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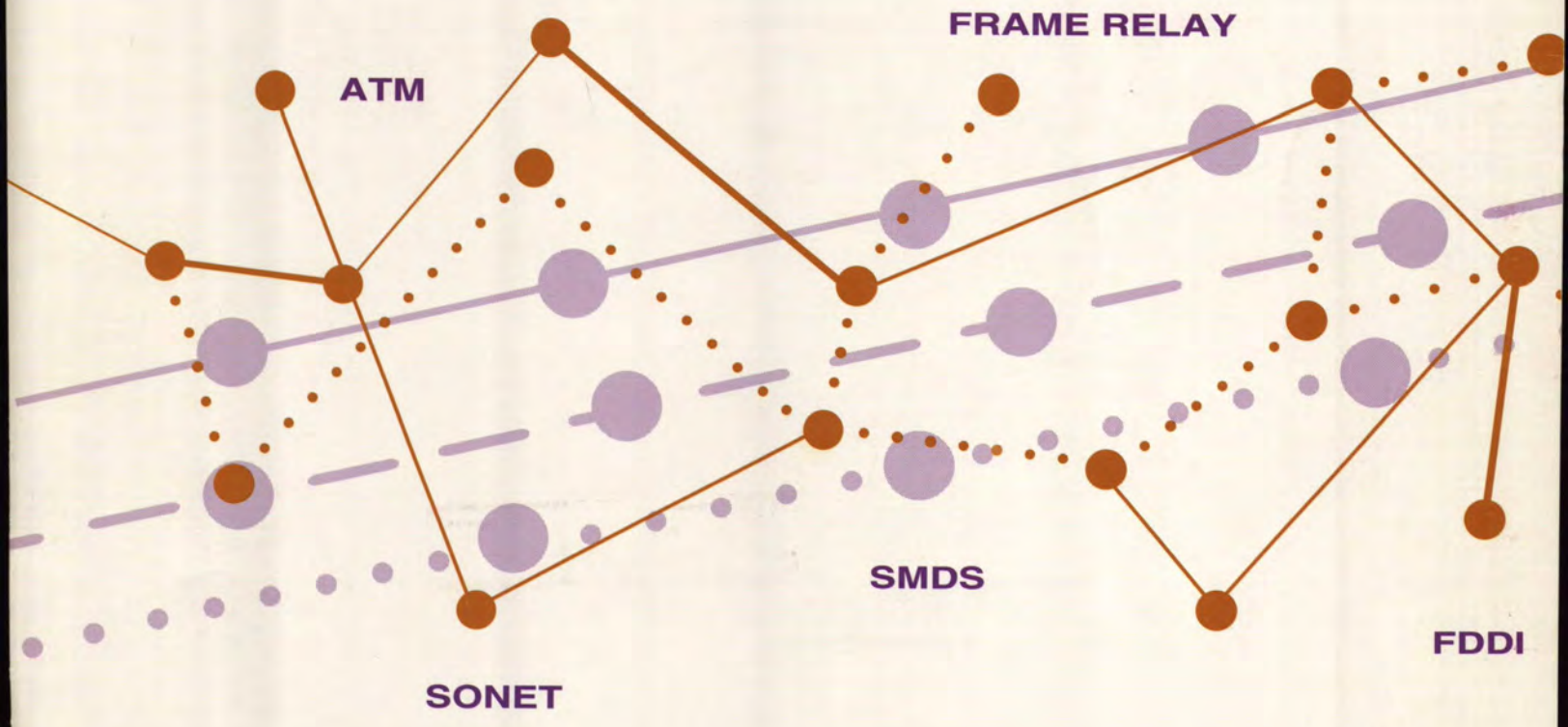
CANADIAN BROADBAND

The Canadian Broadband Telecommunications Industry

A Capability Guide, March 1995



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Telecommunications Directorate
Information Technology Industry Branch
Industry Canada

Cat.No. C2-277/1995E
ISBN 0-662-23528-2
50066E
Également disponible en français sous le titre *La large bande au Canada – L'industrie canadienne des télécommunications à large bande : Répertoire des entreprises, mars 1995*

Preface

This publication presents the capabilities of the telecommunications industry in Canada to supply quality broadband equipment. It highlights the accomplishments and product offerings of Canadian equipment suppliers in the areas of Frame Relay, Synchronous Optical NETwork (SONET), Switched Multimegabit Data Service (SMDS), Fiber Distributed Data Interface (FDDI), Asynchronous Transfer Mode (ATM) and Broadband ISDN (B-ISDN) equipment, and includes their capabilities in T-multiplexing equipment. It is intended for a wide audience of potential customers and will be distributed at trade shows and to trade delegations visiting Canada.

The Information Technology Industry Branch of Industry Canada produces a series of capability guides of which this is one.

The individual corporate profiles were obtained from telephone interviews with the companies themselves, corporate publications and industry analysts.

Additional information can be obtained from:

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Introduction

The Importance of Broadband

Broadband telecommunications provides for the 1990's what microcomputers provided for the 1980's: a fundamental change in the way we live and do business. The 1980's saw desktop computers proliferate in our offices, factories and homes, putting processing power in the hands people throughout the world. The first half of the 1990's saw those computers linked into powerful networks for data communications. The second half of the 1990's will see far more extensive communications, not just for data, but for still image, motion video and high quality audio, to complement the processing power we already have. The benefits of networked multimedia with its impact on industry, commece, education and health care will be delivered by broadband telecommunications.

The Needs of Business

The telecommunications network has become a key element in achieving cost efficient service to customers in many industries. Many innovative organizations use telecommunications to gain a competitive advantage. To impact end user business in a productive manner, networks need to be fast, flexible and reliable, providing timely access to people and information. They must be capable of implementing tomorrow's bandwidth-hungry applications integrating voice, video and data into a unified network environment.

The technologies to deliver this goal have been emerging during the first half of this decade. They provide end user organizations with a comprehensive range of alternatives from which to choose an evolution path for their networks. They enable users to manage the applications requirements of today and the multimedia requirements of tomorrow in a way which preserves existing network investment, is efficient to implement and enables the organization to adapt rapidly to changing business requirements.

The Unique Canadian Offering

Canada's vast distances have resulted in many firsts in terms of telecommunications deployment: public packet switching in the 1970's, optical fiber in the 1980's and an intercontinental ATM network from Vancouver to Berlin in the 1990s. Canadian equipment vendors have a domestic market with extensive requirements for state of the art technology. In addition, the close proximity of the US has resulted in an export orientation for many vendors, the bulk of whose market is abroad. Canada offers the world a unique combination of suppliers that have the ability to serve a demanding home market plus extensive experience in exports.

