



Australian Government

**Department of Communications,
Information Technology and the Arts**

**EXAMINATION OF POLICY AND REGULATION
RELATING TO VOICE OVER INTERNET
PROTOCOL (VOIP) SERVICES**

**REPORT TO THE MINISTER FOR COMMUNICATIONS,
INFORMATION TECHNOLOGY AND THE ARTS**

**PREPARED BY
THE DEPARTMENT OF COMMUNICATIONS, INFORMATION TECHNOLOGY
AND THE ARTS**

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EXECUTIVE SUMMARY

This report has been prepared by the Department of Communications, Information Technology and the Arts (the Department) in consultation with the Australian Competition and Consumer Commission (ACCC) and the Australian Communications Authority (ACA). The ACA will merge with the Australian Broadcasting Authority (ABA) on 1 July 2005, establishing the Australian Communications and Media Authority (ACMA). In this report, recommendations for actions to be taken in the future refer to the Authority in its future form as ACMA.

Following is a summary of findings and recommendations.

Findings

- F1: A fundamental shift is occurring as telecommunications providers begin the transition to next generation networks (NGNs). As providers upgrade their core networks to Internet Protocol (IP), and as broadband access technologies become increasingly available and widely adopted, a range of voice, data and multimedia services will be enabled over a single broadband connection. Voice over Internet Protocol (VOIP) is one of the first manifestations of this shift. At the same time there is a movement from fixed to mobile access for both voice and data and increasing convergence and competition between fixed and mobile services.
- F2: While take-up of VOIP is strong in the corporate market in Australia, consumer take-up of VOIP is still in the early stages and it is unlikely to become a major mass-market technology in the next two to three years. However, consumer VOIP services are already available and at this stage, the regulatory approach does not appear to be unduly impeding these services or stifling innovation.
- F3: VOIP services that can make calls to, and receive calls from, other interconnected telephone networks, will generally fall within the regulatory definition of the standard telephone service. VOIP expands the range of services that fall within this definition, raising questions about what is a 'standard' service and whether all such services should be regulated to the same degree. In the short term, these issues appear to be manageable with some regulatory fine-tuning within the current framework and appropriate consumer awareness strategies. No changes to primary legislation have been identified as necessary.
- F4: One of the key changes to voice services brought about by IP technology is that services are no longer confined to fixed locations. Rather, services are inherently 'nomadic'. This means they can be picked up and taken with the user to other locations and plugged in and used anywhere there is broadband access. This is an attractive feature of the technology and is likely to develop further with NGNs. However, nomadicity creates regulatory and policy challenges in a number of areas, particularly in relation to numbering and the reliability of information in the location database used by emergency service organisations.
- F5: Consumers associate geographic numbers with expectations about the quality, features and pricing of their voice service. Through the Integrated Public Number Database (IPND), geographic numbers also convey location information to

emergency service organisations. Geographic numbers are therefore likely to remain important for the next few years at least and any approach to numbering of VOIP services should not deliberately accelerate any erosion of the integrity of geographic numbers.

- F6: Consumers associate geographic numbers with a location and mobile numbers with a person. The nomadicity feature of IP services has the potential to blur the boundaries between fixed and mobile services. There is an inherent tension between the desirability of personalised numbering associated with VOIP services and the well-established value of geographic numbers. The future evolution of numbering is a longer-term issue that needs to be considered in the NGN context. In the meantime a new number range to accommodate nomadic services would have value.
- F7: Industry charging on the basis of the number dialled is established and appears to be well understood by end users; where services are diverted to other answering points or services, callers understand they will pay for the number dialled. This expectation should translate to VOIP services, whether or not a service is being used nomadically.
- F8: Nomadicity affects emergency call services by making location information in the IPND potentially unreliable. This issue, not unique to VOIP services, is manageable in the short term through a combination of targeted regulatory measures and consumer awareness strategies. Internationally, efforts are being made to develop longer-term technical solutions to the location information issue as it is a concern to many governments.
- F9: No immediate VOIP-specific competition issues have been identified. The introduction of the technology is expected to have a mild positive effect on competition as application service providers and Internet service providers (ISP) begin offering voice services in competition with the incumbent telecommunications providers. However, some potential issues have been identified:
- the capacity of integrated operators to position themselves to control VOIP via their control of broadband access
 - the capacity of carriers to hold back the quality of rival services and applications employed over their networks
 - other potential new sources of bottleneck power emerging (although it is too early to know what all of these will be).
- F10: The framework to protect public safety and assist with law enforcement and national security remains very important. This includes obligations and measures relating to emergency call services, access, interception, privacy and the protection of security and critical infrastructure. VOIP poses some challenges in these areas but, with the exception of emergency call services, these will be addressed in separate processes already underway.

- F11: VOIP technology and capabilities are different from those of the circuit-switched telephone service and consumers differ in their ability to understand and use emerging voice services. To assist consumers to make informed choices there is a need for strategies to close the information gap between those who understand VOIP or will quickly come to do so and those who are less technologically aware. As with mobile services, change will come as people become more familiar with the technology.
- F12: It is important that the benefits of new technologies such as VOIP be made available as broadly as possible, including to those people with special needs such as the speech and hearing impaired. There do not appear to be any significant impediments to making and receiving calls to and from the National Relay Service (NRS) from a VOIP service. Like other users, people with disabilities can expect additional choices and will need more information about the quality and compatibility of different service and equipment offerings.
- F13: Quality of service for VOIP can be highly variable, but this does not mean that VOIP is necessarily a lower standard service. Calls made over the public Internet are subject to variable performance due to competition for Internet resources. Over managed networks the provider has end-to-end control of the services and can deliver good quality. In practice, quality of service is not likely to be a major issue as new providers will be competing with established voice services. Those offering a quality of service that is significantly lower than traditional telephony services are likely to find it difficult to compete in the market. In the short-term, quality of service issues can be addressed by providing information to enable consumers to compare services, and in the medium-term by industry self-regulatory processes consistent with international developments.
- F14: A key feature of emerging Internet-based services such as VOIP is that users can load an application or purchase a service that is separate from the underlying carriage service. This provides greater scope for services to be supplied from offshore, giving rise to concerns about the ability to enforce Australian law and its asymmetric application to domestically-based providers. This is a long-term issue which will be difficult to resolve without international cooperation.

Recommendations

- R1: As VOIP is one of the first manifestations of a more fundamental transition toward NGNs, a staged approach should be adopted to manage this process. This will require:
- a. a short-term, two to three-year strategy to finetune arrangements within the existing policy and regulatory framework to accommodate VOIP
 - b. continuing examination of the longer-term issues identified through this process pending a more comprehensive review of both the interim arrangements for VOIP and broader NGN issues.
- R2: The short-term strategy should deal with the immediate issues raised by VOIP. The key elements of the strategy should be:
- a. ensuring that the fully-featured service under the Universal Service Obligation (USO) remains available to all on request

- b. providing some regulatory flexibility in relation to VOIP within certain parameters (notably the application of the Customer Service Guarantee (CSG) and quality of service requirements) to facilitate market development. This would include the option of a separate number range (see separate recommendations below).

- R3: The longer-term strategy and work plan to deal with the broader transition to NGNs, including continuing VOIP issues, should be implemented by the Department in consultation with ACMA, the ACCC and relevant industry and consumer bodies. The work plan should include examination of the following:
- a. jurisdiction and extraterritoriality issues (that is, the enforcement of Australian laws on service providers located offshore)
 - b. interoperability and standards
 - c. emerging competition issues
 - d. potential critical infrastructure vulnerabilities and other security issues
 - e. changes in consumer expectations, perceptions and behaviour that may make some legacy regulation redundant
 - f. new technologies such as next generation messaging that provide opportunities to extend the services available to people with disabilities
 - g. potential international and domestic Internet governance issues including numbering and addressing and voice spam that flow over into the NGN environment
 - h. quality of service.

Numbering

- R4: A new number range should be made available for use by VOIP service providers. This range should accommodate services that depart from the expectations of a traditional telephone service, for example, because they are intended for itinerant use, are PC-based or otherwise differ significantly from the services on other number ranges.
- R5: Geographic numbers should continue to be made available to telecommunications carriers and other providers of services that are a close substitute for a traditional telephone service.
- R6: In seeking number allocations, and choosing the appropriate range, prospective VOIP service providers should have regard for ACMA guidance concerning the nature and characteristics of services for which the numbers will be used (Table 2 provides guidance on the types of services for which the different number ranges may be used, and the services for which geographic numbers are not considered appropriate). All services would be required to comply with service requirements in the *Telecommunications Numbering Plan 1997*.

Nomadcity

- R7: Because all VOIP services are capable of being moved, location information provided automatically to emergency service organisations may be inaccurate. VOIP services should be flagged in the IPND so that the emergency service operator will know they will need to ask the caller for location information. ACMA should give priority to consulting with law enforcement agencies, emergency service organisations and industry generally on how the end user and service provider can manage and update flags and other information in the IPND.
- R8: Industry should be encouraged to find a technical solution to the issue of location information reliability in IP services. ACMA should work with domestic providers and vendors to ensure that any global solution can be implemented in Australia.
- R9: Location dependent services need information about the location of the customer in order to route the call to the destination closest to the customer (for example services using 13, 1300 and 1800 numbers). In general, if a VOIP service is being used at a fixed location, the expectation is that calls to these numbers will reach the correct destination. Service providers should disclose to consumers any limitations in the operation of these services, for example where the service is being used nomadically.

Competition

- R10: Continued monitoring will be needed to identify new competitive bottlenecks and new forms of anti-competitive conduct. The ACCC should be asked to monitor and report on VOIP competition issues in its annual competition reports.
- R11: Number portability should apply to services within the geographic number range and the new number range but not between them.
- R12: The current preselection arrangements, which include provision for exemptions, should continue to apply.

Consumer issues

- R13: ACMA should conduct consumer and industry awareness activities about the differences between VOIP and circuit switched telephone services, and the ways in which customers can influence the performance of their VOIP service.
- R14: VOIP service providers should be required to disclose to customers the characteristics of the VOIP service and the differences between any VOIP service they purchase and traditional, circuit-switched telephone services. This would include:
- any differences in the application of the CSG
 - variations in quality of service that can be expected
 - reliance on mains powering
 - the number range (geographic or 05) which will apply to the service

- security vulnerabilities (such as viruses and hacking)
- the need to verbally provide location information to emergency services
- the operation of location dependent services when the service is being used nomadically
- whether the VOIP service allows a telephone touchtone keypad to be used for services such as telephone banking.

