exemption ESA) if:

(i) there are three or more ULLS-based competitors (excluding Telstra) in the ESA;

(ii) the ULLS-based competitors have an aggregate market share in the ESA equal to or greater than 30 per cent; and

(iii) the aggregate ULLS spare capacity for the ESA is equal to or greater than 40 per cent of the aggregate number of WLR SIOs in that ESA.

(b) The exemption is subject to a number of conditions before it takes effect. These deal with factors which are, in the Tribunal's view, insurmountable barriers to ULLS-based entry.

For your reference, a copy of the Tribunal's LCS/WLR Order is attached. The basis on which the exemptions for PSTN OA take effect are in substantially the same form.

1.3 The commencement of Part XIC of the *Competition and Consumer Act 2010* (**"CCA"**) (which amends the telecommunications access regime set out in Part XIC of the *Trade Practices Act 1974* (Cth)), empowers the Australian Competition and Consumer Commission (**"Commission"**) to make "access determinations" which (among other things) regulates the terms and conditions on which Telstra (and other carriers) must provide access to declared services.

1.4 On 20 July 2011, the Commission made final access determinations (**"FADs"**) in relation to the pricing for the supply of declared fixed line services (including LCS, PSTN OA and WLR). The Commission maintained the Tribunal's Metropolitan Orders in the FADs.

1.5 Part XIC also empowers the Commission to vary a FAD. In September 2011, the Commission released its "Inquiry into varying the exemption provisions in the final access determinations for the WLR, LCS and PSTN OA services - Issues paper" (**"Issues paper"**). The Commission considers that *"further examination of the matter of exemptions is warranted by, among other considerations, the change in the legislative framework... and the rapidly evolving competitive environment"*[1].

The Exempt ESAs

1.6 The Tribunal's Metropolitan Orders require the Commission, amongst other things, to determine which ESAs are to be exempted as provided for under those orders (ie those ESAs that satisfy the threshold test and conditions). The Commission undertakes this assessment at six monthly intervals, with the exemptions taking effect six months after the publication by the Commission of the list of Exemption ESAs on its website.

1.7 The Commission has undertaken three rounds of exemption calculations:

(a) on 30 June 2010, the Commission published a list of 129 Exemption ESAs, calculated using CAN RKR data[2] as at 31 March 2010. The exemption of these ESAs took effect from 30 December 2010;

(b) on 30 December 2010, the Commission published a list of 52 further Exemption ESAs calculated using CAN RKR data as at 30 September 2010. The exemption of these ESAs will take effect from 30 June 2011 (unless sooner revoked by the FAD); and

(c) on 30 June 2011, the Commission published a list of 34 further Exemption ESAs calculated using CAN RKR data as at 31 March 2011. The exemption of

[1] ACCC, Issues paper, p 6.
[2] If you would like further background on the CAN RKR data, please let us know.

these ESAs will take effect from 30 December 2011 (unless sooner revoked by the FAD).

A list of the 215 Exemption ESAs is attached.

Price Regulation

1.8 The existence of retail price controls and prohibitions on anti-competitive conduct contained in the CCA (including under Part XIB of the CCA[3]), may impact the manner in which Telstra prices the supply of WLR, LCS and PSTN OA.

2 The LTIE and other statutory criteria

2.1 Pursuant to s 152BCA of the CCA, in varying the FADs, the Commission must take the following matters into account:

(a) whether the determination will promote the long-term interests of end-users ("**LTIE**") of carriage services or of services supplied by means of carriage services. In that regard, the CCA provides three objectives which the promotion of the LTIE is said to achieve:

(i) promoting competition in markets for carriage services or services supplied by means of carriage services (together **"listed services"**);

(ii) achieving any-to-any connectivity; and

(iii) encouraging the economically efficient use of, and investment in, infrastructure by which listed services are supplied, or are likely to become capable of being supplied.