Canada: In Partnership with the World

Broadband provides challenges for any equipment vendor: from the vast range of technologies to be integrated into a single system, to the varied demands of customers for performance of different types of traffic. Partnerships are the name of the game in broadband telecommunications. Many Canadian companies have partnered together to provide complementary expertise in developing overall systems, many have close relationships with government and university research laboratories, and many have entered into collaborative business arrangements with companies internationally. Canadian corporate links world-wide draw together expertise both in product development and also in marketing, ensuring international customers the latest, proven technology plus local support in their own country.

Canadian Research

Broadband telecommunications is a research intensive area. Many Canadian corporations have extensive research facilities in house. In addition, pre-competitive research is conducted collaboratively in many university and government research laboratories, funded and managed by consortia of industrial and government sponsors. Major industrial funders automatically have rights to patents arising from the research. Of particular importance today are ATM facilities available to industry for testing applications such as networked multimedia and assessing the quality of service ATM delivers to different types of traffic. Both local and wide area ATM test networks are available in many research organizations including the Communications Research Centre of Industry Canada, the coast to coast CAnadian Network for the Advancement of Research for Industry and Education, CANARIE, TRLabs and the Canadian Institute for Telecommunications Research.

Organisation of this Guide

Canadian broadbnad telecommunications equipment suppliers are organised alphabetically in this guide. In order to find a company with products in a specific area, the reader can consult Table 1 for Customer Premises Equipment Suppliers and Table 2 for Public Network Equipment Suppliers.

Table 1
Canadian Broadband Customer Premises Equipment Suppliers

Company	Sonet	ATM	Frame Relay	SMDS	FDDI	Other
ABL	X					
BNR	X	X	X			X
Eicon			X			
Gandalf		X	X			
GN Navtel		X	X	X		
Idacom		X	X			
LSI		X				
Luxcom						X
Memotech			X	X		
MPR Teltech		X				
Mitel		X	X			
Newbridge	X	X	X			
NT	X	X	X			X
Plaintree		X			X	
PMC-Sierra	X	X				
Positron	X					
Prism	X					
STRTC			X			
Transys	X					
West End			X			X
Xinex	X	X				
Yamatech					X	

Table 2
Canadian Broadband Public Network Equipment Suppliers

Company	Sonet	ATM	Frame Relay	SMDS	Fibre/Coax
BNR	X	X	X		X
Eastern Ind.	X				
GN Navtel		X	X	X	
Idacom		X	X		
LSI		X			
MPR Teltech		X			
Newbridge	X	X	X		
NT	X	X	X		X
PMC-Sierra	X	X			
Positron	X				
Prism	X				
Transys	X				

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Tom Faustino, Vice-President, International Sales

Corporate Profile

ABL Canada Inc., incorporated in 1992, is a publicly traded company on the Montreal and Toronto stock exchanges. ABL was formed as a result of the acquisition and integration of several highly specialized companies with complementary skills and experience in digital video compression, fibre optic access and transmission, and multimedia applications.

ABL designs, manufactures and markets a diversified range of products for the telecommunications industry that enable the delivery of multimedia services. Its product line is anchored by network access products, including digital video codecs and fibre optic multiplexers; broadband switches; and network management systems. Its products address the current need of telephone companies, cable television operators, satellite broadcasters and competitive access providers to upgrade and adapt their existing networks to accommodate the larger capacity or bandwidth requirements of multimedia transmission.

ABL has established strategic alliances with major telecommunication equipment suppliers such as ANTEC Corporation, Northern Telecom Limited and ComStream Corporation, a subsidiary of Spar Aerospace Limited, for the distribution of its products. ABL's products are sold on a world wide basis including United States, Europe, Mexico, South and Central America, Asia and Australia and New Zealand.

ABL has 151 employees, with its principal facilities in Montreal and Mentor, Ohio.

Broadband Products

NX-100 is a SONET network interface which operates at OC-1 rates.

VT 140 is a studio quality digital video codec which converts analog video signal to digital without compressing the signal.

VT34/35 are compression codecs for transmitting broadcast signals, the 34 in Europe at a 34Mb/s transmission speed, the 45 in North America at 45Mb/s.

VT21 is a full motion video codec transmitting at a rate of 21.5 Mb/s. ABL's codecs have gained acceptance due to their ability to compress video and audio signals down to 21.5 Mb/s without degradation of the signal.

InterDesk is an H.320 compliant desktop videoconferencing system that uses switched 56k bps, ISDN and T-1 lines, and the system can accommodate a bandwidth of up to 1.9Mbps. This product supports video conferencing, shared whiteboard, and shared applications.
InterDesk comes with video capture, compression, and decompression board; and a camera. A developer's software tool kit is also available.

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Bruce Johnston, Director of Sales
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Corporate Profile

Atelco Limited is a privately owned company whose primary business is the distribution of communication test products. Nextest International is a division of Atelco Limited which focuses on the distribution of WAN test products worldwide through a network of distribution companies. Nextest International maintains worldwide distribution agreements with Network General Corporation located in Menlo Park, CA for their WAN test products and with Nortech Fibronic located in Quebec City, Quebec for their Fiber Optic Power Meters. Atelco Limited was established in 1975 while Nextest International was formed in November 1993. Atelco Limited maintains shares and interests in Microtest Inc., Phoenix, Arizona and DataTools, Atherton, California. Some of the organizations Nextest sells its products to are: RBOC's, GTE and AT&T in the United States, PTTs in Europe and Australia Telecom in Australia. Major Canadian customers include: Bell Canada, Unitel, Stentor & related telephone companies, Northern Telecom, and Rogers Cable Systems.

Nextest sells through a worldwide network of distributors. They currently have 30 distributors in countries around the globe and are searching for distributors in India, South America and Africa. As an International distributor of communication test products Nextest also applies factors to a suppliers published US End User List Price. Factors applied would take into account duty, taxes, freight, exchange rate, administration costs and a profit margin. Nextest offers its network distribution members a discount rate. This rate is determined by size of market, promotional activities and yearly quota.

Nextest participates directly in trade shows and trade magazines in the United States. In all other countries Nextest depends on distribution networks to actively promote the products in their countries. Nextest co-sponsors distributors efforts in various ways. Nextest has a US direct mailing program to support distributors. Nextest uses a combination of drop shipments from suppliers warehouses directly to end users and shipments from its warehouse in Richmond Hill, Ontario.

Broadband Products

LM2000

The LM 2000 is a PC based high speed WAN protocol analyzer. In addition to supporting new technologies such as Frame Relay, network managers can use this versatile device to solve problems with traditional wide area networks. The LM2000 supports a broad range of protocols including frame relay, SNA, X.25, QLLC, Q.931, async and bisync at speeds from 50bps to 2.048 Mbps. The LM2000 helps manage complex Frame Relay networks by providing an overall view of network activity, as well as the ability to perform in-depth protocol analysis.

4500 Fibre Optic Power Meter

The 4500 series fiber optic power meters simplify the process of turning up, testing and maintaining fiber optic links. Some of the features are:

Automated loss measurement

Single connector measurement useful for bi-directional end to end loss tests and other measurements.

