July 2003

directions

A Journal for Telstra Technology

Telstra

Contents

Telstra.com migrates

CRITICAL first steps in an ambitious program to establish a standard online operating environment have been taken with the successful migration of the Telstra.Com Home Page to a new platform.

Telstra.One is the program to deliver Telstra's next generation technology environment which is a key step towards Telstra's online vision of allowing customers to connect anywhere, at any time, using any device - in effect, a standard operating environment for managing all online interaction with customers.

This environment will allow any business to deliver services, content and applications to users across wireline, wireless and broadband networks, and supports content development by third party suppliers through the use of open standards.

With an anticipated boom in growth of new services, products and content driven by development in wireless broadband and other internet technologies, Telstra.One will provide the foundation for a wide variety of future applications and business services.

Peter Gamgee, Telstra.One program director, said Telstra.One was essential to support the next evolution of online services.

"In the rush to bring a lot of online services to market very quickly there has been little time to consider how all these great new services will interact with each other, or what is really common," Peter said.

"There has been development in a lot of different areas using different environments and applications to provide online solutions. This results in duplicated work and the creation of software application and IT infrastructure 'silos' - expensive to run and maintain, which adds to business costs."

Peter said a number of different platforms and systems had developed to support Telstra's online presence, and the migration to an online standard operating environment would reduce business costs associated with running many different platforms and applications.

"The migration of the Telstra.com Home Page to the new platform represents a critical milestone; there has been no visible change to how customers see and use the Home Page - however we have proven our ability to design and deploy applications on the new technology, and introduced time saving processes."

There are at least 6 separate platforms currently supporting Telstra's major online applications which are expected to be migrated to the new online standard operating environment in the future.

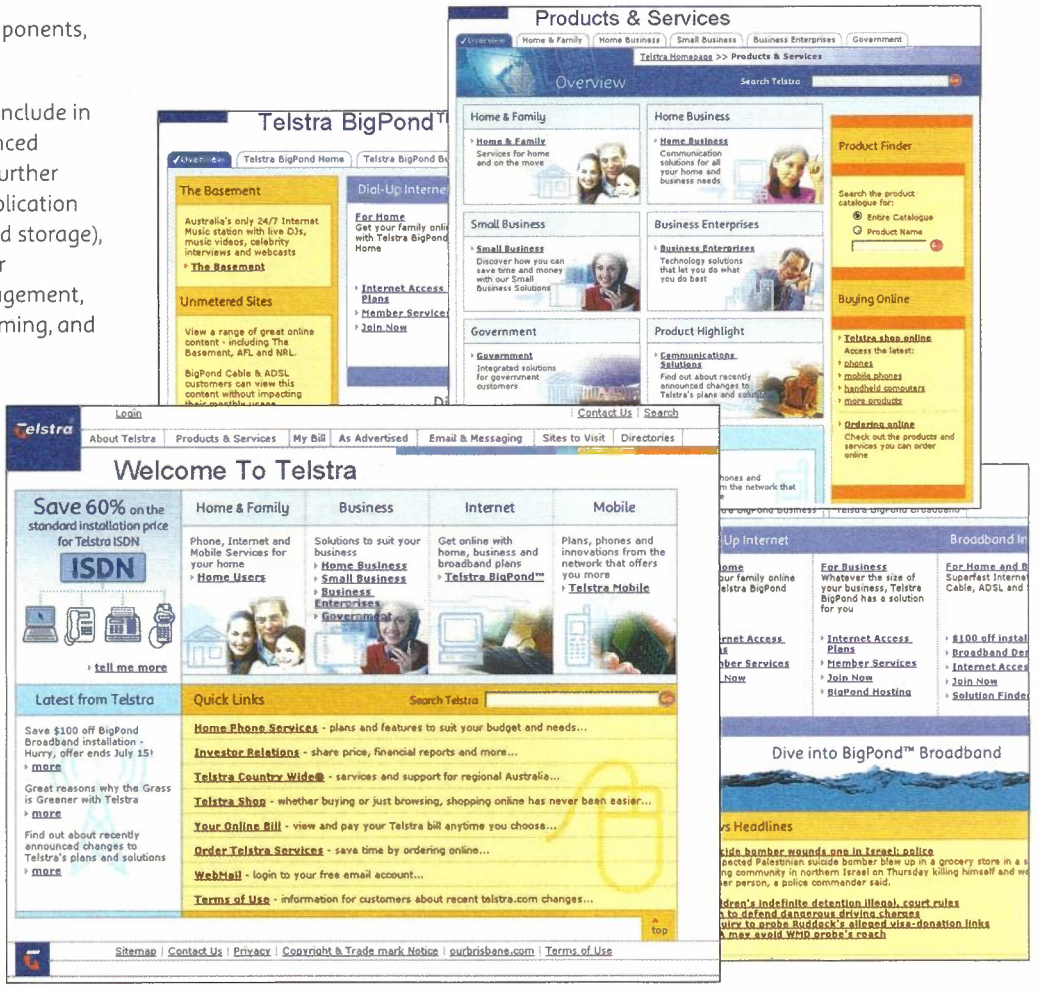
The recently completed Release A comprised the migration of the Telstra.com Home Page and the deployment of web server, portal server, directory server, based on SUN products and operating systems, test and production environments, integration with the existing telstra.com hosting

to Telstra.One

platform, operational components, processes and training.

Release B, scheduled to conclude in August, will provide enhanced network availability and further platform deployment (application server, database server, and storage), Siteminder to portal server integration, content management, unified reporting and alarming, and capability upgrades.

Release C is scheduled for September this year. Although the exact content is still to be finalised, the candidate content includes the development environment, SUN Enterprise Edition Application Server, Oracle database, Mobile Access Portal, and Capability Upgrades for the Content Vending Machine.



The Online Standard Operating Environment (Online SOE) uses Sun Microsystems' open standards approach and will incorporate a Microsoft.Net standard to maximise access and opportunities for content developers.

The collaboration and close working relationship between Telstra and Sun Microsystems that characterises the Telstra.One program is producing other benefits.

