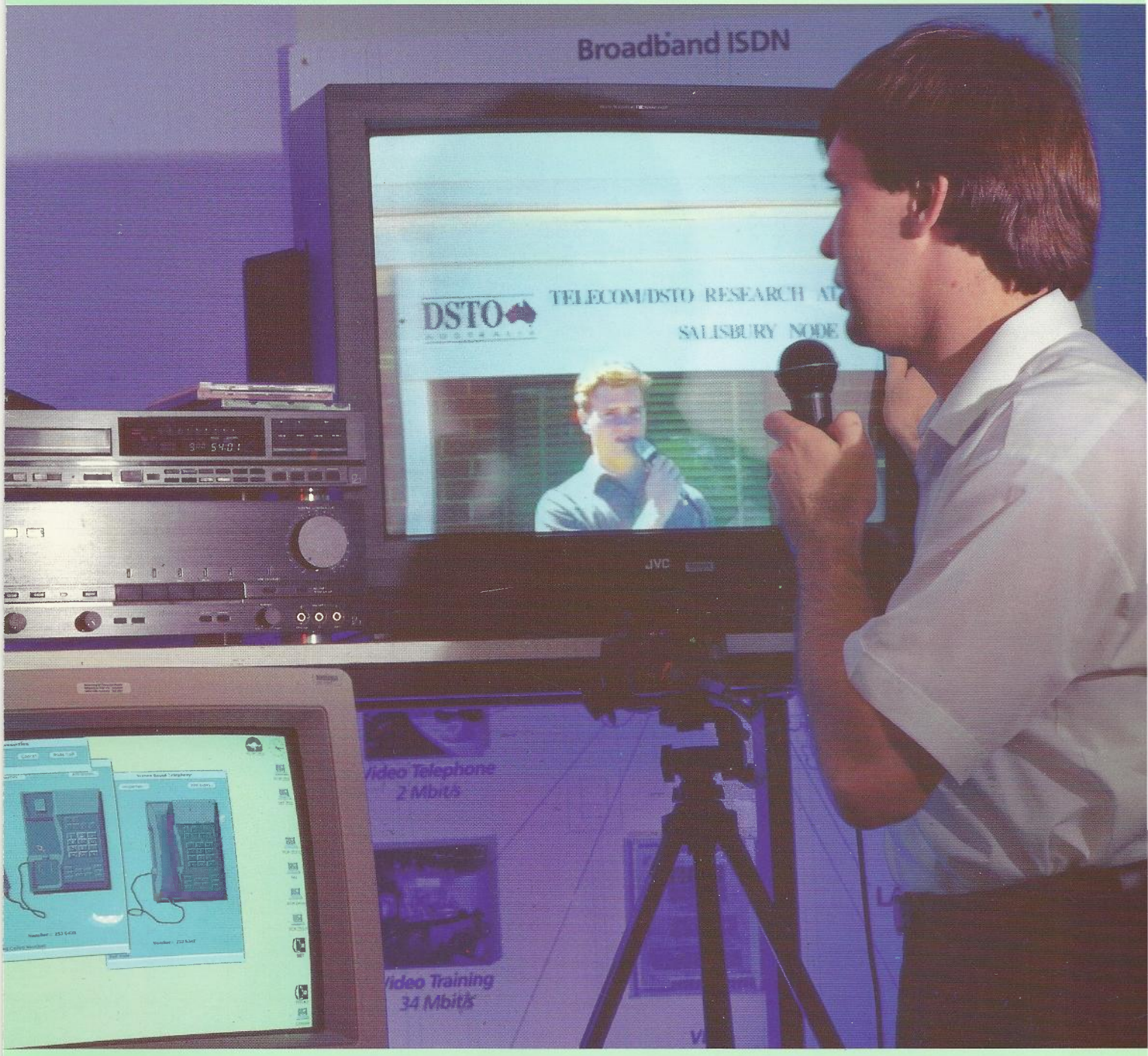
IN CONFIDENCE

RESEARCH

QUARTERLY 73



October
November
December
1993

A RESEARCH UPDATE FOR TELSTRA STAFF ONLY

FOREWORD

This quarterly publication provides brief insights into recent project activities and achievements of the Telecom Research Laboratories (TRL) that might be of wider interest or assistance to Telecom staff in the performance of their work. Information is provided under a number of headings including:

- The Telecom Research Laboratories – A Brief Overview;
- Broad Categories – by Activities;
- Research Laboratories' Information Transfer – includes Reports, Papers, Talks and Standards Contributions;
- Visitors to the Laboratories;
- Staff Contacts.

The names and telephone numbers of appropriate TRL personnel are included throughout the booklet. Interested persons are invited to make direct approaches for further information.

A.K. Mitchell
for DIRECTOR OF RESEARCH

Our Cover:

Researcher Daniel Kirkham talking to colleagues at DSTO, Adelaide over the research ATM Network.

The Research Quarterly has been printed on 100% Australian made Recycled paper.

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THE TELECOM RESEARCH LABORATORIES – A BRIEF OVERVIEW

The Mission

Telecom Research Laboratories' (TRLs') mission is to provide Telecom with technological and scientific leadership, knowledge and expertise so that it can be the best provider of telecommunications and information services.

The mission is being achieved through seven key areas:

- provision of strategic advice and expert consultancy;
- value adding to Telecom's products and services;
- cost reduction of Telecom's equipment, systems and networks;
- technical support of Telecom's existing plant and equipment;
- transfer of technology to other parts of Telecom;
- increased ownership of Telecom's products through system and component design, and;
- maintenance of a highly skilled, expert and motivated workforce.

A Resource for Telecom

TRL is responsible for performing Telecom's research needs. TRL conducts a Research Programme derived from a corporately endorsed and approved Business Plan. The services that TRL provides are available to all other organisational units of Telecom.

The annual formulation of the Business Plan requires the consideration of corporate priorities and performance needs of R&D projects and related activities. This is in terms of the required "deliverables" and the resources needed to ensure their timely delivery. These processes require that specific projects are either funded by a particular "client" unit in Telecom or on a corporate basis.

Deliverables include:

- the conduct of the Research Programme in accordance with the approved Business Plan;
- the operation of Corporate Facilities (National Information Resource Centre, Intellectual Property Consultancy, and Time and Frequency Standards), and;
- the management of and participation in Corporate External R&D Programmes on behalf of Telecom.

Mission Statement

To provide Telecom with technological and scientific leadership, knowledge and expertise so that it can be the best provider of telecommunications and information services.

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CUSTOMER SERVICES AND SYSTEMS

Secure Personalization Of Smart Cards

Smart Cards are promising to infiltrate many areas of Telecom's business. Utilizing their cheap and secure personal computing power, a user can securely identify themselves to a remote party.

