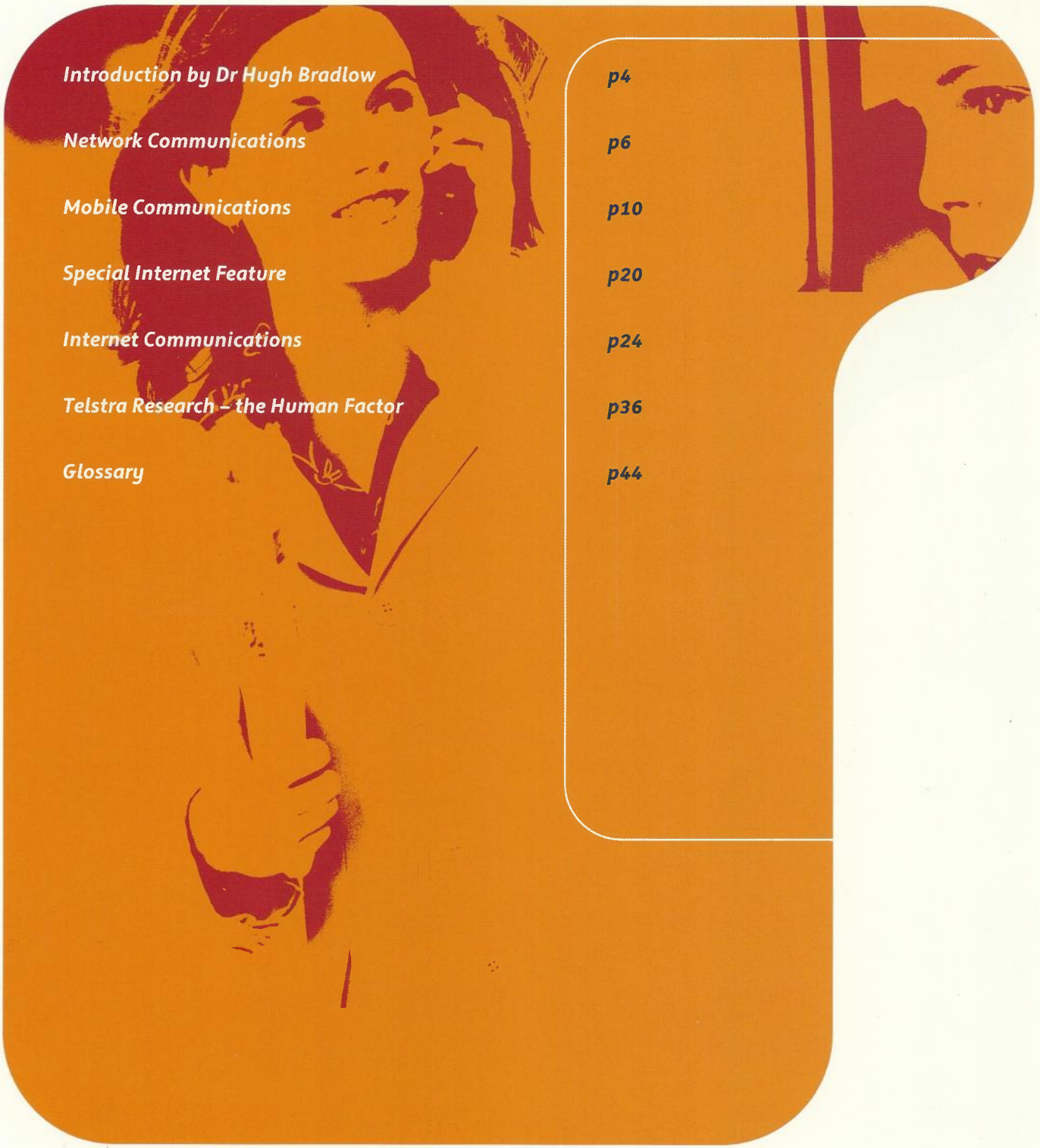
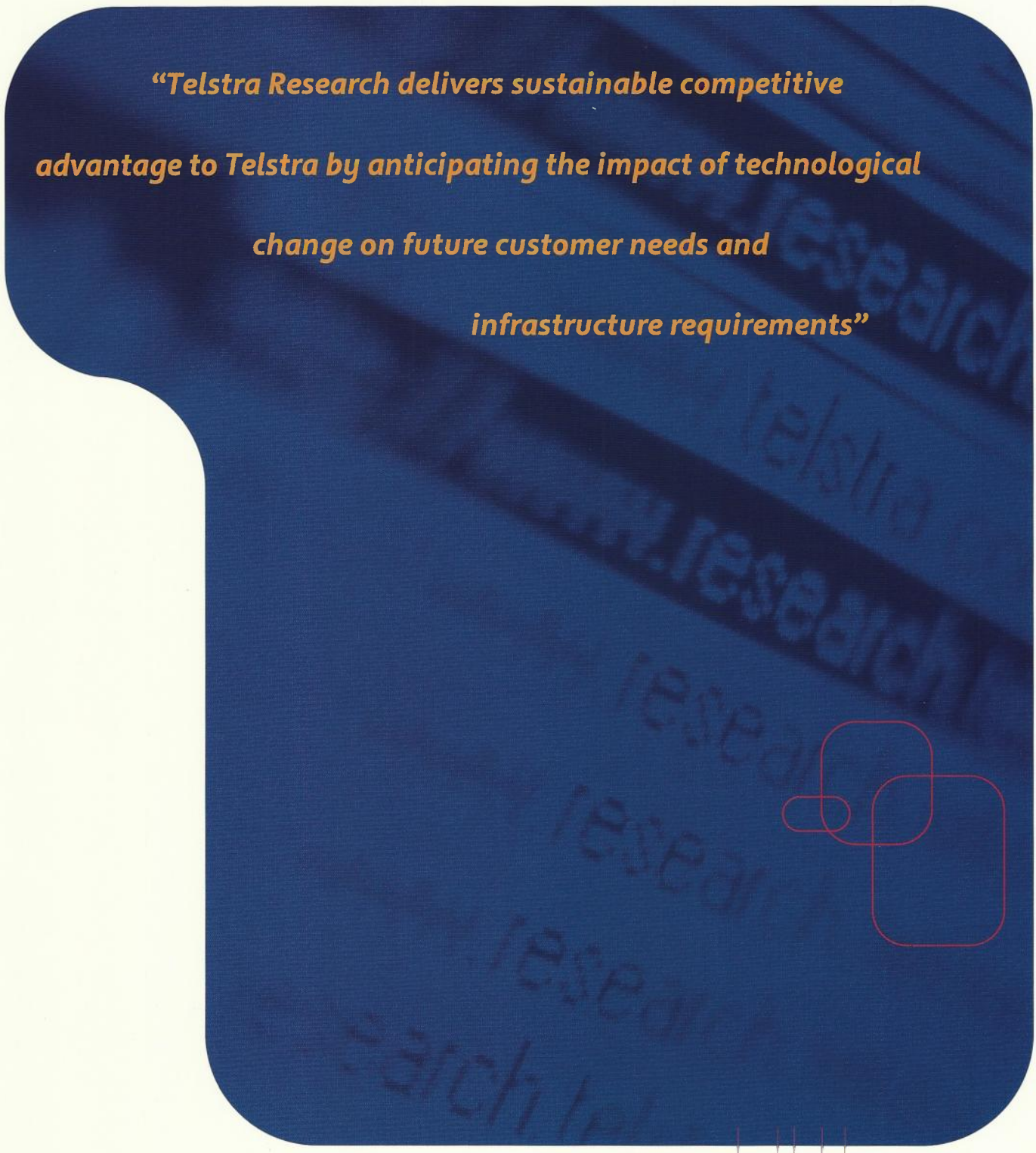
Telstra

contents



missionstatement

"Telstra Research delivers sustainable competitive advantage to Telstra by anticipating the impact of technological change on future customer needs and infrastructure requirements"



Telstra research

Telstra Research provides business focused research and development (R&D) that underlies Telstra's delivery of new customer value and growth opportunities, and supports Telstra as a telecommunications service provider and network operator. An important part of the role of Telstra Research is the evaluation of new and emerging technologies that contribute to Telstra's technology strategy and positioning.

Consisting of about 300 staff, Telstra Research is home to many of the company's high achievers – with 70% of researchers with degrees and 23% with higher degrees, such as PhDs. The research environment stimulates people's creativity, allowing them to develop their own talents.

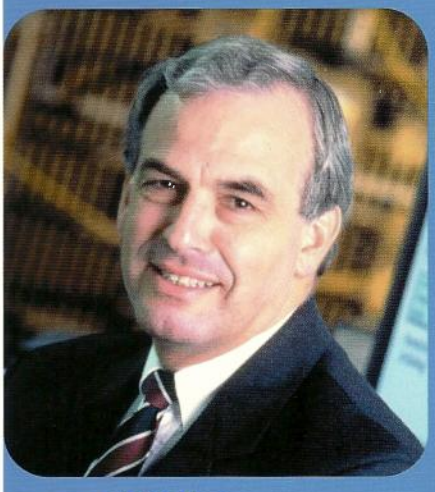
Telstra researchers are a highly skilled group of people who encompass technical skills in the following areas:

* Intelligent networks
* Switching and control
* Teletraffic
* Radio
* Transmission systems
* Internet
* Artificial intelligence
* Web and application design
* Computing
* Human factors
* Electromagnetics

Telstra's R&D is a significant part of the company's proud tradition of being a leader in developing today's and tomorrow's technology solutions. It focuses on innovation and commercialisation, as well as capturing visionary and blue sky research ideas for the company.

"You can reduce uncertainty in the

If Australia is to become more than a fun holiday destination for overseas travellers, then we need to start creating a great deal of intellectual property - for this is what will determine the type of country Australia becomes, and who our children will be working for, in the future.



Dr Hugh Bradlow
Chief Technology Officer

The world has changed. In the Internet age, there is more interaction than ever before. SMS, Email, mobiles and a swarm of web-based applications have all transformed the way we communicate. The changes have been electrifying and we are privileged to be a part of this exciting new era which is enabling unprecedented communication and interaction between people and machines.

The challenges and opportunities that exist for countries like Australia in the Internet era are immense. The search for differentiating technologies (as opposed to enabling technologies) inevitably leads Australians to software and applications. Among other things, the Internet has changed technology innovation forever. In the past, technology was developed in giant global laboratories (eg Bell Labs), whereas today, due to the Internet, thousands of small players can compete. Telstra is aware of the role it can play in influencing future technology and is on the lookout for early signs of valuable ideas.

Last year, in recognition that its research division was ideally placed to further leverage its impact and capture more value for Telstra shareholders, the company announced a major reshaping of its research activities. The changes have brought about a fundamental shift in Telstra's research profile, with a greater focus on seeking out new business propositions - and their commercialisation - that offer increased economic value to Telstra. While innovation and the generation of new product ideas has been, and will always be, a part of Telstra Research, the changes to Telstra's research arm means that there is an even greater focus on this vital part of R&D.

Since announcing its R&D changes, Telstra Research has lodged many patent applications and has started negotiations with various parties regarding commercialisation paths for Intellectual Property (IP). In this fast moving, globalised world, an important ingredient necessary for Telstra's success is the ability to establish effective partnerships with both domestic and international players. Telstra is committed to Australian industry and supports local development which is placing more emphasis on software and knowledge-based products.

In a market which is saturated with technology offerings, an important area for Telstra researchers is ease of use. As technology is becoming increasingly complicated to use, researchers are looking at behavioural issues – for instance, one of the projects by Telstra Research, *eLaunceston*, is about testing people's behaviour towards the Internet.

Telstra Research has also set up a developmental laboratory in Launceston and has embarked on a powerful customer trial project called the *Launceston Broadband Project (LBP)*. A joint project with the Federal Government, it is an exciting initiative for Telstra because the company is now able to trial its products with a selective audience. If a product doesn't succeed, there is no major brand disadvantage because the product hasn't been put on the market.
Vendors are also looking to trial their applications via Telstra's established Launceston research community.

future by helping to create it"

Technology Leadership

Telstra may only represent two percent of the international market, but its influence in shaping industry-wide technology leadership is well recognised. At Supercomm** in Atlanta this year, Telstra showed leadership in the global telecommunications industry by identifying key technology areas – such as the next generation of broadband access systems, mobile data systems and operational support systems on which cooperation is required to achieve industry-wide progress.