Message exchange capability.

Optical return loss measurement.

Visible light source.

Wavelength meter.

Upgradeable.

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Jacques Guerette, Manager of Media Relations
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Corporate Profile

Bell-Northern Research (BNR), the research and development subsidiary of Northern Telecom, is one of the world's largest telecommunications R&D organizations. The company is owned 70 percent by Northern Telecom and 30 percent by Bell Canada. Worldwide, Northern Telecom's research occupies 3,333,000-sq-ft of space at 12 significant sites. BNR has about 4,900 employees in Canada, 3,300 in the US, 1,400 in the UK, and 100 in Asia-Pacific.

BNR performs its research at many sites around the world, including two in Canada (Ottawa and Montreal- in cooperation with Institut National de Research Scientific), three in the United States (Raleigh, Richardson, and Atlanta), four in the United Kingdom (Harlow, New Southgate, Maindenhead, and Monkstown), one in Japan (Tokyo), one in Australia (Sydney), and one in China (Beijing- equal partnership with the Beijing University of Posts and Telecommunications). A second Chinese lab is planned for Shunde in the Guandong province which is near Hong Kong. In 1994, BNR established 51%-owned Netas of Turkey , the largest private R&D facility in Turkey.

BNR's more than 10,000 R&D professionals and support staff perform multi-site project development through one of the world's most advanced internal communications networks, linking all labs.

Major Achievements

BNR's research and development resources will be used to aid NBTel achieve its objectives of deploying broadband multimedia networks province wide. New Brunswick Telephone was the first major telephone company in North America to implement a completely digital network.

BNR is one of more than 30 companies cooperating together to accelerate the development of standards and inter-operability in ATM technology.

BNR and Online Media (Acorn Computer Corp PLC subsidiary) are developing a set-top box based on ATM technology that will be used in digital-on-demand multimedia service trials in Cambridge, England.

BNR and Northern Telecom have established an alliance with Mitsubishi Electric Corporation of Japan to introduce next-generation switching systems for the enhancement of Japan's telecommunications infrastructure to satisfy the needs of Japanese companies for enterprise

broadband networks.

Research

BNR is a world leader in the design and development of advanced telecommunications systems. BNR performs research and development in the following areas:

- FiberWorld, Northern Telecom's vision of end-to-end fiber-optic networks based on global SONET/SDH standards;
- Broadband multimedia communications
- optoelectronics;
- digital signal processing;
- digital transmission;
- personal communications;
- on-line operations systems;
- network planning;
- digital switching including ATM;
- synchronous transmission systems;
- fibre access telecommunications products;
- intelligent networks;
- software to provide programmable network elements for custom services;
- wireless personal communications systems, including digital cellular and low power wireless networks;
- test automation tools

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CANARIE is a non-profit corporation established in 1993. It has evolved out of the efforts of more than 200 people from 56 organizations representing Canada's research, university, business and government communities. Their efforts, over a four year period, developed the seven year multi-phase Business Plan which defined a program to improve Canada's overall competitiveness in the Information Age. CANARIE has over 140 private and public sector, fee-paying members. It has a seventeen member Board, with eight members representing the private sector and eight representing institutions, with the seventeenth being jointly appointed.

Its mission is to facilitate the development of critical aspects of the communications infrastructure of a knowledge-based society and economy in Canada, and in so doing to contribute to Canadian competitiveness in all sectors of the economy, to wealth and job creation and to our quality of life.

Phase 1 of the CANARIE program is now underway. It encompasses three primary areas:

Infrastructure: the upgrading of CA*net, the Canadian arm of the internet to faster T1 speeds;

Testing and Trials: the creation of a very high speed National Test Network (NTN), to enable Canadian companies and researchers to test advanced networking technology and showcase Canadian products;

Applications: a grant program supporting product and service development to encourage the private sector to bring innovative network-related products and applications to market.

Total direct and indirect investment for CANARIE's Phase I activities will be over $100 million, of which the federal government has contributed $26 million. Total investment for Phase II activities is estimated to be over $400 million, of which the federal government has contributed $80 million. This initiative could generate over $1 billion in economic benefits, including over 20,000 person-years of employment over seven years.

Of particular importance to the broadband industry is the CANARIE Inc. National Test Network which is the world's largest ATM Test Network connecting over 60 ATM switches in 7 regional test networks spanning approximately 6000 kilometres with connections across Canada from Victoria to St. John and now the world's first ATM test network to connect across the Atlantic via Teleglobe to

Berlin and the ATM PNO test network at OC3 speeds. The CANARIE National Test Network was built with the cooperation and support of Stentor and Unitel.

Already several applications are being planned and undertaken for the network. They include: a nation-wide Mbone multimedia conferencing experiment to test and exercise the network for multicasting traffic engineering and congestion; a switched VSAT multimedia demonstration between the University of Ottawa and MPR Teltech; a multimedia dental forensic medical imaging experiment between UBC and the RCMP research centre in Ottawa; and a Telesim ATM network management trial. Other applications and tests in the planning stages include a 3D Seismic processing and visualization trial; and a collaborative radiology experiment.

Five of the seven regional networks are operational as of March 1995. They are: Rnet in BC, Wnet in the Prairies, LARG*net in London, ACORN in the Maritimes, OCRInet in Ottawa and RISQ in Quebec.

The CANARIE Test Network is also connected to similar Test Network initiatives in the European Community, in particular the ATM PNO trial. As well, Telesat Canada is planning to provide satellite ATM connections for a number of applications.

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Corporate Profile

Established in 1990, the Canadian Institute for Telecommunications Research (CITR) is a federally incorporated, not-for-profit research company devoted to enhancing the competitiveness of the Canadian telecommunications and software industry through university-based research and postgraduate studies.

CITR encompasses 17 universities and three specialized research institutes, called Member Institutions. These Member Institutions work in close conjunction with corporate partners, known as Industrial Affiliates. Member Institutions and Industrial Affiliates sign internal agreements that outline how they will work with one another in areas such as intellectual property, confidentiality of information and financial management.

There are presently 11 Industrial Affiliates: BNR Ltd.; CAL Corporation; Hewlett-Packard Canada; IBM Canada; Mitel Corporation; MPR Teltech Ltd.; Newbridge Networks Corporation; NovAtel Communications Ltd.; Spar Aerospace Ltd. and Stentor Resource Centre Inc. Coordinated projects now being undertaken by CITR Member Institutions involve almost 400 research and support staff.

CITR is one of 10 networks selected to continue into Phase II of the NCE program, a $197-million federal initiative directed at enhancing research excellence and university-industry collaboration in a broad spectrum of scientific and engineering disciplines.