For example Telecom's GSM mobile network uses smart cards to identify the subscriber to the exchange, and to subsequently encrypt the conversation to prevent eavesdropping. In all such smart card applications it is important that the personalization of the card to a user is done securely. This involves the installation of a secret key (usually a large random number) on the card, which will later uniquely identify the user. The security of all future use of the smart card depends on this number remaining secret.

Telematic and Security Systems (TSS) section of TRL is building a prototype of a device that will allow this personalization process to occur in an insecure environment. For example, in the case of GSM smart cards, the personalization process is carried out at a dealer's premises. In other cases, such as bank's credit cards, a third party may be used to personalize smart cards and issue them to user's on Telecom's behalf.

The cornerstone of the device is the implementation of the cryptographic algorithm invented by Rivest Shamir and Adleman (the RSA algorithm) in software on a tamper proof card reader. Although implementations existed previously, they were too slow for mass card personalizations, taking over 2 minutes for a single encryption computation. Using advanced techniques TSS was able to reduce this to less than 15 seconds.

Using the RSA algorithm, and the tamper proof feature of the device, two important aspects of security can be achieved. Firstly it is ensured that the user's secret key remains secret. Secondly the device produces a tamper proof audit record showing detail of all smart cards that have been personalized. This prevents the device being used to personalize unsolicited smart cards.

(Contact: S. Malikoff, Customer Services and System Branch, (03) 253 6750)

Speech Recognition for Service Control

Telecom Research Laboratories have developed a world class, connected word, speech recognition capability which we own and can fully control. The speech recognition system can be trained on Australian accented speech for a broad range of applications. This article is intended to alert business units to the short term opportunities for integrating this technology for the automatic control of existing and new services. The performance which has been achieved at TRL is comparable to the best reported by major overseas R&D laboratories. Currently there is no other connected word recognition system which will recognise Australian accented speech over the telephone network.

A number of relatively simple services which include:

- voice messaging and,
- Interactive voice response systems (IVR),

can be controlled by a touch tone telephone (DTMF control). However, there is still a significant number of potential customers who only have access to a rotary dial telephone. Automatic speech recognition will enable a large percentage of this otherwise lost market segment to access the services. Furthermore, it is generally accepted that users would prefer to speak digit strings in a connected[1] (natural) fashion rather than be prompted to speak each digit in isolation.[2]

There are many more potential services which could not be controlled by a touch tone telephone. For example, many services may be better controlled by saying a meaningful control word rather than pressing digits on a keypad which must be translated to a function in the mind of the user.

For network based service control by voice the following basic requirements are generally required:

- recognise all voices (speaker independence),
- recognise words spoken in a natural fashion (connected not isolated word recognition),
- recognise control words in a sentence (word spotting)[3] and,
- high performance over the PSTN.

Speech recognition systems which meet the above requirements cannot be purchased "off the shelf" for Australian accented speech. TRL has customised (trained) a number of overseas *isolated word recognition* systems which can be trained on our Australian speech databases. Apart from the constraint of isolated word recognition, their performance has proven to be inadequate for most applications. AT&T (Bell Labs.) is recognised as a world leader in the field and has developed systems which meet the basic requirements but these systems will not perform well on Australian accented speech. Furthermore, AT&T recognise the technological advantage of their speech recognition technology and sell it as part of a specific IVR system (Conversant). These and other difficulties led to the development of TRL speech recognition technology which is based on a statistical method known as hidden Markov modelling (HMM) which is recognised as the (currently) most successful way to implement speech recognition. Performance results for connected digit

1. Connected word recognition
2. Isolated word recognition
3. Recogniser will still work with spurious words such as "um", "the number is . . .", etc.

recognition have shown that our systems are comparable to that achieved by AT&T.

In order to train a speech recognition system for use in the PSTN, a very large speech database collected over the PSTN is required. The database needs the voices of thousands of speakers in order to adequately model the variability in the speaker characteristics, network conditions and telephone handset types. Having an adequate speech database is as important as having access to the basic technology and is a major reason why the leading suppliers of speech recognition technology have not offered products for the Australian market.

We currently have an Australian speech database comprising approximately 2,000 speakers and this will soon be extended to 4,000 speakers including the more common ethnic groups.

AT&T have used their speech recognition technology to make very significant savings in the area of operator assisted services and as a means of voice control for their Conversant IVR system. Other Telecos, particularly in North America, are also using speech recognition technology to cut their costs and provide new services. The technology has potential role in a wide range of areas including:

- operator assisted services
- general network services (e.g. voicemail)
- mobile services

There are likely to be many more opportunities for using this type of technology in conjunction with Telecom's current and planned products and services.

Full control of the technology will provide strategic advantages which include:

- ability to rapidly modify the recogniser vocabulary for new applications
- ability to refine the technology and bring services to market quickly
- ability to integrate the technology with a broad range of systems.
- ability to differentiate products from our competitors.

Our future developments in large vocabulary recognition will provide an even more sophisticated service interface. This technology has strategic importance for Telecom since it will provide cost reductions, and facilitate the introduction of new services. Business units within Telecom are invited to discuss with TRL, opportunities for the use of speech recognition systems to support their business needs.

(Contact: M.J. Flaherty, Customer Services & Systems Branch, (03) 253 6753)

New Section in Customer Services and Systems Branch

A new section has been set up in CSS called Network Services Integration Section and is headed by Paul Kirton. The aim of this section is to look from the customers point of view at network needs and at the customer to network interface. This section will foster new applications and associated network developments. The section will also provide research input to customer modelling and charging issues. Initial projects include corporate customer communication requirements, development and potential of the analogue display services interface (ADSI) for screen phones, applications and their integration for use with ISDN, CAD conferencing applications and demand/price elasticities for STD and IDD.

(Contact: P. Kirton, Customer Services and Systems Branch, (03) 253 6165)

SWITCHING AND TRANSMISSION NETWORKS

Public Launch of Telecom/ Defence Research ATM Network

On November 30 1993, the then Minister for Telecommunications, David Beddall, and the Minister for Defence Science and Personnel, John Faulkner, officially launched the Telecom/Defence Research ATM Network by cutting an electronic ribbon simultaneously in Adelaide and Melbourne using a virtual shared workspace. The shared workspace is one of many applications running on the Telecom/Defence Research ATM Network (RAN).

The RAN consists of two ATM (Asynchronous Transfer Mode) switches, one at TRL, one at DSTO (Defence Science and Technology Organisation) in Salisbury, near Adelaide. They are connected via a 34 Mbit/s transmission system. As well as being used to demonstrate applications, the RAN provides a platform for experiments in congestion management in ATM networks and will soon be used as part of experiments in broadband signalling and broadband Intelligent Network services.