While the vision for a future information economy has been established, the reality is that it remains only a vision. In terms of implementing the future vision, Telstra has made excellent progress on its Data Mode of Operation (DMO)*** strategy, which was initiated three years ago, but there remains a strong need for the industry as a whole to progress key technology issues.

In particular, there is a need for the industry to progress in terms of 'plug and play' operational support systems. While Telstra is working on the customer-focused processes that are needed to deliver 'information age' services, the implementation of these processes requires a new generation of systems which are modular, commercial-off-the-shelf and can work with other pieces of a very complex technology puzzle.

For this to be achieved, a standard view of process and functions, where all participants speak a common language, is required. With Telstra's assistance, the Telecommunications Management Forum (an international body) is making considerable progress towards defining a standard framework under which systems can be built. Telstra would however like to see even wider support – particularly from the vendor community – for systems to be built to this master plan.

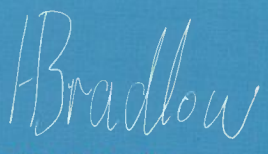
There are also many Internet challenges which lie ahead. At Supercomm, Telstra reminded the audience that the Internet, a 30-year old technology, was undergoing significant transformation and that in order to meet future user expectations, it would need to prove itself as scalable, robust, secure and capable of delivering carrier-grade quality.

No-one doubts the effects that the technology revolution is having on Telstra and the telecommunications industry. The mobile revolution hit us over a decade ago, the Internet and Web revolution is surging over us and the Interactive TV revolution sits in the wings.

As we look forward, it is for Telstra researchers to ask questions like: ***what will replace the Internet?*** In fact, researchers are already working on 'active networks' or 'programmable networks' that promise to replace the Internet in one or two decades.

Technology change is the only constant in today's fast moving global environment. The challenge for Telstra's Research division is to understand the changes and bring them into the company early, so that Telstra can position itself to use these ideas to inspire new infrastructure, products and services that will lead us into the future.

Enjoy your reading!



Dr Hugh Bradlow

Chief Technology Officer

** Supercomm is the largest telecommunications tradeshow in the United States and attracts 40,000 visitors each year. This year, panellists included representatives of British Telecom, Deutsche Telecom, Level 3 Communications, Telecom Italia and other major industry players. Dr Hugh Bradlow represented Telstra.

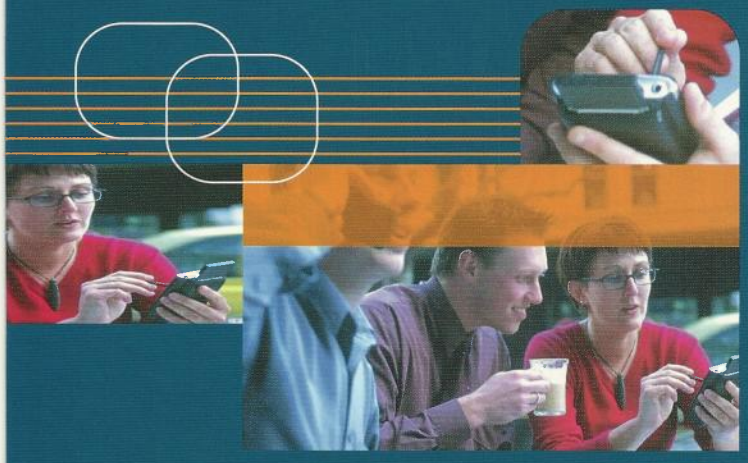
***Telstra's DMO strategy is a comprehensive infrastructure plan for Telstra to migrate its services to a core IP infrastructure, which will give customers broadband capability, offer them wireless data services and deliver new telephony via a combination of the web and telephone.

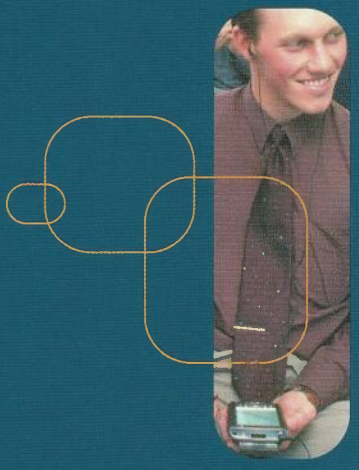
(networkcommunications)

* *Telstra's phone network reaches 98% of Australia's population and includes 3.1 million kilometres of optic fibre*
* *Leading edge, real-time management of Telstra's network means that every five minutes, the company's traffic management systems scan data from over 27,000 traffic routes*
* *Telstra operates fixed, mobile, national and international networks*
* *Telstra's international business operations involve 19 countries across Asia, North America and Europe*
* *In 2000, more than 11 billion calls were made on Telstra's network*
* *A collection of trends is changing the face of Telstra's network – including broadband access, interactive entertainment, digital consumer appliances and mobile services*

making 'big company' communications available to **small business**

Providing a comprehensive enterprise-wide private networking solution for medium-sized enterprises has always been a challenge.





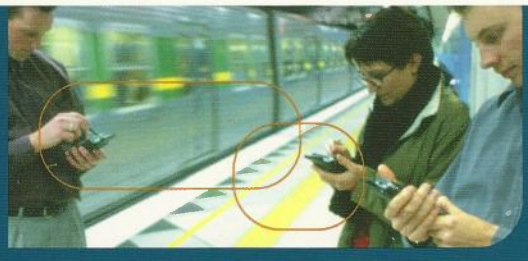
Unlike large corporations, they cannot afford to have an IT division building a private network and at the same time, their requirements exceed simple dial-up Internet based solutions.

Telstra Research has helped Telstra address this market through the deployment of Virtual Private Network technology – the heart of Telstra's Private Internet Protocol (IP) product. This technology allows enterprise customers to share network resources, such as switches, routers and servers with other customers, yet maintain total separation of their data from other customers. Customers benefit from reduced infrastructure costs, while gaining the advantage of a fully managed and flexible network.

Telstra Research has focused on enhancing the capabilities of the Private IP product and has advocated the use of Server Virtualisation technology to deliver a range of core network and application services to Private IP customers.

One of the advantages of virtualised network and service infrastructure is that services for a new customer can usually be provided without the need to install new hardware. Telstra's research into activation technologies is paving the way for customers to directly activate and configure their services and have them available almost instantly.

giving bandwidth priority for **quality of service**



In an increasingly mobile and technology-driven era, customers are not concerned about how a service is provided - they just want it to be good. Today's customers come to companies like Telstra with a certain level of service expectation or demand and they expect that expectation to be met. Through Telstra's Quality of Service (QoS) program, Telstra researchers are aiming to measure customers' thresholds regarding service quality and are hoping to configure networks to perform at, or above, these thresholds. This will make the existing infrastructure more efficient, but most importantly, will provide Telstra customers with a level of service quality that meets and exceeds their expectations.

The primary aim of QoS is to predict service levels and increase user satisfaction. At present, there is a clear customer demand for more bandwidth. Without QoS, the only option in providing a better service is the over-provision of bandwidth. However, the more practical option is to increase the efficiency of the existing bandwidth, as users will always generate enough traffic to cause bandwidth congestion - regardless of how much is provisioned.

Bandwidth can be used more economically by under-standing that different applications have different QoS requirements, such as delay-sensitive real time video and delay-tolerant email. By establishing different levels of QoS, applications that have various network requirements can be accommodated at a higher service level.

Customer behaviour is most accurately predicted by analysing their motivations and the tasks they perform while using network services. This specialised field - looking at how users interact with their machines and its applications - involves a skill set rarely found outside Telstra Research.

building Telstra's **new generation** network

Exponential growth of Internet services demands supporting infrastructure that is able to manage the huge amounts of daily data traffic crossing Telstra's network.

This year, Telstra awarded a $900,000 contract to researchers at Adelaide University to assist the company in optimising its data communications, especially those relating to the Internet.

The three-year contract, which sees the continuation of a 16-year relationship between Adelaide University's Teletraffic Research Centre (TRC) and Telstra, is aimed at helping Telstra design and build its new generation, Internet-based network.

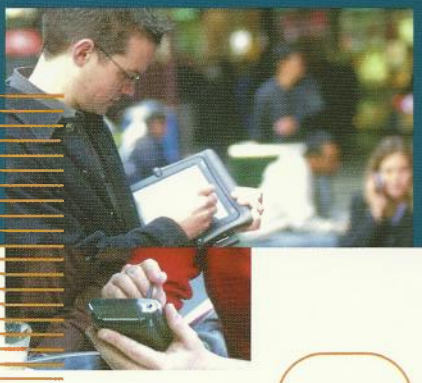
The TRC is skilled in telecommunications research – particularly in the software and network area that underpins phone, fax and Internet-based networks. A software program called DiaMond is presently being developed by the TRC and Telstra Research to help predict future infrastructure requirements.

DiaMond assists Telstra's network planners in ensuring that the network has the required quality and robustness necessary to deliver quality service to customers. It realistically models network traffic demands by using actual traffic samples to estimate the amount of resources required. Without an adequate provision of network resources, congestion and service degradation occurs.

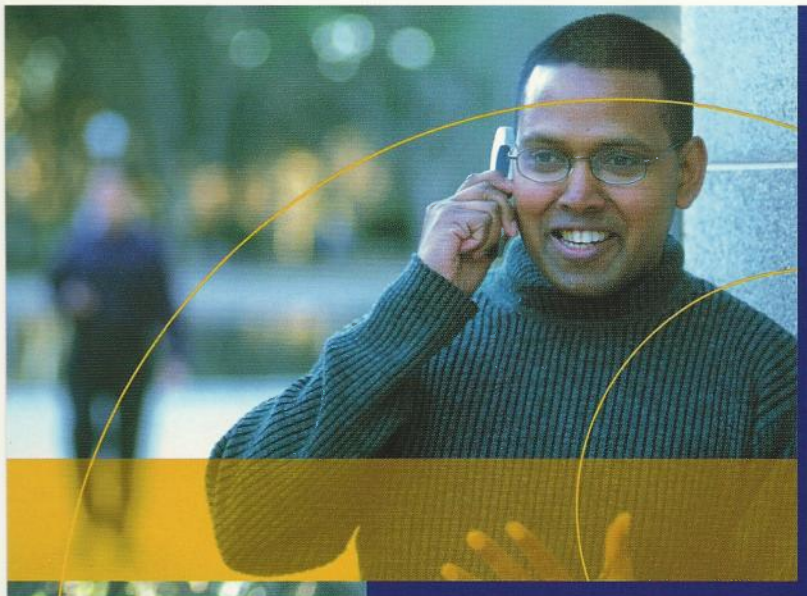
DiaMond addresses three specific stages in the network planning process:

* **Network Validation** – accurate reports on the network topology and provisioned parameters;
* **Performance Verification** – adequate performance in delivering services, including performance under various failure scenarios;
* **Forecasting** – network infrastructure upgrades may be required to cater for growth in traffic.

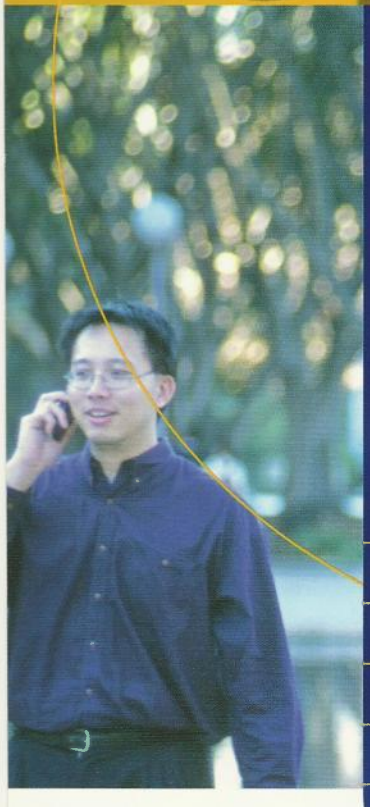
Because of the current skills shortage in Internet Protocol (IP) expertise in Australia, Telstra's contractual arrangement with the Adelaide's TRC is providing University staff and students with real challenges, leading to practical experience in the brave new world of telecommunications and IT.



mobile communications



* *There are 11 million mobile subscribers in Australia*
* *Telstra is the leading mobiles player in Australia with a GSM network reaching 94% of Australia's population and a CDMA network reaching almost 98% of the population*



* *Telstra's Mobile products incorporate 15% of Telstra's revenue mix*
* *GSM (Global System for Mobile Communications) and CDMA (Code Division Multiple Access) are Telstra's two national mobile networks*
* *Mobile phones are becoming lighter with a longer battery life and service costs are decreasing – this trend is set continue*

mobile

tightening security for WAP services

Security measures for Wireless Application Protocol (WAP) have been enhanced by Telstra Research whose recommendations to the 2001 International WAP Forum on improving WAP security were accepted this year.