Telstra Research Laboratories (TRL) is poised to become a Sun Microsystems iForce Solution Centre, joining a global network of 28 development centres.

The iForce initiative will help Telstra tap into the efforts of the world's best Java developers, solutions providers and prototype solutions, giving Telstra a powerful edge in the creation of new applications and solutions that can operate on the Online SOE.

As part of a global network of iForce Solution Centres, Telstra Research Labs will provide an environment for the development and testing of new solutions for the Java developer community and Telstra's third-party partners.

The relationship should also provide opportunities for Telstra to commercialise the intellectual property relating to the Telstra.One initiative.

Sweating the assets and IT's customer

Telstra Technology's recent restructure and creation of product infrastructure managers is designed to provide better service to internal customers. In this article Directions takes a look at the new Telstra Technology from within, and without.

Customer service is prime - it's the bedrock that supports Telstra's very existence - and recent changes to Telstra Technology have been driven by a need to connect firmly with that base in relation to internal customers.

Telstra Technology provides integral services to the key Telstra business units of Telstra Consumer & Marketing, Telstra Business & Government, Telstra Country Wide, and Telstra Wholesale, Broadband & Media.

None of these critical customer facing groups can function effectively without the technological assistance of Telstra Technology, and these groups are seeking greater support.

Structural changes to Telstra Technology, and in particular the creation of Product Infrastructure Managers and Technology Managers responsible for specific technologies, are designed to build closer relationships with TC&M, TB&G, TCW, and Telstra Wholesale, Broadband & Media.

With 13 years' experience in Telstra, Sharda Symons, Product Infrastructure Manager for Narrowband Access, said these internal relationships are all important.

Sharda returned to Telstra Technology to take up the Product Infrastructure Manager role after a two year stint in Finance & Administration, working in a more commercial function, managing a national vendor portfolio for data products.

Sharda Symons: Product Infrastructure Manager, Narrowband Access.

In her previous role the customer/supplier relationship was very clear; Sharda was the national commercial lead in business negotiations with a range of vendors such as Nortel, Cisco and Siemens.

Developing that same clarity around internal customer relationships is a key part of the new Product Infrastructure Manager role, Sharda said.

"What I can take from my previous role that is critical in my new responsibilities is that relationship management and account management experience," Sharda said.

"The key to success is communicating with our internal customers - being able to have a relationship that can withstand troubled times.

"This is really important for our customers who are our colleagues in

building relationships service

TC&M, TB&G, TCW, and Telstra Wholesale, Broadband & Media.

"They have to be able to trust us and consider us a part of their team as much as anything else, and they have to be comfortable that they can share their concerns. It is also about building credibility with our customers through a track record of delivery.

"Of course the technological support must be there; and that always has been there - I think what has been missing sometimes is the customer relationship."

Sharda's responsibilities as General Manager, Product Infrastructure, Narrowband Access provide good examples of this approach.

Narrowband technology is a critically important part of Telstra's basic access business, and Sharda's customers in TCW, TC&M, TB&G, and Telstra Wholesale, Broadband & Media all rely on the narrowband team's ability to support new ways to generate revenue from what is essentially "well traveled" technology.

"We - that's Telstra Technology and our internal Telstra customers - are operating in a narrowband market where there is lots of competitive pressure," Sharda said.

"The challenge is that some of these products like basic access are not new products, so how do we approach long standing issues in a new way? How do we look at these old challenges from a new perspective?

"We need to show leadership in optimised investment and leveraging the assets, and explore new ways of growing revenue and reducing costs".

"That's the advantage of the new structure - that I have a small, highly motivated team capable of taking on an issue and working with all parts of the business to drive it through to completion.

"This not only requires a close working relationship with our customers, but we also need to work with our Telstra Technology colleagues in Broadband - we need to be able to show leadership across the board.

"And this absolutely means teams with the right people in TT who are capable of providing viable options for the business."

Viable options from Telstra Technology are exactly what Lynda O'Grady requires in her role as Chief of Products, TC&M.

And on the whole, viable options are exactly what Lynda gets from Telstra Technology, with the success of recent product launches such as One# and Home Message 101.

As the Chief of Products, Lynda creates the links between what is technically possible and what the external market is prepared to pay for in relation to fixed and mobile products.

"We sit between the technology groups and the marketing and sales groups, and work with areas in Telstra Technology to try and identify new applications for existing and new technologies," Lynda said.

"It's a bit like connecting the dots - there is an outline of a possible new product, and often we ask our technology colleagues if they can put some new 'dots' in place.

"That's why the Product Infrastructure Managers and Technology Managers are important - they know so much about what the technology can do."

"Increasingly we are asking our technology buddies for a bigger picture of what a particular technology can do.

"I think there is a vast store of intelligence and intellectual property in Telstra Technology; it is an extremely valuable asset which needs to be liberated.

"However, alot of TT people are buried in the deep physics and mathematics of how the technology works and they need to realise more clearly just how important they are to the success of the business as a whole.

"The pressures of bringing a new product to market in a tight time frame needs to be moderated by the kind of detailed performance analysis and verification that TT provide so well - we certainly need TT to ensure that we are neither precipitous nor irresponsible.

"What we are about is recognising a partnership role and having the TT team with us as partners so we can make sound commercial decisions."

TRL History

Eighty years of TRL's specialist scientific expertise brings important contributions to research in Australia

Telstra's prestigious Research Laboratories (TRL) are celebrating their 80th anniversary in June! For 80 years, TRL has pioneered new technologies in Australian telecommunications research.

The history of TRL began in June 1923, with the establishment of a one-person Research Unit within the former Postmaster General's (PMG's) Department. Sidney Witt was given a charter to 'study the latest discoveries, inventions, and developments in electrical communications' and to advise the PMG on those 'which are promising and likely to benefit the Department's telephone and telegraph services'.

This charter remains relevant today, and TRL continues to develop groundbreaking technology solutions, focusing on leading edge research, innovation and commercialisation.