Research Program

CITR has five major projects including 4 in the area of broadband:

1. Design and Management of Broadband Networks

We are working toward a particular vision of the network of the future in which all telecommunication services will be carried on a single, versatile, high speed platform based on ATM (Asynchronous Transfer Mode). The challenge is to work out in detail how to manage that network so that it is predictable, tolerant of occasional overload and fault conditions, and capable of delivering the broad mix of telecommunication services required within prescribed quality-of-service objectives. Our goal over the next three years is to produce a fully specified

management architecture shown systematically to work. This work includes: Network Performance Modelling; Congestion Control; End-to-End Requirements for MPEG2 Video; Interactive Multimedia Related to ATM Design and Network Resources Management.

2. Broadband Services

We are working to provide the software technology that will allow the integration of a multitude of customized multimedia applications on a single, versatile broadband network. The research program spans a range of issues related to the development of software technology for distributed multimedia communications. Its long-term goal is to develop an applications programming interface for a variety of broadband services requiring access to multimedia databases distributed over a wide-area ATM network. This work includes: Continuous-Media File Server; Quality of Service Negotiation; Scalable Video Encoding and Application Development.

3. Photonic Devices and Systems

The speed and intelligence of computing platforms for broadband switching and routing will have to grow with rising demand for throughput. A critical bottleneck in developing such systems is the availability of advanced backplane technology permitting very high interconnection capability for high-speed signals between printed circuit boards. In this research program, we hope to increase printed circuit board interconnection capacity many-fold by developing optical backplane technology based on smart pixels and free-space optical interconnection. In addition to supporting and enhancing the traditional electronic infrastructure, this new interconnection capability should stimulate the design of new architectures and switching fabrics that will allow the economic realization of high-capacity broadband systems and networks. This work includes: InP-Based Smart Pixels; Optical and Optomechanical Hardware and Large ATM Architectures.

4. Broadband Indoor Wireless Communications

This research program aims to unite broadband communications with wireless personal communications to effect untethered access from portable terminals to a wide range of broadband communications services. Our long-term goal is to design and demonstrate a system architecture for a broadband digital communications system that provides wireless access on demand, at aggregate transport bit rates up to 155 Mb/s, to an ATM-based local area network (LAN) or Broadband Integrated Services Digital Network (B-ISDN). This work includes: System Architecture; Modulation and Signal Processing; Experimental Transmission Link and Broadband Infrared.

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Paul Wilker, Director of Business Development

Corporate Profile

The Communications Research Centre (CRC) is Industry Canada's primary communications R&D institute with a staff of 200 engineers and scientists supported by 50 technologists conducting R&D in two divisions: Radiocommunications & Broadcast and Communications Systems.

CRC has collaborative R&D arrangements with over two dozen research organizations in North America and Europe. Major clients include federal government departments, universities, and private industry.

The Centre has more than 100 protected technologies and dozens more under development which are ready for commercialization through licensing agreements or collaborative ventures.
Within CRC, broadband telecommunications research is conducted in the Broadband Applications Development Laboratory, BADLAB, which is designed to demonstrate and test innovative applications over ATM networks. The network in the BADLAB has connections to other ATM networks including the Ottawa Carleton Research Institute Network, OCRInet, the Canadian Network for the Advancement of Research, Industry and Education, CANARIE, and other remote networks via satellite.

The BADLAB mandate is to test, demonstrate and license technologies developed by CRC, to test and demonstrate ATM applications and to make the lab available to small and medium sized high technology R&D companies to develop application.

Research Program

ATM network interconnection has been accomplished via satellite links. CRC worked with industry on aperture-coupled and dielectric resonator integrated antennas and arrays. A small active array for EHF satcom terminals and, a world first, a 20 GHz antenna/amplifier fully integrated on a GaAs chip, were demonstrated.

The Broadband Applications and Demonstration Laboratory (BADLab) tests and demonstrates multimedia applications over ATM networks with a focus on distant education, medical, science & engineering, and government services.

Current and planned applications include: ATM native authoring tool, emergency measure training, forensic dentistry, remote access to government information and services, remote cardiology consultation, remote robotics, virtual laboratory, virtual museum, virtual newspaper, virtual seminars and virtual trade mission.

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Jack Kenny, Manager, Marketing

Corporate Profile

Founded in 1974, Eastern Independent Telecom (EIT) is a 100% Canadian-owned and controlled distributor of telecommunications products and services. The company's products include central office switching, transmission, power, centrex products, voice processing systems, circuit packs, video conferencing and ATM technology. EIT also provides consulting services ranging from specific network design and development to implementation. Various distribution and partnership agreements with world-class manufacturers provide EIT with access to global markets. EIT is a distributor and installer in Canada and the United States of Alcatel and Seimens equipment. Major clients include Canadian and North-Eastern United States based telcos, service providers and resellers. EIT has R&D facilities which developed BIT BOSS, an intelligent, multi-vendor and multi-technology switching system. EIT has a US subsidiary in Ogdensburg, New York to provide turnkey integration and installation of Siemens Stromberg-Carlson and Alcatel Network Systems Inc. products. EIT is currently undergoing ISO-9000 certification.

Broadband Products

EIT's BITBOSS is a multipurpose intelligent protocol manager that provides inter-connectivity between integrated systems using T1, ISDN and CCS7.

EIT exports installation services for:

- Alcatel SONET access, transport and digital cross-connect products
- Siemens Digital Central Office and Remotes (DCO & EWSD)
- Siemens Digital Carrier Switch (OCC)
- Newbridge T1 Multiplex Equipment

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Corporate Profile

Founded in 1984, publicly-traded Eicon Technology Corporation (Toronto Stock Exchange) researches, develops, markets, and supports server based products that allow personal computers to access IBM SNA networks and corporate inter-networks for client/server applications. The Montreal area company's products offer connectivity solutions for micro-to-mainframe, micro-to-mini (both IBM and non-IBM), and LAN-to-LAN communications. It received ISO 9002 certification in 1992. Eicon has a world wide staff of 500.

Its principal product is the EiconCard (with an installed base of over 100,000 cards world wide) which allows computer networks to communicate over public data lines.

Other products include gateway software, router software, interconnect software, emulation software, and toolkit software.

Eicon products are distributed in over 70 countries with approximately half of sales coming from Europe, a third from the US and the remaining from Canada, South America, and the Pacific Rim. Sales are coordinated through sales headquarters in Montreal, Dallas and London and supported by 17 offices in 7 countries.

It has sales offices in the US, UK, France, and Germany, as well as a manufacturing and R&D facility in Ireland.

Eicon's strategy is to provide LAN to mainframe connection using Frame Relay and help customers migrate away from lower performance X.25. As well, Eicon is noted for producing software routers implemented on servers that are almost as fast as much more expensive hardware routers. Eicon also has products which simplify the integration of LAN and SNA traffic over a frame relay connection for remote offices. Whereas most competitors products require separate channels for both types of traffic, Eicon has succeeded in combining both traffic using one frame relay connection. Eicon has begun performing research on ATM technology.