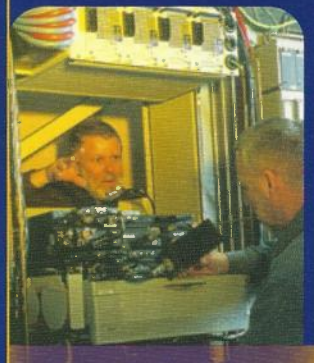
Telstra Research has improved security provided in WAP services in several areas including:

* Improving the WAP Wireless Identity Module specification for deploying key public infrastructure with smart cards;
* Providing application layer encryption with a Wireless Markup Language Script function. (Input by Telstra Research has helped resolve competing aims of confidentiality services for users of scripts as well as assumptions about the integrity and authentication of the script, which has resulted in a sensible outcome for WAP mobile commerce services.)

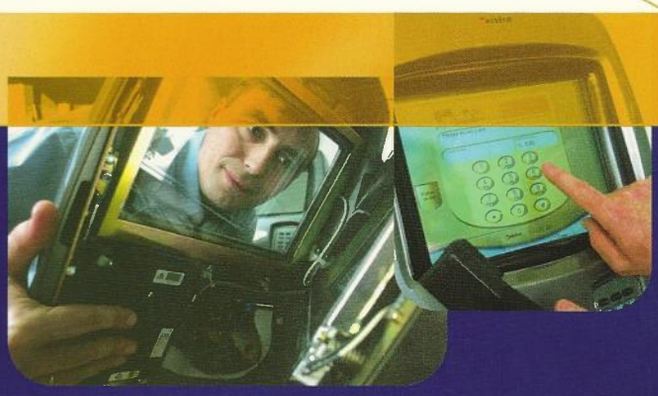
Telstra Research has also contributed to a draft specification for digitally-signed WAP content, including telephony scripts, web pages and bank PINs in mobile commerce applications.

Another area where Telstra Research has proposed enhanced WAP security measures includes password protection for users, which should increase user acceptance of mobile commerce. In practice, a user would be prompted by the content provider whenever a password or other confidential information is requested. The user would then know who is asking for the information and can make an informed decision about whether to proceed.

Handset manufacturers are already supplying WAP-enabled devices, while carriers, such as Telstra, are providing WAP services to subscribers.



towards a converged **network**



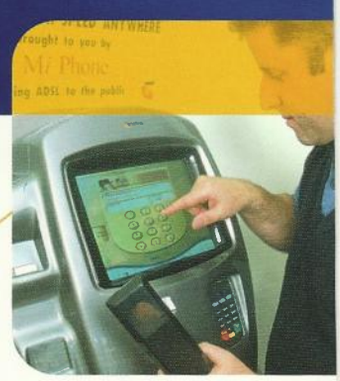
In the past, access to data networks has generally been of a fixed nature to a private network. However, the introduction of new forms of access technology – such as ADSL (Asymmetric Digital Subscriber Line) and GPRS (Generalised Packed Radio Service) – is enabling users to connect to a network in many different circumstances.

Providing the ability for a user to access their service provider or private network via any access technology creates a number of challenges. Telstra Research has been studying and recommending ways to make switching between access types seamless for users, by focusing on areas of scalability, protection, seamless access and quality of service.

In the future, there will be particular technologies that encourage the convergence of networks including application services like IP telephony, video conferencing and Mobile IP. For instance, Mobile IP extends the dynamic access concept to mobile roaming, which allows a user to roam between access technologies while maintaining their connection – like a mobile phone. Or applications started at work, with LAN connectivity, can continue to operate without interruption across GPRS on the way home and via, for example, ADSL while at home.

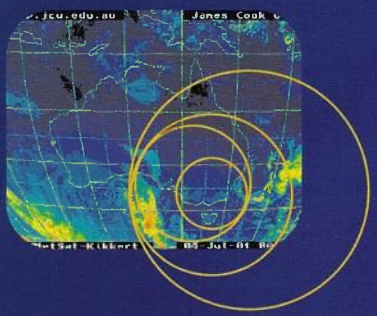
Highly flexible access to network and services will be delivered by a combination of integrated authentication infrastructure and policy servers – areas presently under investigation by Telstra Research.

If the network convergence trend continues, users will be the winners as they will gain maximum flexibility in tailoring and using various network services according to their own needs.



fine tuning **customer communications**

Predictive modelling tools, that identify trends in past customer data to help forecast future customer behaviour, have been developed by Telstra Research and received great interest from Telstra's offshore partner, HongKong Tel (CSL).



Recognising that all communications are not necessarily relevant to each customer, Telstra's predictive modelling product allows Telstra to zoom in on customers' areas of interest and has been particularly helpful in retaining mobile customers for the company.

Predictive modelling allows Telstra to understand customers more intimately by:

* Helping predict the value of communications across a customer's lifetime;
* Predicting the reliability of customer payments;
* Forecasting which customers are likely to adopt new services, such as WAP and SMS.

Like weather forecasting, predictive modelling does not offer guarantees, however the ability to offer customers relevant information in accordance with their needs is a significant boost to ensuring the efficiency and profitability of Telstra's customer communications.

Corporate SMS – making it easier to find the people you work with

The virtual organisation or office is becoming more and more familiar as we use technology to access our work from remote locations.

The indispensable mobile phone and laptop computer have both become a person's home base as outsourcing trends and client partnering become more prevalent. But at times, finding the person you need from your mobile phone directory can prove difficult. Certainly in today's fast corporate world, contacts can date very quickly and your phone only lists the people you've previously dealt with – not necessarily the person you need to speak to today.

Enter SMS-CED (Short Messaging System – Corporate Electronic Directory): the directory for the whole corporation, accessible in a few seconds from your mobile phone. Telstra is presently trialing the SMS-CED service with Telstra staff and an external version is being developed as a new offering to corporate customers. By sending the name you need to a special number, your mobile phone soon shoots back listing names and numbers which match your search.

SMS messages are quick, concise, discrete and effective – in fact, the very model of modern communication – but can be difficult to send. At the time of writing, SMS Buddy, a prototype of an upcoming Telstra product puts a tiny icon on the screen of your PC. You can easily send an SMS by selecting the person or people you want from the address book, typing in your message and hitting send. It's much faster than web-based or phone alternatives.

For those who need to reach a team, SMS Group Messaging is the answer. Using the web interface to set up your distribution lists, a single message sent from your phone will reach everyone on your distribution list.

And for vision-impaired people, text to speech translations of SMS can be received as a voice call without the sender ever needing to know how the message is delivered.

developing **smart antennas** for the mobile network

Telstra Research is presently evaluating the availability of smart antenna products, an emerging radio technology which is expected to improve both the quality and capacity of Telstra's current GSM, CDMA and future 3G networks.

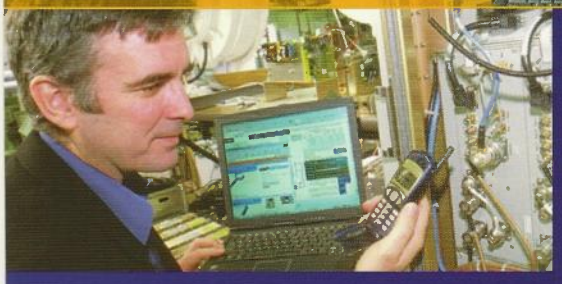
Smart antennas work by reducing interference in the mobile phone network. Researchers have been evaluating commercially available smart antenna products by assessing the amount of interference reduction recorded at base stations as a result of the smart antenna device.

Keeping interference within acceptable bounds and maintaining call quality is a priority for Telstra. Interference on cellular networks is generally minor, however is usually the result of signals from a base station being spread beyond the boundary of that cell.

While a range of techniques can be used to combat the effects of increased interference (within inner city areas, Telstra has deployed a 1:1 'frequency-hopped' network which allows mobiles to 'hop' over a pool of frequencies and which more equitably distributes interference during any one call), smart antennas further refine and reduce interference problems.

Telstra's analysis has included matching the coverage of smart antennas to that of the conventional base station sectors currently deployed in the GSM network. Since only a few base stations cause above average interference, it is expected that only a limited number of base stations will be upgraded with smart antennas.

GPRS delivers **new data services** to customers



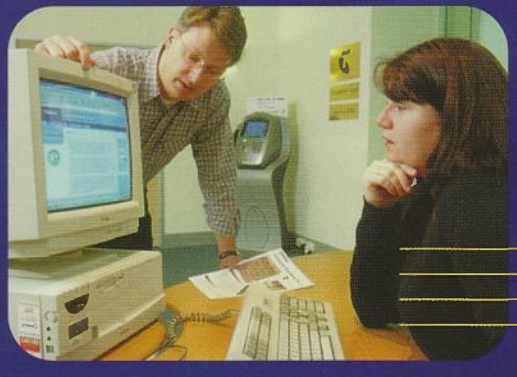
Telstra Research has developed a methodology and test bed for measuring the data performance of General Packet Radio Services, or GPRS.

GPRS uses packet data transmission over the GSM (Global System for Mobile Communications) network to facilitate mobile Internet access and other data applications. The new test bed allows researchers to measure data simultaneously – both on the GPRS radio link and on the link from customer to host. These tests enable Telstra researchers to quantify the network design requirements for Internet applications over GPRS.

To complement the performance measurement test bed, researchers have also developed a GPRS performance analysis and dimensioning tool. This allows network designers to provision sufficient network infrastructure to satisfy demand for speech and data applications. At the same time, different quality objectives can be met for these two traffic types.

There are presently no commercially available tools for performance testing of GPRS networks and those developed by Telstra are unique in their scope, flexibility and power.

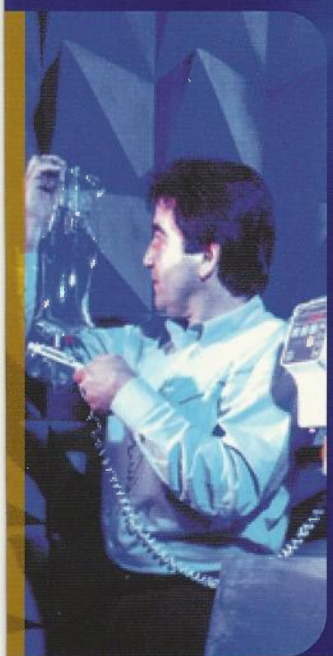
Telstra's work on GPRS has enabled the company to successfully launch the GPRS service and ongoing work in this area will ensure optimum design and performance of the network.



getting the buzz out of **medical equipment**

Anyone who has ever used a mobile phone is probably familiar with a buzzing noise that can occur when mobile phones are placed near radios or audio equipment.

This interference, known as Electromagnetic Interference (EMI), also has the potential to cause malfunctions in medical equipment, which is why mobile phone users are sometimes asked to switch off their phones when in a hospital.



However, restrictions on mobile phone usage in hospitals aren't consistent across the medical profession and, given the significant benefits in allowing doctors and other medical staff to remain in communication with their patients while in the hospital environment, it's important that only necessary restrictions are placed on mobile phone users.

To help determine what these restrictions might be, Telstra Research, in conjunction with the Therapeutic Goods Administration (TGA) – the federal agency responsible for regulating health products, such as medical equipment – has been conducting trials in Australian hospitals to better understand the nature and extent of the impact mobile phone usage has on hospital equipment.

Initial stages of the testing have been carried out using simulated mobile phone transmissions directed at medical equipment by Telstra researchers. Tests have also been conducted in hospitals, incorporating a variety of technologies, including GSM and CDMA – the two technologies used in Australia.

Mobile phones involved in the laboratory and hospital tests use special software controls to allow the researchers to set the power and other transmit parameters of the handsets, which are usually set by the network itself. Researchers can then determine the type of interference and at what distance it occurs, from specific types of medical equipment, for a variety of situations and locations throughout hospitals.