R15: Quality of service indicators should be developed by ACMA to enable consumers to meaningfully compare services and to facilitate subsequent monitoring by ACMA. This should be done pending the development of an industry quality of service code that could be applied to services that are close substitutes for a traditional telephone service. Such indicators could make reasonable provision for VOIP's specific operational characteristics. Quality of service in terms of both voice quality and service reliability is a longer-term NGN issue for consideration by industry bodies such as ACIF. In the transitional period when new service types are being offered, ACMA should increase its oversight of the quality of service offered to customers.

R16: The CSG should apply in full to VOIP only where the service is:

- a. supplied in fulfilment of the USO
- or
- b. the primary service provided to the premises and the VOIP service provider is also the carriage service provider.

R17: To the extent that VOIP service providers are carriage service providers supplying a standard telephone service, they should continue to be required to be members of the Telecommunications Industry Ombudsman (TIO) scheme.

R18: VOIP services should continue to be subject to relevant content regulation, including that currently applying to telephone sex services.

R19: To the extent that VOIP service providers are carriage service providers supplying a standard telephone service, they are required to comply with other existing obligations such as the provision of operator services and directory services, unless exempted via existing processes.

People with disabilities

R20: Access to new services should continue to be governed in accordance with the provisions of the *Disability Discrimination Act 1992*.

R21: In the longer term, consideration needs to be given to new technologies such as next generation messaging that provide opportunities to extend the services available to people with disabilities.

Public safety, law enforcement and national security

- R22: Two-way VOIP services that connect to the public telephone network must provide free 000 and 106 emergency call access and reliable calling line identification (CLI).
- R23: Dial-out only VOIP services must provide free 000 and 106 emergency access.
- R24: Critical infrastructure vulnerabilities arising from the increasing deployment of VOIP need to be examined. A review by the IT Security Expert Advisory Group of the security threats that could arise from VOIP is due to report by mid 2005.

Jurisdiction and extraterritoriality

- R25: The resolution of jurisdiction issues is a long-term challenge that requires further work and cooperation in international fora. Dealing with extreme cases of regulatory non-compliance by offshore providers will require further examination, but potential sanctions include refusal of resources such as numbers, consumer warnings, blacklisting and 'do not deal' rules.

Application of subordinate regulation, industry codes and standards

- R26: ACMA should review and amend relevant subordinate regulation to ensure it is applicable to VOIP, including the timeframes and requirements in the CSG standard and the requirements for the labelling of equipment in customers' premises.
- R27: ACIF should be requested to review and amend as necessary the codes, guidelines, standards and specifications that currently apply to standard telephone services to ensure they apply appropriately to VOIP services and are technology neutral as far as possible.
- R28: ACMA should examine the implications of VOIP for the operation of technical regulation generally.
- R29: New and non-traditional providers of networks and services should be encouraged to participate in industry self-regulation processes and in ACIF's work on NGN issues.

Review

- R30: The ongoing development of VOIP services should be monitored. As clearer indications emerge of how these services are likely to develop, consideration should be given to conducting a more comprehensive review encompassing both the operation of the interim arrangements for VOIP and the broader issues posed by NGNs.

1. INTRODUCTION

This report documents the findings and recommendations of a study by the Department, in conjunction with the ACA and the ACCC into the appropriate policy and regulatory framework for emerging VOIP services. The document presents a framework approach that takes account of extensive consultation between all three agencies. It is not exhaustive in matters of detail and a number of specific issues will require ACMA and the ACCC to undertake further work and consultations within their own areas of responsibility. A detailed discussion of specific issues is contained in [Section 4](#) and [Appendix 1](#).

Context and process

In 2004 there was growing industry and community interest in the mass market provision of voice communications services using VOIP technology. Adoption is being driven by the corporate market, with IDC reporting a 98 per cent increase in corporate VOIP services between 2003 and 2004. This trend is expected to continue. Frost and Sullivan estimate that IP telephony will make up 69 per cent of the large business and corporate sector by 2007.¹ At this stage, small-to-medium enterprise and consumer uptake remains low, but there is increasing interest in VOIP from these sectors as broadband access improves and consumers become more confident with the technology.

In August 2004 the Minister for Communications, Information Technology and the Arts asked the Department to give priority to examining the policy and regulatory issues arising from the deployment of VOIP, particularly potential barriers to market entry and innovation.

The Coalition, in its 2004 election policy, *Information Technology: Connecting an Innovative Australia*, undertook, if re-elected, 'to review and, if necessary, legislate to remove barriers to entry for next generation services such as VOIP'.²

In addition, in October 2004 the industry regulator, the ACA, released a discussion paper on how VOIP fits within the existing regulatory framework as well as on some of the more immediate regulatory issues associated with the provision of VOIP services on which the industry had sought clarity.³ The paper made a call for public submissions closing 31 December 2004. The Department and the ACCC also released discussion papers in late 2004 inviting comments via the ACA's process or to the agencies directly.⁴

To complement the public consultation process, joint consultative workshops were held in Brisbane, Melbourne, Perth and Sydney in early December 2004.

1 Paul Budde Communication, *Australia – NGN – VoIP – Stats, Overview, Analyses*, 2005.

2 The Coalition, *Information Technology: Connecting an Innovative Australia*, 2004, p17.

www.liberal.org.au/2004_policy/Sept19_Information_Technology_final.pdf

3 Australian Communications Authority, *Regulatory issues associated with provision of voice services using Internet Protocol in Australia: Discussion paper*, October 2004.

http://internet.aca.gov.au/acainterwr/aca_home/issues_for_comment/discussion/aca_voip_dp.pdf

4 Department of Communications, Information Technology and the Arts, *Discussion paper: Policy and regulatory issues for emerging voice services*, November 2004.

www.dcita.gov.au/__data/assets/pdf_file/16852/DCITA_joint_voip_workshop_paper_041129_Final.pdf

Australian Consumer and Competition Commission, *VoIP services – Competition implications*, November 2004.

www.accc.gov.au/content/item.php?itemId=549642&nodeId=file41aa53c1b5ff7&fn=VoIP%20competition%20issues.pdf

In total, 49 submissions were received and examined by the three agencies. The Department, the ACA and the ACCC have worked closely in examining the issues raised by VOIP.

Scope of the review

The report focuses on issues relating to voice telephony and does not extend to wider Internet or NGN issues. Given the rapid pace of development and the need to accommodate innovation, the report seeks to be sufficiently comprehensive to provide timely guidance to industry and the community. That said, some conclusions can only be tentative at this time.

The review did not examine:

- issues concerning the costing, funding and scope of the USO, which were reviewed in April 2004⁵
- issues addressed by the ACCC review of price control arrangements applying to Telstra, which was publicly released on 30 March 2005.⁶

Similarly, the Attorney-General's Department has responsibility for privacy and interception issues. While there are specific privacy obligations in the *Telecommunications Act 1997*, privacy policy is primarily a matter dealt with in the Attorney-General's portfolio. The Office of the Federal Privacy Commission provided a report to the Attorney-General on 31 March 2005 on its review of the private sector provisions of the *Privacy Act 1988* which may have implications for the consideration of VOIP privacy issues. The work of the Attorney-General's Department will be supported by the Department and ACMA, but the issues are not covered in any detail in this report.

Key principles

In undertaking the review, the Department's starting point, consistent with the general objects of the telecommunications regime set out in section 3 of the Telecommunications Act and broad Government policy, has been:

- promoting competition and service innovation as a means of delivering benefits to the community
- protecting consumer interests in such areas as pricing, fault handling, quality of service, privacy and complaint handling
- protecting the public interest in such areas as emergency service access, law enforcement and national security
- ensuring the framework remains as technologically neutral as practicable
- promoting the practicable use of industry self-regulation.

⁵ Department of Communications, Information Technology and the Arts, *Universal Service Obligation (USO) and Customer Service Guarantee (CSG) Review*, June 2004.
www.dcita.gov.au/tel/fixed_telephone_services/industry_issues/the_universal_service_obligation_uso/universal_service_obligation_uso_and_customer_service_guarantee_review_csg

⁶ Australian Competition and Consumer Commission, *2004 Review of Telstra Price Control Arrangements*, 30 March 2005.
www.accc.gov.au/content/index.phtml/itemId/599799/fromItemId/599715

In addition to these general principles, in conducting the review, the Department has also had regard to the following regulatory principles:

- maximising regulatory certainty and predictability for consumers and industry through the transition to NGNs
- minimising regulatory disruption
- avoiding, as far as possible, regulatory tilt that might artificially encourage or discourage the take up of particular service types and options
- ensuring there is sufficient flexibility to deal with future and unforeseen developments.

2. VOIP AND CIRCUIT-SWITCHED VOICE SERVICES—KEY FEATURES

The traditional telephone service everyone is familiar with has been around for more than 100 years. While many aspects of it have changed, its basic operation has largely remained the same. It is an analogue service in which the sound waves of speech are converted into electrical waves by the microphone in the telephone's mouthpiece for transmission and reconverted into sound waves by the speaker in the receiving telephone's earpiece. These analogue calls are passed over dedicated electrical circuits established between the caller and the called party. That is, it is a circuit-switched service.

With the increasing digitalisation of communications, analogue transmission of voice calls in the trunk telephone network has gradually been replaced by digital transmission. This involves the analogue signal being electronically sampled and converted into data (in a similar way to the encoding of music on a CD) for transmission. Digital transmission supports efficiency gains in transmission and more sophisticated call processing.

Further advances in technology, the increasing take-up of broadband connections and commercial forces are now seeing digital transmission of voice calls extended to users' premises.

What is VOIP?

Voice over Internet Protocol technology encodes voice communications into IP packets for transmission. The term VOIP might best be used to denote this basic technology. Generally, however, VOIP is used as a catch-all for a range of voice services, often quite different. VOIP services require a broadband connection which could be provided over different broadband infrastructures (e.g. DSL, HFC, WiFi, and optical fibre).