TRL provides business focused Research and Development 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 TRL is the evaluation of new and emerging technologies that contribute to Telstra's technology strategy and positioning.

Landing the sub-marine telegraph cable from Java at Port Darwin Harbour.

TRL expertise also provides product innovation and differentiation, the development of techniques and tools for new technology deployment and management, and solutions for complex technological problems.

Dr Hugh Bradlow, TRL's Chief Technology Officer and Managing Director, is proud of TRL's long-standing history in Research & Development achievements that have put Australia on the world's technology map.

"Here at TRL we have a vision that this company has held for eighty years - to bring leading edge technology that actually makes a difference to the way in which Australians communicate and live their lives. We make life simpler, so every day activities can be taken for granted to a point where you don't even think about the complexity that sits behind the technology enabling you to do what you need and want to do," Hugh said.

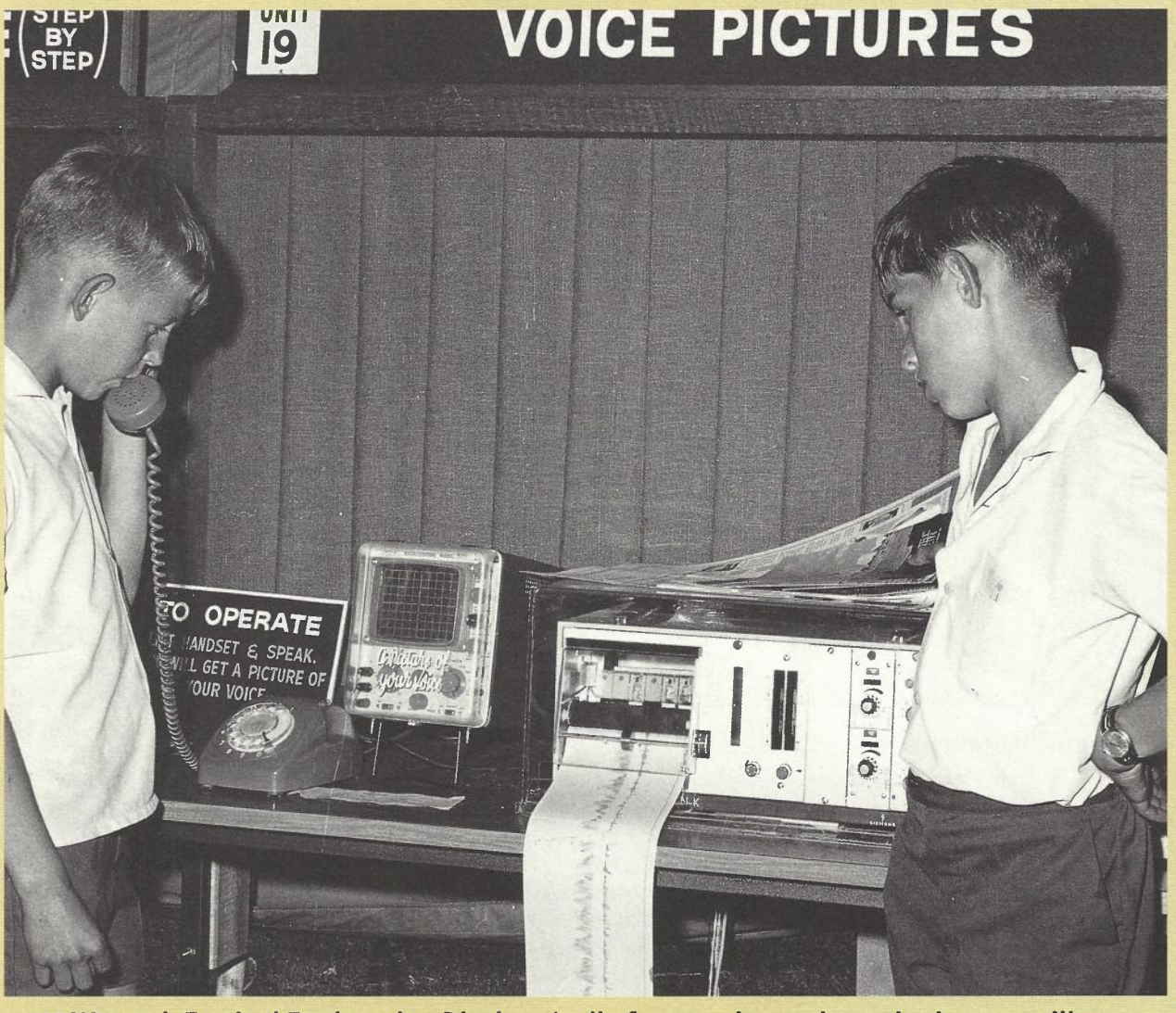
"We are seeing beyond the routine and beyond what is possible today. We are taking ideas and seeing them become a reality for millions. Here at TRL, these are the things that excite and drive us."

Over the decades, TRL has made a significant contribution to research in Australia. What follows is a fraction of TRL's outstanding achievements.

In 1941, TRL designed and set up a short-wave transmitting station to broadcast to the South Pacific islands and South East Asia. This later became Radio Australia.

In the fifties, after years of research, TRL's specialist expertise played a key role in introducing television to Australia using the 625 line PAL standard.