(b) legitimate business interests of a carrier or carriage service provider who supplies, or is capable of supplying, the declared service, and the carrier's or provider's investment in facilities used to supply the service;

(c) the interests of all persons who have rights to use the declared service;

(d) the direct costs of providing access to the declared service;

(e) the value to a person of extensions, or enhancement of capability whose cost is borne by someone else;

(f) the operational and technical requirements necessary for the safe and reliable operation of a carriage service, a telecommunications network or a facility;

(g) the economically efficient operation of a carriage service, a telecommunications network or a facility; and

(h) any other matters which the Commission thinks are relevant.

[3] See for example section 151AK

2.2 On the meaning of the LTIE, the Tribunal has previously observed that:

> *Having regard to the legislation, as well as the guidance provided by the Explanatory Memorandum, it is necessary, in our view, to take the following matters into account when applying the touchstone - the long-term interests of end-users:*
>
> > ** End-users: in this matter, "end-users" include actual and potential subscribers to subscription television services and other viewers in their households. The term is also likely to include businesses, such as hotels and other places where people congregate, that subscribe or may potentially subscribe to subscription television services;*
> >
> > ** Interests: the interests of end-users lie in obtaining lower prices (than would otherwise be the case), increased quality of service and increased diversity and scope in product offerings. In our view, this would include access to innovations such as interactivity in a quicker timeframe than would otherwise be the case; and*
> >
> > ** Long-term: the long-term will be the period over which the full effects of the Tribunal's decision will be felt. This means some years, being sufficient time for all players (being existing and potential competitors at the various functional stages of the subscription television industry) to adjust to the outcome, make investment decisions and implement growth - as well as entry and/or exit - strategies.* [4]

2.3 Ultimately, the Commission takes the approach that the LTIE will be promoted where FAD terms and conditions contribute towards the provision of:

(a) goods and services at lower prices;

(b) goods and services of a high quality; and/or

(c) a greater diversity of goods and services.

2.4 In handing down the Tribunal's Metropolitan Orders, the Tribunal held that the LTIE was likely to be promoted with an exemption for WLR, LCS and PSTN OA in the Attachment A ESAs, rather than without. This exemption was on the terms described above (i.e. satisfaction of the threshold test on conditions).

3 Instructions

3.1 Please provide your expert opinion on the following:

(a) What are the ongoing costs of operating a DSLAM and a MSAN (excluding installation costs)?

(b) What costs are likely to be incurred in expanding, and the infrastructure required in order to expand, the capacity of a DSLAM or a MSAN (for example, by adding a port or a voice card) in order for the DSLAM or MSAN to be used to provide PSTN switched voice services or carrier grade VoIP?

---

[4] *Seven Network Limited (No 4)* [2004] AcompT 11 at [20].

(c) Are there any additional costs, other than those set out in your response to question 2 above, which are likely to be incurred in providing PSTN switched voice services or carrier grade VoIP?

(d) Assuming a retail voice service (i.e. local calls, long distance calls, fixed to mobile calls etc) is provided by a service provider via DSLAM and ULLS to retail end customers, would the additional provision of a wholesale resale voice service by that service provider require the purchase and installation of additional equipment and the incurring of additional operating costs?

(e) Could a billing system implemented to service retail customers also be used to service wholesale customers without significant modification? If significant modification is required, what would be the additional cost?

4 Assumptions and Other Matters

4.1 We advise as follows:

(a) the prices of WLR, LCS and PSTN OTA, as set by the Commission in the non-exempt areas, are set out in the FADs, a copy of which is attached and are as follows:

(i) LCS:

(A) 1 January 2011 to 30 June 2011: 9.1c (per LCS call); and

(B) 1 July 2011 to 30 June 2014: 8.9c (per LCS call);

(ii) PSTN OA:

(A) 1 January 2011 to 30 June 2011:

	Flagfall (cents per call)	**EMOU charge (cents per minute)**	**Headline rate (cents per minute)**
CBD	0.85	0.35	0.57
Metropolitan	0.84	0.49	0.70
Provincial	0.94	0.68	0.91
Rural	2.06	3.66	4.18
Average	0.95	0.76	1.00

(B) 1 July 2011 to 30 June 2014: national average price is 0.95c per minute;