VOIP service types

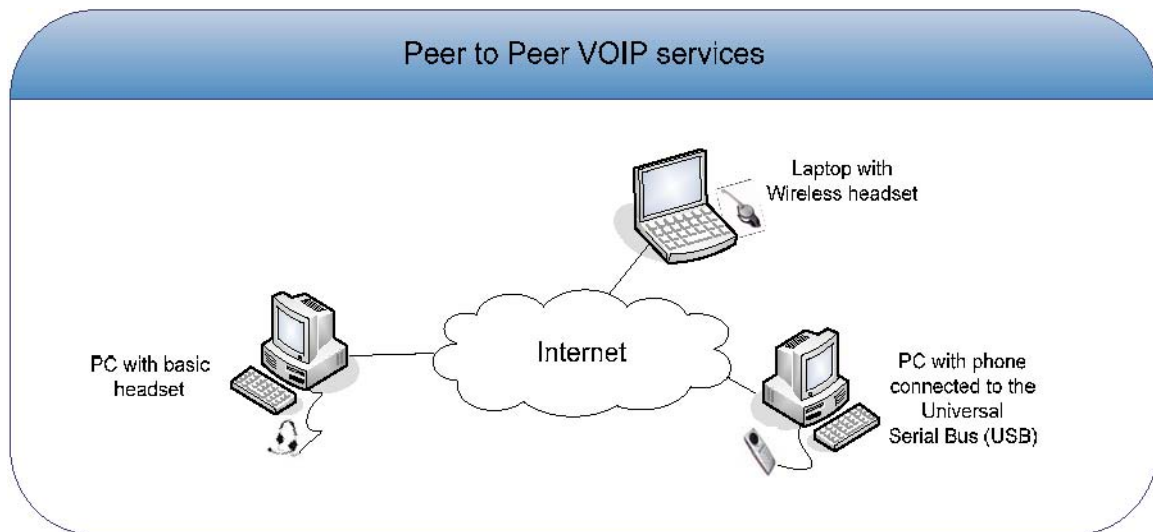
As a basic method of providing voice communications, VOIP can be used in many ways. It can be used to provide telephony services. It can also be integrated into other services to provide a voice communications capability, but not necessarily telephony as it is generally understood. For example, VOIP can be integrated with online advertising to enable customers to 'click to talk' to a sales consultant. Such hybrid services are considered in this report, but the main focus is on telephony services.

In terms of connectivity, there are four possibilities:

1. Peer-to-peer services—isolated from the public telephone network and allows users only to make and receive calls on-net.
2. Dial-out only services—which allow the user to make outgoing calls, including to public telephone numbers, but not to receive calls.
3. Dial-in only services, which support only incoming calls from public numbers—these do not feature in the current discussion but would appear to be an option for premium rate services and for services with 13, 1300 and 1800 numbers.

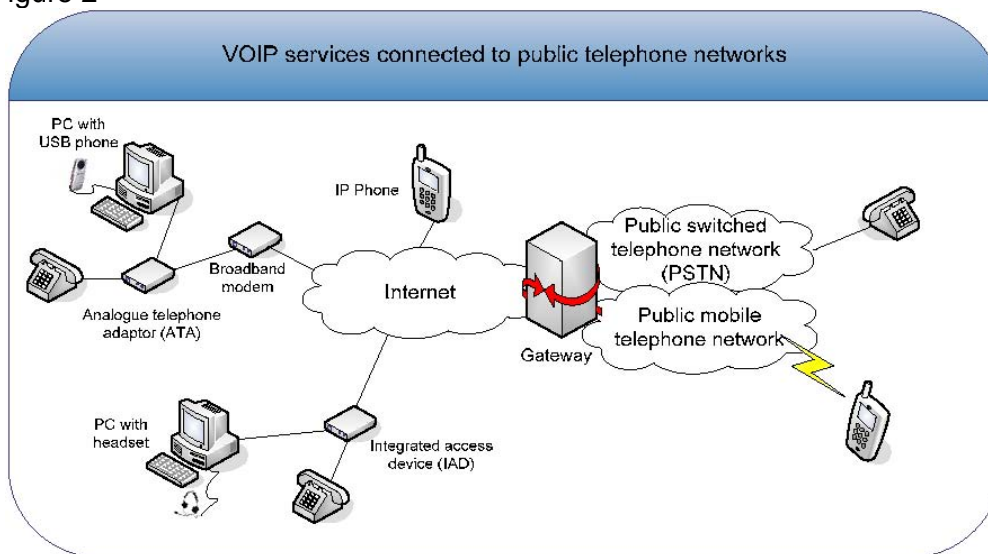
- Services providing any-to-any connectivity—that is the ability to make or to receive a call to or from any other telephone.

Figure 1



Source: DCITA

Figure 2



Source: DCITA

VOIP supply scenarios

The supply of VOIP services requires basic infrastructure, a carriage service and a voice application. Different kinds of service providers may offer services with different levels of integration between each element. For example:

- *Peer-to-peer VOIP services* for on-net calls (not connected to the public telephone network) are typically provided by an online provider, requiring the user to have a separately sourced broadband connection.
- *VOIP over broadband services* provide interconnection with other types of voice services. These are typically provided by an online provider with the user having a

separately sourced broadband connection.

- *Vertically integrated VOIP services* that offer interconnection with other types of voice services bundled with both a broadband connection and ISP service.
- *Corporate or enterprise VOIP services* generally provide the highest voice quality of service of all the VOIP service types, with interconnection to other types of voice services.

Regulation of telephone services does not impinge significantly on peer-to-peer services or corporate networks. Consequently, with a few exceptions, this review focuses in most detail on the other supply scenarios in which consumers have access to services with public numbers.

VOIP service options

The diversity of services available to the public is illustrated below in Table 1, which shows that voice services may be delivered as:

- traditional telephone connection
- close substitute with a telephone handset independent of a personal computer
- service that is based on a personal

or

- laptop computer.

Variations are also possible where cable or wireless broadband connections are used, or where dual mode handsets are available. It is also likely that all services will be capable of being provided as a 'softphone' to be loaded on to a laptop or another programmable device or as a telephone look-alike plugged into or incorporating a specific VOIP adapter. These options could be deployed to different market sectors or at different times.

In Table 1, the traditional telephony model gives users the least influence over the way the service is configured. More flexible service options give users more influence over the way the service is configured and used.

Table 1 is confined to services with access to the public telephone network. In sections 1 and 2 of the table, a voice service with an independent handset is likely to be associated with a location—much like a traditional fixed telephone service, whereas the services in sections 3 and 4 are likely to be associated with a person—more like a mobile telephone service. However, with VOIP the distinction between fixed and mobile services becomes less distinct than it has been in the past.

Table 1. VOIP service options

Service character	Availability of service	Selling point
1. USO service or stand alone voice service	Always on	Quality
Example 1: Service provided in fulfilment of the USO	Static and always on	Quality service
Example 2: Stand alone voice service to the premises	Static and always on	Quality service
2. Stand alone telephone	Normally available	Quality
Example 3: Bundled supply of handset, software, voice service and Internet connectivity using a managed network	Normally available, subject to user setup	Marketed as quality service with lower cost
Example 4: Bundled supply of handset, software, voice service and Internet connectivity using the public Internet	Normally available, subject to user setup	Marketed as quality service with lower cost
Example 5: Bundled supply of handset or modem and voice service independent of a personal computer	Normally available, subject to user setup	Marketed as quality service with lower cost
3. PC-based service	Depends on user setup	Economy
Example 6: Bundled supply of software and voice service for use with a personal computer, with or without handset	Availability depends on user setup and dynamic choices	Marketed as cheap calling option
Example 7: User purchases software, voice service and connectivity as separate elements for use with personal computer, with or without handset	Availability depends on user setup and dynamic choices	Marketed as cheap calling option
4. Itinerant service	Depends on network access and user setup	Mobility
Example 8: User purchases voice service for itinerant use, with or without handset, e.g. for WiFi use. (Dual mode mobile handset may also be used under separate mobile carrier licence)	Intermittent availability	Marketed as versatile and location independent

The descriptive information in the table is based on current market conditions. It illustrates the diversity of VOIP services that can interconnect with the public telephone network. It is not a hierarchy and it does not represent a formal classification system. In some cases, users may change the way they use a service, for example moving between a desktop location and a laptop computer.

Location independence

One of the main differentiating features of VOIP is that users can access their service at different locations. This capability, known as ‘nomadicity’, allows an itinerant user to make and receive calls wherever there is access to a broadband connection. On the other hand, it calls into question the reliability of location information associated with numbers in the IPND. Location-based number allocations are also important because of consumer expectations about charging. Users are already familiar with similar issues in the mobile context, with its separate number range.

Quality of service

Quality of service for VOIP can be highly variable, but this does not mean that VOIP is necessarily or in the medium-term to be regarded as a lower standard service. To a large extent it depends on the degree of control the service provider has over the call from origination to termination. Calls made over the public Internet are subject to variable performance due to competition for Internet resources. Over managed networks the provider has end-to-end control of the services and should be capable of delivering good quality.

At a practical level, users of a VOIP service share responsibility for the overall quality of their service. It will be affected not only by the standard of service provided by the underlying broadband connection and the voice service provider, but also by the quality of the user's installation and the actions of the user—who may, for example, be running other applications at the same time as a voice call.

3. VOIP UNDER THE CURRENT POLICY AND REGULATORY FRAMEWORK

Voice services generally are subject to the telecommunications regulatory regime set out in the Telecommunications Act, the *Telecommunications (Consumer Protection and Service Standards) Act 1999* and Parts XIB and XIC of the *Trade Practices Act 1974*. They are also subject to many subordinate regulatory instruments and self-regulatory industry codes, standards and guidelines.

The key to classifying VOIP services under the current framework, and therefore determining the regulatory obligations that apply to them, are the concepts of:

- ‘carriage service’, and ‘carriage service provider’ in the Telecommunications Act
- ‘standard telephone service’ in the Telecommunications (Consumer Protection and Service Standards) Act.

Under the Australian regime, where VOIP services fall within these definitions, they are subject to the relevant regulatory requirements unless exempted.

Are VOIP services carriage services?

While there is some scope for debate about particular cases, it appears that in most instances VOIP services interconnecting with the broader telecommunications network are carriage services. (That is, they are electro-magnetic services for carrying communications between points, where ‘carry’ or ‘carriage’ includes transmitting, switching and receiving). Given that VOIP services will generally be services carrying communications between points over one or more network units owned by one or more carriers and supplied to the public, the providers of these services will be carriage service providers. Where VOIP services and providers fall within these definitions they are subject to the obligations that apply, including compliance with the Numbering Plan, number portability requirements and requirements relating to law enforcement, national security and privacy.

In the less regulated area of peer-to-peer VOIP services, users may be responsible for assembling different elements of their service. For example, they could obtain software for a voice service and combine it with broadband carriage capacity provided by another party. As a further complication, the user may obtain software and an Internet voice service from an overseas supplier. While this is likely to have limited impact in the area of public telephone services, it does add complexity to the application of broader carriage service provider obligations, particularly where there are questions of international jurisdiction.

Are VOIP services ‘standard telephone services’?

Under the current framework if a voice service is a carriage service for the purpose of voice and provides ‘any-to-any’ connectivity (that is, it can make calls to, and receive calls from, other telephones connected to other interconnected telephone networks), then it is considered to be a standard telephone service. Most VOIP services connected to the public network meet this definition of a standard telephone service and, therefore, attract a wide range of regulatory obligations, including emergency service access, preselection, provision of CLI, provision of access to the NRS, the CSG and membership of the TIO scheme.