In 1979, TRL developed one of the world's first digital radio



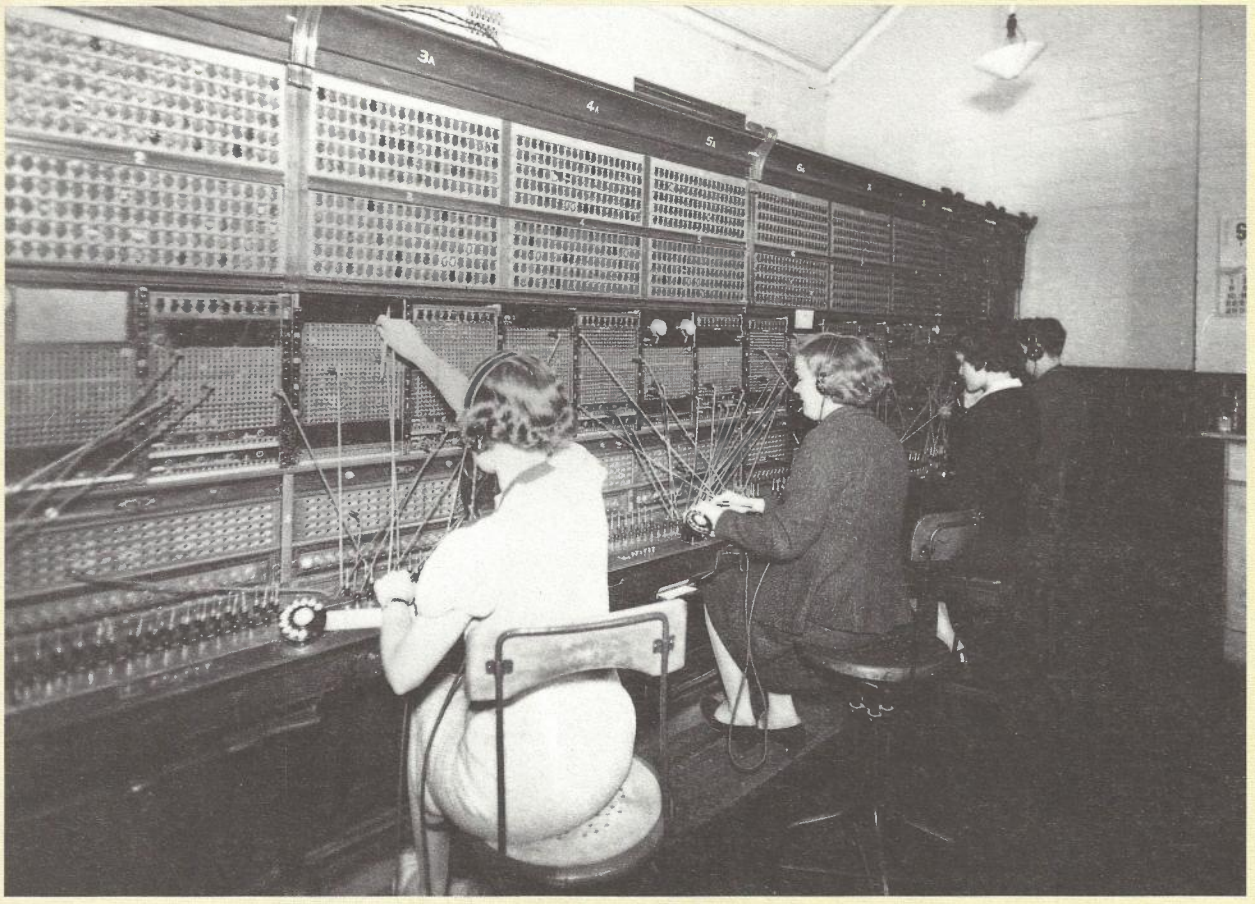
1973 Waratah Festival Engineering Display. Audio frequencies as the cathode ray oscilloscope and the printed graph of the voice record on the oscillomink.

telecommunications systems for the outback - a milestone in helping Australia defeat the tyranny of distance - consisting of a Digital Radio Concentrator System (DRCS) for providing PSTN (Public Switched Telephone Network) access to rural communities.

In 1983, TRL assisted in designing the microelectronics for the Cochlear ear implant - an implantable hearing device for hearing impaired and profoundly deaf people who are unable to benefit from traditional hearing aids.

As early as 1985, TRL began investigating the use of Asynchronous Transfer Mode (ATM) packet switching to support potential interactive multimedia services. During this time TRL also developed a high-level security system for Electronic Funds Transfer (EFTPOS), as well as services based on public key cryptography.

In the late eighties, TRL developed and tested concepts for intelligent network architecture to support the first Priority™ One3 service - a service that could automatically connect calls with a '13' prefix to the service branch nearest the callers' location. TRL staff demonstrated how databases and telephone exchanges



Manual Exchange 1939.

could be linked under computer control to provide the service. This was an application of TRL's research into what was then a new generation of telephony control systems, the first 'intelligent networks'.

In the mid-nineties, TRL demonstrated to designers, planners and vendors that a proposed 240km undersea optical fibre link to Tasmania could be made repeater free by installing optical amplifiers at either end of the link. At the time, optical amplifiers were not commercially available and this was the first use of optical amplifiers in Australia.

Hugh says "Looking to the future, we also expect a range of new applications - including those based on mobile data, interactive TV and voice technology. A new generation of mobile phones using technologies such as Java (J2ME) or BREW are expected to have the ability to update their software over the air - making mobile phones behave more like a PC."

"TRL looks forward to researching complex data technologies, making them become as reliable, secure and as everyday a part of our lives as the telephone network is today. With the improvements in network performance and reliability that TRL is pioneering - and with the extension of the Internet via the broadband and wireless data technologies that Telstra is delivering today - we expect to see this vision rapidly become a reality."

Consisting of about 300 researchers, TRL is home to a group of highly skilled people with a diverse pool of technical skills many of whom are world class leaders in their own field of research, with 30% of researchers holding higher degrees, such as PhDs. The research environment, with its state-of-the-art communications research facilities and equipment, stimulates people's creativity and provides exciting challenges and opportunities for Telstra to explore new technological ideas.

Over the decades TRL's experts have continued to push technological boundaries, contributing to an exciting eighty years of Research and Development achievements.

For more information, go to: http://intranet.trl.telstra.com.au/history.htm

TRL 70 years forward

This year, TRL celebrates its 80th year. To mark this milestone, Telstra's Chief Technologist and MD of TRL, Dr Hugh Bradlow, takes a creative view of what exciting technological developments might be possible in the next 70 years - when TRL celebrates its 150th birthday.