These experiments are supporting the introduction of ATM into Telecom's network in the form of the Experimental Broadband Network and ultimately the introduction of ATM as a core network technology.

The cooperative development with DSTO has cemented a strong working relationship with the Department of Defence. It has allowed us to gain insights into the special requirements of Defence and has led to our involvement in internal Defence studies into communications migration strategies. Defence are our first customer to have seriously examined and recommended the introduction of ATM technology into many facets of their communications.

The RAN is also the focus of our demonstrations to customer groups in the broadband area. The demonstrations include video conferencing, image transfer, LAN interconnection, a co-operative multi-media work station, hi-fidelity audio and broadcast quality video switching.

ATM technology is already making an impact in the marketplace in the area of Local Area Networks (LAN). ATM LAN switches are available off-the-shelf today and a number of organisations are already purchasing and installing them. TRL will shortly be installing an ATM LAN and the RAN will be used to investigate the interconnection of private ATM LANs with the public network.

(Contact: D.H.M. Giddy, Switched Networks Branch (03) 253 6388)

Generic Service DataBase Development Seminar

A seminar on Intelligent Networks, held at TRL, was presented to Telstra staff on 26 October, 1993. The seminar focussed on two topics: Competitor's Intelligent Network and the Generic Service DataBase (GSDB) development. Both topics were presented by members of Network Services and Signalling Section, Switched Networks Branch. A brief introduction to the role of GSDB in Telstra was given by Derek Carty of Service DataBase Development, Network Products Business.

The presentation on Competitor's IN provided up-to-date information on an IN platform developed by DSC Communications Corporation. This platform, called MegaHub PACE, hosts a family of DSC products that includes Signalling Transfer Points, trunk switches, and IN systems based on the Bellcore AIN. The architecture of MegaHub PACE and the IN features that it can support were discussed and analysed. DSC switches are used by a number of our competitors.

On the same topic, an analysis of the ProLink One Number Service, launched by BellSouth Cellular in July, 1993, was also presented. ProLink combines a single (or personal) number and a call completion service, with a rich set of features. It is offered to customers who use both fixed and mobile networks. It enables a customer to be in touch via cellular, wireline, fax, pager or voicemail at all times. The presentation discussed possible network architectures that a competitor could deploy to launch a nationwide ProLink service. An analysis of the capability of Telstra adjuncts to provide coverage of the features provided by ProLink was also given.

The second topic was GSDB. The development of GSDB began in March, 1993. The goal of this research project is to contribute to future Telstra inhouse IN developments which use the adjunct approach, so as to allow more rapid provisioning of IN services. Current adjunct implementations are, to a large degree, service specific (e.g. One3 and TeleCard). The GSDB, however, offers a generic approach, in which service creation and service-independent building blocks are used to create IN services. This approach would reduce lead time to design and prototype new services.

The seminar reported on the progress of the GSDB design. First, an overview of the GSDB architecture was given and it was compared to other adjunct design approaches currently used in Telstra. Adjunct architectures do impose some limits on service features that can be supported. This issue was analysed and a preliminary list of features to be offered by GSDB was given.

The seminar provided an overview of the call model for GSDB. The call model described in the ITU Recommendations for Intelligent Networks Capability Set 1 (IN CS1) has been

adopted for GSDB. It is flexible enough to support a multitude of IN services. Finally, the call control functional components were discussed. Their use was demonstrated with a service example.

Copies of the seminar notes are available on request.

(Contact: H.K. Cheong, Switched Networks Branch, (03) 253 6310
D.M. Harsant, Switched Networks Branch, (03) 253 6153)

Gravity Model Used to Help Prepare Plan for Vietnamese Network Development

In January 1993, Telstra CEO, Mr Frank Blount, met with Mr Nguyen Ba, Director, Ho Chi Minh Post and Telecommunications. At that meeting, it was agreed that Telecom Australia would provide a network plan for the Southern Economic Region of Vietnam, comprising Ho Chi Minh City and the provinces of Song Be, Dong Nai, and BariaVung Tau.

In April of that year, Mr Neil Crane of IBU led a team of engineers comprising Maurie Sparkman from Telstra in Hanoi, Hessel De Jong and Jeff Lowrey from Telecom Australia, and Ron Lukin from IBU, on a data collection and fact finding mission to Vietnam. The team worked with Vietnamese engineers to define the plan parameters and to collect and verify all available information. Actual data concerning traffic flow from exchanges was extremely thin on the ground, yet the plan required, as a foundation, a projection of traffic dispersion figures both within and between the provinces and incorporating traffic flows.

TRL assistance was sought in the preparation of a traffic matrix using ' gravity models', which have the ability to generate traffic dispersion matrices given information about the size and geographic distribution of the customer mass, and the possible traffic at nodes. Such a gravity model was already available on the NetCAD platform. It had been developed under contract by the Teletraffic Research Centre (TRC) at the University of Adelaide, in conjunction with members of Network Analysis Section at TRL. The planning team were put in touch with the Director of the TRC, and a project began to adapt the existing models to the particular challenging circumstances of the Vietnamese situation.

The problem was to use limited traffic data, together with the estimated customer base in different population centres, and geographic factors such as the distances between those centres, to derive a reasonable traffic dispersion matrix describing the projected end to end traffic demand. With so many unknowns, this was a difficult task, and in addition there was a tight time frame for the project as a whole and the dispersion work in particular. Researchers from the TRC used data from the Sydney Metropolitan network to examine the distance dependence of traffic flows, and were able to produce the values required after a period of intense effort. After additional interaction with the planning team, who were in close contact with Vietnamese engineers, these figures were further refined and were accepted as the basis of the dimensioning and network design work that followed.

The project was just five months in duration, and its results are already being used. Evidence of its success can be seen in the continued involvement of Telstra in the Vietnamese network including the current expansion of the network plans to include other important growth areas of Vietnam. It is another example of the benefits of collaboration between Telecom Research Laboratories, a Telecom Centre of Expertise, and a business unit of Telstra.

(Contact: D.Veitch, Switched Networks Branch, (03) 253 6494)

TELECOMMUNICATIONS SCIENCE

Reliability Of The Touchfone TF200

The Touchfone TF200 is Telecom's standard rental telephone and about 2 million units are purchased by Telecom each year. With new services and upgrades accounting for less than half of these telephones, many questions were asked about the reliability and suitability of the TF200. To find the answers a TF200 Breakthrough Team was formed and TRL invited to participate. The scope of the TF200 investigations was broad and included aspects such as the suitability of the TF200 design and the quality of manufacture of the telephone; the field practices for storage, installation and recovery; the Telecom policies for upgrades from older telephones; the refurbishment process and; the usefulness and accuracy of fault data from computer systems such as LEOPARD. After an extensive investigation, this team is now developing a plan for the implementation of its recommendations.