Eicon has hardware and software strategic alliances with over 200 independent vendors world

wide including companies such as AT&T, IBM, Microsoft, Novell, Lotus Development, Bay Network Systems, Racal-Datacom, Retix, Sprint, and Tandem.

Eicon is a member of the Networking Technical Support Alliance (NTSA) a non-profit organization that is an alliance of data communications industry companies who aim to support customers develop and operate multi-vendor networks. Member corporations design, manufacture and service OSI Layer 3 or lower products including routers, bridges, hubs, NICs, multiplexers and switches.

Eicon offers worldwide hardware and software technical support via telephone and electronic Bulletin Board System from Montreal and London. Eicon also provides on-site services and training both on-site and at its Montreal and London facilities. All hardware products carry a standard 1 year warranty.

Major Achievements

Eicon introduced in 1994 InterConnect Server for Netware, the first integrated SNA/LAN inter-networking product for Novell Netware. The server was named "Hot Product of the Year" by *Data Communications* magazine.

International Data corporation recognized Eicon Technology as the world leader in SNA gateways. Eicon technology is Canada's third largest software vendor.

Broadband Products

Eicon has introduced products that implement frame relay on the LAN server which eliminates the requirement for an IBM cluster controller at a remote site or a router at the mainframe site. This is ideal for banking and insurance customers that install LANs in branch offices and also need access to the corporate mainframe.

InterConnect Server
InterConnect Server software provides a comprehensive solution for branch office integration. It is a multi-protocol gateway, multi-protocol router and a protocol converter. It works with traditional SNA networks, X.25 packet-switched networks and frame relay networks. This product allows SNA, X.25, OSI LAN network traffic to share the same connection. This provides considerable simplicity for the implementation of enterprise networks. The software achieves this advantage by implementing the Internet Engineering Task Force's standard for multi-protocol frame relay, RFC 1490. Future releases are expected to support SMDS and ATM.

EiconCard
Eicon Technology's EiconCard is an intelligent wide area communications coprocessor card for Intel-based workstations. It has the ability to connect to data communications services operating at speeds up to 2 Mbps including Frame Relay, SNA, X.25 ad ISDN.

Router Software
Eicon has four inexpensive router packages that work on various LANs (TCP/IP, Novell IPX/SPX, NetBIOS/NETBEVI and Apple Talk) and can be used to provide communication between LAN attached PCs and X.25, PPP, leased lines, or frame relay. This software also comes with a feature rich Windows based console software.

Dual-Port Network Adapter (DPNA/PC)
The DPNA is communications controller switch compatible with X.25 and Frame Relay Networks. It also supports SNA/SDLC. It has two ports with a speed of 128 Kbps and supports two network trunks at a trunk speed of 128 Kbps. It also provides Multi-line routing, port selection and contention, line testing, performance measurement and network configuration.

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Wendy Burgess, Vice-President Quality and Communications

Corporate Profile

Publicly-traded Gandalf Technologies (Toronto Stock Exchange and NASDAQ) is a holding company for seven operating subsidiaries which design, manufacture, and supply communications solutions encompassing a comprehensive array of products, systems, network design, and support services.

Gandalf develops LAN inter-networking products including multiplexers, terminal adapters, wiring hubs, gateways, and bridges. A family of remote access products, Gandalf Xpressway, allow remote PCs to interconnect with central LANs.

Its WAN line of access products include routers, bridges, gateways, branch hubs, and switching network servers. Gandalf's customers are the information systems departments of major corporations, institutions, telecommunication carriers and governments around the globe. Its strategy is to provide tailored LAN and WAN products that will allow communications with LANs and other corporate computing resources from remote locations such as branch and home offices.

Gandalf products are sold through Gandalf subsidiaries and distributors in over 75 countries. It employs about 1,000 people worldwide and has manufacturing, system assembly, and test capabilities in three countries on two continents. About half of revenue comes from North American markets. Gandalf is ISO 9002 certified.

Gandalf's primary research, performed by Gandalf Premier in Ottawa, involves the development of LAN and WAN equipment, personal computer connectivity products, network management systems, and LAN/WAN inter-networking. International research facilities are located at Cherry Hill, NJ and Warrington, UK.

Major Achievement

Gandalf Technologies and Standard Microsystems Corp. have agreed to integrate SMC's ES/1 with Gandalf's Xpressway product that will allow Gandalf to offer a product that will connect enterprise level ATM switches with ATM services being offered by public carriers.

Broadband Products

Xpressway is a central site inter-networking product to connect geographically disperse field

personnel, telecommuters and branch offices with central site LANs. The product is a remote access concentrator that aggregates the traffic of up to 128 remote locations onto a single LAN. It also provides automatic setup and tear-down of remote connections, without user intervention. Xpressway Central is a modular hub with 11 slots and up to 12 ports per module that supports UTP, thin coax, thick coax, fiber cabling, Token Ring, Ethernet, FDDI and recently HSSI, ATM & DXI. It integrates bridging, switching, routing, terminal server, and WAN facilities, and SNMP management is available. It supports single-mode and multi-mode fiber, and dual-attached connections. The port data rates are 4/16/10/100 Mbps. The backplane speed is up to 800Mbps.

2300 Regional Concentrator is a WAN product that provides voice, data, LAN, and video integration for regional concentration over private and public circuit-switched and frame-relay networks.

WGM 2590 is an adapter card that supports X.25, TCP/IP and Frame Relay and uses SNMP management software.

2050 Network Communications Server is aimed at meeting the backbone switching and transport needs of corporations with private WANs. The 2050's patented Quic Bus architecture combines cell relay, frame relay and circuit switching technologies to accommodate voice, data and video. The 2050 ensures each node learns the topology of the network and implements changes as they occur. Routes through the WAN are discovered and built automatically.

Local LAN Bridges (LANLine 5210, 5211 and 5220L) allow networks to be segmented to reduce congestion and increase performance.

On-Demand LAN Bridges (LANLine 5220i, 5225i and 5240i) use data compression to efficiently link individual PCs or PCs to File Servers in an Ethernet network (using various protocols such as TCP/IP, IPX, Spanning Tree, AppleTalk or DECNet) or through a WAN (T1, E1, 56k bps, ISDN or dial up).

Remotely connected LAN Bridges/Routers (LANLine 5250 and 5220) use data compression at remote sites to connect to a central LAN (multi-protocol, IP, IPX, PPP) through a WAN connection (X.25, T1, E1 ISDN or dial up).

Passport is a graphics-based network management software system which integrates the management of both LANs and WANs on a single platform using SNMP. The software supports hubs, routers and T1 multiplexers.

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GN Navtel is a privately held wholly owned subsidiary of Great Nordic of Denmark. GN Navtel is one of the world's leading designers, manufacturers, and marketers of innovative test products used by telecommunication providers, networking equipment manufacturers, and large network users. GN Navtel employs 140 people at its integrated 4,200 sq. meter research, development, manufacturing and head office facility in Markham. GN Navtel is ISO 9001 certified.

