



Australia's Source for Telecommunications Intelligence

Australian Wholesale Voice Networks and Capabilities Prepared for Mallesons Stephen Jaques

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1 Methodology

Market Clarity has conducted an assessment of wholesale voice services on behalf of Mallesons Stephen Jaques, in order to address the following questions:

1. What alternative providers to Telstra of LCS and WLR currently operate in the wholesale telecommunications market?
2. What infrastructure do alternative wholesale providers use?

In this report, Market Clarity has used the term “facilities-based voice networks” to indicate the ownership of voice switching equipment.

The methodology used to compile this assessment is described below:

1. Compile a list of Australian facilities-based voice networks. **Market Clarity’s Voice Service Provider Database** was used as the basis for determining the presence of facilities based voice networks. In this database, Market Clarity tracks service and infrastructure characteristics from close to 400 Australian voice providers. This process is further described in Section 1.2.
2. For each identified voice infrastructure owner, check to see if wholesale services are offered. Where a provider offered wholesale voice services on both a TDM- and IP-based infrastructure, each service type was separately considered.
3. For each identified wholesale voice service, determine if local call services are offered.
4. For each identified wholesale voice service, determine if emergency services are offered.
5. For each identified wholesale voice service, determine if wholesale line rental services are offered.
6. For each identified wholesale voice service, identify the TDM and/or IP-based voice infrastructure utilised.
7. For each identified wholesale voice service, determine the geographic scope of the service.

8. For each identified wholesale voice service, separately consider the ability of the provider to offer a wholesale Local Carriage Service (LCS) as defined by the ACCC¹.
9. For each identified wholesale voice service, separately consider the ability of the provider to offer a Wholesale Line Rental (WLR) service as defined by the ACCC².

Further details are provided in Sections 1.2 through 1.5, below.

1.1 Defining the LCS and WLR Services

In this report, Market Clarity has adopted the following ACCC definitions for the wholesale Local Carriage Service (LCS) and Wholesale Line Rental (WLR) service.

1.1.1 The Wholesale Local Carriage Service (LCS)

From the ACCC August 2007 Discussion Paper³:

The LCS is a wholesale local call service that allows access seekers to resell local calls without deploying substantial alternative infrastructure. It involves the carriage of a telephone call from one end-user to another end-user in the same standard zone.

The service functions at the resale level. There is no access seeker equipment required in the provision of the service (although access seekers may seek to provide other elements or services in conjunction with the service). Telstra, as the access provider, provides the end-to-end call service between the called and calling party.

The detailed service description of the declared service is contained in the ACCC's final decision on declaration in its *Local services review*⁴.

¹ ACCC Final Decision: Local Services Review, Appendix C and D (July 2006)

² ACCC Final Decision: Local Services Review, Appendix C and D (July 2006)

³ ACCC Discussion Paper: Telstra's local carriage service and wholesale line rental exemption applications (August 2007)

⁴ ACCC Final Decision: Local Services Review, Appendix C and D (July 2006)

The local carriage service is a service for the carriage of telephone calls from customer equipment at an end-user's premises to separately located customer equipment of an end-user in the same standard zone. However, the local carriage service does not include services where the supply of the local carriage service originates from an exchange located within a Central Business District Area of Sydney, Melbourne, Brisbane, Adelaide or Perth and terminates within the standard zone which encompasses the originating exchange.

Definitions

Where words or phrases used in this declaration are defined in the Trade Practices Act 1974 or the Telecommunications Act 1997, they have the meaning given in the relevant Act.

In this Appendix:

Central Business District Area *means the exchange service areas that are classified as CBD for the purposes of the ordering and provisioning procedures set out in the Telstra Ordering and Provisioning Manual as in force on the date of effect of the renewed declaration.*

Public Switched Telephone Network *is a telephone network accessible by the public providing switching and transmission facilities utilising analogue and digital technologies;*

Standard Zone *has the same meaning as in Part 4 of the Telecommunications (Consumer Protection and Service Standards) Act 1999;*

Telephone calls *are calls for the carriage of communications at 3.1 khz bandwidth solely by means of a public switched telephone network.*

Market Clarity notes that the declared service does not specify any limitations on the technology platform that may be used to deliver a 3.1 kHz telephone call, and Market Clarity has interpreted this clause as allowing the inclusion of IP-based calls.