In northern Australia, replacement of the TF200 has a strong seasonal pattern and environmental factors, particularly lightning and humidity, were thought to be the cause. Laboratory experiments at TRL enabled these two effects to be isolated. Large numbers of TF200s underwent environmental testing in conditions of high temperature and humidity to examine the manufacturing quality across a batch and between the two manufacturers. Other tests compared the most recent TF200 design with earlier versions. Several sub-assemblies such as the keypad unit were also tested separately.

TRL suggested that two lightning-hardened versions of the TF200 be developed and evaluated in a field trial. One version incorporated a mechanical hookswitch to provide physical isolation between the telephone and the line while on-hook. In the other, a semiconductor protective device replaced the usual metal-oxide varistor. The TF200 Breakthrough team organised the field trial with local field staff and co-ordinated installation and recovery of the 16,000 trial telephones over the 1993/4 lightning season. These trial TF200s have a conspicuous label on the base and any that fail are sent to TRL for analysis. Not all failures are due to lightning so a detailed analysis of each returned telephone is necessary. Equal numbers of the two hardened versions and new standard TF200s were installed in each region selected for the trial. The comparative performance of these trial telephones has also been determined under laboratory conditions and several failure modes seen in the field, reproduced. The field trial concludes at the end of March.

The Breakthrough team recently made a presentation to the CEO summarising its activities and findings. The last Breakthrough team meeting is due in March at which time the team will visit each manufacturer and provide feedback on the outcomes and initiatives resulting from the team's activities.

(Contact: D.J. Kuhn, Telecommunication Science & Technology Branch, (03) 253 6673)

SCOFS – A Small Capacity Optical Fibre System

Low cost applications of optical fibres and optoelectronics in the Local Loop are a significant Strategic Research area in TST Branch. The work is predicated on the ability to identify key component technologies that are likely to fall in price substantially. This predictive capacity requires an intimate appreciation of components and fabrication methods.

Recently, an approach from the Customer Access Network Branch for South Australia and Northern Territory provided an opportunity to turn some of this strategic research into a new product and at the same time help Telecom satisfy an unfulfilled need for service to some isolated customers, at an affordable price.

The first batch of the new SCOFS telephone systems will go to 30 customers at Dundee Downs located on the Northern Territory coast approximately 150 km by road East of Darwin. The new service will emanate from the Brooks DRCS repeater, Telecom's nearest point of presence, at a distance of approximately 15 and 30 km respectively from the nearest and farthest customers. The hostile terrain (for electronic equipment) is summarised as follows:

- Tropical, Coastal Environment with a prolonged wet season
- High Lightning Activity
- Dispersed semirural community needing long cables runs
- Difficult (Helicopter) access for wet season maintenance
- No mains power

The high lightning activity indicated a non-metallic cable solution and a detailed analysis revealed that an optical fibre solution would be cost effective even if lightning were not a factor. All of the equipment is solar powered and the optical link helps minimise the powering cost. Less than 1 Watt per customer per end is needed.

The key to economic deployment of SCOFS is simplicity and versatility in the optoelectronic design. Simple optoelectronic modules using low cost lasers and detectors and logic can operate up to 50 Mbit/s. The present system operates at 500 kbit/s leaving ample capacity for future upgrades. Full

duplex operation on a single fibre is achieved by Wavelength Division Multiplexing (WDM), leading to efficient utilisation of the fibre. The system is insensitive to reflections from connectors, splices and detectors so that low cost components and construction practices can be used.

The system design requires a modest receiver sensitivity which is readily achieved using a standard PIN photodiode, transimpedance amplifier and compensator combination. The electronic components are low cost and widely available silicon integrated circuits. The laser transmitter is a key element in meeting the cost, performance and powering targets for the system. The lasers are uncooled 1310 nm and 1550 nm Fabry-Perot devices in SMOF-pigtailed coaxial packages with internal monitor photodiodes and a launched optical power of -3 dBm. Uncooled lasers represent a very substantial saving on (i) the laser package, (ii) the temperature control circuits and (iii) power consumption.

Allowing for appropriate manufacturing tolerances on both the lasers and the WDMs, total temperature excursions of approximately 50 C can be tolerated without compromising the link power budget or reflection isolation requirements. A simple laser driver circuit was designed to accommodate the required device operating environment. This environment includes wide threshold current (temperature) variations, wide bit rate variations, and no laser current when the system is idle. In this circuit, feedback from the monitor photodiode causes the laser output to go high whenever the data input is high ("1" bit) and when the input goes low ("0" or no data) the laser is turned off. The laser stabilises to the specified output within a small fraction of the bit period. For the kind of applications contemplated here this method of driving the laser offers substantial advantages over the widely used bias-tee network.

The optical link is integrated with a commercial pair gain system (Telspec, model 4DPGS) through a four wire digital interface. The optical 4DPGS is fully compatible with standard installation, network management and fault location practices.

The production prototype SCOFS has been serving four customers on the Noonamah Exchange in Darwin over the last month under the close scrutiny of Pair Gain Construction (NT) staff. Installation for the first customers in Dundee Downs will begin at the end of the wet season. CAN Branch SA/NT anticipate substantial deployment of SCOFS in rural Australia.

(Contact: P. Kemeny, Telecommunications Science and Technology Branch, (03) 253 6686)

TRL INFORMATION TRANSFER

During the last quarter, the TRL staff have published or presented details of the progress and noteworthy achievements of various projects and activities. These publications comprise both official Telecom publications (in the form of Research Laboratories Reports and Branch Papers) and papers submitted for external publication in learned journals or presented to outside organisations (including professional institutions and societies).

Some of the listed Research Laboratories Reports and Branch Papers are confidential and restricted to appropriate areas within Telecom are indicated by the '*' included in the publication number. Only the titles of such publications are included hereafter.

Reports and Branch Papers 'for general use' are available on request and are also listed with abstracts or summaries of the contents of such publications appended after the lists.

Persons seeking copies of Research Laboratories Reports or Branch Papers should please telephone the appropriate source, as indicated below. Alternatively, a request form (included overleaf) can be completed and forwarded to:

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For Branch Papers the relevant Branch Administrative Managers (BAMs) may be contacted as shown:

- BAM, Customer Services and Systems Branch (03) 253 6483;
- BAM, Switched Networks Branch (03) 253 6401;
- BAM, Telecommunication Science and Technology Branch (03) 253 6674;
- BAM, Transmission Networks and Standards Branch (03) 253 6399.

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RESEARCH LABORATORIES REPORTS

8213* – Pay TV Set Top Units and Associated Scrambling Systems
Witham, R.C.

8267* – Switching for Broadband Video Distribution Services
Clemow, S.

8274* – Interworking ATM and N-ISDN (Alcatel Specific)
Avery, J.