GN Navtel offers comprehensive training programs for its customers to ensure customers become fully proficient in the use of Navtel's equipment.

GN Navtel products are distributed in the United States by GN Navtel Inc., in Europe and Australia by GN Elmi. In the rest of the world the GN Navtel products are sold by independent distributors.

Major Achievements

Introduced in 1993 the DST 2000, the first test set to test complex high-speed transmission data services which includes protocol validation without the need for operators to interpret code.

Introduced in 1994 interWatch 95000 an ATM/LAN/WAN protocol analyzer with a UNIX based operating system.

Broadband Products

Interwatch 95000 ATM Protocol Analyzer
GN Navtel's InterWatch 95000 ATM protocol analyzer also has WAN, Ethernet and Token Ring capabilities, a Unix-based operating system, VME bus, RISC processors on all I/O modules and a dedicated 486 processor for its X-Windows/Motif user interface. The initial release will provide multiport Ethernet and Token Ring LAN analysis and multiport ATM at the DS3 level. Support for speeds of 155 Mbps OC-3c for SONET and SDH are to follow in 1995.

DST 2000
The DST 2000 allows first-level maintenance technicians with minimal training to test a frame relay network. The unit can verify configuration, capacity, connectivity, and performance. It supports X.25, Frame Relay and SMDS protocols and
RS-232C, RS-449, RS-530, ITU V.35, T1 and ISDN interfaces.

9470 Frame Relay Protocol Analyzer
The 9470 is designed for product development applications, tests and emulates frame relay links at up to 2 Mbps. It supports Async, BSC, SNA/SDLC, X.25, SMDS, Frame Relay, HDLC, IPARS, and DDCMP protocols. It interfaces to RS-232C, RS-449, ITU V.35, T1 and ISDN.

9460 Datatest Plus
The 9460 is a field service unit that performs frame relay testing and emulation at up to 256 kbps. Protocols supported: Async; BSC; SNA/SDLC; X.25; DDCMP; and Frame Relay. Interfaces supported: RS-232C; RS-449; ITU V.35; T1; and ISDN.

9415 PC Protocol Analyzer
The 9415 is a PC board add-on that operates at up to 256 Kbps and supports Async, BSC, SNA/SDLC, X.25, DDCMP and Frame Relay protocols.

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Danny Wilson, Marketing Manager

Corporate Profile

Hewlett-Packard's IDACOM Telecommunications Division specializes in high-performance protocol testing solutions for the designers, integrators, and operators of broadband asynchronous transfer mode (ATM) and data communications networks.

IDACOM produces high-speed protocol analyzers and distributed network test systems. Its major products are the PT family of protocol analyzers and the Broadband Test System which supports tests up to 622 Mbps.

IDACOM markets its products to communications hardware companies, telephone companies, and other signal carriers worldwide, as well as end-users such as banks, governments, and the military. IDACOM also has operations in Burnaby, BC to service the Pacific Rim and IDACOM has undergone tremendous growth in the last year with a 93% increase in sales.

Recently Hewlett-Packard through its IDACOM division was the first company to produce a product that conforms to the ACT-Frame Relay committee's test specifications.

Hewlett-Packard frame relay conformance test products address the needs of frame relay networks as they exist today and as they will exist in the near future. These products will evolve to comply with the final standardization of the frame relay protocol, thereby ensuring that tomorrow's equipment will be compatible with the networks that are built today.

Broadband Products

IDACOM's PT Series of protocol testers can be used by network managers to perform stimulus-and-response testing. This allows network managers to broadcast and monitor test sequences simultaneously from up to 10 different network nodes in order to isolate network problems. These are sophisticated devices for developers, system integrators, carriers, and large end-users. They can be configured with software, interface cards, and multiple ports to test WAN protocols, including frame relay, X.25, and integrated services digital network (ISDN), at speeds up to 2 Mbps. All these testers have disk storage, printer interfaces and are AC powered.

PT300 Dual Port Portable Protocol Tester
Protocols supported: Async; BSC; SNA/SDLC; X.25; Sync; Frame Relay; HDLC; X.32; X.75;

Group 4 Fax; BOP; COP
Interfaces supported: RS-232C; RS-449; X.21; ITU V.35; ISDN

PT302 Portable High Speed Protocol Tester
Protocols supported: SNA/SDLC; X.25; X.75; Frame Relay; SMDS
Interfaces supported: RS-449; ITU V.35; T1; E1

PT500 Multiport Protocol Tester
Protocols supported: Async; BSC; SNA/SDLC; X.25; Sync; Frame Relay; HDLC; BOP; COP; X.32; X.75
Interfaces supported: RS-232C; RS-449; X.21; ITU V.35; ISDN

PT502 High Speed Multiport Protocol Tester
Protocols supported: X.25; Frame Relay; SMDS
Interfaces supported: RS-485; RS-530; X.75; Frame Relay; SMDS

PT540 Multiport WAN Protocol Tester
Protocols supported: Async; SNA/SDLC; X.25; Sync; X.32; X.75; Frame Relay; BOP; COP
Interfaces supported: RS-232C; RS-449; ITU V.35

RTA Unattended Dual Port Protocol Tester
Protocols supported: Async; BSC; SNA/SDLC; X.25; Sync; X.32; X.75; Frame Relay; BOP; COP
Interfaces supported: RS-232C; RS-449; ITU V.35

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Peter Wilson, Director of Marketing

Corporate Profile

LSI Logic Corporation of Canada, incorporated December 1985, is a 55 per cent-owned subsidiary of LSI Logic Corporation of Milpitas CA. LSI Canada is a public company trading on the Toronto, Montreal and Alberta stock exchanges.

LSI Canada designs, develops, manufactures, and markets application-specific integrated circuits (ASIC) and related design services and technology The company also designs and markets reduced instruction set computer (RISC) microprocessors, digital signal processing (DSP) products, PC chip sets, and provides circuit board assembly services. LSI Canada has designed more than 700 ASIC chips and generated more than $250 million in sales. These chips are incorporated into broadband equipment around the world. Applications include video-on-demand, ATM, desktop ATM

Customer-Specific Integrated Circuits, CSICs, allow customers to choose a standard product and specify certain changes that will tailor the product to the customer's particular requirements. Together, LSI Logic engineers and engineers in a trendsetting partner company may define a product to meet some unique needs of the partner company's particular industry. The industry partner may have exclusive rights to the new product for a period of time, after which LSI Logic is free to take the product to market.

LSI is a member of the DesktopATM25 Alliance of companies that are developing standards for the use of 25 Mbps ATM at the desktop.

LSI Logic's R&D concentrates on advanced computing chipset technology including products for ATM and digital video. In Canada, about 4% of revenue is spent on R&D, in the US the parent company spends about 12% of revenues on research.