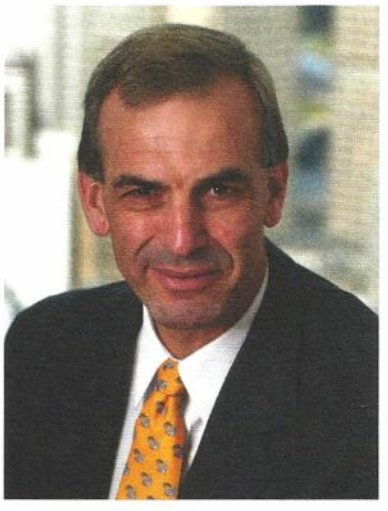
IT'S the year 2073; inter-planetary space travel tourism is commonplace, partial anti-gravity is now deemed theoretical, robot legislation controls artificially intelligent machines, and computer-based telecommunications have merged with bio-engineering and nanotechnology.

It's also the year that Telstra Research Laboratories celebrates it 150th anniversary with a spectacular showcase of the latest in wetware - communication systems that link directly to the human nervous system.

Master of ceremonies at this auspicious event is none other than former head of TRL, Dr Hugh Bradlow, who played such a pivotal role in the development the Personal Life Experience Access System (PLEAS) that formed the basis of many of today's communication innovations.

Thanks to developments in biological regeneration, 120-year-old Hugh doesn't look a day over sixty, and attends the event in his characteristic retro business look, complete with turn-of-the-century business suit and trademark thick, black rimmed glasses.

The glasses are no ordinary second world eye-sight correctors; they are in fact a priceless collectors item - the original prototype PLEAS comglasses from 2021, complete with wireless access, micro-computer, and projection prism for beaming



information directly to the users' retina.

In the gleaming atrium at the top of Telstra House in Melbourne, Hugh takes the podium. The lights dim, and the audience grows quickly quiet.

"Ladies and gentlemen, media-bots, and remote viewers. Welcome to the 150th anniversary of TRL, and thank you for the opportunity to speak here today.

"Today, in 2073, you will see for yourself - or even try out if you are bold - some of TRL's amazing developments - bone phone implants, eyeball cameras, even communication devices that link the human mind to machines, creating a hybrid consciousness capable of controlling space flight calculations or complex micro surgery.

"And there are others here who will tell you about TRL's great future.

"I would like to look back, if I may, to the start of this century, when the internet was barely 25 years old, and where mobile phones were just starting to feature colour screens and rudimentary data bandwidth.

"Back then, in 2003, I was the head of TRL, and I had a vision of the future, a dream of how communications could transform our lives.

"The advent of wireless technology opened new and exciting possibilities, and TRL was then, as it is, now, at the forefront of technological change.

"We weren't just aiming to predict the future - we also focussed on making the technology of the day work for all end users. TRL's role was to take current, accessible technology and refine it, to develop commercial applications - some of you may remember Lyrebird; TRL's commercial speech recognition program which was one of the forerunners of many of today's talking robot applications.

"It was impossible not to see the potential; communication devices kept getting smaller, and faster, while networks were able to manage more and more bandwidth.

"I imagined a communication device so small it could fit into the frame of a pair of glasses, just like the ones I wear today.

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Assessing the Architecture of

Internet update - some of the successes and the challenges ahead

Geoff Huston, Chief Internet Scientist.

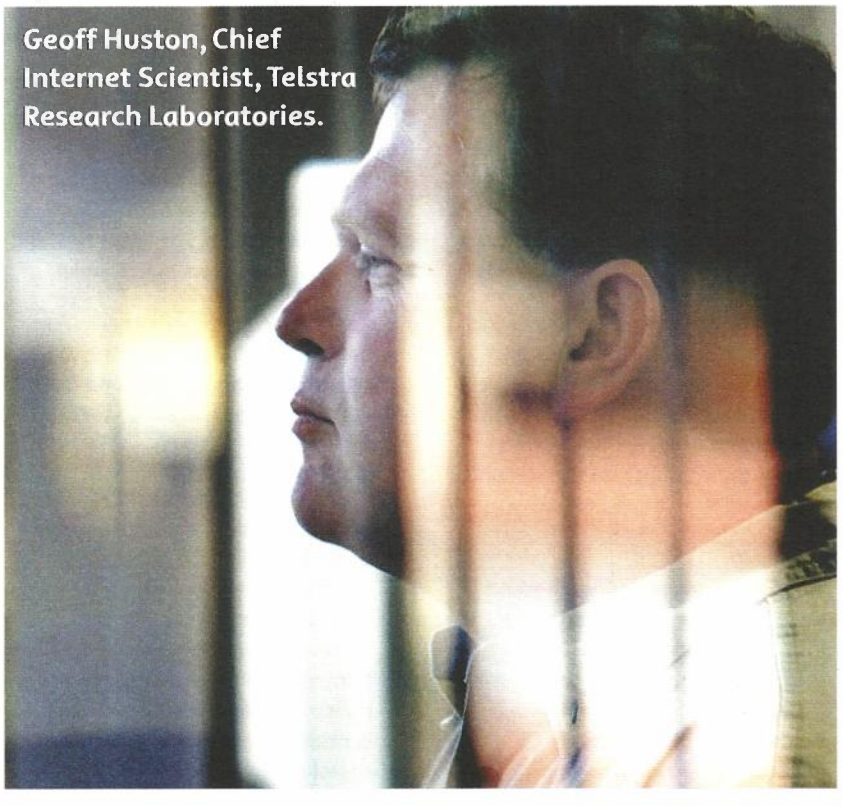
The initial research work that underpins the architecture of the Internet started in the 1960s and the basic specification of the protocols used by the Internet were completed by the mid-1970s. That is almost 30 years ago, and what is surprising is that a communications protocol developed in that period was defined with sufficient generality and extensibility that it is now the foundation protocol of the global data communications industry.

Over the intervening three decades the Internet Protocol (IP) has scaled in almost every metric by a factor of millions. An IP circuit now operates at speeds of up to 40 billion bits per second, and the network spans hundreds of millions of users and connects a similar number of end systems. Yet the core protocol, IP, remains essentially unaltered. That is an impressive achievement in protocol design.