8283* – Signalling System Number 7 Management: Comments on the Management Recommendations
Gates, D.

8286* – Network Management Expert Systems
Hogg, S.

8287* – Pointer Sequences and Wander in SDH Networks under Synchronisation Failure Conditions
Zilberg, E.

8288* – The Impact of Noise & Distortion on an Analogue CATV Hybrid Network Design
Semple, G.J.

*The Reports marked * are classified as 'IN CONFIDENCE' – For Telecom Australia Use Only'.*

Research Laboratories Report Note: In some cases Research Laboratories Reports classified as "In Confidence – For Telecom Australia Use Only" will only be released to staff when accompanied by their Section Manager's authorisation.

TELECOMMUNICATION SCIENCE & TECHNOLOGY

93/027* – 'Evaluation of BD139 Transistors For The CLI Project'.
Li, S.

93/028* – 'Overvoltage Evaluation of Elmag and Sedlbauer NT1s-Interim Results'.
Day, P.

93/029* – 'Overvoltage Evaluation of The DCS20'.
Day, P.

93/030* – 'Evaluation of TF200 Impedance Matching Units'.
Day, P. & Parkinson, S.

93/031* – 'Evaluation of ASICs Used in Alcatel SDH Transmission Equipment'.
Rogers, T.; Li, S.; Molnar, S. & Frost, C.

93/032* – 'Failure Analysis of Philips OM1796 Integrated Circuits From Alcatel TF200s'.
Li, S. & Rogers, T.

93/033* – 'Evaluation of ASICs Used in NEC SDH Transmission Equipment'.
Li, S.; Molnar, S.; Frost, C. & Rogers, T.

93/034* – 'Assessing The SGS-Thomson TSX5070FN Codec for Manufacturer Quality & Expected Reliability'.
Petkovic, N.

93/035* – 'Failure Analysis of Philips LTE42008R Microwave Bipolar Transistors in Siemens CTR190 34 M6/s Digital Radio Systems'.
Petkovic, N.

93/036* – 'Evaluation of Siemens SH100B and SH100CK ASICs From Siemens 140 and 565 Mbit/s Equipment'.
Li, S.; Molnar, S. & Rogers, T.

93/037* – 'Evaluation of Siemens SH100CK 1124 ASICs From Siemens 140Mbit/s Radio Transmission Equipment'.
Li, S. & Rogers, T.

93/038* – 'Evaluation of Motorola RF Hybrid ICs-MHW710-1'.
Li, S.

93/039* – 'Failure Analysis of AM-7958-2PC Telephone Subscriber Line Interface ICs'.
Li, S.

TRANSMISSION & NETWORK STANDARDS

TNS0350* – 'Timing Performance Measurement Results for Existing and Proposed Network Slave Clocks'.
Hui, A.

TNS0351* – 'Survey of Quality of Services Studies in ANSI, ETSI and ISO'.
Harris, R.

TNS0352* – 'Quality of Service and Network Performance Questions for Study in the ITU-T, 1993 to 1996'.
Harris, R.

*The Branch Papers marked * are classified as 'IN CONFIDENCE' – For Telecom Australia Use Only'.*

Branch Paper Note: In some cases Branch Papers classified as "In Confidence – For Telecom Australia Use Only" will only be released to staff when accompanied by their Section Manager's authorisation.

RESEARCH LABORATORIES BRANCH PAPERS

RESEARCH LABORATORIES PAPERS PRESENTED/ PUBLISHED

'Networked Access to Interactive Multimedia', The Filmmaker and Multimedia Conference, North Ryde, NSW, October 1993.
Biggar, M.J.

'Networked Access to Interactive Multimedia', Australian Multimedia Journal, Pages 33-34 & 36, Nov/Dec 1993.
Biggar, M.J.

'A Decade of Experience – Review of Polyethylene Insulation Performance In Above Ground Installations in Australia', 42nd International Wire And Cable Symposium, St.Louis, USA, November 1993.
Boes, P. & Latoszynski, P.R.

'Development and Application Of A Long Wavelength OTDR To Provide Early Warning of Degradation In A Fibre Network', ACOFT '93, Wollongong, NSW, Nov/Dec 1993.
Clarke, K. & Duncan, A.M.

'Integration of Expert System Tools Into Conventional Software Environments', 1st Australian and New Zealand Conference on IntelligentInformation Systems, Perth, W.A., December 1993.
Dai, W. & Wright, S.L. (Murdoch Uni.)

'INDEX: An Architecture that Integrates Expert System Techniques within Conventional Software Environment.', Joint Europe/USA Conference on Expert Systems Applications &Artificial Intelligence, Paris, France, December 1993.
Dai, W. & Wright, S.L. (Murdoch Uni.)

'A Framework for Building Intelligent Cooperative Systems', 6th Australian Joint COnference on Artificial Intelligence (AI93), Melbourne, November 1993.
Dai, W. & Wright, S.L. (Murdoch Uni.)

'Mathematical And Numerical Models of CdTe Deposition In A Pre-Cracking Metalorganic Chemical Vapour Deposition Reactor', Journal of Crystal Growth 133 (1993)230-240, North-Holland, 1993.
Davis, T.J. (CSIRO, Clayton); McAllister, T. (CSIRO, Clayton); Faith, M.E. & Leech, P.W.

'Meaning in Spoken English', 1993 Australian Joing Conference on Artificial Intelligence (Natural Language Processing Workshop), Melbourne, November 1993.
de Beler, M.; Huang, X. & Rowles, C.

'X-Ray Spectroscopy Reveals Domains of Density In Silica Fibres', ACOFT'93, Wollongong, NSW, Nov/Dec 1993.
Duncan, A.M. & Warminski, T.

'Towards a New generation of Customer Switching Experience & Realities', 12th Australian Microelectronics ConferenceMICRO'93, Sufers Paradise, Queensland, October 1993.
Heinze, G.C.

'New Fluoride Glass Visible Laser Materials', ACOLS'93, University of Melbourne, December 1993.
Goh, S.C.

'A Novel Luneburg Lens Feed For Multiple Beam Antennas', IEEE Antennas and Propagation Society Internation Symposium, Ann Arbor, U.S.A., June/July 1993.
Goonan, M.J. & Davies, W.S.

'Bandwidth Management for reconfigurable Multi-Service Networks', 8th Australian teletraffic Research Seminar, Melbourne,Victoria,Australia, December 1993.
Herzberg, M. & Bye, S. J.

'A Decomposition Approach to Assign Spare Channels in Self-Healig Networks', Globecom '93, Houston, Texas, USA, December 1993.
Herzberg, M.

'A New Algorithm for Automatic Configuration of Hidden Markov Models', Algorighms and Learning Theory Workshop, Tokyo, Japan, November 1993.
Iwayama, M. (Hitachi); Indurkhya, N. & Motoda, H. (Hitachi).