Some VOIP services are unlikely to meet the definition. For example, peer-to-peer VOIP services do not pass the any-to-any connectivity test if they are purely Internet-based: a one-way connection to the public telephone network (dial-in or dial-out) provides only limited connectivity. Some services are not offered solely or primarily for the purpose of voice—for example, hybrid services where the voice component is ancillary to an online game.

Despite these ambiguities, where these new services interconnect with the broader telecommunications network, they will most likely be considered carriage services and be subject to carriage service regulation. ACMA, however, can exempt providers from certain carriage service obligations where such obligations would not be consistent with the objectives of the telecommunications legislative framework.

Overseas policy and regulatory approaches to VOIP

The policy and regulatory framework for VOIP has been examined by many jurisdictions around the world, including Canada, the European Union, Hong Kong, Japan, Korea, the United Kingdom, and the United States. For regulatory purposes, most countries, apart from the United States, are treating VOIP services (generally with the exception of peer-to-peer services) like other voice services. Most have a tiered approach to regulating voice services, which appears to recognise the need for a legislated guarantee of access to a telephone service of a high quality. Beyond this, there seems to be acceptance that other voice services may be less regulated.

The United States is generally not treating VOIP services in the same way as traditional telephone services, instead treating them as computer-based ‘information services’ that are relatively unregulated. However, arrangements for legal interception, emergency service access, disability access and USO contributions remain in contention.

Views expressed in consultations and submissions

A total of 49 submissions were received in response to the ACA, the ACCC and the Department’s call for submissions. They fall into three broad categories with some arguing for:

- the status quo whereby all VOIP services should preferably meet all standard telephone service (STS) requirements, though conceding that some variation may be inevitable (some incumbents and consumer groups particularly)
- a light touch regulatory approach whereby VOIP should be free of most, if not all, regulation—some qualify this, wanting a light touch until the technology matures (especially US-based VOIP service providers and companies, some industry associations and some Australian-based VOIP service providers);
- a two-tier regulatory approach whereby there is a standard service subject to full regulation, as well as provision for less regulated services with VOIP service providers choosing which type of service to offer (some incumbents and Australian and overseas-based VOIP service providers).

A number of respondents stressed the importance of aligning Australia's regime with overseas countries such as the United Kingdom on the one hand, or United States on the other.

A sizable number of submissions were received from emergency service organisations (police, fire and ambulance). Most emergency service organisations want VOIP services to provide full 000 functionality, including the provision of accurate CLI and location information. Most also stress the importance of voice quality in emergency situations and want voice services to be highly reliable.

Does the current policy and regulatory framework impose unreasonable barriers to entry on VOIP?

Carriage service regulation includes compliance with the Numbering Plan, number portability requirements, a requirement for the provision of information to the IPND and requirements relating to legal interception, cooperation with law enforcement agencies and privacy. These obligations are generally important both to the consumer and to the national interest. As such, they represent the minimum set of obligations that should apply to all providers of voice services.

It is arguable that the current standard telephone service definition is too broad—covering an increasingly diverse range of services creating definitional difficulties around what is a 'standard' service—and is used to do too many things in the current legislation. This issue is not unique to VOIP services. The risk with such a broad definition is that by capturing a wide range of services and subjecting them to the same level of regulation, choice and innovation could be restricted.

In fact, however, new VOIP services are being offered in the marketplace. The cost of entry to the market for VOIP service providers is relatively low. Application providers and ISPs are offering VOIP as an add-on to broadband access, and consumers benefit from the low cost of equipment. In the mobile market, data and video have been added to cellular services without changes to the regulation of mobile voice services.

In summary, it appears that the current regulatory framework does not present an unreasonable barrier to VOIP services entering the market. In general, carriage service regulation is appropriate for all voice services, including VOIP services. While standard telephone service regulation is wide-ranging and in some cases specific to the public switched telephone network (PSTN), its application to VOIP appears to be manageable in the short term with some regulatory fine-tuning. ACMA has considerable discretionary powers under the current framework to exempt services on an individual or class basis from specific obligations attaching to the standard telephone service. For greater clarity, the framework for the application of obligations and exemptions can be set out in regulatory instruments. These and other regulatory issues are discussed in sections 4 and 5.

In the longer term, it may be appropriate to review the standard telephone service definition in light of the increasing range of services entering the market.

Effect on competition

VOIP services have introduced new opportunities for competition on the basis of price and functionality. With relatively low levels of take-up so far, there appear to be no negative effects on competition arising from the entry of this technology into the market and no immediate competition issues have been identified. However, providers of VOIP services and other packet-based information services will continue to rely on networks managed by separate network operators. Broadband network providers could be in a position to favour their own services over those of competitors, and this will need to be monitored. Particular issues for attention include:

- the capacity of integrated network operators to position themselves to dominate the VOIP market through their control of broadband access
- the capacity of carriers to constrict the quality of rival services and applications employed over their networks
- other potential new sources of bottleneck power that may emerge (although it is too early to know what these will be).

Overall, the introduction of VOIP technology is expected to have a mild positive effect on competition as application service providers and ISPs begin offering voice services in competition with the incumbent telecommunications providers. The impact will probably be less than in countries like the United States, where VOIP strategies feature as a leading aspect of vigorous competition between established cable television companies and telecommunications carriers.

Extraterritorial supply and enforcement issues

International business services are well established with corporate networks (often IP-based) being accommodated within the Australian telecommunications framework with little difficulty. Services provided directly to consumers, however, could raise new issues.

Internet-based services such as VOIP can be provided from an offshore location, beyond the reach of Australia's telecommunications regulation. This is particularly true for peer-to-peer services but could also be true of services interacting with the public telephone network. It could add complexity, for example, to the issue of emergency call access, or it could impede the enforcement of legal interception requirements. More broadly, off-shore services could challenge the competitive neutrality of telecommunications regulation and evade Australian consumer protections. These issues are discussed further in section 4.

4. THE FUTURE POLICY AND REGULATORY APPROACH TO VOIP

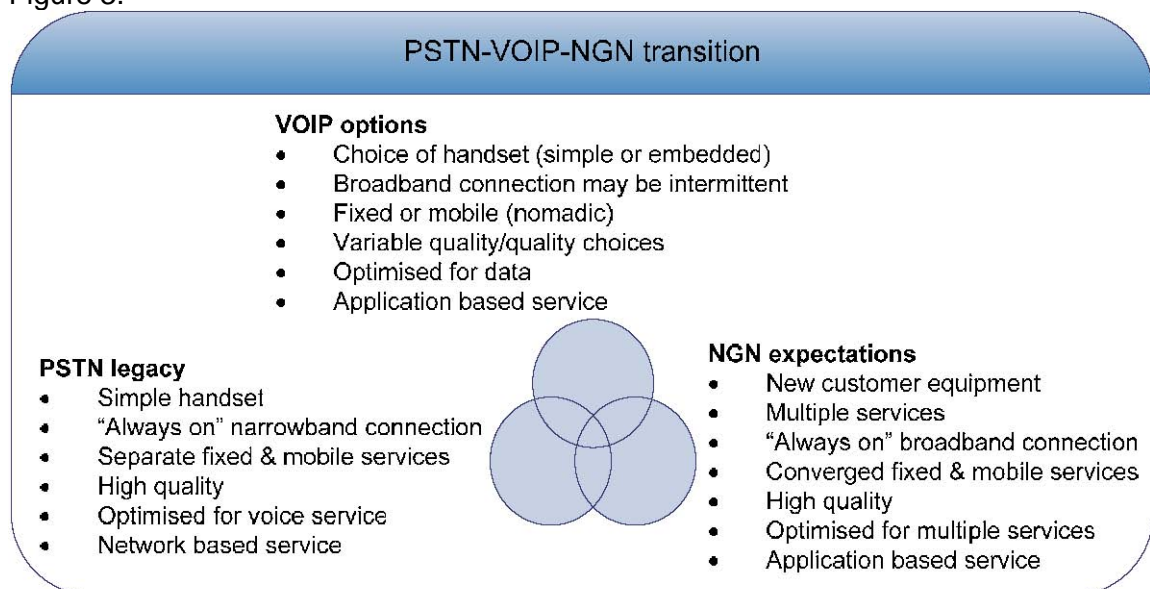
Transition—short-term and long-term perspectives

A fundamental shift is occurring as telecommunications providers begin the transition to NGNs. Over the next few years, carriers are expected to renew the switches at the core of the network, replacing the circuit switches that were designed to open and close voice circuits with new switches designed for handling data. This ‘next generation’ network will enable packet-based data, including voice traffic, to be transmitted across the whole network. Another change coming with NGNs, although it might take longer, is the widespread take-up of broadband terminal equipment to connect directly into the new IP-based networks.

When these two developments come together, voice traffic using end-to-end packet switching (probably IP-based) will replace analogue telephony. This is a long-term scenario. In the meantime, as discussed in section 2, several different kinds of VOIP services are entering the market, with different levels of quality and security, and with different business models and markets. These new providers are attracted by the reduced capital cost of voice service network equipment.

At this stage, it is not clear how the market will respond to these various offerings, nor what the new balance will be between fixed and mobile services, or between Internet and carrier based services. Further variations, including dual mode fixed-mobile, and mobile-IP telephones will extend the range of choice available over the next two or three years. While the technology has developed rapidly in recent years, there is further scope for innovation and for advancement.

Figure 3.



Source: DCITA

In these complex and rapidly changing circumstances, a nuanced policy and regulatory framework is needed. While it is important to take account of the changes under way, it would be unwise either to try to make assumptions about market developments, or to force them with premature regulation. As far as possible, the regulatory framework should be

technologically neutral, and be able to be applied appropriately and proportionately to services provided on different technology platforms.

Given the rate at which new technologies are becoming available and at which the market is changing, it seems realistic to suggest that interim arrangements should be put in place to cover the next two to three years. As it is difficult at this stage to look beyond that time frame in the development of VOIP services, ongoing development of VOIP services should be monitored. As clearer indications emerge of how these services are likely to develop, consideration should be given to conducting a more comprehensive review encompassing both the operation of the interim arrangements for VOIP and the broader issues posed by NGNs.

This section of the report looks at both short and long-term strategies for responding to the developments that are in train. VOIP must be seen in the context of its long-term development and potential to replace the public telephone network in an NGN world. Ideally, measures that are put in place now should act as a bridge to assist the transition to the NGN future.

Short-term strategy

In the Department's discussion paper of December 2004, a number of options for classifying VOIP services were canvassed, including various two-tier classificatory models and an NGN model. These options were considered unsuitable for our current purposes, largely because they would require more regulatory change than is necessary given the developing state of the market. There was also concern that a two-tier approach would take longer to implement and could increase the potential for regulatory gaming and tilt.