Upon completion of the testing and trials, data will be collated and checked for consistency so the TGA can provide accurate advice to hospitals on what restrictions should apply to mobile phone usage. In this way, patients and the public will be able to benefit from mobile phone usage while in hospital - without compromising the proper functioning of hospital medical equipment.

helping to improve the **bionic ear**

"I'm very happy with the bionic ear because now I can hear things like the wind blowing or the birds singing and the dinosaurs and dragons on TV."

Herbert, BEI Annual Report 1999-2000

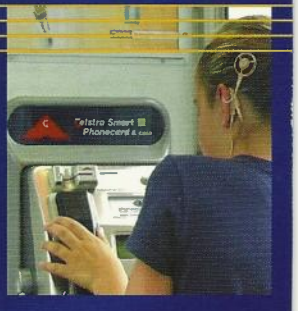
"When I lost my hearing I became really depressed ... I felt that life wasn't worth anything ... The bionic ear has given me my life back – it's absolutely marvellous."

Ron Burgess, BEI Annual Report 1999-2000

Telstra's three-year research project to help improve the Bionic Ear and to advance automatic speech recognition systems combines the Bionic Ear Institute's (BEI) knowledge in brain science with the communications expertise of Telstra Research.

The research collaboration is aiming to learn more about how the brain decodes speech. Results so far are showing promise with new ideas being tested every three months. With intellectual property being an important outcome of the research, Telstra and the BEI are likely to apply for patents on their research results.

Hearing loss is the most common disability in Australia, with over ten percent of the Australian population having some form of deafness. Telstra's relationship with the Bionic Ear program began when Telstra technicians first worked with Professor Graeme Clarke and his Melbourne research team in the development of the bionic ear in the 1970s.



The bionic ear now provides hearing to nearly 30,000 people, returning hearing to people who have a severe hearing loss, by bypassing the damaged hearing system and directly stimulating the hearing nerve.

Telstra researchers are working with BEI scientists to determine whether knowledge gained from research on the responses of neurons in the brain stem could be used to improve the performance of speech-recognition systems, particularly in noisy situations.

Telstra actively supports the BEI through sponsorship arrangements which help to raise awareness and attract funding to the Institute, which is a not-for-profit medical research organisation affiliated with Melbourne University.

There is a special fit between Telstra and the Institute as both are working to improve communication between people – whether it's using the bionic ear implant, or mass communication using the latest telecommunications advances. The research project is due for completion in 2002.

commercial success for EME research software

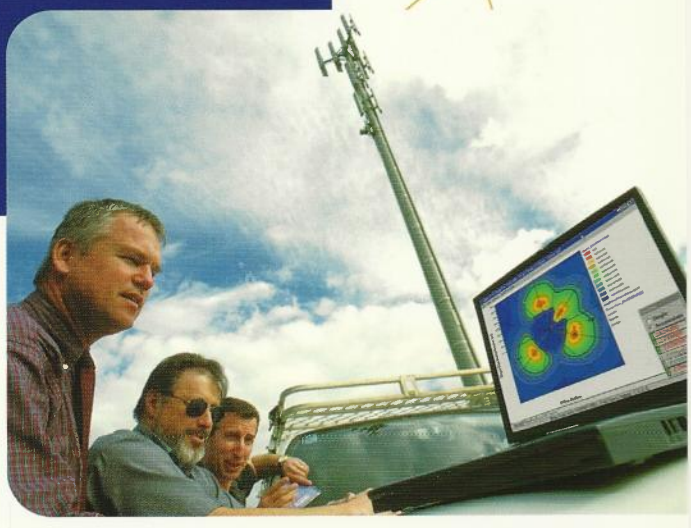
Telstra's Electromagnetic Energy (EME) software tool, which assesses radio frequency levels in public areas and around base stations sites, is now being sold commercially.

The software program, written by Telstra Research, has been used within Telstra since 1996. It gives operators, site managers and independent consultants a simple but powerful tool in which to provide emission information in an easily understood format that eases uncertainty about emission levels in public areas.

The true value of the tool is its ability to carry out up to 660,000 calculations and pictorially display the emissions around sites that would be impossible using a spreadsheet or similar means. The program also meets the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) methodology for EME assessment.

Launched commercially in September 2000, the software tool has been sold to other telecommunication carriers and EME consultants in Australia. In addition to the World Health Organisation (WHO), the tool has also been sold to customers in the United Kingdom, Sweden, South Africa, Portugal, Spain, Poland and Turkey.

An enhanced version of the product is being developed and is due to be completed towards the end of this year.



the Internet
a special feature

The Internet has forever changed the life of the consumer and we are now entering a brave new world in which everything communicates.

But what is it about this brave new world that people value most?

Geoff Huston
Telstra's Chief Internet Scientist

anything, anywhere, anyhow, anytime, anybody

For a technology that is 30 years old and was built at a time when there were only a few thousand computers in the world, the Internet has been the phenomenal success story of modern communications.

Contrary to what some may believe, success for the Internet hasn't come because it is an outstanding piece of technological architecture. In fact, almost any other good protocol could have achieved the same outcomes. But the beauty of Internet Protocol (IP) was that it didn't belong to any single vendor and that its implementation was publicly available, kick-starting its widespread adoption. On top of that, the Internet was cheap.

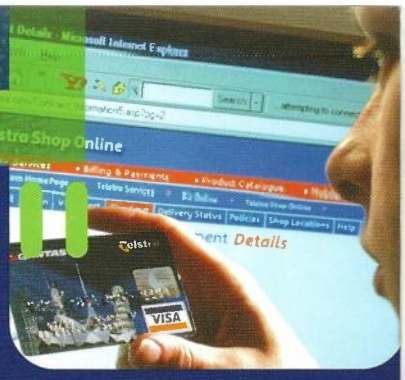
Viewed from today's perspective, the development of the Internet was largely inevitable. As far back as the 1950s and motivated by the Cold War, there was a great deal of interest in communications systems that could withstand some form of military attack – the idea being to design packet protocols that were more reliable than the networks on which they operated. From this research work into highly resilient packet switching techniques came the Internet.

The Internet is not an evolution of telephony architecture. It's revolutionary and it's complex. It is more reliable than its foundation (network) and today, withstands a huge amount of individual component failure every day across the world. It's resilient, efficient and cheap.

Telstra's Chief Internet Scientist, Geoff Huston, says the network in the Internet is not intelligent and has none of the rich network functionality we see in voice-based technology. To be blunt about it, it's cheap, simple and dumb.

"Inside the Internet network are ordinary packet switches," he explains. "Packet switches are simple boxes that sit inside equipment racks. They're cheap because they don't do a very good job – they merely forward packets as best they can meaning that some packets may get dropped, delayed and reordered – they're not high quality devices.

"But what makes it all work is what's on the edge of the Internet network and the fact that computers connected to the network are incredibly sophisticated. Part of the edge software is the Internet Protocol stack. It uses a model called end-to-end. When my computer sends data through the



network, it pushes a packet into the network with the remote-end Internet address in the packet header. But the network may not reliably deliver the packet, so the local computer keeps a copy of it and, only when my computer receives an acknowledgment that the packet has arrived, can I drop the local copy of the packet. If the packet doesn't make it through the network, it can be resent.

"All the intelligence required to support reliable data transfer in the Internet network is in the end system. If the network loses a packet, the end systems recover."

According to Geoff, take-up of the Internet was in many ways inevitable because something was always going to be developed to make personal computers (PCs) talk to each other. At the time the Internet picked up steam, so too did personal computers and their joining meant that PCs became more than dumb electronic typewriters thanks to the Internet network which connected them.

Today, the Internet is about ubiquity. "We've gone past the research, gone past a small class of technology users and we're now staring ubiquity in the face," says Geoff.

"Sony's recent announcement that it will be placing Internet Protocol (IP) in every piece of consumer electronics was stunning. We are entering an appliance world in which IP is disappearing into the woodwork and it's not just about computers anymore."

Geoff has spent a lot of time in developing countries talking to people who are developing the Internet for the third world. In the developed world, some of the barriers to the Internet are legacy-related; large, established industries who see the Internet as a threat. However, in the developing world, there are fewer threats because there are less established ways of doing things.

"Some of the work being achieved in Mongolia and Uzbekistan is astonishing – the Internet is within the economic reach of these countries and for them, it is a world of amazing opportunity. One of the largest rollouts of DSL (Digital Subscriber Line) is occurring in Korea – it's so cheap that it's being rolled out nationally."

While the cost of the Internet is cheap, its low cost has also caused some disruption. According to Geoff, the recent fight between Napstar and the music industry wasn't about whether music could be downloaded across the Internet or whether we still needed plastic to make music - it was a fight about copyright.

"Once they sort out the copyright issues, music will be downloaded and the industry that puts music on plastic and then distributes it, will disappear," Geoff predicts.

"Once I can get the content of a CD to you at a low enough price, I can get exactly the same content to you via the Internet – and if music is the issue today, it may well be that videos become the issue of tomorrow. When it gets cheap to download a few hundred gigabytes, then movies become susceptible to be downloaded over the Internet."

The Internet has forever changed the life of the consumer and we are now entering a brave new world in which everything communicates. But what is it about this brave new world that people value most?

"People value person-to-person communication," says Geoff. "Messaging is highly valued. I don't have to interrupt what I'm doing to instantly respond to a message, so I have more control as to how I interact with others via messaging networks. And the value of a message is higher than mass market replicated content.

"In my opinion, messaging is where the highest value is. All the other applications can happily use the same Internet infrastructure, but these messages are a record of our lives ... they're not a TV set.

"But the Internet does not imply the terminal decline of voice networks," he explains. "I think the voice system is going to be with us for a very long time. It works so well and I don't think that anyone can replicate voice with the Internet – it's just too expensive and by the time you've spent all your money, you might actually have been better off to have built a new voice network altogether."

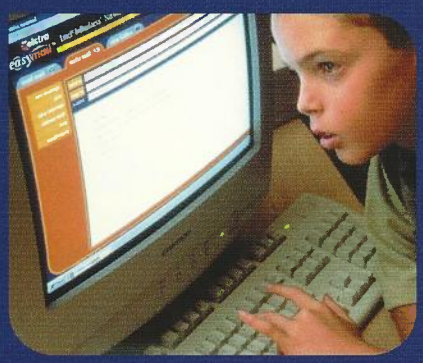
Today, a huge amount of time is spent listening to consumers and what they value, reducing technology barriers and making technology seamless. Ultimately, Geoff doesn't think people should bend their heads to technology.

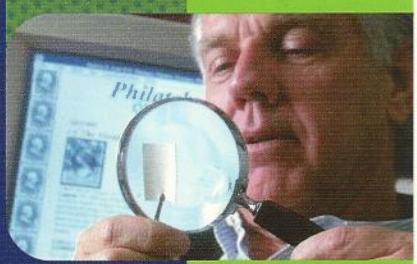
"Technology is the servant, not the master. Our job at Telstra is to ensure we listen and understand and build our perceptions of what people need and what they really value.

"In a technical sense, we still have a lot to do. The Internet is a 30-year-old protocol that we're trying to stretch so it works at billions of bits per second. When you consider that the original design specification was developed during a time when networks operated at thousands of bits per second, there's some adaptation that has happened along the way. There's no doubt that the industry is coming together – vendors and operators alike – to address some of these Internet architecture problems.

"This model of simple networks with clever edge devices is one that drives the Internet onward. Simple networks are easily deployed and simple networks can scale to support a world of tens of billions of connected devices. There is a wealth of opportunity in using the Internet to support an ever-broadening class of communications services."

"The Internet is here to stay!"

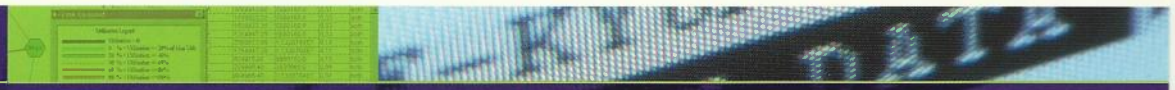




Internet communications

* At the end of 2000, nearly eight million Australians were on line - representing 41% of the population
* Telstra is a leading Internet player and is the largest Internet Service Provider (ISP) in Australia
* Telstra has captured more than 25% of the national Internet market
* By the end of 2001, all Australians will have access to broadband services via cable, ADSL or two-way satellite technologies
* As a result of its DMO (Data Mode of Operation) project, Telstra is well on the way to delivering a fully robust infrastructure for today's information economy

the tyranny of email



Despite the ever-present nature of email, tools to help users manage the torrential flood of information contained in email messages are either weak or non-existent for many organisations.