(iii) WLR:

(A) 1 January 2011 to 30 June 2011: $22.10 (monthly price per service); and

(B) 1 July 2011 to 30 June 2014: $22.84 (monthly price per service);

(b) the standard prices of WLR, LCS and PSTN OTA set by Telstra in exempt areas are $27.60 (WLR residential lines), $31.77 (WLR business lines), 9.28c (per LCS call) and 1cpm (headline rate for PSTN OA) which are equivalent to prices previously set by the Commission. Telstra provides discounts to various competitors on those standard prices;

(c) Optus provides WLR, LCS and long-distance equivalent services in the exempt ESAs in competition with Telstra via a combination of ULLS and resale services;

(d) there is a sub-wholesale market for WLR, PSTN OA and LCS in which AAPT, M2, Optus and others participate (essentially, reselling Telstra's WLR, LCS and PSTN OA to other customers); and

(e) NBN is proposed to be rolled out over the next 8 -10 years.

5 Documents

5.1 We enclose copies of the following documents:

(a) a copy of the Tribunal's LCS/WLR Order;

(b) a copy of the list of exempt ESAs;

(c) a copy of Part C of Telstra's submissions on the Commission's *Public inquiry to make final access determinations for the declared fixed line services - Discussion paper* (regarding the exemptions);

(d) a copy of Telstra's submissions in response to Access Seekers' submissions regarding the Commissions *Public inquiry to make final access determinations for the declared fixed line services - Discussion paper* (regarding the exemptions);

(e) a copy of the Commission's *Final Access Determinations Nos 1 to 6 of 2011*, dated 20 July 2011;

(f) a copy of the Commission's *Inquiry to make final access determinations for the declared fixed line services - Final report*, dated July 2011; and

(g) a copy of the Issues paper.

6 Purpose

6.1 Telstra may provide a copy of your expert report to the Commission. Please assume that your report (or certain aspects of it) will be accessible to the public.

7 Confidentiality

7.1 This letter and any information or documents that Telstra provides to you in relation to this retainer are confidential. To maintain confidentiality we request that you:

(a) use Telstra's confidential information only for the purposes of this retainer;

(b) not disclose Telstra's confidential information to anyone without Telstra's written consent;

(c) if requested by Telstra, destroy or return to Telstra all records containing Telstra's confidential information; and

(d) address all of your communications to Mallesons Stephen Jaques.

8 Your fees

8.1 We request that you provide us with a fee proposal, identifying the basis on which you will charge for this work (including disbursements) and an estimate of those fees.

8.2 Further, please note that we will pay your fees. Please send your accounts to us.

9 Correspondence

9.1 Please direct all correspondence in this matter to Mallesons Stephen Jaques, for the attention of Agata Jarbin or Sarah Weinberg.

10 Presentation of your report

Please include the following with your report:

(a) a copy of your curriculum vitae including qualifications, experience in the field and any publications;

(b) our instructions to you;

(c) any other facts, matters, documents or assumptions upon which you rely in preparing your report;

(d) any plans, calculations, analyses, measurements or other material that you refer to in your report; and

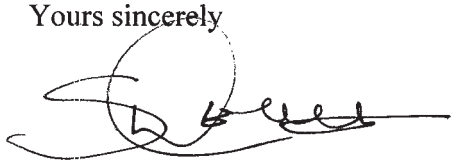
(e) any enquiries you make that are necessary to respond to the questions we ask you to consider and also the results of any such inquiries.

Please address your report to Mallesons Stephen Jaques.

If you require any further instructions or material to prepare your expert report please contact Sarah Weinberg on +61 3 9643 4369 or Agata Jarbin on +61 3 9643 4165.

Thank you for agreeing to assist Telstra in this matter.

Yours sincerely



Sarah Weinberg
Senior Associate
Direct line +61 3 9643 4369
Direct fax +61 3 9643 5999
Email sarah.weinberg@mallesons.com

Agata Jarbin
Partner
Direct line +61 3 9643 4165
Direct fax +61 3 9643 5999
Email agata.jarbin@mallesons.com