'An S-Shaped Optical Fiber Loop Resonator Using A 3 x 3 Nonplanar Fiber Coupler', Microwave And Optical Technology Letters, Vol.6, No.15, USA, December 1993.
Ja, Y.H. & Dai, X.

'An Experimental Study Of An S-shaped Two-Coupler Optical Fibre Ring Resonator', ACOLS'93, University of Melbourne, December 1993.
Ja, Y.H.

'On The Existence Condition For Bistability In A One Coupler Optical Fibre Ring Resonator By Using Degenerate Two-Wave Mixing', ACOLS'93, University of Melbourne, December 1993.
Ja, Y.H.

'Densely Spaced Two-channel Wavelength Division Demultiplexer With An S-shaped Two-coupler Optical Fiber Ring Resonator', Applied Optics, Vol.32, No.33, USA, November 1993.
Ja, Y.H.

'Performance Parameters Of A Wavelength-Division Demultiplexer Made With A Single 3 x 3 Coupler Optical Fiber Ring or Loop Resonator', Journal of Lightwave Technology, Vol.11, No.8, USA, August 1993.
Ja, Y.H.

'Kerr Bistability In A 3 x 3 Coupler Optical Fiber Ring Resonator', Applied Optics, Vol.32, No.27, USA, September 1993.
Ja, Y.H.

'Optical Multiple Stability In A Fibre Double-Ring Resonator Using Degenerate Two-Wave Mixing', ACOLS'93, University of Melbourne, December 1993.
Ja, Y.H.

'Single-Mode Four-Port Optical Fiber Loop Resonators Using A Nonplanar 3 x 3 Fiber Coupler', Microwave And Optical Technology Letters, Vol.6, No.16, USA, December 1993.
Ja, Y.H. & Dai, X.

'SDH Management Network: Architecture, Routing and Addressing', IEEE Global Telecommunications Conference, Houston, Texas, USA, November 1993.
Katz, H.; Sawyers, G. & Ginger, J.

'An Electronic Notebook for Knowledge Acquisition & Organisation', Australian & New Zealand Conference on Intelligent InformationSystems, Perth, December 1993.
Kendall, E.A.. & Senjen, R.

'A Hypertext-Based Knowledge Organization Tool', Australian Artificial Intelligence Conference, Melbourne, November 1993.
Kendall, E.A. & Senjen, R.

'Isolated Speech Recognition with Low Cost Neural Networks', Neural Information Processing Systems, Denver, Colorado, USA, December 1993.
Kowalczyk, A.; Dale, M.; Ferra, H.L. & Rowles, C.D.

'Counting Function Theorem for Multi-Layer Networks', Neural Information Processing Systems, Denver, Colorado, USA, December 1993.
Kowalczyk, A.

'Fault-finding strategies for Telecom Australia's FTTCP field-trial', ACOFT, Woolongong, NSW, December 1993.
Lampard, G.J.

'Being Correct is Not Enough – The Role of Domain Knowledge in the Utility Problem', 6th Australian Joint Conference on Artificial Intelligence (AI'93), Melbourne, November 1993.
Leckie, C.

'Ohmic Contacts To p-Type InGaAs/InP With A Graded Bandgap Heterobarrier', Materials Research Society Proceedings, Vol.318, Fall Meeting, Boston, USA, November 1993.
Leech, P.W. & Reeves, G.K (RMIT, Melbourne).

'Analysis of Defects In Metal-Semiconductor-Metal (MSM) Detectors in Hg1-xCdxTe By Nuclear Microprobe', Australian Microelectronics Conference, Surfers Paradise, Queensland, October 1993.
Leech, P.W.; Dooley, S.P. (MARC, School of Physics, University of Melbourne) & Jamieson, D.N. (MARC, School of Physics, University of Melbourne).

'Properties of HgTe As A Contact Layer To n-Hg1-xCdxTe', Semiconductor Science Technology 8, 2097-2100, UK, 1993.
Leech, P.W. & Reeves, G.K . (RMIT, Melbourne).

'Controlled Temperature Annealing of Amorphous Silicon Photovoltaic Modules', 7th International Photovoltaic Science & Engineering Conference, Nagoya, Japan, November 1993.
Muirhead, I.J.

'Long Term Performance Modelling of Amorphous Silicon Photovoltaic Modules', Solar'93, Perth, WA, December 1993.
Muirhead, I.J.

'Performance of A Commercial Scale Raps System At Tortoise Head – French Island', Solar'93, Perth, WA, December 1993.
Muirhead, I.J.

'Calculating The Lifetime Of Silica Optical Fibres', ACOFT'93, Wollongong, NSW, Nov/Dec 1993.
Ostojic, P.

'Low Dispersion Optical Circulators', ACOFT'93, Wollongong, NSW, Nov/Dec 1993.
Pattie, R.A.

'Using Prosody for Lexical Access to Large Vocabularies', AI'93, Natural Language Workshop, Melbourne, November 1993.
Raskutti, B. & Rowles, C.

'Electrical Modeling And Characterisation Of Alloyed Ohmic Contacts', Materials Research Society Proceedings, Vol.318, Fall Meeting, Boston, USA, Nov/Dec 1993.
Reeves, G.K. (RMIT, Melbourne); Leech, P.W. & Harrison, H.B. (Griffith University, Brisbane).

'The Use of Context in the Understanding of Spoken English', AI'93. Workshop on Natural Language Understanding, Melbourne, November 1993.
Rowles, C.; de Beler, M.; O'Donnell, M. (Sydney Uni.) & Sefton, P. (Sydney Uni.).

'Tradeoff between Gain and Noise Performance in Optimisation of Erbium Doped Fibre Amplifiers', ACOFT, Wollongong, NSW, December 1993.
Ruhl, F.

'Epistemological Implications of the Use of Participant Observation in Knowledge Engineering', 6th Australian Joint Conference on Artificial Intelligence (AI'93), Melbourne, November 1993.
Senjen, R. & Mee, W.

RESEARCH LABORATORIES PAPERS PRESENTED/ PUBLISHED

RESEARCH LABORATORIES PAPERS PRESENTED/ PUBLISHED

'Stoichiometry, Thickness and Crystallinity of MOCVD Grown HgCdMnTe Determined By Nuclear Techniques of Analysis', 8th Australian Conference On Nuclear Techniques Of Analysis, Ainse, Lucas Heights, NSW, November 1993.
Studd, W.B. (RMIT, Melbourne); Johnston, P.N. (RMIT, Melbourne); Bubb, I.F. (RMIT, Melbourne) & Leech, P.W.

'A Review of Mathematical Models for Spread Spectrum Mobile Networks', 8th Australian Teletraffic Research Seminar, Melbourne, Australia, December 1993.
Whiting, P.A.