However, not everything in the IP world has managed to scale as well as the base IP protocol. As the Internet grows, our dynamic routing protocols and the related area of traffic engineering continue to present challenges. Each order of magnitude of growth of the Internet has implied a need to refine the routing protocols to scale to the new dimensions of connectivity and policy. In addition, the hop-by-hop forwarding paradigm tends to aggregate traffic on major trunk routes, driving the Internet's demands for ever-faster base circuits.

Mobility and high-speed wireless operations remain a real challenge for IP. With the advent of widespread adoption of the combination of personal digital devices and various forms of wireless connectivity, the mobile communications environment wants to break free traditional voice and embrace the broader capability of the Internet. The match of IP to wireless mobility is not a natural one. "Identity" is a weak concept in the IP protocol. IP assumed that computers never moved (probably a reasonable assumption in the mainframe days of the early 1970's!).

If we want to support mobility as well as various security models, introducing some form of location-independent identity into the IP protocol model is a necessary change. Beyond identity, the medium of wireless is also a challenge for IP. The IP protocol specification - and the Transmission Control Protocol (TCP) in particular - make some inherent assumptions about the network, particularly relating to the stability of the round trip timers and the loss characteristics. Wireless can alter these properties and this can force TCP to be very conservative about how much data can be passed through the network. If the promise of 3G high-speed wireless services is to be achieved we will need to examine how to further refine TCP to operate efficiently in this environment.



Geoff Huston, Chief Internet Scientist, Telstra Research Laboratories.

the Internet

Despite these issues, there is a clear goal in sight. The numbers of mobile IP devices are set to dwarf the current numbers of conventional IP systems, and there is an expectation that there are valuable utilities that may be constructed from the building blocks of high-speed wireless and IP.

Security of our communications systems has been subject to intense scrutiny in recent months, and the Internet is no exception. Much of the environment of the Internet relies on a distributed trust model. There are vulnerabilities in the protocol suite that are a result of this distributed trust environment, as trust without explicit authentication is always a risky proposition in a public communications environment. The ability to forge email headers and distribute vast amounts of unsolicited mail is just the tip of the 'distributed trust' iceberg of inadequate application security. Much remains in the effort to add explicit authentication as a precursor to trust.

While the Internet has achieved surprising results so far, that does not mean that the protocol design effort is over. There is still much work to be done in the IP world and that will - perhaps - always be the case.

To quote Harald Alvestrand, the chair of the Internet Engineering Task Force: "If you're not moving, you're dead"!

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TRL 70 years forward

"This device would include a tiny prism, capable of projecting visual information directly onto the retina of your eye, allowing you to see a computer screen.

"It would incorporate speech recognition, and have the capacity to record and transmit whatever I was seeing or experiencing back to my personal data warehouse.

"The data warehouse contains vast amount of information, all managed, documented and retrieved using advanced artificial intelligence programs, capable of instant searching.

"With these glasses, I imagined being able to meet someone - a former work colleague perhaps - and I recognise the face but cannot recall the name.

"I simply ask my glasses to search while looking at the person. In an instant data is retrieved, providing me with a name, where we met, what my colleague's partner's name is, as well as the name of their dog.

"Without hesitating or breaking my stride I walk up to my colleague and we begin to catch up.

"Some people said it was an impossible dream, but this dream did become reality, and I still have these glasses here with me today in 2073.

"Of course they seem old fashioned today, but they represent what I think has been TRL's greatest contribution to our lifestyles - the ability to make technology work for people.

"The last quarter of the last century was a time of incredible change; there was an explosion of ideas and inventions, and the pace of change became very rapid.

"New ideas came thick and fast, a lot of focus was on building technology, and always the emphasis was on making humans learn how to use the technology.

"In TRL the focus has always been on making technology fit in with humans, to make the technology invisible.

"That requires a detailed understanding of technology, which you can only get through experiment and analysis.

"It also required a detailed understanding of people, and I am proud to say that TRL's great success has been to continue to make technology work harder for people."

Preparing for network evolution

Fibre To The Ho

The once blue-sky dream of optical fibre direct to the customer's premises is fast becoming a commercial reality as costs, competition and technical capability converge to drive the next evolution of Telstra's network.

Telstra has launched a technical trial to assess the performance of cutting edge Fibre To The Home (FTTH) technology; results from the trial are intended to be used as the basis for a pilot deployment in a new commercial or residential development.

In effect, Telstra is preparing to move quickly when FTTH becomes the preferred option for new developments, and this is expected to occur within the next two to three years.

Capable of providing voice, data and video direct to the home or business over a single optical fibre, FTTH has for some time been regarded as an inevitable next step in the evolution of access networks, delivering bandwidth capability far beyond that of traditional copper infrastructure and over longer distances.

FTTH opens up the possibility for future growth in new products and services that make greater use of the increased bandwidth availability and is expected to lead to improvements in end to end customer service management.

The cost of maintaining copper networks continues to increase, and the cost of providing ADSL for copper based networks to provide increased bandwidth is considerable.

At the same time, the costs of fibre optic cable and technology continue to fall. Trends in the US, UK and South East Asia highlight the use of fibre optic cable to customers' premises and FTTH technology as a key competitive advantage.

Jim More, Telstra's Technology Manager Fixed Access, Voice and Mobility (V&M), said Telstra's Wireline Access Strategy of providing fibre optic cable and FTTH technology was identified about 18 months ago as both desirable and inevitable.

"It's not a matter of if, but when," Jim said. "The evolution of Telstra's access network away from copper to a fibre-based network is going to happen.

'The Wireline Access Strategy was set up in part to define a path for the future development of the network, and the eventual move to FTTH for Telstra's access infrastructure has received in-principle internal endorsement.

"Copper is expensive in terms of materials and on-going maintenance and operations, while fibre optic technology presents the opportunity for growth and new services that make best use of broadband.

"For new residential estates and multi-story apartments, we estimate the rising costs of copper and falling costs of FTTH technology place the break-even point about three years away.

"After that point, we expect our competitors will be trying hard to take the lead in this area, which is why we have begun the trial.