1.1.2 Wholesale Line Rental (WLR) Service

From the ACCC August 2007 Discussion Paper⁵:

⁵ ACCC Discussion Paper: Telstra's local carriage service and wholesale line rental exemption applications (August 2007)

The WLR service involves the provision of a basic line rental service that will allow the end-user to connect to the access provider's PSTN. The end-user is provided with:

- *The ability to make and receive standard PSTN voice calls such as local, national long distance, international, fixed-to-mobile or mobile-to-fixed calls*
- *A telephone number.*

As with the LCS, access seeker equipment is not involved in the provision of the WLR service, although access seekers may again seek to provide other elements or services in conjunction with the service.

The detailed service description of the declared service is contained in the ACCC's final decision on declaration in its *Local services review*⁶.

However, different considerations can be applied to IP-based calls. First and foremost, the service provider must be able to offer an IP-based service able to replicate the features and capabilities necessary to provide a WLR service, such as the ability to provide subscribers with a telephone number.

To assign a telephone number to its customers, the IP telephony provider must:

- **Acquire numbers from ACMA under the Australian telephone numbering plan** — This is an administrative rather than a technical requirement.
- **Enable its infrastructure to associate these numbers with its subscribers** — Within the IP network, IP telephony subscribers are identified by their account ID and their IP address. These must be associated with a PSTN number for the provider to offer unique telephone numbers to its customers.

In this analysis, Market Clarity has adopted a narrow interpretation of the WLR service description, in that we view the provision of a *basic access line* as equating to a requirement for an access connection. Numerous infrastructure permutations are possible:

- Traditional (TDM) voice switches and the ULLS, using voice band frequency (3.1 kHz bandwidth).
- Traditional (TDM) voice switches and the ULLS with VoDSL or ISDN (supports 2 or more “phone lines”) — noting that these services are typically focused on the business market.
- Traditional (TDM) voice switches and other terrestrial access infrastructure such as direct copper connections, wireless technologies, hybrid fibre coax (HFC), direct fibre, etc (supports 1 or more “phone lines”).

⁶ ACCC Final Decision: Local Services Review, Appendix C and D (July 2006)

- Softswitches (IP) and the ULLS, with one or more virtual circuits (virtual “phone lines”) for connectivity to:
 - ↳ An Integrated Access Device (IAD), which is a gateway device that translates between traditional analogue and IP voice formats, allowing end-users to use their existing analogue telephone handsets with a VoIP service;
 - ↳ Computer applications (softphones); and
 - ↳ IP phones.
- Softswitches (IP) and other terrestrial access infrastructure such as direct copper connections, wireless technologies, hybrid fibre coax (HFC), direct fibre — with one or more virtual circuits (virtual “phone lines”) for connectivity to:
 - ↳ An Integrated Access Device (IAD);
 - ↳ Computer applications (softphones); and
 - ↳ IP phones.

In addition to the wholesale voice provider offering a service that allows end-users to make and receive standard PSTN voice calls, when using VoIP technologies (which can technically be operated independently of the underlying access network infrastructure) we have included a requirement to provide an access service connecting the end-user premises to the voice network to carry the IP service. This is consistent with the DCITA recommendation 16 in its recent review⁷ that the CSG should apply when the VoIP service provider is also the carriage service provider. The end result is a service that:

- Allows an end-user to connect to the network at the access, IP and SIP (or H.323, etc) layers; and
- Allows an IP-based voice service provider to use traffic engineering techniques to ensure voice quality across the end-user’s physical access link, through the provider’s voice switching facilities, and providing a connection to separately located customer equipment of an end-user in the same standard zone.

It is Market Clarity’s opinion that a VoIP provider must have QoS-level control over the underlying transmission between both customer premises and the providers call switching infrastructure, in order to guarantee no less than PSTN-level audio quality, reliability and dependability of the service from one CPE to the other CPE.

⁷ DCITA, Examination Of Policy And Regulation Relating To Voice Over Internet Protocol (VoIP) Services, Report to the Minister, November 2005, online at http://www.dcita.gov.au/communications_for_consumers/telephone_services/emerging_voice_services.

1.2 Market Clarity Voice Service Provider Database

Market Clarity holds an extensive database of Australia's voice service providers (Fixed Voice, Mobile, VoIP, IP Telephony), covering the full range of voice technologies and services. This database tracks detailed information on over 390 Australian voice service providers, and includes facilities owners, carriers and resellers. The database provides information on voice providers' main business, other lines of business, infrastructure ownership, target markets (including retail and wholesale focus), and regulatory status (whether they are TIO members or hold a carrier license).