'Connection Admission Control in ATM Networks', 8th Australian Teletraffic Research Seminar, Melbourne, Australia, December 1993.
Zukerman, M. & Tse, P. W. (Monash Uni).

'Modelling Markov Modulated Traffic by a Gaussian Process', 8th Australian Teletraffic Research Seminar, Melbourne, Australia, December 1993.
Zukerman, M. & Cheng, V. (Monash Uni)

BIBLIOGRAPHIES

In the recent quarter the National Information Resource Centre has conducted literature searches to compile bibliographies on the following topics:

Clayton NIRC

93/293 Six Sigma

93/329 Leadership and learning organisations

93/338 Telecommunications services of the future

93/339 Cable location and damage procedures

93/400 PABX markets

93/402 Value Added Network Services: markets and overview

94/010 Voice processing applications

Melbourne NIRC

1103/93 Succession Planning

1106/93 Nintendo (background, markets, alliances, revenue)

1107/93 Sega (background, markets, alliances, revenue)

1120/93 Relationship Marketing

1122/93 Credit Card Incentives

1121/93 Credit Cards – Market in US and Australia

1123/93 Market Segmentation

1150/93 Self Empowered Work Groups

1159/93 Telecommunications in Jordan

1/94 AT&T's "True Rewards" Program

12/94 The Centrex Market

22/94 Telecommunications in Australia-trends and future directions

48/94 AT&T Tridom

43/94 Hughes Network Systems

52/94 Downsizing

53/94 Reengineering

72/94 Qualcomm Inc.

Sydney NIRC

274/93 Telstra and Joint Ventures

275/93 Timed local calls

276/93 Syncordia

277/93 R&D in Australia

278/93 LEOs

279/93 VSATs

294/93 Organisational morale

311/93 Call management centres

317/93 Telecommunications and the Olympic Games

318/93 Operator assisted products

321/93 ATM in Australia

323/93 Change management

328/93 Network failures

351/93 EDI and corporate gateways

To obtain a copy of a bibliography please contact the NIRC office which produced the bibliography. Full contact details are given below.

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Sydney, NSW 2000
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Other offices of the National Information Resource Centre are located at:

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Fax: (08) 231 3837

Telecom House
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Perth, WA 6000
Enquiries (09) 491 8999
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Melbourne, Vic. 3001
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VISITORS TO TRL

A wide variety of people from within Telecom and from external organisations visit the Laboratories, either as individuals or in groups. The visitors include executives, clients, researchers and officials of government and private organisations, and the purposes of such visits are to facilitate information transfer relating to the management and outcomes of R&D activities of mutual interest. Some notable visitors during the last quarter were:

October

Pakistani Military Officers
Brigadier Basharat; General Askari; Air Commander Shezada; Accompanied by John Moran, International Business.

Invetech
Bill Hunter, Business Manager; Alex Filipovic, Product Manager New Products; Lea Acance, Pricing Manager; Liz Atkinson, Segments Manager; Georgina Cane, Segments Manager Consumer. Accompanied by Ian Jenkins, Manager Access Products, NTG.

National Australia Bank
Ross Pinney, Group Manager, Corporate Strategy; Andrew Bowden, Strategy Consultant; Chris Williams, General Manager, Business Markets; Stephen Coulter, Head of Personal Markets; Lawrie Brooke, General Manager, Cards; Richard Ward, Head of Product Services & Systems; Peter Furze, Head of Distribution and Service Standards; Stuart Marshall, Group Manager, Global Technology Strategy; Trevor Bennett, Manager Group Technology Strategy Development; David Kelly, Head of Strategy and Planning, Australia Bank; Cameron Huston, Manager Strategy, Australian Bank; Cliff Breeze, Chief General Manager Group Technology. Accompanied by Graeme Davidson, Manager, Business Development.

Technology Education Association of Victoria
Peter Shilson and other members of TEAV Committee.

Commonwealth Bank
David Kidd and Roger King, Executive Managers Information Services. Accompanied by Cathy Aston, Account Executive, Andrew Charitou, Account Executive and Brian Holland, Communications Consultant.

Deakin University
Richard Tan, Associate Director, Computing Services; Ed Brumby, Deputy Director, Course Development; Ayse Ekinci, Course Development; Dr Louise Moran, Director, Course Development, Professor David Stokes, Dean, Faculty of Sciences; Garry Moorfield, Head, Public Affairs; Nicholas Clark, Head, Education Media Services; Geoff Beeson, Deputy Vice Chancellor, Academic Services; Barrie Hesketh, Manager, Computing Services, Craig Warren, Networking Manager; Robert Brownlee, Teleconferencing Manager; Peter Horan, Matthew Joordens Graham Costan, Dr. Selva Selvalingam and Dr Jana Rdhana, School of Engineering and Technology. Accompanied by George Diamantopouloc, Account Executive; Phil Day, Sales Executive; David Ellis, Communication Consultant; Christine Pendlebury, Corporate Account Assistant.

RAAF College – Engineer Training Squadron
Flgoff D I Brinton, Pltoff G P Caddy, Flgoff G M Deards, Flgoff A G Du Preez, Fltlt G J Forrest, Pltoff G R Harvey, Flgoff G M Herrmann, Pltoff P A Keays, Pltoff R Magno, Pltoff A E McCreath, Flgoff P J Meehan, Pltoff B M Murray, Flgoff T M Pope; Pltoff A Plummer.

Delegates from Asia-Pacific GSM MoU Co-operative
18 Delegates

Monash High School
30 Students and 3 Teachers.

Department of Defence
Gary Jones, First Assistant Secretary. Accompanied by Bob De Boer, Project Director, Jindalee; Anne-Maree Sheridan, Jindalee and Marilyn McPherson, Aide to First Assistant Secretary.

The Australian
Philip Dutchak, Journalist.

Ashwood School Annexe Class
10 Students and 2 Teachers.

Institute of Information Technology Assessment Electronics & Telecommunications Research Institute, Korea
Dr My Shun, Executive Co-ordinator.

Australian Geological Survey Organisation
Mr David Berman, Head of th Information Technology Program. Accompanied by Kathleen Grass, Account Executive.

Telecom Industry Development Authority
Accompanied by Gerry Moriarty and Mike Orwin.

Army School of Signals
Capt S C Amos; Maj J Baker; Maj J P Detering; Maj G F Downing; Maj L J Ettridge; Capt W R Hanlon; Maj J M Hatton; Capt S J Lee; Capt M J Mathews; Maj K Mitchell; Maj G L Petch; Capt S J Roberts; Maj C J Robinson; Capt G D Rogers; Maj J I Rutups; Maj W J W Sutherland; Maj N M Turner; Maj J R Veenendaal; Maj P Watson; Maj J C Whittington; Capt C J MacFarlane; Capt R H McLellan; Capt D G Peploe; Capt C L Robertson.