"Of course, the trial is strictly of a technological performance nature; the associated customer, commercial and operational matters will be addressed pending trial results."

Jim said there were three key issues driving Telstra's investigations into FTTH technology for network access technology:

Competitive threat: In overseas markets, most fibre to home or business is delivered by competitors to the major telecommunications carrier. The competitors are using a targeted approach, picking off high-value geographic segments and new developments, and in many cases, stealing a march on the major telco.

Improved network management: Fibre to the home or business is expected to provide Telstra with a huge advantage in terms of network management, particularly with accurate pre-provisioning, remote network service management, and the likely introduction of 'smart' devices in the home or business at the end of a digital network. An example is the ability for a customer to self activate a range services within minutes of walking in the door, or the increased accuracy of pre-provisioning and records management. It is estimated that this aspect alone will result in a substantial (approximately 60 per cent) reduction in the operating costs associated with activation.

Future growth: Fibre to the home brings with it huge potential for future growth in new types of services and products which maximise the benefits of broadband access.

me

Ted Culph and Bruce Clarke examine the Home-Optical Network Terminal (H-ONT) which is the interface between the optical fibre entering a premises from the Passive Optical Network and the in house customer wiring for telephone, data and video services. Behind them Daniel Willis is installing the WDM (wavelength-division multiplexer) ready for the technology trialling at TRL.

Expected to start in May, the technology trial will be managed by Telstra Technologies in the Voice & Mobility business unit (V&M), and will be carried out by Telstra Research Laboratories (TRL) in Melbourne.

Following completion of trial, Telstra will then seek to negotiate with interested developers willing to contribute towards costs associated with a commercial pilot in a new residential or high density apartment development.

Ted Culph, from Technology Infrastructure - DSL, Fixed Access, V&M, said the trial would determine the technical and service delivery performance of currently available Passive Optic FTTH technology for delivery of standard voice services, broadband services of similar speed to existing ADSL or cable services, and Foxtel pay TV.

"The trial defines a base level of service, and establishes a standard set of products," Ted said. "It utilises a passive optical split network using equipment from Alcatel and Scientific Atlanta. Each main fibre will use an optical splitter to fan out to provide service to 32 homes.

"It is leading edge technology and there are few telcos we know of in the world currently offering delivery of all three services (voice, data and video). We believe Telstra will be one of the first companies in the world to trial a fully digital video service."

When operating, the Passive Optical Network will make use of three wavelengths; two will be devoted to upstream and downstream transmission of voice and data, while the third will be a dedicated for broadcast digital video.

Telstra has a large task ahead. The introduction of a Passive Optical Network will have a major impact on access network design, construction, maintenance and recording systems. The introduction of active electronics into the customers' premises will present new challenges not only for installation and maintenance but also for service quality, reliability and availability.

Telstra boosts

Telstra's forward planning leads to an impressive increase in capacity of the Internet network

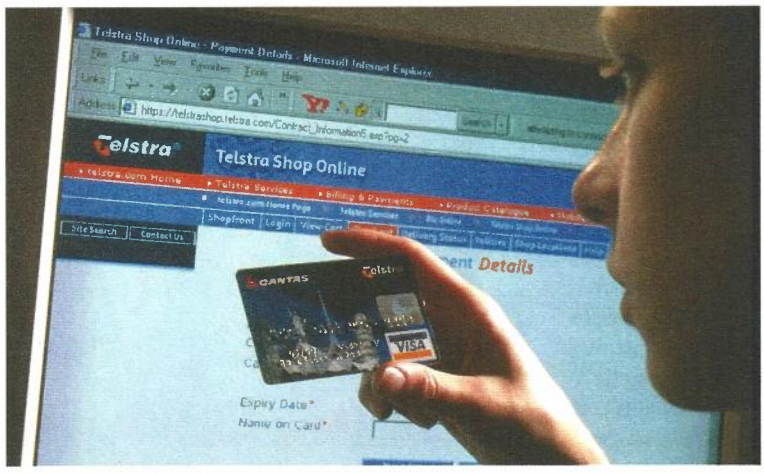
Telstra has increased the bandwidth in parts of the Telstra Internet Direct national backbone from one Gigabit per second (Gbps) to 10 Gbps to cater for the ever increasing volume of internet traffic.

Internet traffic has increased by 55% over the past year, and Telstra expects one million broadband customers - retail and wholesale - to be using its network by the end of 2005, up from today's 275,000 customers. Each day Telstra's Internet infrastructure carries over 17 Tera Bytes (TB) of data – equivalent to 700 million e-mails with standard attachments.

David Woodgate, Manager Data and Technology, Data & Online (formerly Manager Internet Development, Wireline & Wireless), says the first 10 Gbps link was deployed in January 2003 within the Sydney metropolitan network.

"10 Gigabit Ethernet is an evolution of the globally-accepted Ethernet technologies, most commonly used within local access networks (LANs) like office networks. 10 Gigabit Ethernet is therefore seen to be a relatively low-risk way of increasing metropolitan trunking speeds from current 1 Gbps to 10 Gbps," David said.

The 10Gbps link has been activated on the Telstra Internet Direct (TID) backbone, an all-IP network that handles a variety of traffic, including permanent high-speed business connections, broadband services via cable, Asymmetric Digital Subscriber Line (ADSL), and satellite and aggregated traffic from dial-up



Internet Service Providers (ISPs) such as Telstra BigPond. The TID service currently has 15,000 customers using 22,000 services, and those numbers are growing at up to 15% every year.

The TID backbone is built around a meshed network of 16-slot Cisco 12416 Internet routers, providing Telstra with a high-end routing platform for backbone and edge applications. Cisco's 12000 Series Internet router is part of its family of multimillion packets-per-second IP and MPLS (multi-protocol label switching) routing platforms.

Phil Davies, from the Internet Network Planning Group, Data & Online (formerly from the Product and Infrastructure Planning group, Wireline & Wireless), said the main item that needed to be addressed was getting the technology to work within the Telstra network. "We ensured the existing Telstra network devices (routers and switches) were suitably prepared to accept the new cards and that they would work with Telstra transmission infrastructure."