Voice services tracked in this database include:

- **VoIP Services** — Information on over 270 services offered over private networks or over the Internet, targeting consumer, business and wholesale customers. Categories tracked include Hosted IP Telephony (Hosted PABX and IP Centrex), IP Video, Wholesale products and a range of related information. Each provider's target market for VoIP services is tracked, along with facilities ownership and resale arrangements.
- **Fixed Voice** — Providing information on over 190 facilities owners and resellers (including Preselection, Call Override, and Calling Cards).
- **Mobile Voice** — Providing information on 120 facilities owners, MVNOs and resellers.

The information contained in Market Clarity's **Voice Service Provider Database** was compiled via primary research:

- As publishers of the **Aussie VoIP List** (<http://www.marketclarity.com.au/voip/>), voice service providers regularly contact Market Clarity to tell us about their services — even before they're launched. Provider websites are checked on a monthly basis, to see whether any new services are offered, or whether any services have been withdrawn. We also find that many service providers offer a wide range of related services, such as Internet access, which we separately track. Market Clarity regularly contacts these service providers via phone or email to ask questions about their services.
- Market Clarity augments the information in this database with specific survey instruments and phone interviews on a regular basis.
- In addition to primary research, Market Clarity receives press releases from a wide range of organisations and subscribes to industry newsletters, magazines, and so on, where we also learn of new service launches, which we then investigate.
- Market Clarity routinely checks TIO membership lists and ACMA carrier licenses.
- Market Clarity frequently participates in industry conferences, and speaks with a wide range of industry colleagues on a regular basis.
- Market Clarity is an active member of the Communications Alliance VoIP Working Group.

Maintenance of Market Clarity's Voice Service Provider Database is a core research activity, and database contents are updated on an ongoing basis. Market Clarity publishes extracts from this database on its website — *The Aussie VoIP List*⁸.

Market Clarity's **Voice Service Provider Database**, along with our analyst team's market knowledge, was used as the basis for determining the presence of facilities based voice networks; eg. voice services based on the ownership of voice switching equipment. At this initial stage of the analysis, over 100 companies were identified as owning voice-switching equipment.

For this project, Market Clarity verified to the full extent feasible, the accuracy of information pertaining to voice facilities ownership and capabilities.

Market Clarity also checked that all entities listed in the ACMA numbers register had been considered in the analysis.

1.3 Availability of Wholesale Services

The next criteria for assessing the suitability of a given voice service as potential candidate for LCS or WLR is to determine whether the facilities owner *currently* provides wholesale services.

Market Clarity tracks the availability of wholesale voice services (by service type) in its **Voice Service Provider Database**. Information from this database was used as the first step in assessing wholesale service availability⁹. While there are many voice network facilities owners, particularly in the IP-based telephony market, only 42% of these organisations offer wholesale services. The current status of wholesale voice service offers were then checked on each provider's website. In numerous instances, Market Clarity analysts confirmed information directly with voice service providers.

Market Clarity notes that the wholesale voice market is further broken down into categories that, for the purposes of this document, may be considered as "**First Tier Wholesalers**" and "**Second Tier Wholesalers**". These can be defined as follows:

⁸ <http://www.marketclarity.com.au/voip/>

⁹ Market Clarity notes that a number of self-proclaimed wholesale service providers are actually offering sales agencies; e.g. the sales agent acts only as a retail outlet for the IP telephony service, receiving a commission on sales but without maintaining any ongoing relationship with the end user. After the sale is completed, the relationship is between the customer and the VoIP provider. Within Market Clarity's **Voice Service Provider Database** sales agencies are tracked separately, and were not considered as wholesale voice services in this analysis.

- **First Tier Wholesalers** — First Tier Wholesalers offer services over networks or switching infrastructure that they own. In the voice market, this would include those wholesalers that operate their own voice switching infrastructure (either TDM-based or IP-based).
- **Second-Tier Wholesalers** — Second Tier Wholesalers do not own network or switching infrastructure. Instead, these companies act as “traffic aggregators”. A Second Tier Wholesaler may, for example, acquire services such as bulk call minutes from a First Tier Wholesaler, and on sell these services to retailers as part of a value-added service bundle combining voice services with broadband, supported by business back office functions such as billing and marketing support.

Since they do not own infrastructure, Second Tier Wholesalers are not considered as LCS or WLR candidates.