It has offices in Vancouver, Calgary, Edmonton, Toronto, Ottawa, and Montreal.

Major Achievements

LSI Canada has designed more than 700 ASIC chips and generated more than $250 million in sales. These chips are incorporated into broadband equipment around the world. Applications include video-on-demand, ATM, desktop ATM

Recently Hewlett-Packard has incorporated the 32-bit ATMizer chip set from LSI into its ATM

video server products and have signed a memorandum of understanding to co-design a chip set for video-on-demand TV set top boxes. Also Newbridge has incorporated the product into its VIVID ATM-LAN products.

LSI has recently signed an ATM networking partnership agreement with IBM and Bay Systems (Wellfleet/SynOptics).

Analysts credit LSI Logic Corporation with creating the Application- Specific Integrated Circuit (ASIC) industry when it was incorporated in 1981. Since then LSI Logic has grown to become a Fortune 500 company, with 1992 revenues of $617 million and 3,400 employees worldwide.

Broadband Products

The **ATMizer Megacore** is an ATM network controller that performs Segmentation and Reassembly (SAR) and all ATM layer operations at 155 Mbps. By supporting ATM adaption layers 1, 2, 3/4, and 5, the ATMizer can process up to 64K Virtual Channels (VCs) of voice, data, and video simultaneously.

ATMizer R/T Development Platform allows designers to develop, test and debug software independent of the physical connection. With an optional framer module attached, the ATMizer development system supports emulation of system performance with physical media including unshielded twisted pair and optical fiber. Currently the framer modules support 25.6 Mbps category 3; 100 Mbps 4B/5B; 51 Mbps STS1; 155 Mbps Sonet/STS-3 FDDI; and 45Mbps DS3 ISDN.

ATM Application Specific Standard Products. LSI Logic introduced the LX and BX lines of ASSP products based on its ATMizer architecture. The LX products, targeted at network interface cards (NIC), include the LX-25 for low-speed NICs, the LX-33 for midrange NICs that support PCI bus and the LX-40 for server NICs and supporting SBus. The BX line is targeted at backbone applications and include the BX-50 for backbone router hubs and interfaces. The X-25 will support 51 Mbps data speeds; the LX-33 and LX-40 will support up to 100Mbps; and the BX-50, a 50MHz part with a different memory structure, supports 155Mbps.

The **CASCADE 110** Ethernet chip core facilitates the development of both conventional 10 Mbps Ethernet and broadband 100 Mbps Fast Ethernet products.

The **Image Processing line** includes video-compression and image-compression functions supporting JPEG, MPEG, and ITU industry standards These devices allow designers to incorporate still or full-motion image compression into a variety of video and still broadband product applications such as video conferencing and multimedia.

The **CoreWare Program** allows systems designers to combine building blocks--such as microprocessors, floating-point processors, cache memories, and peripheral controllers--on a single piece of silicon, just as they now combine them on printed-circuit boards using standard, off-the-shelf components.

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Corporate Profile

Luxcom Technologies Inc., a privately held company, was formed in 1988 by a group of professionals who were the original founders of Foundation Instruments Inc., a well known manufacturer of fibre optic equipment.

Luxcom Technologies Inc. develops and manufactures fibre-optic communications products for both commercial and military applications. The majority of the company's products are exported to Europe. Major customers include Seimens Plessey Defense Systems, Canadian Department of Defence, Optilan UK, Walmore Electronics UK and SHL Systemhouse. Luxcom also installs fibre optic systems world wide.

Broadband Products

Commercial products include fibre optic ethernet transceivers in various configurations; fibre optic ethernet hubs (both large and small); managed and unmanaged, universal (synchronous/asynchronous) data modems; T1/E1 fibre optic modems (OM-15 supports speeds up to 2.048 Mbaud); and, fibre optic video/audio products.

Its list of military products include a variety of tactical links and ruggedized DS1/E1 fibre-optic links.

Luxcom custom designs products where off-the-shelf broadband products do not meet customer EMI/RFI, Tempest, nuclear hardened, or environmental requirements such as temperature, humidity, shock, vibration, dust, sand, fungi or vermin.

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James Kennedy, VP, Sales & Marketing (North Andover)
David Ball, VP, Engineering & R&D (St. Laurent)

Corporate Profile

Publicly-traded on the Toronto Stock Exchange, Memotec Communications develops, manufactures, and markets communications networking products. The company, headquartered in St. Laurent near Montreal PQ, operates a second facility in North Andover MA, where 210 persons are employed.

The company sells to end users, telcos, and system integrators in over 50 countries. In 1992, 78% of total sales were made in the US.

Memotec maintains separate research and development centres in both Montreal PQ and North Andover MA. Activity in Montreal tends to focus on packet and multimedia products, whereas the engineering staff at North Andover tend to concentrate on digital and network management products.

Packet products and multiplexing/multimedia product lines are manufactured in Montreal. LAN connectivity, and T1/Fractional T1 product lines are built in North Andover.

Major Achievements

The company's first multimedia product, the CX 1000, incorporates packet switching products, voice & data compression multiplexers, dial-up modems, and 56 Kbps DSU/CSUs. It has integrated ATM and Frame Relay technology.

Memotec is also developing the CX3000, a higher capacity system incorporating 3.2 Gbps bus architecture complemented by RISC-based processors.

Broadband Products

Products manufactured by Memotec include X.25 and frame-relay packet switching; compression multiplexing/multimedia; digital modems; and LAN connectivity products.

Aurora T1 Multiplexer
Synchronous input rate: 1.544M-2.048 Mbps
Composite link rate: 44.736 Mbps

CX1000 Voice/Data/Video multiplexer
The CX 1000 Multimedia Multiplexer is a flexible platform designed to support a variety of Wide Area Network (WAN) access capabilities. It incorporates both ATM and Frame Relay technology. Modules providing Data Compression, Voice Compression, integral CSU/DSU's, and Dial-up Modems plug into the CX 1000 chassis, which is available in both 16 and 6 slot versions.

Composite link rate: 1.544M-2.048 Mbps

ConnectLAN 5050B Remote Bridge and 5050E Remote Bridge/Router
Network compatibility: Ethernet
WAN services supported: X.25; T1; E1; Frame Relay; SMDS
Network management standards: SNMP

ConnectLAN 5200/5300/5400/5500 Remote Bridge/Routers
Network compatibility: Ethernet; IBM Token Ring
WAN services supported: X.25; T1; E1; Frame Relay; SMDS
Network management standards: SNMP

FR 970 Packet switch; Frame Relay switch
The FR 970 Multi-Protocol Frame Relay Concentrator reflects Teleglobe's strategic commitment to high speed networking technologies. The FR 970 combines all the advantages of a Frame Relay Concentrator and a Multi-Protocol PAD together with an integral DSU/CSU in one compact unit, providing connectivity to private, public or hybrid Frame Relay and Packet networks.