David Woodgate and Ash Garg, both from Internet Development, Wireline & Wireless, said their main technical challenge was identifying where within the network the new technologies should be introduced. "We had to identify the links which needed to be upgraded, based on utilisation and upgraded on the basis of speed, congestion and in the event of network failure," said David.

Ash added, "We also had to make sure that functionality was still OK with introducing the existing software, and that it had the capacity to support both existing and anticipated new products."

Bob Phillips, from Network Services, Telstra Internet Direct Operations, is excited about the new technology and the challenges it brings. "Telstra is working at the cutting edge of technology and making it work," he said.

"The challenge for us in Operations was keeping the network available to customers while building it and

Internet backbone

redesigning the network infrastructure with minimal customer impact. However, the redundant network design means that a single link failure does not affect the performance and capacity of rest of the network, which makes it much easier to make these changes."

Phil says that by upgrading the 1 Gbps links to 10 Gbps using Cisco's implementation of standard 10 Gigabit Ethernet ensures that Telstra's Internet backbone will be free of congestion in the event of a router or link failure, and caters for future bandwidth growth in a more cost effective and scalable manner than the previous 1 Gbps links.

"It also makes the network more flexible, that is, more able to cope with rapid changes in demand, which is important for customers as it gives them confidence in our products and networks," said Phil.

Bob points out that the 10 Gbps upgrade makes life easier for groups within Telstra.

"The major redesign of the network over the past 18 months means that the whole network is easier to run and changes are easier to implement. We have developed a proven solution for any network that can be scaled to that size."

David says that this is the beginning of an ongoing program to upgrade 1 gigabit Ethernet links in the metropolitan areas of the core network to 10 gigabit Ethernet links. "Sydney and Melbourne are the first cities where this will happen, and the first wave of such upgrades will be completed in these cities by June. Other capital cities will subsequently be upgraded, as demand requires."

Internet communications

- **There are approximately 845 million Internet users worldwide.**
- **Telstra offers three delivery technologies - cable, satellite and phone line - to ensure all Australian homes and businesses have access to high-speed, convenient Internet services.**
- **Telstra two-way satellites now allow BigPond* users to upload as well as download at higher connection speeds.**
- **Telstra's continued rollout of ADSL, which converts the ordinary telephone line into a high-speed digital Internet access line, saw more than 800 exchanges ADSL-enabled at the end of June 2002.**
- **Of these 800 exchanges, 252 were located in regional Australia.**
- **In 2002, the Telstra Broadband Fund was launched to stimulate and fast-track the development of new and innovative broadband applications, tools and technologies.**
- **The next wave of wireless growth is expected to come from high-speed data (eg. using a personal computer with a wireless connection to the Internet).**

East Timor project concludes successfully

After 1195 days of operation, the eleven base stations set up to form the East Timor mobile network which ran off of a base station controller switch in Adelaide, have been decommissioned and physically recovered back to Australia for ongoing deployment in the Telstra Mobile network.

Five of the base stations were located in Dili where Telstra - through Telstra International - also operated the fixed telephone network. The other six base stations were located in regional centres around East Timor and were the only forms of public communications in those areas.

Throughout the operation there was a continuing requirement for coordination between Telstra and many international organisations including the United Nations, the new government of East Timor, various non-Government organisations and armies of the 61 nations which constituted the Peace Keeping Force.

The total traffic carried over the three years that the mobile network was in operation was 210 million call minutes.

Although the customer base reached over 22,000 at its peak, the higher calling rate per customer meant that this equated to more like 80,000 customers in Australian terms.

One of the five base stations in Dili was by far the busiest in the entire Telstra Mobile network for most of its working life.

Sniper & Fraud unleashed

The labour intensive task of identifying and prioritising CCPs (Cross Connect Points) requiring relief has been automated thanks to clever programs designed by Bernie Lock and Geoff Bennett from Fixed Access, Voice & Mobility (formerly Access Planning & Development, W&W).

The programs, SNIPER (Switched Number Identifier Priority Enhanced Reporter) and FRAUD (faults, reserved, abandoned left in situ, unusable and disconnected pair statuses) collate and analyse information from various systems to produce a prioritised program of works. This enables Telstra to extend the life of CCP's and provide additional network capacity.

Since February 2003, 746 pillars have been validated with 402 run out dates extended beyond 12 months with a saving of approx $1m. SNIPER will pro-actively validate 2.7-million cable pairs/year for the next 5 years.

For more information contact: Bernie Lock 03 5329 9029 or Geoff Bennett 03 6223 9364.

Securing our IT and IP infrastructure

The Network Security Operations team within Network Services established the SecurITy.net Centre to ensure appropriate response to any security issue related to Telstra's IT and IP infrastructure.

Consisting of a small number of IT and network security specialists, the centre takes a proactive approach towards IT and IP security issues to avoid downstream impact to customers. The centre's people provide the expertise, knowledge and experience to handle infrastructure security issues.

The SecurITy.net Centre is the single point of contact for the management of security risks, vulnerabilities and incidents in Telstra's network and platform infrastructure.

SecurITy.net Centre can be contacted by calling 1300 066 822 or via e-mail at security.net@team.telstra.com.

Network change Advisory Board introduced

A Network Change Advisory Board has recently been introduced to provide effective management of proposed changes in our network and to ensure that these changes adhere to aspects of Telstra's change management program.

The key role of the board is to co-ordinate and communicate network service impacts caused by proposed changes to our customer facing business units and customers.

The board members include various groups from Network Services, IS, together with representatives from key Telstra business units such as Telstra Country Wide, Business & Government, Consumer & Marketing, Wholesale, Broadband, Online & Media.

For more information please contact: John Romano- (03) 9634 2703 - NM Business Services, Network Services

Bruce Brown - (02) 9395 9046 - Manager Change & Configuration Mngt, Network Services

Directions
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Editor: Maryanne Gaffney
Telephone: (07) 3898 7123
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