While email messages contain the day-to-day record of an organisation's evolution, most corporations consider the storage requirements of email too demanding and impose limits on what's preserved, forcing users to either back up mailboxes to archives or delete the messages altogether.

However, deleting a relatively innocuous message may have serious consequences for the future effectiveness of a business and in a knowledge-based enterprise, one's network of contacts, as well as the supporting record of why actions were or were not undertaken is critical for success.

The major problem with email is that it's very difficult to know in advance which messages will be valuable in the future. Yet, providing unlimited storage space for email messages can prove costly. Estimates of worldwide volumes of email increasing from 9.7 billion in 2000 to 14.4 billion this year indicate a serious problem for this business communications tool which has become as critical as the telephone.

Telstra's own enterprise network has some 1,000 file servers and 120 mail servers distributed throughout Australia. As a service provider, particularly one offering online-based services, Telstra's use of email – both internally and with customers – is significant and growing.

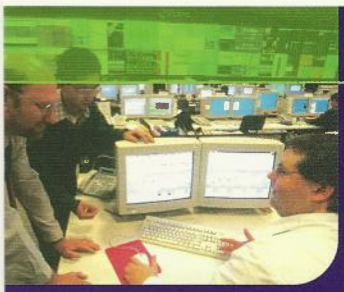
If business is to maximise the knolwledge value of email, it must provide users the ability to retain the total email pool and offer them instant retrieval through a sophisticated search capability; not only of the basic message content – but also within attachments to the email.

To address some of these issues, Telstra's Chief Software Strategist, Mac Lemon, engaged Melbourne IT company and Telstra Research commercialisation partner, 80-20 Software together with storage vendor, EMC, in a proof-of-concept to jointly supply the capability to store, index and search all of a user's current and archived email on an unconstrained basis.

The 80-20 product, Retriever, is a search engine for the Microsoft* Outlook email client which creates an index of all Outlook email messages when it is first installed. Employing technologies originating from Telstra researchers, its indexing process is intelligent and when used in conjunction with services offered by a storage service provider, it can provide virtually unlimited storage space at a fraction of the cost of adding additional physical storage to networks within an organisation.

Already, feedback on the Retriever tool has been positive. Telstra has been trialing the product internally and users have been keen to adopt the service, which some are suggesting will be the new 'killer' product for email.

enhancing voice over IP



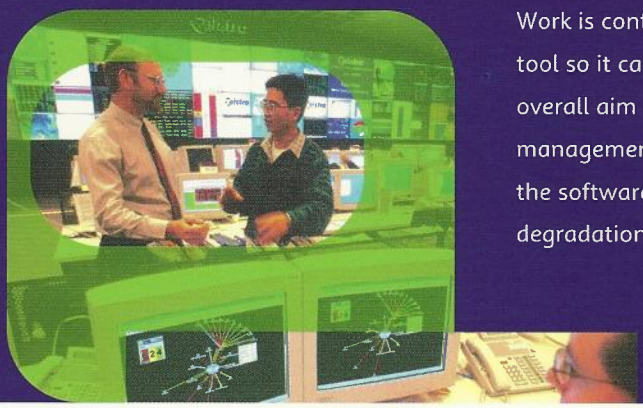
Monitoring the performance of voice services as they migrate to an IP world is likely to be the differentiator that determines the success of Telstra's VoIP products and services.

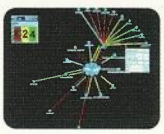
Unlike the Public Switched Telephony Network (PSTN), VoIP can vary in quality over the duration of a call, particularly if the IP network is not properly engineered. In order to build systems for monitoring and managing VoIP performance, Telstra has drawn upon extensive experience gained from various VoIP trials.

The latest tool, developed by Telstra Research, is known as Vis VoIP/V-MART (or Visualisation of VoIP/VoIP Monitoring Analysis Reporting Tool). This tool has the capability to provide product and network-wide views that are not readily available from off-the-shelf systems. Currently, Vis VoIP/V-MART monitors Telstra's Internet Call Connect product.

The tool's visualisation ability provides vital information about the health of the Internet Call product at a glance. It is now routinely used by Telstra's Global Operations Centre for traffic monitoring and has powerful drill-down capabilities for performance analysis.

Work is continuing by Telstra researchers to enhance the tool so it can be applied to other VoIP products. The overall aim is to provide a common look-and-feel management tool for all VoIP products, and to provide the software intelligence for identifying performance degradation and fault location.





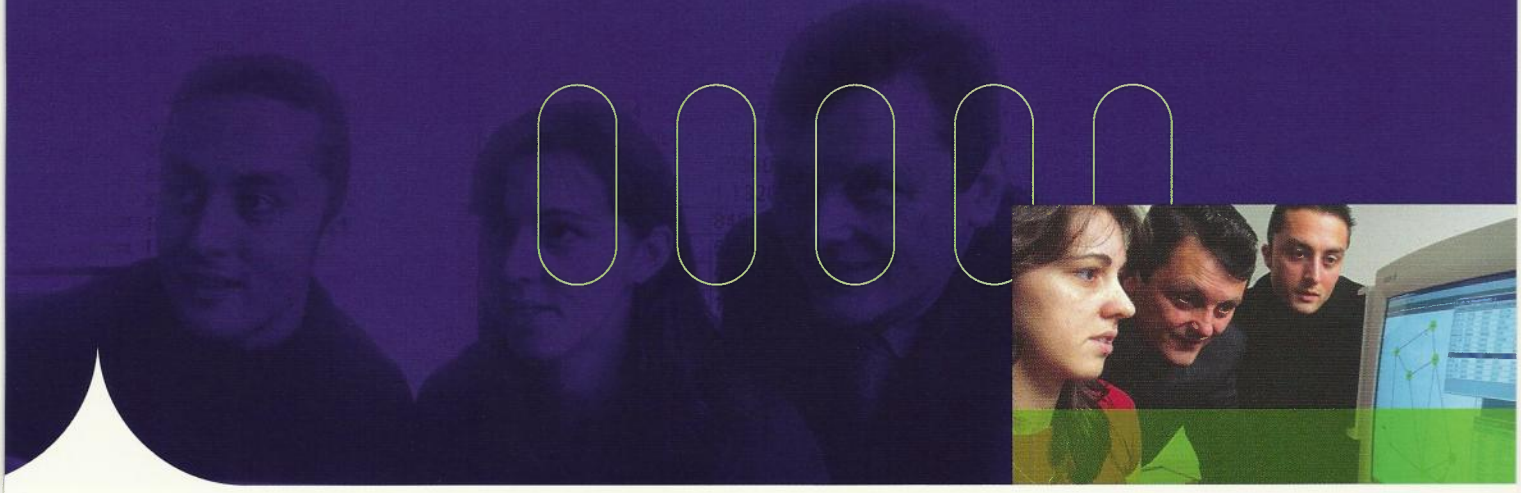
using **artificial intelligence** to deliver next generation telephony

The planned use of Internet technology for the delivery of voice – presently being developed under Telstra's next generation telephony program – creates technical challenges due to the immaturity of both the required network technology and the necessary computer systems for service and network management.

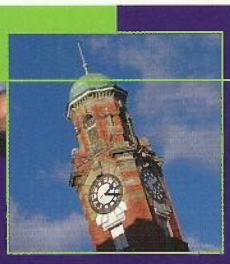
While Telstra has considerable experience in operating a large telephony network, the network technology required to implement new voice services is significantly more complex. Consequently, the need for more effective management systems will be even greater than is the case for the existing telephony network and an efficient service assurance system will impact directly on the cost of maintaining a reliable network operation.

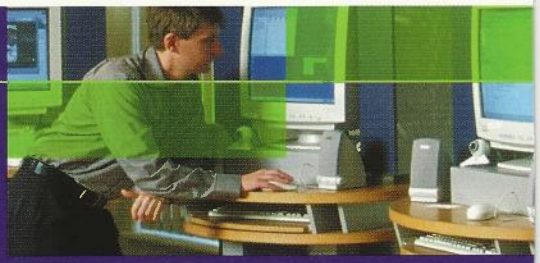
The work being carried out by Telstra Research is aimed at developing Artificial Intelligence techniques that will allow the creation of effective management systems for fault diagnosis. In particular, the work is directed towards proactive fault management techniques, rather than reactive techniques – with the objective to provide early warning, location and diagnosis of developing network faults. This will enable problems to be addressed before there is a major impact on the quality of customers' services.

This is in contrast to reactive fault management, where network problems are addressed after they have impacted network performance. By proactively monitoring potential 'hot spots' in the network, Telstra is ensuring a better service for customers.



hi-tech comes to Launceston





The opening of Telstra's new Broadband Laboratory (B-eLab) in Launceston last August saw, for the first time, a major Telstra R&D facility located beyond Sydney or Melbourne.

This change acknowledges that today's communication infrastructure allows, and indeed encourages, facilities to be located away from large population centres. The new laboratory is the centrepiece of a $30 million joint project between Telstra and the Federal Government – the Launceston Broadband project.

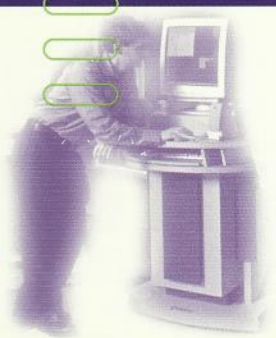
B-eLab's location has proven to be a major attraction for staff, who have been recruited worldwide. This year, seven university graduates joined B-eLab, six of whom were from the University of Tasmania, and all agree that Launceston offers a great work location and lifestyle.

The role of Telstra's newest laboratory is to develop and trial commercial quality broadband IP network applications. To achieve its broadband application trial charter, B-eLab has a dedicated operations team, a state-of-the-art backend network and server complex, blanket ADSL coverage in the Launceston metropolitan area and a regime of rebates in place to encourage early adoption of broadband services by Launceston customers.

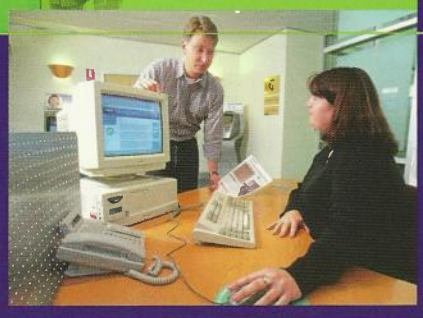
The Development team is currently working on a range of broadband projects including:

* ADSL to the Streets: Public broadband application trial;
* Distributed Call Centres on Demand: A trial of distributed call centres using ADSL access networks;
* Isizzle: A trial of SIP-based (Session Initiated Protocol) communications over ADSL.

In addition, projects based around broadband Internet appliances and broadband wireless network are being scoped.



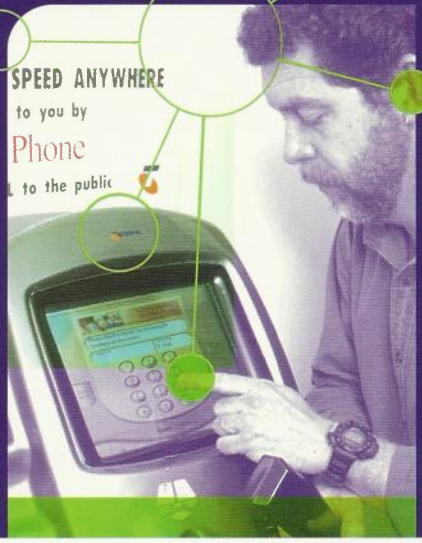
bringing **multimedia kiosks** to Launceston



As part of the Launceston Broadband Project, a $5 million business development fund provides seed funding for small-to-medium businesses to develop their broadband application concepts to the point where they can be trialed on the B-eLab network. B-eLab is also approaching organisations directly who may have broadband content or applications to be trialed on a real network with real users.

The first year of B-eLab's operation has been a time of establishment, rapid growth and developing relationships with customers and partners. 2002 will see the results of its first development and trial projects – with B-eLab products out in the market place – placing Launceston at the centre of broadband application R&D.

Multimedia payphones, or information kiosks, are the latest hi-tech product to come out of Telstra's Broadband Laboratory in Launceston.