International Digital Communications (IDC) Tokyo, Japan
Mr Hideo Suetsugu, Vice Chairman; Accompanied by Peter MacArthur, Department of Foreign Affairs and Trade; Ian de Montfort, Business Manager, Japan/ Korea; Robert Orme, Regional Manager; Gabrielle Tyler, Adviser, Corporate Policy.

Japanese Embassy, Canberra
Mr Nobuaki Kawakami, First Secretary of Science.

Victorian Ministry for Roads and Ports
Mr Kevin Shea, Advisor to Victorian Minister for Roads and Ports; Sally Freeman, Personal Assistant to the Minister. Accompanied by Daryl King, Telecom Account Executive, Corporate & Government Business.

Telecom
Mr Michael Ash, Account Manager to Advanced Bank.

Seven Network
Mr Sean O'Halloran and Mr Colin Wright. Accompanied by Graeme Ward, Director, Strategy Directorate; John Murphy, Group Manager, Business Directions Unit.

VISITORS TO TRL

TRL's Organisation

TRL is headed by the Director of Research and comprises an Executive Group, the National Information Resource Centre and nine Branches. Details of the upper structure of TRL are given in the following table.

STAFF CONTRACTS

POSITION TITLE	BRANCH CODE	CONTACT NAME	PHONE 253–	INTERNET ADDRESS
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– Business Planning & Planning	SBP	Roger Smith	6655	r.smith@trl.oz.au
– Transmission Networks & Standards	TNS	Alan Gibbs	6383	a.gibbs@trl.oz.au
– Telecommunication Science & Technology	TST	Geoff Mitchell	6671	g.mitchell@trl.oz.au
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– National Information Resource Centre	NIRC	Helen Rodd	6163	h.rodd@trl.oz.au
• Senior Manager, External Strategies	SBP	Geoff Willis	6533	g.willis@trl.oz.au
• Managers:				
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– Human Resources	HR	Frank Phillips	6441	f.phillips@trl.oz.au
– Product Development Fund	SBP	Robin Court	6294	r.court@trl.oz.au

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– Secure Communications	Nick Demytko	6781	n.demytko@trl.oz.au
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– Artificial Intelligence Systems	Chris Rowles	6244	c.rowles@trl.oz.au
– Expert Systems	Chris Rowles	6244	c.rowles@trl.oz.au
– Electronic Directories	Rolf Exner	6718	r.exner@trl.oz.au
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– Human Communications	Des Clark	6711	d.clark@trl.oz.au
– Human Factors	Gitte Lindgaard	6723	g.lindgaard@trl.oz.au
Network-related Work			
– Broadband ISDN	Garry Heinze	6165	g.heinze@trl.oz.au
– Data Network Evolution	Peter Hicks	6308	p.hicks@trl.oz.au
– ISDN & Common Channel Signalling	Barry Dingle	6292	b.dingle@trl.oz.au
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– Network Architectures & Planning	Bob Warfield	6379	b.warfield@trl.oz.au
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– Protocol Engineering	Geoff Wheeler	6415	g.wheeler@trl.oz.au
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– Mobile Communications Systems	John Campbell	6368	j.campbell@trl.oz.au
– Optical Customer Access Network	John Semple	6410	j.semple@trl.oz.au
– Mobile Satellite Networks	Fred Bullock	6396	f.bullock@trl.oz.au
– Wireless Access	Fred Bullock	6396	f.bullock@trl.oz.au
– MANs & Customer Access Management	Phil Potter	6424	p.potter@trl.oz.au
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– Network Synchronisation	Rod Gray	6182	r.gray@trl.oz.au
Reliability-related Work			
– Electromagnetic Compatibility of Equipment	Stan Davies	6390	s.davies@trl.oz.au
– Bioelectromagnetic Hazards	Ken Joyner	6315	k.joyner@trl.oz.au
– Electronic Component & Equipment	Doug Kuhn	6673	d.kuhn@trl.oz.au
– New Cable Technology	Bruce Chisholm	6642	b.chisholm@trl.oz.au
– Scientific Consultancy	Bruce Chisholm	6642	b.chisholm@trl.oz.au
– Electrical Interconnection	John Godfrey	6552	j.godfrey@trl.oz.au
– High Voltage Studies	Ian Stevenson	6603	i.stevenson@trl.oz.au
– Occupational Health, Safety & Environment	Terry Elms	6583	t.elms@trl.oz.au
– Optical Interconnection	Alfred Kruijshoop	6622	a.kruijshoop@trl.oz.au
– Semiconductor Reliability & Characterisation	Tim Rogers	6636	t.rogers@trl.oz.au
Components/Materials-related Work			
– Optoelectronics	Jim Thompson	6606	j.thompson@trl.oz.au
– Energy Conversion & Storage Systems	Doug Kuhn	6673	d.kuhn@trl.oz.au
– Metallurgy	Tim Keogh	6551	t.keogh@trl.oz.au
– Photonics	Garth Price	6689	g.price@trl.oz.au
– Polymers	Ray Boast	6645	r.boast@trl.oz.au
– Semiconductor Device Fabrication	Peter Kemeny	6686	p.kemeny@trl.oz.au

STAFF CONTACTS

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– Scientific Engineering	John Lowing	6470	j.lowing@trl.oz.au
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– Intellectual Property Consultancy	Owen Malone	6519	o.malone@trl.oz.au
– Academic Programme	Geoff Willis	6533	g.willis@trl.oz.au
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– Standards of Electrical & Optical Quantities	Rob Harris	6124	r.harris@trl.oz.au

TRL is managed to a rolling 5-year Business Plan, which is corporately reviewed and approved annually. The Business Plan encompasses agreed 'deliverables' and the resources needed to achieve them. The deliverables include:

- the conduct of the TRL's R&D Programme, comprising a range of investigatory projects performed for and notionally funded by a variety of Telecom Client Divisions, with their endorsement;
- the operation of Corporate Facilities for the whole of Telecom, including the provision of specialised services relating to:
  - library information and translation services,
  - intellectual property consultancy services,
  - academic programme.

The preceding table gives details of TRL activities and appropriate staff contacts.

IN CONFIDENCE

ADDRESS LIST UPDATE

- Are you receiving TRL's RESEARCH QUARTERLY (RQ)? If NO, please tick the "Addition" box and fill out the address form below.
- If you do receive RQ and your present address etc is incorrect, please tick the "Correction" box and fill in your correct address.
- If you wish to nominate others who would benefit by receiving RQ please tick the "Addition" box and fill out the address.
- If you receive RQ now and would like to discontinue receiving it please tick the "Deletion" box and fill out the address form and return it to us.

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