1.4 Availability of Essential Features

1.4.1 Local Carriage Service (LCS)

An important part of the assessment of LCS candidate services is whether the service provides features considered to be essential to a local telephone service. Such features include:

- **Emergency Services Access** — Does the service provide free, 24-hour access to emergency services calling (“000 calls”)? IP telephony services do not universally support connection of emergency services calls. This is complicated by questions of geographic location. Since PSTN services are tied to service location, carriers are able to supply emergency services operators with the callers’ location. IP telephony services are not tied to a location and cannot at this point embed the caller’s location information in the call data passed to the operator. In this aspect of service, IP telephony is similar to mobile service. Market Clarity considers the ability to switch emergency services calls as a prerequisite for consideration as an LCS substitute. Market Clarity notes that the ability to switch emergency services calls does not eliminate complications that may arise due to the nomadicity of many VoIP service users.

1.4.2 Wholesale Line Rental (WLR) Service

Similarly, WLR candidate services are assessed relative to service features considered essential to a wholesale line rental service. Such features include:

- **Basic Access Service** — Does the wholesale voice provider also offer an access service? If so, does it use its own access infrastructure, or is it reselling another wholesale service? Does it matter? In this analysis, Market Clarity has adopted a narrow interpretation of the WLR service description, in that we view the provision of a basic access line as equating to a requirement for an access connection. Numerous infrastructure permutations are possible, and are described in Section 1.1.2.
- **Dial Tone** — Does the service provider's equipment provide the end-user with dial tone, directly interpret the dialled digits of the end-user when placing a call, and cause the end-user's telephone to ring when receiving a call? This might be achieved in a variety of ways, as listed in Section 1.1.2 above. At its most basic level, the provision of dial tone is a “network ready signal.” In PSTN networks, this is provided via dial tone. In mobile networks, network readiness signals are provided via a little 5-bar signal strength indicator on the mobile device that indicates when a handset has an active association to a nearby mobile base station, and can be used to place a call; and, will ring (or signal in some manner) an incoming call. Most VoIP handsets, softphones and IADs have some sort of display with an indicator of whether it is logged in to a SIP server or not. In this case, the logged in indicator serves as the “network ready signal.” In this analysis, Market Clarity has adopted a technology neutral interpretation of the WLR service description, meaning that a “network ready signal” — provided in a manner that is appropriate and in common practice with a given technology — be considered as the functional equivalent of dial tone.
- **Lifeline** — For the purposes of this document, “lifeline” service means the telephone service is available in the absence of other utility services, such as household electricity (for example, is the residential customer able to make telephone calls during a blackout?). While emergency services access is part of the USO definition of a standard telephone service, the “lifeline” aspect of the service is not. In the absence of legislation or industry standardisation, Market Clarity does not consider the provision of lifeline service as a prerequisite to the provision of a wholesale line rental service.

1.5 Other Considerations Relevant to Wholesale PSTN Services

When considering whether or not providers are able to offer PSTN services to the extent that Telstra does as an access provider with the WLR and LCS services, it is necessary to also look at other methods of providing PSTN services that might provide similar functionality, and be referred to using similar terminology, however relying on subtly different technical network arrangements to achieve the goal of providing a PSTN service.

Many voice service providers advertise wholesale PSTN services and the ability to carry PSTN traffic, but use the declared services of Domestic PSTN Originating Access and/or Domestic PSTN Terminating Access (often referred collectively as PSTN OTA) to interconnect with the Telstra network, and the networks of other infrastructure-based providers, such as the mobile telephone networks. While these services are not directly part of the current inquiry, they are nonetheless related as the PSTN TA component of the service may be required by a wholesale voice service provider to offer local calls.

Telstra has divided their national PSTN into 66 Call Collection Areas (CCAs), each of which encompasses many Exchanges. With Telstra's OTA service, an access seeker can interconnect their network with Telstra's PSTN network at one or more CCAs and gain a form of wholesale access to the subscribers within the CCA.

Once connected at a CCA, an access seeker can use the Terminating Access service to send calls to Telstra's network for termination on a telephone service within that CCA that is physically connected to the Telstra PSTN. Similarly, interconnection at a CCA using Originating Access is required for an access seeker network to receive calls from subscribers, which can then be transported outside the CCA for termination.