Taking ADSL to the streets, the multimedia information kiosks are aimed at tourists and can also act as information portals for local businesses. They contain local advertising, phone directories, video and audio clips, maps, restaurant and accommodation guides and airline and bus timetables. The kiosks can also be used as a normal payphone.

It's intended that the kiosks will be placed at bus terminals, hotel foyers and shopping centres around Launceston for one year to test the technology.

Combining broadband ADSL capabilities with the kiosk is unique to Telstra and will help Launceston become a high-tech communications centre.

likely commercialisation for ***dynamic contact centre*** *on demand*

One project providing a new IP-based platform and commercialisation opportunity for Telstra Research is the Dynamic Contact Centre on Demand (DCCoD).

The platform introduces a new business concept enabling call centre providers to use their own agents or to hire third party agents.

With features such as lower cost, simple and faster activation speed, accessibility to the PSTN (Public Switched Telephone Network) and IP contact, DCCoD offers a contact centre solution suitable for small-to-medium enterprises, as well as larger corporate companies.

Telstra's latest Internet research shows **older people are not 'technophobes'**

Preliminary sampling from Telstra's latest Internet research findings show that seniors (55 years and over) are keen users of computers and the Internet, believing that a knowledge of new technology gives them a common bond with their families, especially grandchildren.

The research results were taken from a small sample group of 44 people in Launceston that were hand-picked from senior's organisations – such as the Lions Club, School for Seniors and Rotary – to ensure adequate representation from the senior community.

The research project found that online shopping is a popular form of e-commerce among seniors – an interesting result given the general assumption that seniors do not use online transactions.

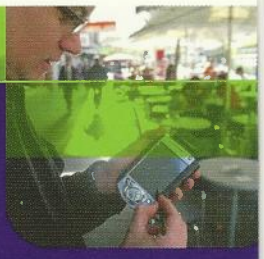
The findings also show that a quarter of research participants had used the Internet to pay bills and that in terms of future usage, those with Internet access said they would like to use online shopping, banking and bill payment.

Seniors are one of the fastest growing segments of the community to access the Internet and are predicted to drive Internet growth in the near future. Telstra's research project is ongoing and while results are preliminary only, they provide an increased understanding about seniors' motivations, perceptions and attitudes toward Internet usage.

Telstra Research is also conducting a research study into child and teenage Internet usage which will run until May 2002. Despite young people in Australia being among the highest users of computer and Internet technology in the world, there are very few recent Australian studies into why young people use the Internet.

The research study is aimed at uncovering longitudinal trends in young people's Internet behaviour.

dynamic trading for B2B



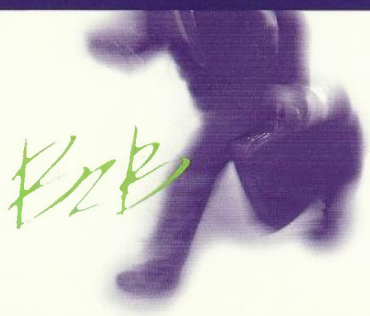
The ultimate success of business-to-business (B2B) online trading and collaboration is dependent on the ability of businesses to discover the online services they need and to use them in a more flexible way.

Presently, most B2B solutions lack the ability to establish new trading partnerships and, in order for businesses to partner on demand (dynamic trading) with other businesses, they require a mechanism for exposing their web services.

Work by Telstra researchers in this area provides the basis for easier partnering and collaboration between businesses. It is based on automatic service discovery standards, namely, UDDI (Universal Description Discovery & Integration) and ebXML – two recent significant global initiatives in the B2B space that satisfy the requirements of discovery and support.

UDDI provides a global registry for businesses to publish information about their web services and protocol descriptions for accessing them, while ebXML enables an electronic marketplace to facilitate B2B trading of modular services using standard message format.

The dynamic trading concept provides the basis for a business to partner with another business in the delivery of services in a wide range of domains, such as – trading, mobility, resource, network management and content management. Telstra Research is presently exploring several scenarios to apply this concept in the mobility and trading domains.



measuring **broadband online service** performance

Much is expected of broadband technologies, so the pressure to deliver is high. Understanding broadband customer experiences and performance issues is the key to meeting expectations.

To achieve this, three tools have been developed by Telstra Research, currently implemented as prototypes, for measuring broadband online service performance.

Broadband robot - generates online traffic to measure performance factors such as download rates, web page availability, delays and login times. This enables Telstra, for the first time, to gauge the end-to-end performance of broadband Internet services and report the statistics to a central server for storage and presentation.

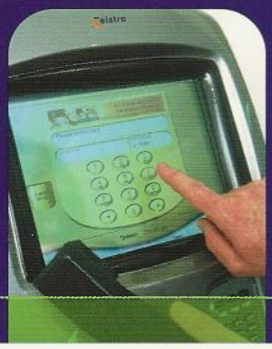
Web reporter - measures the performance experienced by Telstra customers (with customers' permission) when they access web pages and stores performance statistics. The web reporter also monitors the performance and popularity of Telstra's (telstra.com and bigpond.com) and competitors' Internet portals when accessed by Telstra's broadband Internet (ADSL and Cable Modem) customers.

Traffic analyser - analyses online traffic and application trends.

This information is critical in making decisions about allocation of resources in the supporting infrastructure for broadband online access.

The aim of detecting and isolating performance issues is to fix them before customers feel the effects. In future, performance monitoring tools could incorporate features like automatic alarm generation where performance issues are identified.

Ultimately, these tools will help Telstra understand its customers better and provide appropriate service performance levels so the company can stay ahead of its competitors.



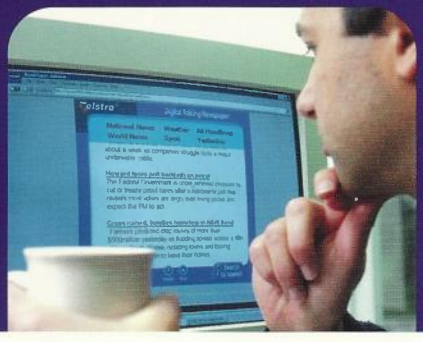
a digital talking newspaper?

A new service prototyped by Telstra Research allows people to navigate and search for news items by both text and speech.

Called the Digital Talking Newspaper (DTN), the system is capable of delivering digital newspaper as text synchronised with audio over a desktop PC and handheld devices, such as palm tops and mobile phones for Internet users.

The DTN system takes news source files and processes them before converting them to audio files using Text to Speech (TTS) conversion. Audio, text and images are then presented to the user in a navigable format, with users able to play back news, navigate from one item to the other in the menu via simple mouse clicks and search for news items using text and speech.

DTN is well suited for mobile users, the print disabled, dyslexic people and the aged because of its ease of use.



Can you imagine a future where all your electronic devices talk to each other?

A future where your mobile phone can talk to your home security system, your car knows where to find a parking spot and, in the event that you forget where you've parked it, your mobile phone can show you the way.

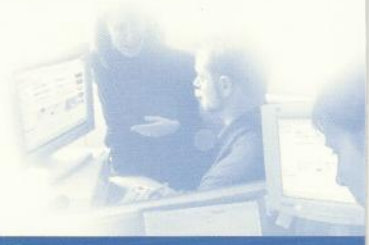
In this future, your location is known by your own virtual agent which is able to intelligently gather and filter information to present you with what you need in your current location and context. For instance, take the every day task of taking shopping from the car to your house - with arms full of groceries – in the future there will no longer be the frustration of fumbling for keys. As you approach the front door, it will unlock and open for you.

Telstra Research is carrying out research on applications that rely on knowing where the user is. This electronic presence is known as ePresence, where your environment modifies itself as you approach it. For example, as you move from room to room in your house, the sound from the stereo might follow you until it turns off when you arrive in the room where your family is watching TV.

You will also be able to extend your physical presence electronically – allowing you to control the temperature of your house from remote locations, or perhaps you'll want to warm up the pool, switch on your electric blanket or program your VCR from your mobile phone.

The idea of presence is not restricted to people. In fact, the most likely candidate for using presence information is in the movement, storage and identification of packages and objects.

Partnering



This year, about 150 new ideas and products have been introduced to Telstra via new and existing relationships with venture capital and incubator companies.

Expanding its external activities in the area of hi-tech innovation, Telstra has entered into relationships with several local and international venture capital companies whose businesses invest in hi-tech start up and seed stage companies in the telecommunications, data communications and Internet industries.

building relationships with **venture capital & incubator** companies

The main focus of these new arrangements is for Telstra Research to:

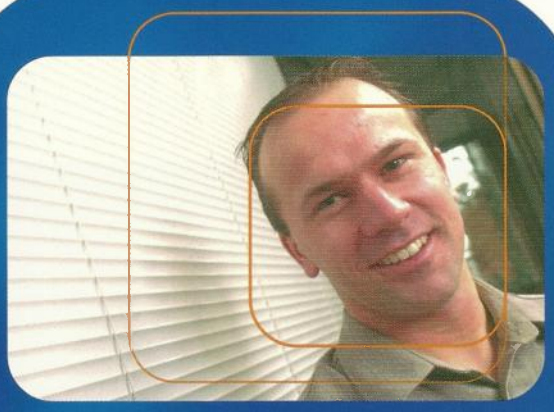
* Gain exposure to a significant deal flow in early stage information technology;
* Provide real intelligence about trends and developments that are in Telstra's interests; and,
* Provide an extra vehicle to commercialise intellectual property as developed by Telstra's R&D staff.

Some of the companies Telstra has arrangements with include:

* Gemini, a pioneer in Israel's venture capital industry;
* ePark, Australia's leading seed stage venture capital investor; and,
* The Australian Distributed Incubator, which focuses on mentoring, consulting and venture capital fundraising.

Already, several proposals are poised to enter incubation to create new companies in the hi-tech arena. In future, Telstra hopes to extend its network to allow great opportunity for its staff to commercialise promising ideas, and to give local companies an extra avenue to provide hi-tech solutions so that Telstra can enhance its product offerings to customers.

(our people)



steve **telburn**

MBA, BSc

The very nature of R&D means that it's exploratory and experimental, so the technologies that are produced can create unexpected business opportunities. Some of these fit outside Telstra's core business strategy or can be applied to industries other than telecommunications.

These new ideas present an exciting opportunity to create value by forming a spin-off company, starting a new joint venture or by licensing Intellectual Property (IP). My job is to help technologists shape their ideas into an attractive business proposition. Once we've found 'the next big thing', they get busy building a prototype, while I develop a business plan and try and sell our idea to venture capital firms and potential joint venture partners.

I'm excited by the idea of investing in new businesses – I think it would be satisfying to read about a successful new start-up and be able to say that I wrote the business plan for that company!

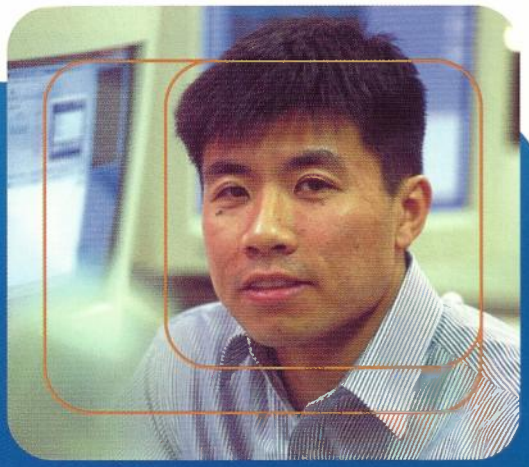
natasha **dragun**

BA (Hons)

Working as a socio-technical researcher means that I'm involved in understanding user needs and responses to different technologies.

I'm currently working on the Electronic Communities Project, which is a longitudinal study looking at how and why people use the Internet. The project has a regional focus, with most of the research activities conducted in Launceston, Tasmania. I'm presently leading the Youth Online Project.