The state of the market at present does not call for fundamental changes in the policy and regulatory framework to facilitate market entry, but some adjustments are needed in the short-term to facilitate informed consumer choice and continued market development.

The proposed approach is to accommodate VOIP services within the existing framework in the short-term. VOIP services are generally considered to be carriage services and standard telephone services and subject to the obligations that attach to them. VOIP service providers will be granted some flexibility, particularly in relation to the application of the CSG, quality of service requirements and numbering. However, to maintain public safety standards, all VOIP services that terminate calls on the public telephone network will continue to be required to provide free 000 and, for text services supplied to people with disabilities, 106 emergency call access and accurate CLI. In relation to location information, VOIP services will be flagged in the IPND as a signal to emergency service personnel that they will need to ask for location information. Compliance with this new requirement should be targeted as part of ACMA's ongoing audit project for the IPND. The expectation is that technical solutions to the issue of reliability of location information will be developed.

This approach will be supported by new consumer disclosure requirements and consumer information to assist informed decision-making.

It will be important also for government agencies to be alert to market developments in the transition to NGNs. As multiple services are provided over broadband networks, government agencies will need to monitor developments against core communications policy objectives, including the growth of a competitive market, the maintenance of appropriate consumer safeguards, and the protection of other national interests.

Numbering issues

Consumers take for granted some aspects of the telecommunications environment that could be put at risk by premature changes in regulatory settings. For example, consumers associate geographic numbers with expectations about the quality, features and pricing of their voice service. They may not be aware that, through the IPND, the numbers also convey location information to emergency service organisations. This is likely to remain important at least for the next few years. Any approach to numbering of VOIP services will need to take account of this and should not deliberately accelerate a breakdown in the integrity of geographic numbers. The future of geographic numbering is a longer-term issue associated with the growing convergence of fixed and mobile services—an issue that needs to be considered in the NGN context.

Submissions from providers generally favoured the introduction of a new number range. Only a small number wanted VOIP to use geographic numbers only. Opinion differed about whether all or only some VOIP services should also have access to geographic numbers. There were also differences around the purpose of an additional number range. Some submissions advocated using a separate range to distinguish fully nomadic services, others wanted to distinguish ‘non-standard’ services and still others wanted more than one new number range to distinguish between the varying levels of quality of service offered by VOIP services. It seems clear that for providers, consumers, emergency services, and other stakeholders, a new number range would have value in the market, providing useful signals about location independent accessibility, functional innovations (including potential multi-media and cross-platform options) and pricing. A new, non-geographic number range may also be attractive for consumers in that they can take the number with them if they move to a new geographic location either temporarily or permanently (as with a mobile number).

It is therefore proposed that a new number range should be made available for use where providers want to send a different marketing message about the service. The number range proposed by ACMA is the 05 number range. The new number range could accommodate services intended for itinerant use, PC-based and other innovative services, as well as services that cannot meet all of the standard telephone service regulatory requirements.

Geographic numbers should continue to be made available to telecommunications carriers and other providers of services that are a close substitute for a traditional telephone service. For practical purposes, this refers to a service with a conventional handset associated with a fixed location, capable of being used independently of a computer and its associated passwords and access routines. Such a service will normally provide an active connection for incoming calls, and can be used by any person to make outgoing calls. This would include a service that Table 2 describes as a USO or stand alone voice service, or a service with a stand alone telephone handset as illustrated by examples 1 to 5.

Table 2. Proposed regulatory adjustments to CSG, quality of service and numbering

VOIP service character	Customer Service Guarantee	Quality of service	Public number
USO service or stand alone voice service	CSG applies	PSTN equivalent	Geographic
Example 1: Service provided in fulfilment of the USO	CSG applies	PSTN equivalent	Geographic number
Example 2: Stand alone voice service to the premises (first line VOIP)	CSG applies	PSTN equivalent	Geographic number
Stand alone telephone	No CSG	High quality of service	Geographic or non-geographic
Example 3: Bundled supply of handset, software, voice service and Internet connectivity using a managed network	No CSG – consumer disclosure	Consumer advice on expected service level – code to be developed	Subject to user & supplier preference
Example 4: Bundled supply of handset, software, voice service and Internet connectivity using the public Internet	No CSG – consumer disclosure	Consumer advice on expected service level – code to be developed	Subject to user & supplier preference
Example 5: Bundled supply of handset or modem and voice service independent of a personal computer	No CSG – consumer disclosure	Consumer advice on expected service level – code to be developed	Subject to user & supplier preference
PC-based service	No CSG	Depends on user conduct and underlying service	Non-geographic
Example 6: Bundled supply of (handset), software and voice service for use with a personal computer	No CSG	Consumer advice on expected (lower) service level	Non-geographic number
Example 7: User purchases (handset), software, voice service and connectivity as separate elements for use with personal computer	No CSG	Consumer advice on expected (lower) service level	Non-geographic number
Itinerant service	Not applicable	Restricted by variable connection options	Non-geographic
Example 8: User purchases voice service for itinerant use, with or without handset, eg for WiFi use. (Dual mode mobile handset may also be used under separate mobile carrier licence)	No responsible carrier and no CSG	Highly variable - depends on user and service options. Consumer disclosure	Non-geographic number

At this stage prescriptive regulation to avoid ‘leakage’ of geographic numbers to other uses would be inappropriate, but there should be an expectation that industry will use numbers in a way consistent with their stated purpose and with the Numbering Plan.

As with present fixed and mobile numbers, the use of the geographic or 05 number ranges for VOIP services may assist in guiding consumer expectations about the cost of calls.

Customer Service Guarantee (CSG)

The CSG is a legal requirement that carriage service providers meet specified timeframes to connect services, repair reported faults and keep appointments, subject to limited exceptions. If a carriage service provider fails to meet these timeframes, a consumer may be entitled to financial compensation from the provider. The CSG is designed to encourage improvements in service from carriage service providers and to safeguard residential and small business consumers against poor performance. It applies to fixed telephone service providers, but not to mobile, ISDN or satellite phone service providers, unless those services were supplied in fulfilment of the USO.

The Department's April 2004 review of the USO and CSG found that the CSG was effective and that the consumer benefit outweighed any inefficiencies or negative effects on competition. Notwithstanding, there have been perennial concerns about the impact of the cost of the CSG on providers, particularly a number of small providers, and exemption processes have been put in place. The CSG does not apply to the provision of broadband services.

The CSG was designed for public, circuit-switched telephony services where a single provider supplies both the physical connection to the premises and the voice service as a single service. As VOIP is provided over broadband, the question is raised as to whether the PSTN-based CSG should be extended to VOIP and the underlying broadband service. In this context, where multiple suppliers are involved in provision of a service, often with no commercial relationship with each other, the obligations of the CSG are difficult to impose. If they were imposed, they may not offer meaningful protection to consumers.

On balance, it is recommended that the CSG should apply to VOIP only where the VOIP service is:

- supplied in fulfilment of the USO

or

- the primary service provided to the premises and the VOIP service provider is also the carriage service provider.

ACMA should determine how best to identify a specific service as a primary service.

Other supply scenarios (e.g. voice over broadband and VOIP bundled with a broadband service) would be outside the scope of the CSG.

Where consumers opt for a VOIP service, they should be made aware that the CSG will not apply to either the VOIP service provider or the access provider, unless the service is supplied in the manner outlined above.

Quality of service

As with the CSG, the Quality of Service Code C519 was developed by ACIF in the context of the public switched telephone network. Similarly, quality of service issues become more complex where responsibility is shared between providers having no commercial relationship with each other.

Quality of service was an issue that attracted attention in the submissions received. It is widely agreed that VOIP services can provide a very high quality of service, particularly when using fully managed networks. Conversely, quality of service can be highly variable when using the public Internet as a result of:

- congestion on the public Internet
- variations in the quality of broadband access services
- the use of multiple providers in delivery
- the way customers use and equip their broadband and VOIP services.

Two opposing views emerged on the desirability of requiring a specified quality of service standard for VOIP services. On the one hand, there was a strong view that any issues regarding quality of service would be quickly resolved in the market by consumers exercising informed choice. An alternative view was that a high quality of service was essential for the effective operation of calls to emergency service organisations.

Notwithstanding the difficulties a VOIP service may have in delivering a specified quality of service, it is reasonable to expect that VOIP services that are close substitutes for a traditional telephone service will be of a quality that meets reasonable consumer expectations and does not impede access to emergency services. However, given the fundamental operational differences between circuit-switched and IP-based services, some variations in those levels of quality may be acceptable in the short term.

A revised industry-based code for VOIP services will need to be developed by industry consistent with international developments. In the short-term, it is recommended that providers of services that are close substitutes for a traditional telephone service should use C519 as a target, and that quality of service indicators should be developed by ACMA that will enable consumers to meaningfully compare service options. Such indicators could make reasonable provision for VOIP's specific operational characteristics.

Quality of service is also a long-term NGN issue for consideration by industry bodies such as ACIF.

A summary and illustration of these proposed adjustments to regulatory settings is presented in Table 2.

Emergency services

Currently, Part 8 of the Telecommunications (Consumer Protection and Service Standards) Act requires ACMA to make a determination requiring carriage service providers that supply a standard telephone service to provide each end-user with access free of charge to an emergency call service. The determination covers calls to the 000 and 106 numbers (providing access to a text emergency call service for people with a speech or hearing

impairment).

Reliable and effective access to the emergency service organisations is a key feature of current telephone services for individual consumers and the wider community. There appear to be no technical barriers to Australian-based VOIP services that use public numbers providing access to 000 and 106.

However, there are a number of issues of concern, including:

- VOIP services are not network powered so will not work during a power outage
- location information may be unreliable where a service is being used nomadically
- quality of service can be variable, potentially affecting the connection of a call to the emergency service organisation and the ability of the operator to communicate clearly with the caller
- for some VOIP services supplied by overseas-based providers, it may not be possible to call the emergency service organisations.

These issues are not new as the introduction of mobile services posed similar questions. Just as mobile services proved to have some compensating advantages over fixed services due to mobility and multi-mode functioning, emerging VOIP services are likely to offer similar compensatory benefits.

Notwithstanding this, access to emergency service organisations is a key public safety measure. The predominant view of the submissions received is that access to the emergency call service should be maximised. Therefore, all VOIP services that terminate calls on the public telephone network must provide emergency call access to 000 and 106 and reliable CLI.

As discussed previously, VOIP services should be flagged in the IPND to assist the emergency service operators to identify cases where—as with mobile services—they will need to ask the caller for location information.

Industry should be encouraged to develop a solution to providing reliable location information. Internationally, efforts are being made to develop longer-term technical solutions to the location information issue as it is a concern to many governments.