Using OTA, a service provider is able to provide and advertise PSTN services, functions and features using terms such as "provides local calls", "national coverage", "national voice network" and the like, that may easily be confused with similar-sounding services provided using WLR and/or LCS. In addition, these services are often purchased in a bundle including WLR and/or LCS in order to provide a complete telephone service solution. Determining the actual network interconnect arrangements used to underpin a particular service described in marketing material is often difficult and the information is not publicly available, as it is usually treated as commercial-in-confidence.

The issue is that providers that offer wholesale PSTN services in the marketplace, where their services are delivered through the use of Originating Access and/or Terminating Access interconnect at a CCA, are not able to offer a WLR-like service or a LCS-like service (at locations using the OTA service), as the Originating Access service only passes pre-selectable calls — domestic long distance calls, international long distance calls, and calls to other networks such as mobile networks. Local Calls are not passed to the access seeker's interconnects at all.

In order for a service provider to be capable of offering a LCS service, they must receive and switch a subscriber's local calls on their own infrastructure — only if this occurs are they able to offer a wholesale service as an access provider to another third-party access seeker in accordance with the LCS definition.

This forms the essential criteria we have attempted to use to ascertain if it is likely, from a provider's service descriptions and publicly available information about their voice network, that they are capable of offering connectivity equivalent to the LCS service definition, and/or are capable of offering an equivalent service to the WLR:

That the service provider's equipment provides the end-user with a "network ready signal," directly interprets the dialed digits of the end-user when placing a call, and causes the end-user's telephone to ring (or otherwise signal) when receiving a call. This might be achieved in a variety of ways, including through ULLS and equipment such as a DSLAM or MSAN installed in the exchange, or through an independent access network, or through a PSTN line function embedded within a device within the customer's premises such as a VoIP gateway.

Contrast this with the situation of a call collected using Originating Access, where these functions are provided by Telstra voice network.

2 Facilities-based Wholesale Voice Services

In this section, Market Clarity provides information on voice facilities owners who also provide wholesale services across this infrastructure.

Market Clarity has conducted an assessment of wholesale voice services on behalf of Mallesons Stephen Jaques. This assessment is designed to identify wholesalers of TDM and IP-based voice services that can be considered LCS or WLR candidates based on the following criteria:

- The company is a First Tier Wholesaler which owns infrastructure suitable to provide LCS or WLR services; and
- The infrastructure supports voice services that can be considered as PSTN replacement services.

2.1 Wholesale Voice Networks

For the purposes of this report, Market Clarity defines a wholesale provider as offering voice services over networks or switching infrastructure which they own. In the voice market, this would include those wholesalers that operate their own voice switching infrastructure (either TDM-based or IP-based). This is discussed in further detail in Section 1.3.

Whilst Market Clarity has taken care in its assessment of voice switching capabilities, Market Clarity notes that there are many aspects of voice network facilities and operations that could require a deeper assessment in order to fully understand the substitutability of these services for LCS or WLR.

This report is prepared from information collected by Market Clarity as part of its ongoing research program, and is compiled from a variety of sources including interviews with service providers, industry reports, marketing material and brochures, and information located on Internet websites.

Geographic information on service availability is presented in a variety of levels of granularity, from detailed lists of exchanges (typically for providers with equipment installed), to lists of CCAs (Call Collection Areas), city names, regional names, and simply “national coverage”. Some services, including wholesale telephone call termination and origination, can be provided on a national basis and on a per-CCA basis without a service provider having an access network or equipment within each exchange within the CCA or general region indicated, by using the declared services Originating Access and/or Terminating Access.

These providers may not be capable of offering an equivalent service to WLR or LCS, and may not be able to provide service in each exchange within a CCA. A mention of a service being available in a CCA or general region does not necessarily imply that services are available in every exchange within the CCA, city or general region indicated, or that the service might be a substitute for LCS or WLR.

Table 1, below, details the following.

- **Voice Network Coverage** — Five (5) PSTN voice network owners (AAPT-PowerTel, GoTalk, Optus, Soul and Telstra) offer national voice network coverage, including support for regional customers. Two VoIP providers (iVox and Soul) offer national coverage. The remaining providers have less extensive geographic coverage.
- **PSTN Facilities Ownership** — Only four (4) voice network owners (AAPT-PowerTel, Optus, Soul and Telstra) offer facilities-based PSTN services.
- **Wholesale VoDSL Services** — Only two (2) voice network owners (AAPT-PowerTel and Optus) offer facilities-based VoDSL services.
- **Wholesale VoIP Services** — Ten (10) providers (AAPT-PowerTel, engin, Freshtel, GoTalk, IP Systems, ISPhone, iVox, Nextep, Soul and Symbio Networks) offer wholesale VoIP services based on their own facilities.