Working with young people and helping them translate their online experiences is interesting and rewarding. On the one hand, it gives me insight into working with young people to deliver user-friendly information and, on the other hand, it gives young people the opportunity to influence the direction of Internet content development for a large corporation.



paul **ng**

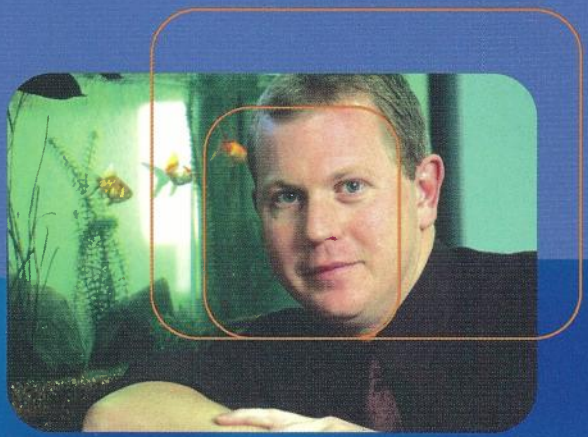
BSc, BE (Hons), MBA

My involvement with Telstra started in the third year of my Engineering degree, when I saw an advertisement for Telstra cadetships. I have been with the company for ten years.

The most significant work I have been involved in while working at Telstra Research has been the TelAIN platform – a second platform developed to carry Telstra's PriorityOne3 product. It was a well managed project with excellent team dynamics.

More recently, I've been involved with project Nimon, which is a tool for monitoring and reporting on network call traffic. My current work is in the call centre space, with a product being developed that will offer call centre-like services with multimedia capabilities.

Outside work, I'm a bit of a fitness fanatic with my main interest being endurance events that involve running and cycling. I think physical exercise is important in that it helps settle the mind, which is important for the type of work that I do.



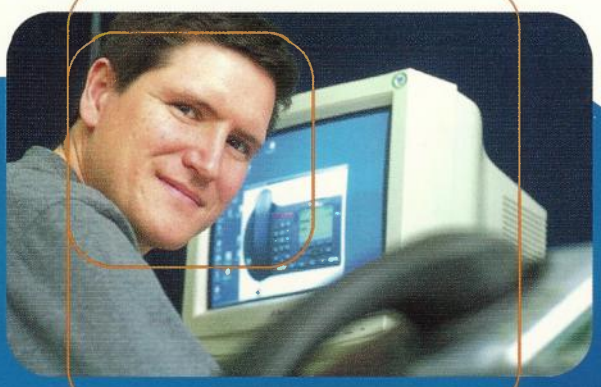
rob **sewell**

BE (Hons), BSc

Telstra Research is rewarding because of the challenging problems we're presented with as well as the opportunities that exist to explore new ideas, which extends thinking and creativity.

I'm presently working on new products to support nomadic customers – people who are never at their desks! This means working out how to put their location, their preferences and all of their telecommunications services together to best suit them.

I spend my time converting ideas to new products, knocking up prototypes for testing and helping the rest of the business put commercial products together. We are close to a commercial version of our product and I'm looking forward to being able to say that I helped build it.



duncan **gibson**

BEng(Hons), BSc

Learning about new technologies and filtering through the mass of technology offerings to find something useful for Telstra is an exciting part of working in Telstra's research division.

Lately, I've been working on advanced applications as part of a program of work in the area of new generation technology (NGT). We're trying to come up with compelling services that are enabled by voice and data riding on the same infrastructure. It's a very competitive field worldwide, but we've come up with a few ideas that provide real benefits for the company and, as far as I know, haven't been thought of by our competitors!

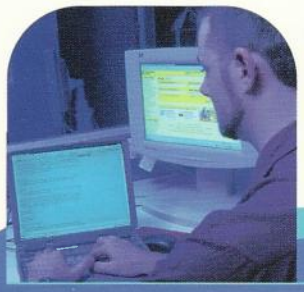
barry **keon**

BSc, Post Grad Dip Pol Sci, MengSci, MBA

A relatively long-term member of Telstra Research (20 years), I have been involved in a diverse range of projects. Recently moving to a new position, I now manage Telstra's external R&D portfolio, which involves interaction with other research organisations, such as Universities.

Computers have changed the way I work and the type of projects that are conducted at Telstra Research. As I move into my third decade with the company, I am now examining technologies which didn't exist five years ago. Now I am exploring technological opportunities and threats for Telstra to ensure that the company is well positioned in the new millennium.

Telstra Research has been a great place to work and I look forward to the new technologies and opportunities that are appearing on the horizon.



human factors drive technology development

With degrees in psychology, sociology and information technology, Telstra's Human Factors Research group plays a vital part in ensuring that Telstra's latest technology developments are helpful and easy to use.

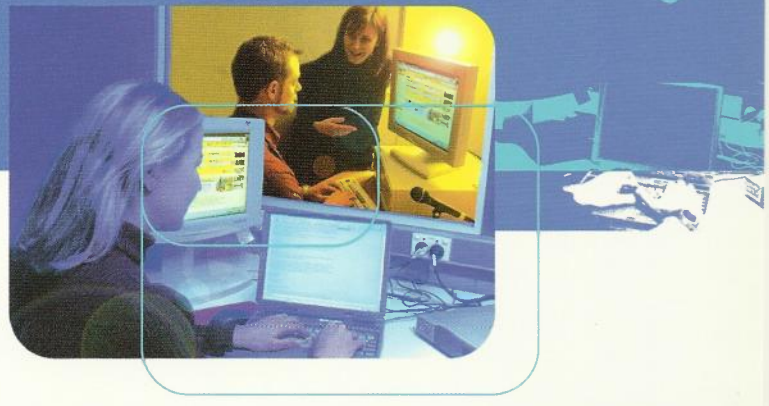
Human Factors is a field of study that bridges psychology and engineering and, in the telecommunications domain, Telstra's Human Factors specialists strive to build a bridge between technology engineers and technology users.

Using focus group participants, Human Factors researchers test prototypes by asking the focus group questions about the new technology – such as what people would be willing to pay for the product and how user friendly it is. If the focus group is concerned about any aspect of the new product on offer, the Human Factors group reports this back to the product researchers so that the product or service can be further refined.

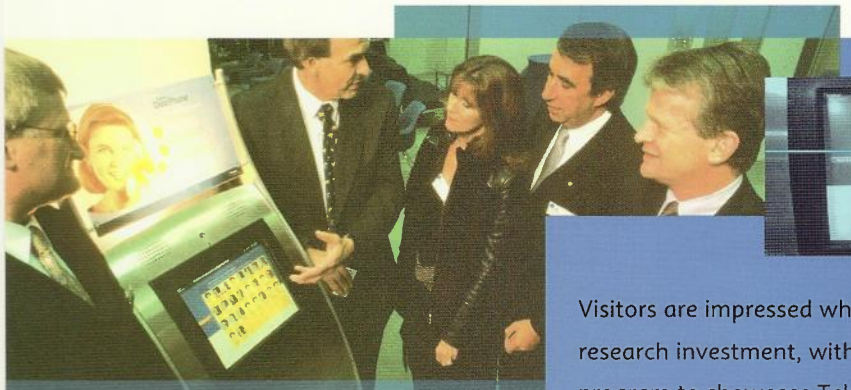
Some of the products and services Human Factors specialists are working on include speech recognition, Interactive Voice Response (IVR) systems and telstra.com. The group's work is aimed at improving the customer experience and ultimately, motivating people to continue to choose Telstra as their service provider.

Testing prototypes for people with special communication needs – such as hearing and sight impaired people – is another important function for the Human Factors group. This year, a Centre for Accessibility was formed to concentrate on making Telstra's Internet services accessible for people with disabilities, by including them in usability testing and design standards. The Centre also intends to examine the usability of new and emerging technologies, such as mobile devices and voice applications.

Working in partnership with Telstra business units and suppliers, the Human Factors group is an integral part of Telstra Research, and has enormous influence on Telstra's future technology development.



providing a look at the future



Impressing hundreds of visitors each year, Telstra's Research visits program provides a tangible demonstration of the company's new and emerging technologies.

Visitors are impressed when they encounter the scale and scope of Telstra's research investment, with Telstra Account Executives taking advantage of the program to showcase Telstra Research to potential new business clients.

In many instances, Telstra Research is the point of difference between Telstra and most of our competitors, providing a reassuring and convincing display of the company's technology leadership.

The Research visits program is not a standard tour, but is tailored according to visitor interests and business needs. For example, representatives from the banking and finance industry may come to see where Telstra is headed in terms of e-commerce solutions, while a visit this year by the Beijing Olympic bid committee for 2008 Games, was interested to learn how Telstra managed communications for the Sydney Olympics.

Each year, hundreds of people are shown through Telstra's technology showcase at Clayton, Victoria, where much of the company's research equipment is based. Whether they be potential investors, politicians, international officials, journalists or Telstra customers, Telstra's Research visits program provides people with the opportunity to glimpse a future technological world and see the company's researchers at work.

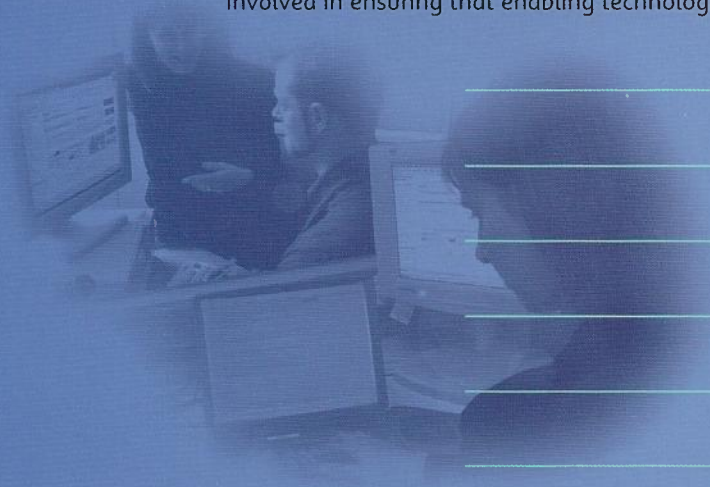
understanding the **way people interact** with technology

Telstra's Human Centred Design Group offers product developers an understanding of the consumer market and the ways in which people interact with technology.

Ensuring that technology is the servant and not the master, the Human Centred Design team facilitates the development of products and services from a user, rather than a technological, perspective.

The team is also exploring key issues which inhibit the take up of new technologies in Australia, and specifically, has a separate focus on the impact of security and privacy on technology usage.

The Human Centred Design team is also involved with the CRC (Cooperative Research Centre) for Smart Internet Technology, which aims to combine research in Artificial Intelligence, social interaction and network development to create enabling technologies for smart Internet applications. Under the User Environment Program, Human Centred Design researchers are involved in ensuring that enabling technologies are useful, flexible, accessible and affordable.



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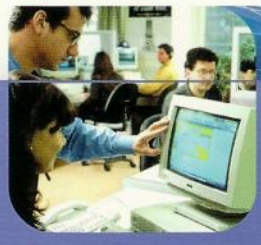


ADSL (Asymmetric Digital Subscriber Line)

A technology that transforms ordinary copper phone lines into high-speed digital lines – Up to 1.5 Mbit/s downstream (from the exchange to the end user) and up to 256k upstream. See also xDSL.

ATM (Asynchronous Transfer Mode)

A high-bandwidth, low-delay, packet-based switching protocol that allows voice, video, text and data to be multiplexed together into a single transmission network with different qualities of service.

B2B (Business to Business) and B2C (Business to Customer)

Business transactions with other businesses or customers.

Big Pond®

Telstra's public Internet service.

Big Pond® Broadband

Telstra's fast, broadband Internet service delivered over hybrid optical fibre/coaxial cable, satellite or ADSL.

broadband

A general term used to describe transmission at bandwidths higher than 100 kb/s (eg high-speed data and video services).

browser

Desktop computer application offering an easy-to-use graphical interface for browsing and retrieving information over the Internet. Microsoft* Internet Explorer* and Netscape** Navigator are the most widely used browsers.

cable modem

A device used for high-speed connections between a PC and the Internet over the pay TV network. Can deliver data at up to 100 times the speed of standard telephone modems.

call centre

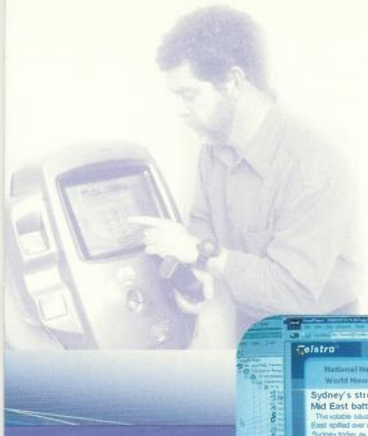
The 'front end' of an organisation or business, comprising a group of people equipped to communicate with customers about bill queries, service issues, technical support, service access and other customer service functions.