One-way dial-out only VOIP services terminate calls on the public telephone network and should therefore be required to provide access to emergency services. However, they do not generally use public numbers and therefore cannot provide accurate CLI. Lack of CLI creates some potential for improper use of the 000 service by hoax callers, but this is outweighed by the public safety benefits of continuing to require dial-out VOIP services to provide access to emergency services. The emergency service operator will need to ask for another call-back number.

Consumer information and disclosure

Consumers need to be aware that their own actions may influence the quality of VOIP services and that VOIP may be different from traditional telephone services in other ways, including location independence. In addition, consumers will need to grasp some issues

that are not covered by regulation but should be included in information materials to support informed choices about service options. For example, users may not be aware that the fixed telephone is supported by an independent power supply, and that voice over broadband—like a cordless telephone—will not work without mains power.

VOIP technology and capabilities are different from those of the circuit-switched telephone service and consumers differ in their ability to distinguish and utilise emerging voice services. Most submissions share the view that it is important for consumers to understand these differences and their implications. It is proposed that ACMA should work with industry to promote consumer awareness about the differences between VOIP and circuit-switched voice services and the ways in which customers can influence the quality of their VOIP service. This would assist consumers to make informed choices and to close the information gap between those who understand VOIP, or will quickly come to do so, and those who are less technologically proficient. As with mobile services, change will come as people become more familiar with the technology.

In addition, under ACMA oversight, providers should be required to disclose the characteristics of the service to ensure that potential customers can appreciate the differences between any VOIP service they purchase and traditional circuit-switched telephone services. Disclosure would be required at the point of sale and, where appropriate, on an ongoing basis—for example, in payment notices. Again many submissions, including those from prospective VOIP service providers, appear to favour such requirements. This is welcome.

Such information would include, but not be limited to:

- any differences in the application of the CSG
- variations in quality of service that can be expected
- reliance on mains power
- the number range (geographic or 05) which will apply to the service
- security vulnerabilities (such as viruses and hacking)
- the need to verbally provide location information to emergency services
- the operation of location dependent services when the service is being used nomadically
- whether the use of services such as phone banking is possible.

ACIF has recently published a brochure titled *What you should tell your customers about their Internet Telephony/VOIP service*, providing guidance to VOIP service providers on information that should be disclosed to consumers who purchase their services.⁷

⁷ Australian Communications Industry Forum, *What you should tell your customers about their Internet Telephony / VoIP service*, April 2005.
www.acif.org.au/__data/page/12628/VoiceOverIP_7.pdf

Other issues

As now, some VOIP services (e.g. peer-to-peer, one-way VOIP services) may not fit within the current standard telephone service definition and therefore will remain less regulated. (Some service types may still be carriage services and subject to carriage service and carriage service provider obligations). In a number of areas, there will be a high level of continuity with existing regulatory requirements. [Appendix 1](#) contains more detailed discussion of such issues.

Long-term strategy

The longer-term strategy should encompass those VOIP issues that require further work and a number of broader issues relating to the transition to NGNs including:

- jurisdiction and extraterritoriality issues (that is, the enforcement of Australian laws on service providers located offshore)
- interoperability and standards developments
- emerging competition issues
- potential critical infrastructure vulnerabilities and other security issues
- changes in consumer expectations, perceptions and behaviour that may make some legacy regulation redundant
- new technologies such as next generation messaging that provide opportunities to extend the services available to people with disabilities
- potential Internet governance issues including numbering and addressing and voice spam that flow over into the NGN environment
- quality of service.

Competition issues

Like other telecommunications services, VOIP services may be vulnerable to anti-competitive conduct and access restrictions. At this stage, no new issues have been identified that the current framework should not be able to handle, but ongoing vigilance will be required. Like other providers of telecommunications services, VOIP service providers that are carriage service providers are subject to the anti-competitive conduct rules and access regime set out in Parts XIB and XIC of the Trade Practices Act.

The ACCC has identified several longer-term issues that will need to be considered as the industry moves toward the introduction of NGNs. In particular:

- changes to the supply chain may create new bottlenecks and new sources of market power may emerge
- uncertainty about the future of existing interconnection arrangements as carriers renew their core switching systems
- legacy regulation may impose inappropriate and unreasonable costs on providers
- network architecture and interconnection standards could impede competition by preventing applications being run across one or more networks
- more generally, standards processes and proprietary technology could be used to erect

barriers for competitors

- debate about how to ensure appropriate financial compensation to all members of the supply chain.

Security issues

Critical infrastructure vulnerabilities arising from the increasing deployment of VOIP need to be examined. The IT Security Expert Advisory Group is commissioning research into the security risks associated with the use of VOIP solutions by the owners and operators of critical infrastructure in Australia with a view to raising awareness within critical infrastructure sector groups about security risks associated with the deployment of VOIP and providing guidance on ways to mitigate risks. The review is due to report by mid 2005.

Jurisdiction issues

The resolution of jurisdiction issues is a long-term challenge that requires further work and cooperation in international fora. Dealing with extreme cases of regulatory non-compliance by offshore providers will require further examination but potential sanctions include refusal of resources such as numbers, consumer warnings, blacklisting and 'do not deal' rules. Part 20 of the Telecommunications Act provides a framework for taking such sanctions if required.

Other international issues

Australia is not alone in moving toward IP-based services and NGNs. Many other issues need to be resolved at an international level, including standards to support functionality, interconnection, interoperability, security, and quality of service. In the NGN environment, the range of such issues will expand further and international engagement will continue to assist Australia both in influencing global developments, and in developing domestic frameworks that take account of global trends.

5. NEXT STEPS

Implementation

Implementation of the Report's recommendations will not require changes to primary legislation.

Some subsidiary regulatory instruments will need to be changed to accommodate proposed adjustments in the areas of numbering, the CSG and quality of service guidelines. Others will need to be reviewed and adjusted as necessary to ensure they take account of VOIP's particular operational characteristics. Statutory requirements for consultation on changes to the Numbering Plan will need to be observed, and it would be useful to provide an opportunity for consultation, feedback and discussion around the wider range of findings and recommendations in this report.

Under section 14 of the *Australian Communications and Media Authority Act 2005* the Minister may issue Directions to ACMA with regard to the exercise of its powers in certain areas. At this stage, it appears to be necessary and appropriate to issue a Direction only with regard to the scope of the Customer Service Guarantee under the Telecommunications (Consumer Protection and Service Standards) Act.

Compliance with emergency service access requirements

Recommendation 22 requires all VOIP services that terminate calls on the public telephone network to provide free access to emergency service organisations and accurate CLI information. It is not necessary to amend the Emergency Service Call Determination to cover services that fall within the definition of a standard telephone service.

An amendment will be required only to extend the requirement to dial-out services. Non-conforming one-way dial-out VOIP services will need to take steps without delay to ensure that their equipment is configured to enable this. Given public announcement of the change, the requirement should come into effect immediately the determination is made.

ACMA may need to review the operation of the Determination in due course. In this, as in some other areas, foreign-based services raise difficulties that will need to be considered internationally over a longer period of time.

Numbering

It is proposed that the recommendations relating to numbering will be implemented by ACMA with amendments to the Numbering Plan. The amendments to the Numbering Plan would address conditions of use and also cover the:

- introduction of a new number range for VOIP services (including guidance on the types of services that can be offered using new numbers)
- application of the geographic number range to VOIP services (including guidance on the types of services that can be offered using geographic numbers)

- provision of guidance on which VOIP services should not be offered using geographic numbers.

Due to the long statutory consultation period for changes to the Numbering Plan (90 days) it is recommended that this process begin as soon as possible.

Customer Service Guarantee

Implementation of the recommendations relating to the CSG requires a Ministerial Direction to ACMA under section 124 of the Telecommunications (Consumer Protection and Service Standards) Act directing it to vary the CSG Standard in accordance with recommendation 16.

Quality of service

It is proposed that the development of technology-neutral quality of service indicators that allow consumers to meaningfully compare VOIP services should be a matter for ACMA in consultation with industry.

The present Code C519 can be used as a target for quality of service of VOIP services pending the development of a new code. In the transitional period, when new services are being offered, ACMA should increase its oversight of the quality of service offered to customers.

Integrated Public Number Database (IPND)

Telstra is required to provide and maintain the IPND as a condition of its carrier licence (*Carrier Licence Conditions (Telstra Corporation Limited) Declaration 1997*), issued by the Minister. The licence condition requires Telstra to comply with a written request from ACMA regarding data to be included in the IPND.

Additional data from VOIP service providers to be included in the IPND would be an annotation that the service location data is not necessarily accurate, which would indicate to the emergency service operator that they would need to ask for location information. Changes in the operation of the IPND may also require amendment of the ACIF Code C555:2002 Integrated Public Number Database (IPND) Data Provider, Data User and IPND Manager Code. This should be considered further by ACMA and ACIF.

Consumer information and disclosure

Recommendation 13 requires ACMA to promote consumer awareness about the:

- differences between VOIP services and traditional circuit-switched telephony services
- ways consumers can influence the performance of their VOIP service.

A major media campaign is not proposed. It is proposed that implementation of this recommendation be a matter for ACMA to accommodate within its existing budget and activities (e.g. toolkits, fact sheets etc.).

Recommendation 14 requires providers to disclose to consumers the characteristics and limitations of any VOIP service they purchase in comparison to traditional circuit-switched telephony services.

It is proposed that implementation of this recommendation be a matter for ACMA. It will need to specify standard information to be disclosed by providers and the form in which it is to be disclosed both at the point of sale and in an ongoing way (e.g. in payment notices).

Information for disclosure should include, but is not limited to:

- any differences in the application of the CSG
- variations in quality of service that can be expected
- reliance on mains power
- the number range (geographic or 05) which will apply to the service
- security vulnerabilities (such as viruses and hacking)
- the need to verbally provide location information to emergency services
- the operation of location dependent services when the service is being used nomadically
- whether the use of services such as phone banking are possible.

The Department welcomes the initial steps taken by ACIF to assist industry in this area. Given that there are VOIP services in the market and that a lack of consumer awareness of these services is an issue that has been raised in most submissions, development and dissemination of this information is a high priority.

Competition

The ACCC has powers to deal with anti-competitive behaviour and ACMA has powers to enact a code or to set standards in relation to VOIP services. These powers should be sufficient to manage any inappropriate behaviour that may arise in the immediate future.

It is proposed that the ACCC utilise its existing annual reporting processes to identify and report on new competitive bottlenecks and anti-competitive conduct in relation to VOIP services.

Application of subordinate regulation, industry codes and standards

It is proposed that implementation of Recommendations 26–29 be a matter for ACMA and ACIF, in consultation with the Department.