Market Clarity notes that Network Coverage largely relies on operator self-reporting. The ability of a provider to offer a substitute for a WLR or LCS service somewhere within a CCA, city or other geographic area does not mean they can do so in every exchange within that geographic area, and should not be implied that all exchanges within the area have contestable service providers.

Furthermore, an operator's willingness to provide a wholesale voice service does not mean that the resulting wholesale service can serve as a substitute for LCS or WLR. The ability of a wholesale service to serve as a substitute for LCS or WLR is further considered in Tables 3 and 4, below.

Table 1. — Voice Network Owners Offering Wholesale Services

Wholesale Voice Service Provider	Voice Network Coverage (Where Known)	Offers Wholesale Facilities-based PSTN Services (Yes/No)	Offers Wholesale Facilities-based VoDSL Services (Yes/No)	Offers Wholesale Facilities-based VoIP Services (Yes/No)
AAPT-PowerTel	PSTN: National Wholesale ISDN service = Sydney, Melbourne, Brisbane Wholesale VoIP and VoDSL: metropolitan areas.	Yes	Yes	Yes

Wholesale Voice Service Provider	Voice Network Coverage (Where Known)	Offers Wholesale Facilities-based PSTN Services (Yes/No)	Offers Wholesale Facilities-based VoDSL Services (Yes/No)	Offers Wholesale Facilities-based VoIP Services (Yes/No)
engin	Sydney, Melbourne, Bairnsdale, Canberra, Adelaide, Hobart, Brisbane, Perth, many regional locations	No	No	Yes
Freshtel	Australia, UK	No	No	Yes
GoTalk	National	Yes	No	Yes
IP Systems	Availability: Most metropolitan locations	No	No	Yes
ISPhone	POPs in Sydney, Melbourne and Adelaide with plans for Perth and Brisbane in early 2008. This is part of a network build-out which will see a total of 14 POPs across the country by June 2008.	No	No	Yes
iVox	All Australian call zones	No	No	Yes
NEXTEP	Most areas of VIC, NSW and QLD. Nextep plans to extend coverage to all states across Australia and in most populated regional areas.	No	No	Yes
Optus	All Australian call zones	Yes	Yes	No - VoIP Gateway only
Soul	All Australian call zones	Yes	No	Yes
Symbio Networks	Sydney. Other locations may be available, but not stated.	No	No	Yes
Telstra	All Australian call zones	Yes	No	No - Retail Hosted IPT only

Table 2, below, provides details of the types of voice switch in use among the voice network owners identified in Table 1.

All of these voice network owners now operate IP-based voice switching platforms either as their sole switching platform (six providers) or in tandem with TDM-based switching platforms (six providers).

Table 2. — Voice Network Owner Voice Switching Platforms

Wholesale Voice Service Provider	Uses TDM-based Voice Switching Platform (Yes/No)	Uses IP-based Voice Switching Platform (Yes/No)	Voice Switching Platform Vendor(s)
AAPT-PowerTel	Yes	Yes	Nortel DMS digital switches and remote access nodes, Broadsoft
engin	No	Yes	Softswitch (vendor not known)
Freshtel	No	Yes	The Freshtel V2 Voicedot network consists of core technologies developed internally at Freshtel, supported by technology from Acme Packet, IBM, Sun, Oracle, Cisco and Juniper Networks.
GoTalk	Yes	Yes	Nortel DMS, Quintum VoIP softswitches and gateways.
IP Systems	No	Yes	Broadsoft, Cisco
ISPhone	No	Yes	Quintum
iVox	Yes	Yes	Customised softswitch, VegaStream VoIP Gateway, Sun servers
NEXTEP	No	Yes	NEC
Optus	Yes	Yes	Nortel DMS, Nortel Call Server 2000 and Sun server softswitches
Soul	Yes	Yes	Cisco, SIP-based softswitch
Symbio Networks	No	Yes	Lucent softswitch, ENTICE platform, Excel softswitch, Session Controller, VegaStream Gateway
Telstra	Yes	Yes	Alcatel (TDM and IP), Ericsson, Broadsoft

2.2 The Potential to Provide Wholesale LCS and WLR Services

In general, as outlined above we regard the essential criteria for determining if a service provider's infrastructure provides a substitute for LCS and/or WLR, such that they could then be an access provider and provide the service to an access seeker, are:

1. That the service provider's equipment provides the end-user with a network ready signal (dial-tone), directly interprets the dialled digits of the end-user when placing a call, and causes the end-user's telephone to signal when receiving a call.
2. The service provider makes this capability available to other service providers on a wholesale basis.