CDMA (Code Division Multiple Access)

A digital standard, designed for use in cellular mobile networks, which assigns a unique code to each user and spreads transmission of user channels across a wide band of radio frequencies. CDMA mobile technology was introduced in Australia from January 2000.

certification authority

A trusted electronic system that uses electronic certificates to authenticate user identity and verify the integrity of transactions or information transfer.



circuit

In traditional PSTNs, telephone connections are made as fixed 64 kbit/s channels or circuits. The alternative to a circuit-switched network is a packet-switched network.

contact centre

The next evolution of a call centre which allows customers to interact with a business via any electronic medium (fax, email, web, as well as voice).

digital TV

The digital transmission and processing of video signals provides a number of benefits over conventional analog TV. These benefits include more TV channels, better picture quality and greater reliability.

DMO (Data Mode of Operation)

Code-name for Telstra's five-year project to adapt its core network for optimal delivery of data, as well as voice. By upgrading its core switching and routing infrastructure, Telstra will be better positioned to deliver new and existing data services, such as the Internet.

DSL (Digital Subscriber Line)

See xDSL.

firewall

Network security system comprising software and hardware to control the flow of data between a private network and the Internet.

GPRS (Generalised Packed Radio Service)

An 'always-on' data service (eg for Internet access) using packet switching rather than circuit switching. It is compatible with GSM and is regarded a second generation plus (2G+) mobile technology.

GSM (Global System for Mobile Communications)

European digital standard for mobile phones based on time division multiple access (TDMA). TDMA allows several conversations to share a single radio channel by each transmitting digitised voice within its allocated timeslot. GSM is the second-generation mobile network used in Australia.

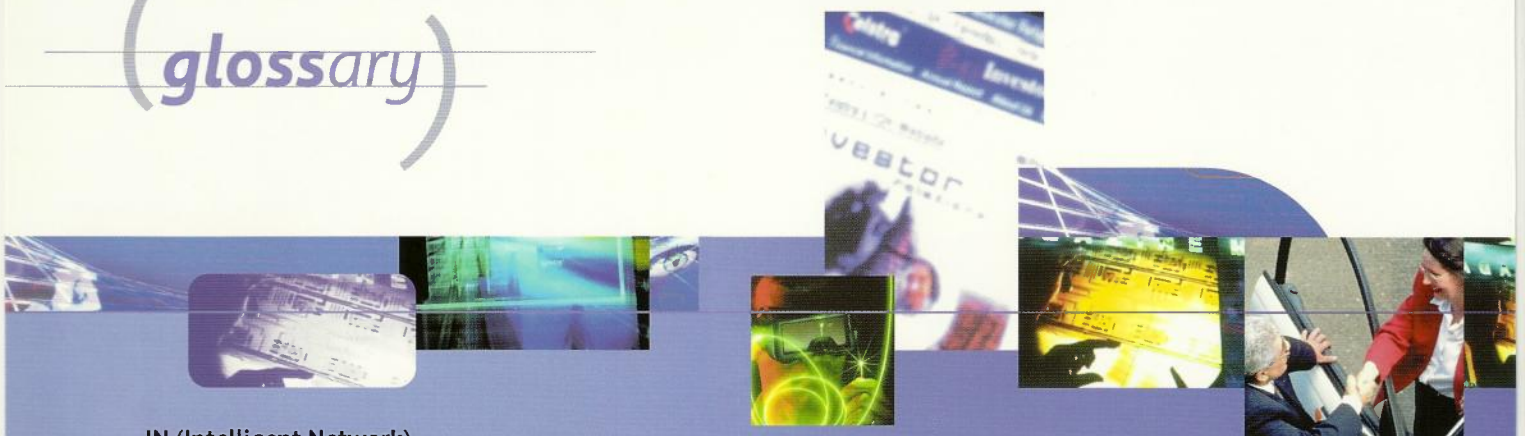
HFC (Hybrid Fibre Coaxial) cable

A shared broadband access architecture using optical fibre between exchanges and hubs in suburban streets, and coaxial cables between the hubs and customers to carry Foxtel pay TV and Big Pond® Broadband services.

home networking

The connection of a home PC or PCs to other electronic appliances within the home (such as a printer or alarm system) so they can all be linked to the public communications network for remote access and automated control.

glossary



IN (Intelligent Network)

A telecommunications network architecture that employs computers to customise services for specific needs, such as call diversion, call waiting and number portability.

Internet (or the Net)

A global inter-network of computer networks, connected via Internet Protocol (IP) and the world's telecommunications infrastructure. IP enables applications such as email, the web, file transfer and other services to run across different networks and operating systems.

IM (Instant Messaging)

Instant Messaging is a rapidly growing area of Internet communications, involving the spontaneous delivery of short messages between 'buddies' or friend.

IP (Internet Protocol)

Part of the family of protocols describing software that tracks Internet addresses, directs outgoing messages and recognises incoming messages. Used in gateways to connect networks at a high level.

IP-VPN

See VPN.

ISP (Internet Service Provider)

A company that connects individuals or organisations to the Internet. Can range in size from an individual operating dial-up access, to providers operating substantial network backbones and fast cable modem access (eg Telstra's Big Pond® services).

Intranet

A network connecting an affiliated set of client computers using standard Internet protocols. Many Intranets now take the form of an IP-based network of nodes behind a firewall, connected by a secure virtual private network (VPN or IP-VPN). Intranets between cooperating companies can be called Extranets.

IVR (Interactive Voice Response)

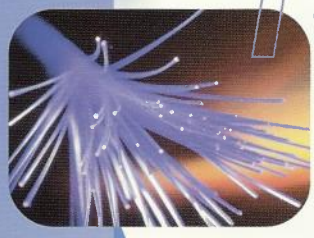
Automated customer service or information selection based on pre-recorded voice prompts controlled by a touch-tone telephone or speech recognition system.

Mbit/s or Gbit/s (megabits or gigabits per second)

Units for measuring rate of digital information transfers. A megabit per second is a rate of one million bits per second; a gigabit, one thousand million bits. New optical fibre technologies can transfer information at the rate of one thousand gigabits, or one terabit, per second.

multimedia

Combination of multiple forms of media in communication of information between users and machines. Communication formats include voice communications (speech recognition, speaker verification and text-to-speech), audio processing (music synthesis, CD-Rom), data communications and video.



multiplexing

Carriage of multiple channels over a single transmission medium; any process by which a dedicated circuit can be shared by multiple users. Typically, data streams are interspersed on a bit or byte basis (time division), or separated by different carrier frequencies (frequency division).

narrowband

Communication technologies with a data transmission capacity of about 64 kbp/s or less. Includes online interactive services (eg Internet), voice, facsimile services, slow-scan video images and low-rate data transmission.

neural networks

A form of artificially intelligent software that attempts to mimic nerve cell/brain functioning to allow computers to handle tasks that may be too difficult for conventional software techniques.

optical fibre

A strand of hi-tech glass that carries signals in the form of laser light pulses. An optical fibre pair can simultaneously carry many thousands of telephone conversations, or a mix of video and voice. An optical fibre cable may contain tens or even hundreds of fibres.

packet

In a packet-switched network, such as the Internet, data is packaged and routed in 'blocks' or packets, each having a header with the network destination address. Packet switched networks are also described as 'connectionless' because the paths selected by routers can vary from moment to moment, as each router is updated with current network information.

PDA (Personal Digital Assistant)

A small, portable device which is used to carry personal data.

PIM (Personal Information Manager)

A software application that manages personal information (eg telephone numbers, addresses, email and calendar).

portal

An individual's customised 'gateway' to the Internet, a portal is a web page designed to allow different users to tailor and aggregate content according to individual preference. Web ports include global and special instant messaging, email and chat facilities to encourage the development of electronic communities.

PSTN (Public Switched Telephone Network)

Generic term for public telephone networks.

public key cryptography

A communications security system under which each user is issued with both a confidential, private electronic key and a public key, allowing users to communicate securely with each other despite no pre-existing relationship.

glossary

QoS (Quality of Service)

Some customers require specified throughput of information for particular services (eg delay sensitive voice traffic) which is referred to as a specific QoS.

regenerator

A device used in digital networks to pick up the attenuating signal and send an identical, but stronger, signal to the next part of the network.

repeater

A device used to amplify and equalise an analogue communication signal weakened and distorted through long fixed or wireless circuits. It has a similar function to a regenerator in digital systems.

RSVP (Resource reSerVation Protocol)

A signalling protocol on the Internet that provides network applications with a means of asking routers to reserve bandwidth.

SLA (Service Level Agreement)

An agreement between a customer and the service provider as to the QoS, reliability, responsiveness to faults etc for a given service.

SMS (Short Messaging System)

Text based message service on mobile phones

Third Generation (3G) Mobiles

Analogue and digital mobile voice networks account for the first and second generations respectively. 3G mobiles are the next generation mobile networks that will handle high bit-rate data connections.

VDSL (Very high rate Digital Subscriber Line)

See xDSL

VoD (Video on Demand)

A service through which customers could access large remote databases of movies and other video programs through a multimedia interface, and control program viewing in the same way as a VCR – for example, using pause and rewind.

VoIP (Voice on Internet Protocol)

Voice calls over the Internet or a private IP network.

WAP (Wireless Access Protocol)

A protocol that enables mobile phones equipped with the appropriate browser to access Web pages from the public Internet.

web (or WWW – World Wide Web)

A series of interlinked computer documents 'marked up' with HTML to display text, graphics, images and sound. Users browse the documents via a graphical user interface. Web sites are like multimedia magazines, with interactive features and links to related sites.

xDSL

A technology that enables the copper telephone loop to carry high speed data streams. The 'x' denotes that there is more than one DSL technology (eg ADSL, HDSL and VDSL).

q→Z

Editor and Project Manager

Kirsteen Lee

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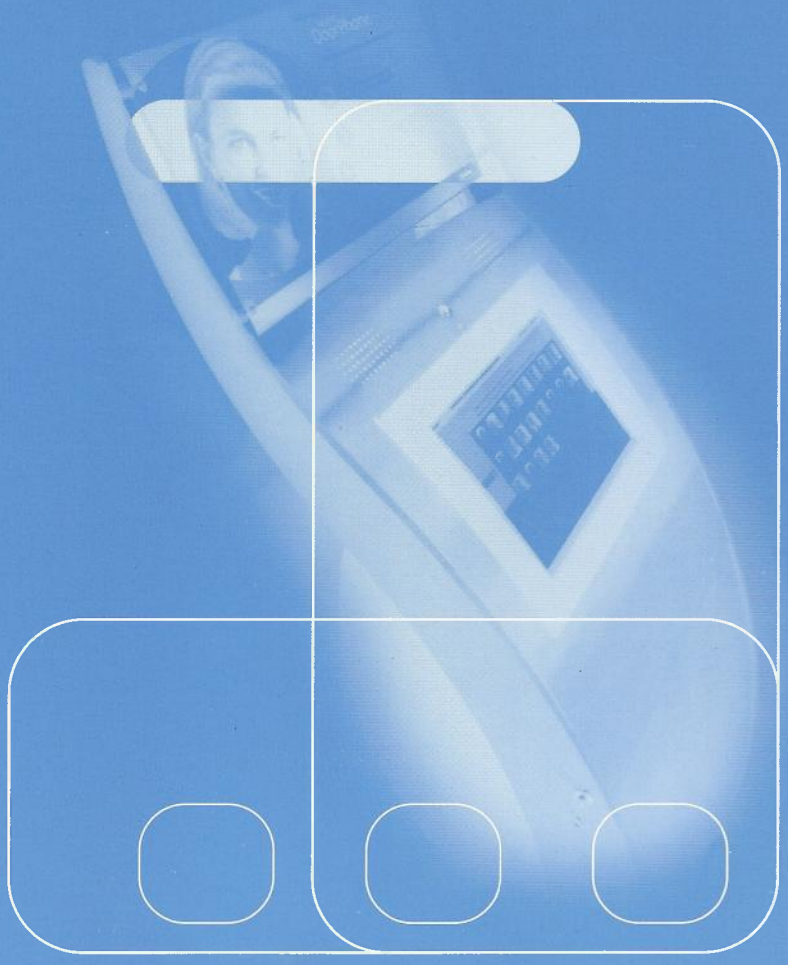

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