Further work

Voice telephony is expected to remain a part of wider consideration of NGN issues as core networks are renewed and broadband access expands.

The Department will need to continue to work closely with ACMA and the ACCC on a number of the issues associated with voice services that should be considered further in that wider context. Among these issues are:

- *numbering and addressing* including:
 - the balance between location-based and personal addresses as fixed and mobile services converge
 - the balance between Internet and telecommunications modes of addressing
- *consumer issues* including access to services, service guarantees, service quality, and rights of redress
- *standards work* to support technology developments, including:
 - new approaches to voice quality and service reliability in the NGN context
 - new approaches to multimedia communication
 - reliable location data
 - improvements in security and privacy of communications
 - innovative services for people with disabilities
- *emergency services communications*—which may need a more thorough review to take account of the challenges and opportunities that will arise from these developments
- *changing consumer behaviour and market conditions* as voice and other personal communications services find their place in a converged telecommunications environment
- *international cooperation* to foster collaboration on these issues and to resolve questions of cross-border jurisdiction and sanctions to deal with unlawful activities.

Competition issues will form a major parcel of work on their own, and the Department, the ACCC and ACMA will work closely to examine the issues that emerge as changes unfold: in network architecture; in the commercial arrangements for a new number range; in the overall value chain between service providers and network providers; and in connectivity, applications and content. New interconnection arrangements will need to be negotiated in the context of wider questions about access to content, with new payment channels to provide financial compensation to all members of the supply chain.

APPENDIX 1: DISCUSSION OF KEY ISSUES—FINDINGS, RECOMMENDATIONS

This section is intended to provide further information about specific regulatory issues and on views expressed in the consultation process.

Retail price regulation and untimed local calls

VOIP service providers are expected to contest the local call market by offering competitively priced local calls, probably with low call charges and reliance on access charges to fund the service. Also, VOIP service providers face potentially lower and less distance-dependent cost structures for VOIP services, which may assist their ability to compete with incumbent providers.

As with mobile, satellite phone and ISDN service providers, VOIP service providers are not required to offer customers the option of untimed local calls, unless the VOIP service is offered in fulfilment of the USO. It appears that calls from VOIP services are not covered by the untimed local call obligation in Part 4 of the Telecommunications (Consumer Protection and Service Standards) Act, as they are not calls of a kind provided on an untimed basis immediately before 20 September 1996.

The Government is committed to maintaining the availability of untimed local calls. Consumers will retain the option of access to a service offering an untimed local call under the USO, and other providers must be competitive with the local call prices offered by Telstra if they want to attract customers.

Against this background, at this stage it seems premature to extend retail price regulation to the broad range of VOIP services. It could also complicate the transition to NGNs in the future, when innovation in pricing structures could be needed both to build the market and to support investment. On the other hand, it might be appropriate to consider pricing regulation of NGNs and NGN services in the future if those networks or services (including VOIP services) exhibit monopoly characteristics.

Dual Tone Multi-Frequency (DTMF)

DTMF is a widely used telephony signalling scheme that allows the transmission of data across an audio channel. Many voice services allow users to utilise their phone for services such as phone banking. Most VOIP services provide DTMF as a feature of the service but on some VOIP services it may not work effectively. VOIP service providers need to ensure consumers are informed where this is the case.

Numbering Plan compliance

Section 462 of the Telecommunications Act requires all carriers and carriage service providers to comply with the Numbering Plan. There appears to be no impediment to carriage service providers who supply VOIP services complying with the Numbering Plan. No issues were raised in the submissions. Therefore, all VOIP services supplied by carriage service providers (i.e. all services using public numbers) should continue to comply with the Numbering Plan. As VOIP's operational characteristics are different to those of circuit-switched services, the Numbering Plan may need to be amended to deal with some technical and process issues unique to IP technology. ACMA should review the

Numbering Plan to ensure it adequately takes into account the operational characteristics of VOIP services.

Interception

Interception is a key law enforcement and national security measure. Parts 14 and 15 of the Telecommunications Act set out requirements for carriers and carriage service providers in relation to cooperation with agencies, interception, special assistance capabilities etc. Submissions from the law enforcement agencies stated strongly that all VOIP services should be subject to these obligations. Most other respondents seemed to accept that legal interception would be a requirement for VOIP services. Therefore, all VOIP services to the extent they are carriage services should continue to be subject to the Act.

However, as VOIP technology operates differently from the circuit-switched network, it raises new issues for how the interception obligations should be met. A number of submissions mentioned the practical and technical difficulties involved in intercepting peer-to-peer and encrypted VOIP communications. It may also be questioned whether some peer-to-peer VOIP services are carriage services captured by Parts 14 and 15 of the Telecommunications Act. These issues require further examination.

Interception policy is dealt with by two complementary Acts and two Ministers. The Telecommunications Act (administered by the Minister for Communications, Information Technology and the Arts) and the *Telecommunications (Interception) Act 1979* (administered by the Attorney-General) work in tandem to place a range of obligations on carriers and carriage service providers (including ISPs) in relation to privacy, the provision of assistance to law enforcement agencies, and enabling lawful call data disclosures and interception of telecommunications. Given the shared policy responsibilities in this area, these issues will need to be jointly considered by the Department and the Attorney-General's Department.

Privacy

Part 13 of the Telecommunications Act sets out the ways in which customer information held by telecommunications companies, including the contents of communications, must be treated by those who collate it and gain access to it. These provisions apply to carriers and carriage service providers. As a result, all VOIP services to the extent they are carriage services would be captured. The Privacy Act and National Privacy Principles establish a generic privacy regime across all sectors of industry, subject to a small business exemption.

The majority of submissions commenting on the privacy implications of VOIP were of the view that VOIP services can and should meet the existing privacy requirements. The ACA has said that the use of VOIP technology in the carriage of calls does not appear to affect the operation or requirements of the Part 13 provisions or the Privacy Act. All VOIP services that are carriage services should therefore continue to comply with the privacy requirements.

The submissions did raise a number of issues that should be considered further, particularly the privacy implications of the availability of customer presence information and of a single number/address being attached to a particular person rather than a location as the Internet and telecommunications worlds converge. The latter issue is a longer-term issue that should be taken up in the broader context of the transition to NGNs.

While there are specific privacy obligations in the Telecommunications Act, privacy policy is primarily a matter dealt with in the Attorney-General's portfolio. The Office of the Federal Privacy Commission provided a report to the Attorney-General on 31 March on its review of the private sector provisions of the Privacy Act 1988 which may have implications for the consideration of VOIP privacy issues. The Department will monitor this issue and provide assistance as necessary.

Calling line identification

Part 18 of the Telecommunications Act generally requires carriers and carriage service providers operating switching systems as part of controlled facilities to provide CLI. CLI is basically the number of the service making a call, transmitted with the call. CLI availability has been important for billing, emergency service operation, law enforcement and the provision of location dependent services (e.g. services on 13, 1300 and 1800 numbers). VOIP services that use public numbers generally appear to be able to provide CLI, and the reasons for requiring it of established services appear to apply equally to VOIP telephone services. Consequently, CLI requirements should, in principle, apply to VOIP services.

There is scope for the CLI of VOIP services to be manipulated (i.e. to show a CLI other than that of the actual service making the call). Industry and ACMA should further consider the implications of this, in conjunction with the use of IPND flagging to identify services as VOIP services.

Integrated Public Number Database

Schedule 2, Part 4 of the Telecommunications Act requires carriage service providers that use public numbers to provide Telstra, as the manager of the IPND, with such information as it reasonably requires to meet its obligations. This includes accurate customer name and location information for emergency service purposes. No barriers have been identified that would prevent VOIP service providers complying with these requirements. The issues of accuracy of location information in regard to nomadic VOIP services and CLI in relation to dial-out only VOIP services are addressed separately in relation to emergency service access. Providers of VOIP services using public numbers should therefore comply with the requirements of the Act.

Number portability

As required by the Telecommunications Act, the Numbering Plan sets out rules in relation to the ability of customers to retain their numbers when moving from one network service provider to another. Number portability is an important consumer and pro-competitive safeguard. No evidence has been provided that number portability imposes a significant cost on industry. The majority of submissions that commented on number portability (mainly VOIP service providers and consumer and user groups) agreed that it should be a requirement for VOIP services that are standard telephone services.

Current number portability requirements should therefore continue to apply to VOIP services with public numbers. Consistent with the arrangements set out for numbering generally, porting will be allowed within both the geographic and new number ranges but not between them. As now, ACMA will have the power to grant exemptions from the number portability requirements on a case by case basis.

ACMA may need to review some technical and procedural issues in the context of IP networks. Experience with the electronic number mapping (ENUM) trial may also help to inform the consideration of these issues in the longer term.

Preselection

Part 17 of the Telecommunications Act and related instruments requires ACMA to make a determination requiring carriage service providers who supply an STS to allow customers to preselect alternate suppliers of long distance and fixed-to-mobile calls. Like number portability, preselection is an important consumer and pro-competitive safeguard. No evidence has been provided that requiring preselection imposes a significant cost impact on VOIP.

Submissions generally indicate that VOIP can meet the preselection requirements but question the relevance of preselection given the relative ease with which consumers can change providers in the online service environment. Removal of preselection on a technologically neutral basis may advantage incumbent providers operating conventional phone services.

On balance, therefore, current preselection requirements should continue to apply to standard telephone services including those using VOIP. As now, the regulators will have the power to grant exemptions where the requirement is inappropriate. A further review of experience with this issue may be appropriate in the longer term.

Access for people with disabilities

Where a provider offers a telecommunications service, it is subject to the requirements of the Disability Discrimination Act and must provide access for people with disabilities to that service unless it would cause unjustifiable hardship. Similarly, where a service provider makes customer premises equipment available as part of its service, it will be required to provide equivalent equipment for people with disabilities, subject to hardship provisions. The telecommunications law reiterates that if something is required under the Disability Discrimination Act, it is part of telecommunications law, largely for USO provision and funding purposes. Given the general application of the Disability Discrimination Act, it will continue to apply to all telecommunications services whether supplied by VOIP or any other technology.

Access to the National Relay Service

Currently carriage service providers supplying an STS must provide access to the NRS. A voice service that is not an STS would not be required to provide access to the NRS.

Submissions from disability organisations expressed a strong interest in seeing the range of services available to people with disabilities under the NRS expanded to include such services as video over IP and text over IP. In the longer term it is expected that IP networks will be able to interconnect directly without having to do so via the PSTN. These issues are being considered in connection with the future delivery of the NRS. In the broader NGN

context, it will be necessary to consider new technologies such as next generation messaging that provide opportunities to extend the services available to people with disabilities.