2.2.1 TDM-based Voice Networks: Candidates for the Wholesale LCS and WLR Services

Table 3, below, provides a summary of TDM-based networks, which, in Market Clarity's opinion, have the network and wholesale service characteristics to be candidates for the supply of LCS and WLR services within each provider's network footprint. We refer readers to the discussion in Section 1.5 on the ability of these providers to offer a substitutable LCS and/or WLR service at all locations within the service footprint.

Table 3. — TDM-based Voice Networks: Candidates for the Wholesale LCS and WLR Services

Wholesale Voice Service Provider	Wholesale Facilities-based TDM Services Market Clarity Opinion: Substitutable for LCS (Yes/No)	Wholesale Facilities-based TDM Services Market Clarity Opinion: Substitutable for WLR (Yes/No)
AAPT-PowerTel	PSTN: Yes ISDN PRA: Yes VoDSL: Yes - TDM voice is bundled with a ULL-based DSL service	DAL: Yes ISDN PRA: Yes VoDSL: Yes - TDM voice is bundled with a ULL-based DSL service
GoTalk	PSTN: Potentially - Unable to be definitive	No
Optus	PSTN: No VoDSL (ZedConnect): Yes - TDM voice is bundled with a ULL-based DSL service	PSTN: No VoDSL (ZedConnect): Yes - TDM voice is bundled with a ULL-based DSL service
Soul	PSTN: Yes ISDN PRA: Yes	Yes - Digital Voice Port (ISDN PRA)
Telstra	Yes	Yes

In Market Clarity's opinion, the five (5) TDM-based voice network owners identified in Table 1 as operating network facilities offer some services which can be considered as LCS / WLR candidates, at least within their own network footprint. However, as Table 3 shows, not all providers offering potential LCS substitutes also offer WLR substitutable services, or WLR-type services that are focused on the consumer market (VoDSL and ISDN are typically offered as a business service.).

2.2.2 IP-based Voice Networks: Candidates for the Wholesale LCS and WLR Services

Table 4, below, identifies IP-based voice networks, which, in Market Clarity's opinion, have the network and wholesale service characteristics to be candidates for the supply of LCS and WLR services within each provider's network footprint.

To provide a Local Carriage Service (LCS), Market Clarity assumes that the IP telephony provider is able to deliver a local carriage service across a "virtual line" which:

- Supports 24-hour free calling to emergency (000) services; and
- Can be substituted for the voice band frequency (3.1 kHz bandwidth) specified in the Declaration.

To provide a Wholesale Line Rental (WLR) service, Market Clarity assumes that the IP telephony provider is able to deliver an access link, coupled with "virtual lines" which:

- Provide full connection to their IP voice network, and from there to the broader PSTN;
- Allow assignment of unique geographic telephone numbers to an end user "virtual line";
- Can be substituted for the voice band frequency (3.1 kHz bandwidth) specified in the Declaration.

An IP telephony service allows the provisioning of "virtual lines" at the IP and SIP layers, by associating the user's account and IP address with a PSTN number provisioned in the IP telephony provider's gateway. This delivers connectivity equivalent to that obtained in the PSTN, allowing users to be provisioned with one or more unique telephone numbers. Note that it is not necessary for the first voice switch the call encounters to be in the same exchange, CCA or even State as the end-user.

In general, we also believe a VoIP-based service must also be operated over the same provider's broadband link or other form of data network to ensure equivalent quality of service (both audio quality, and reliability) to a traditional PSTN service. Market Clarity is of the opinion that VoIP service operated over a general Internet IP network infrastructure is not a suitable replacement for a traditional voice line at this stage.

Table 4. — IP-based Voice Networks: Potential to Provide Wholesale LCS and WLR Services

Wholesale Voice Service Provider	Facilities-based VoIP Services Market Clarity Opinion: Substitutable for LCS (Yes/No)	Facilities-based VoIP Services Market Clarity Opinion: Substitutable for WLR - Including the access connection (Yes/No)	Uses Own Access Equipment (Yes/No)	Offers Wholesale Broadband Access Services (Yes/No)
AAPT-PowerTel	Yes	Yes - When sold with access link.	Yes	Yes
engin	Yes	Potentially - When Naked DSL service is launched later in the year, or in conjunction with Unwired or 3rd party access links	No – Although this could change with the launch of broadband access services	Pending - Naked DSL, Unwired stake holding
Freshtel	Possibly – Local call services offered	No - Wholesale VoIP-based "line rental" services are not offered	No	No
GoTalk	Yes	No - Wholesale VoIP-based "line rental" services are not offered	No	No
IP Systems	Yes	Yes - When sold with access link.	Yes	Yes
ISPhone	Yes	Yes - When sold with access link.	No	Yes
iVox	Yes	Yes - When sold with access link.	No	Yes
NEXTEP	Yes	Yes - When sold with access link.	Yes	Yes
Soul	Yes	Yes - When sold with Voice Enabling Port (VEP) + access link	Yes	Yes

Wholesale Voice Service Provider	Facilities-based VoIP Services Market Clarity Opinion: Substitutable for LCS (Yes/No)	Facilities-based VoIP Services Market Clarity Opinion: Substitutable for WLR - Including the access connection (Yes/No)	Uses Own Access Equipment (Yes/No)	Offers Wholesale Broadband Access Services (Yes/No)
Symbio Networks	Yes	No - Wholesale VoIP-based "line rental" services are not offered	No	No

Of the ten (10) wholesalers in this table, all offer IP-based services that may act as LCS substitutes, but only those with facilities-based access can also offer WLR replacement services. Four (4) of the providers (AAPT-PowerTel, IP Systems, NEXTEP and Soul) are able to provide an end-to-end on-network connection in which the subscriber is connected directly to the provider's infrastructure. This would allow a retailer to offer a PSTN-like service sourced from a single wholesale provider.

Seven (7) of the providers listed in Table 4 currently offer wholesale broadband services. Of these, AAPT-PowerTel, IP Systems, NEXTEP and Soul are known to operate their own broadband infrastructure. IPhone and iVox act as second tier wholesalers for broadband access delivered across other providers' networks. VoIP provider engin is closely affiliated with fixed wireless broadband provider Unwired through The Seven Network. Seven is in the process of acquiring Unwired, and is a major shareholder in engin. In addition, engin has announced its intention to offer Naked DSL packages later this year.

2.2.3 Downstream Wholesale Customer Analysis: Ability for a Wholesale Customer to Offer LCS and/or WLR

In Table 5, below, Market Clarity details retail IP-based voice providers known to be customers of wholesalers identified as offering LCS-equivalent services. This table also identifies whether the wholesale customer owns any of the following access infrastructure:

- **DSLAMs** — Does the wholesale customer own its own DSL-based broadband access network?
- **Fixed Wireless** — Does the wholesale customer offer broadband access over its own fixed wireless access networks?
- **HFC** — Does the wholesale customer offer broadband access over its own hybrid fibre-coaxial (HFC) networks?

In each of the cases below, the wholesale customer could, within its own footprint, offer PSTN-replacement services through the combination of a wholesale voice service and their own access infrastructure¹⁰.

Table 5. — Downstream Customers of LCS Candidates

Wholesale Customer	Wholesale LCS Provider	Access Infrastructure		
		DSLAM (Yes/No)	Fixed Wireless (Yes/No)	HFC (Yes/No)
Adam Internet (AdamTalk)	ISPhone	Yes	No	No
BuzzPhone	iVox	No	Yes	No
Neighborhood Cable	IP Systems	No	Yes	Yes
Widelinx	IP Systems	No	Yes	No

Market Clarity is aware of four (4) retail service providers who are downstream customers of wholesale LCS candidates identified in Sections 2.2.1 and 2.2.2, and for whom the wholesale-retail relationship is in the public domain. Most of these retailers own fixed wireless access infrastructure, while only one provider (Neighborhood Cable) operates multiple physical infrastructure types (fixed wireless broadband and HFC).

Market Clarity is aware of other downstream customers of wholesale LCS candidates, but these wholesale relationships are commercial-in-confidence.

¹⁰ Market Clarity's **Telecoms Infrastructure Database** contains an inventory of Australia's telecommunications transmission infrastructure, covering such diverse technologies as DSLAM deployment, fixed wireless broadband base stations, HFC networks, mobile base station locations, access fibre, long-haul fibre, and point-to-point microwave systems. This database was used to determine access facilities ownership of the known wholesale VoIP services customers.