Membership of the Telecommunications Industry Ombudsman Scheme

The differences between VOIP services and PSTN services have the potential to cause confusion for consumers. There may, for example, be uncertainty about which of the legacy consumer protections will apply to VOIP services. Consumer confidence is essential for the take-up of VOIP services and, therefore, consumers need access to a robust and independent complaints body.

Part 6 of the Telecommunications (Consumer Protection and Service Standards) Act requires carriage service providers to be members of the TIO scheme if they supply an STS to small business and residential customers, or a public mobile telecommunications service, or a carriage service that enables the user to access the Internet. This includes providers of VOIP standard telephone services and providers of other VOIP services (such as peer-to-peer services) if they are provided by an ISP or by a carriage service provider that is otherwise required to be a member of the TIO scheme.

The TIO scheme has provided a highly effective mechanism for complaint handling to residential and small business consumers. Where providers of VOIP services are currently required to be members of the TIO scheme, this should continue.

Location dependent services

Location dependent carriage services (e.g. 13/1300/1800) are defined in the *C555:2002 Integrated Public Number Database (IPND) Data Provider, Data User and IPND Manager* industry code as services that depend for their provision on the availability of information about the geographic location of the caller and route telephone calls to a particular destination, usually the closest destination to the caller. Location dependent services generally use 13/1300/1800 numbers and are typically used for pizza delivery and taxi services. Where such services work correctly, the caller of a taxi service, for example, will be put through to a service in the same city. Where it fails, the call may be answered by a service in another city. Some state agencies have flagged proposals to use 13/1300/1800 services for non-emergency calls for assistance.

As some VOIP services will effectively be fixed services with geographic numbers, location dependent services should work properly. To the extent that a VOIP service operates nomadically (either occasionally or regularly), its ability to provide reliable location dependent services should be a matter for the service provider, and appropriate consumer disclosure.

Technical regulation

The consultation process raised no doubt that technical regulatory requirements should have general application to all voice services that are supplied to the public and interconnect with the PSTN, including VOIP services. Some issues of detail were raised about the need to identify requirements that take account of VOIP's particular operational characteristics. These are issues for ACMA to follow up in consultation with stakeholders, including ACIF, the Department and the ACCC.

ACIF codes and standards

VOIP service providers will be required to comply with existing ACIF requirements applying to the STS. It is up to ACIF to determine whether existing requirements will remain fully applicable to all VOIP services or whether requirements need to be updated to take account of VOIP's particular operational characteristics.

ACIF should be encouraged to give priority to VOIP issues in the short term and to reach out to new and non-traditional providers of networks and services for participation in their continuing work on developing NGN issues.

Telephone sex services

The purpose of the regulation of telephone sex services is to prevent the inappropriate exposure of children to adult material. Therefore, telephone sex services provided over or accessed using VOIP services that are standard telephone services will be subject to the same regulations as apply to other standard telephone services.

Voice spam

The *Spam Act 2003* sets up a scheme for regulating commercial email and other types of commercial electronic messages. The Act prohibits the sending of unsolicited commercial electronic messages. Section 5 of the Act specifically excludes messages sent by way of a voice call made using a standard telephone service from the definition of an electronic message.

The incidence of spam using VOIP needs to be considered among other longer-term issues.

Operator and directory services

Schedule 2, Part 2 of the Telecommunications Act requires carriage service providers supplying an STS to provide operator services to end-users dealing with faults and service difficulties and anything else specified in the regulations. Similarly, Part 3 of Schedule 2 requires carriage service providers supplying an STS to make directory assistance services available to end-users. Consistent with the approach of retaining consumer protections while giving providers greater flexibility, VOIP standard telephone services will be required to comply with these requirements.

Monitoring and reporting

All VOIP STS should be subject to ACMA monitoring and reporting as now. ACMA should consider whether there is a need for a less demanding regime for collecting data on services operating outside the geographic number range.

APPENDIX 2: ACRONYMS AND GLOSSARY

List of acronyms

ACA	Australian Communications Authority
ACCC	Australian Competition and Consumer Commission
ACIF	Australian Communications Industry Forum
ACMA	Australian Communications and Media Authority
ABA	Australian Broadcasting Authority
CLI	Calling line identification
CSG	Customer Service Guarantee
DSL	Digital subscriber line
DTMF	Dual tone multi-frequency
ENUM	Electronic number mapping
HFC	Hybrid fibre coaxial cable
IPND	Integrated Public Number Database
IP	Internet protocol
ISDN	Integrated Services Digital Network
ISP	Internet service provider
NGN	Next generation network
NRS	National Relay Service
PSTN	Public Switched Telephone Network
STS	Standard telephone service
TIO	Telecommunications Industry Ombudsman
USO	Universal Service Obligation
VOIP	Voice over Internet Protocol
WiFi	Wireless fidelity

Glossary

Any-to-any connectivity	The property of any telecommunications device allowing the user to connect to the public telephone network and to other users with any other telecommunications devices, or the equivalents for people with disabilities, as required under the definition of a standard telephone service.
Broadband	High speed capacity (e.g. for an Internet service), which may be delivered over a number of technologies, including DSL, cable, satellite, powerlines and wireless.
Calling Line Identification	Information about the number from which a call originates, transmitted via digital signal to the terminating location.
Carriage service	An electro-magnetic service for carrying communication between nodes, including transmission, switching and receiving, as defined in the Telecommunications Act.
Customer Service Guarantee	An Australian Government initiative that requires telephone companies to pay financial compensation to customers where certain minimum performance standards are not met, for example, timely connection on request and timely repair of faults.
Dial-in and dial-out services	VOIP services that allow customers to 'dial-in' from the public telephone network, or to 'dial-out' to others on the public telephone network, who need not have a VOIP telephone or software application.
Dual tone multi-frequency	A widely used telephony signalling scheme that allows the transmission of data across an audio channel, enabling services such as phone banking with a touchtone keypad.
ENUM	A standard adopted by the Internet Engineering Task Force (IETF) that uses the domain name system to map telephone numbers to web addresses or uniform resource locators (URLs). This enables users to link multiple Internet-based communications services – such as VOIP, email, and instant messaging – to one familiar telephone number.
Firmware	Software embedded in a hardware device containing information about the operation of that device, for example, the programming in a computer's Read-Only Memory.

Integrated Public Number Database	An industry-wide database that contains information related to all listed and unlisted public telephone numbers in Australia, regardless of the service provider. This information includes the telephone number itself, and the name and address of the customer. It is used to maintain public directories and by law enforcement agencies and emergency service organisations. The database is maintained by Telstra under the conditions of its carrier licence.
Interconnectivity	A carrier's ability to deliver telecommunications traffic to another carrier's network, and to receive telecommunications traffic from another carrier's network.
Internet Protocol	A protocol that forms the basis of today's public Internet, controlling the movement and distribution of data packets. IPv4 is the protocol currently in general use; its successor IPv6 is being developed.
Interoperability	The ability of software applications, terminal devices or operating systems manufactured by different vendors to accept or provide services from each other and communicate effectively.
Location dependent services	Services that use available information on the location of call origin to direct calls to a termination point where the called party, usually a business, can best assist the customer; for example, 13 numbers for taxi companies.
National Relay Service	An Australia-wide telephone access service allowing people with speech and hearing impairments to use the public telephone network. Calls can be converted to text, or vice versa, using a teletypewriter or a computer with modem, with the assistance of a specially trained Relay Officer.
Nomadacity	A capability of VOIP and other next generation services allowing users to access services wherever there is a broadband connection, by plugging in their terminal equipment or using wireless technology.
Number portability	The ability of customers to transfer their telephone numbers from one carrier to another, if they wish, as mandated by the ACA under the Numbering Plan.

Packet-switching	A communications technology in which messages or fragments of messages are sent via packets—units of user data with a header containing addressing and identity information. Packets are individually routed between network nodes by means of packet protocols, most commonly the IP. The transmission path is not dedicated and different packets from the same message may travel in different routes depending on network traffic and intelligence. On arrival, the receiving PC or device reassembles the packets into the original message.
Peer-to-peer	A network architecture in which each computer has both server and client capabilities, allowing the use of applications in which users can transfer data either directly or through a mediating server. VOIP applications on peer-to-peer networks therefore allow users to make and receive calls entirely over the Internet, independently of the public switched telephone network.
Preselection	Preselection allows customers to choose their preferred service provider (e.g. for long-distance calls) and to change that preference from time-to-time. It also allows customers to make use of over-ride dial codes to choose a different service provider on a call-by-call basis.
Public Switched Telephone Network	The network of circuit switches that has been the basis of public telephony for the last 100 years, over which a dedicated electrical circuit is established for every voice call.
Quality of service	A measure of performance for a network that reflects transmission quality (for voice services, with specific reference to voice quality) and availability of service, typically specifying minimum speeds of data transmission and maximum levels of loss, latency, jitter and error.
Softphone	Short for software telephone, a virtual telephone image on a computer screen, representing available telephone functionality through downloaded software, in the absence of a normal telephone handset.
Spam	Unsolicited commercial electronic messaging via emails, instant messaging, SMS and other mobile phone messaging.
Standard telephone service	A carriage service for the purpose of voice telephony (or equivalent for a person with a disability) providing any-to-any connectivity, as defined in the Telecommunications (Consumer Protection and Service) Standards Act.
Tele-typewriter	A terminal input device that enables people with disabilities or speech impairment to communicate via a text telephony service over the public switched telephone network.

<p>Universal Service Obligation</p>	<p>The universal service regime is set out in Part 2 of the Telecommunications (Consumer Protection and Services Standards) Act. The USO ensures that all people in Australia, wherever they reside or carry on business, have reasonable access, on an equitable basis, to: (a) standard telephone services; (b) payphones; and (c) prescribed carriage services (none have been prescribed). The regime is funded by an industry levy imposed under the Telecommunications (Universal Service Levy) Act. The service obligation must be fulfilled by a Primary Universal Service Provider. Telstra is the Primary Universal Service Provider for all of Australia. However, any service obligation can be made contestable, in which case competing Universal Service Providers may be approved by the Australian Communications Authority.</p>
<p>Voice over Internet Protocol</p>	<p>A range of emerging voice telephony services delivered over a broadband Internet connection, in which voice data is converted into digital packets and routed using the Internet Protocol.</p>
<p>Wi-fi</p>	<p>Short for wireless fidelity, a local area network that uses high frequency radio signals to transmit and receive data over short distances. Using Wi-fi, enabled computers or other devices in proximity to an access point can establish a wireless connection to the Internet.</p>
<p>106 service</p>	<p>The emergency service equivalent of 000 for people who have speech or hearing impairments. It allows people to send emergency messages via a teletypewriter or a computer with modem.</p>