The FR 970 concentrator delivers cost effective communications, reducing the number of lines required by combining data from Frame Relay, X.25, SNA, SDLC and HDLC devices over one or more trunks. Equipment already in place, such as multiplexers, PADs, switches, bridges and routers can be connected to the FR 970 to provide access to public or private Frame Relay networks. Users benefit from the immediate cost savings.

SP 9700 PAD Packet switch; FRAD Frame Relay switch
Compatible with: X.25 Networks; Frame Relay Networks
Port speed: 64 Kbps
Trunk speed: 128 Kbps

IDM 1500 and ISU 1500 Data Service Units
Memotec offers the Switched Multi-megabit Data Service (SMDS) 1500, and SMDS CSU/Data Service Unit (CSU/DSU) designed to allow TI access to SMDS users.
Data transmission speed: 56K-1.536 Mbps

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Dr. Ian Munns, Senior VP, Marketing and Technology

Corporate Profile

Mitel Corporation is an international manufacturer of business telecommunications systems, public switching systems, and semiconductor products. Mitel is traded on the Toronto, Montreal, New York and London stock exchanges under the symbol MLT.

Mitel's mission is to be a world leader in creating communication solutions that provide exceptional value for customers. The company has sold more than 173,000 business telephone systems in 80 countries and employed about 3,600 people in 1994.

Mitel offers a new generation of leading edge fiber optic linked products for the PBX market, incorporating a modular design that allows customised configurations.

Mitel's semiconductor division not only meets the company's own requirements, but also supplies integrated circuits, wafers and hybrids to other manufacturers.

Mitel has manufacturing facilities in Kanata ON, Bromont PQ, Ogdensburg NY, and Caldicot, Wales.

Mitel's strategy for the future includes continuing to evolve its PBX line and develop new applications. Mitel is committed to leading the integration of the telephone and the computer to deliver switched audio and visual services in conjunction with computing services.

Research

Mitel integrates its extensive R&D efforts within its key manufacturing facilities, directing activities toward the application of the latest electronics and software technologies rather than to basic research. At Mitel Semiconductor, 500 employees are involved in three business segments: integrated circuits, hybrids, and integrated products. ICs investigates digital components and custom designed wafer fabrications, and in hybrid multi-layer interconnect is a thrust area.

Major Achievements

Market share leader in US in the under-400-line PBX market

Revenues $0.5bn 1994

Mitel Semiconductor growth: 40% per annum

Winner of 1994 Canada Export Award

ISO Accredited

Broadband Products

SX-200 and SX-2000 LIGHT PBX
These products are PBXs employing Fibre Distributed Architecture, consisting of control nodes and peripheral nodes, interconnected by fiber optic cable. Being modular, this architecture lets you expand your PBX by increments, using components small enough to fit under a desk. This not only saves space, but puts applications closer to workgroups using them, providing increased productivity and easier maintenance.

Mitel VMIC Backbone Access Switch Circuit
In addition to its wide range of analog and digital phone IC products, Mitel Semiconductor has developed a range of high speed telecommunications integrated circuits designed to enable real time networking solutions that integrate computer and telephony applications. Products support the Fiber Distributed Architecture, SONET/OC-3, ATM, T1, E1 interfaces allowing networks to simultaneously carry LAN and Frame Relay traffic in conjunction with real time traffic such as voice and video. Within the campus network environment, Mitel integrated circuits are designed to deliver the additional value of real te networking at a fraction of the cost of other solutions such as ATM.

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Alistair Taylor, Director of International Marketing

Corporate Profile

MPR Teltech is one of Canada's leading high-technology companies, providing advanced telecommunications systems and products to an international portfolio of clients in more than 15 countries. Incorporated in 1979, the company is owned by BC TELECOM and employs more than 600 people at five locations in Canada, the U.S. and Germany.

MPR Teltech specializes in using advanced technology to develop innovative business solutions for telecommunications service providers, equipment vendors and corporations that use sophisticated information systems. Its business areas encompass a broad spectrum of advanced telecommunications technologies including high speed data networking (ATM), satellite communications systems, customer care systems, network systems engineering, intelligent networks, wireless communications, digital signal processing applications, Cospas/Sarsat emergency beacons, electronic product packaging, operations support systems, and multimedia communications.

Major Achievements

MPR Teltech earned international recognition as the first company in the world to develop and commercially market ATM switches. This technology was licensed to Newbridge Networks for incorporation into several of their products.

MPR Teltech has an agreement with Newbridge Networks for the joint development of ATM technologies, products, and markets which is an extension of a two-year agreement between the companies, during the tenure of which two product releases were delivered. One of the objectives of this agreement is to increase the speed of one of Newbridge's ATM backbone switches from 1.6 Gbps to 102 Gbps.

MPR Teltech currently plays a key role in developing the infrastructure for Canada's Information Superhighway. CANARIE has funded MPR Teltech for the development of applications using current ATM transmission capabilities and that will showcase the expanded capabilities possible with the new ATM fabrics being developed with Newbridge Networks.

Broadband Product Research

WAVE

The WAVE product line enables carriers to offer premium-quality switched video communications to large business and institutional users. WAVE products include standards-based hardware and software for high quality video networking over advanced public-switched ATM networks. WAVE is an end-to-end carrier solution, including Terminals, Broadband Multipoint Conferencing Units, Internetworking Gateways and a comprehensive Service Management System.

ATM Product Development

MPR Teltech is performing high-speed ATM cell switching fabric design, transmission interface design (supports DS1, DS3, E1, E3, SONET OC-3, SDH STM-1, and TAXI) and ATM access interface design (supports Full-Motion JPEG Compressed Video interface, Audio-digital stereo over ATM, Ethernet, Token Ring, FDDI, and DS1&DS3 circuit emulation).

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Corporate Profile

Newbridge Networks Corporation, a public company traded on the Toronto and New York stock exchanges, designs, manufactures, markets, and services an extensive array of broadband products. Newbridge is one of Canada's premiere high technology companies that has had tremendous growth and technical success.

Newbridge was founded in 1986 by Terence Matthews, previously one of the co-founders of Mitel Corp. Newbridge has grown to a $500 million company with over 1,800 employees world wide.

The company's MainStreet family of products ranges from high capacity ATM multiplexers for use in corporate networks and telephone company central offices to low capacity, narrowband feeder multiplexers used to extend digital circuits beyond backbone networks to remote corporate locations. Newbridge products have a broad range of voice interface options and support a large number of terminations per-site and sites-per-network.

Wide area network (WAN) and local area network (LAN) technologies are supported by Newbridge products to provide desktop-to-desktop multimedia connectivity on a local or global basis. Other products allow networks to interact with information being transported by the network.

The company's communication technologies cover every contemporary communications format including asynchronous transfer mode (ATM), SONET, frame relay, circuit switching, statistical multiplexing, and packet switching.

Significant research into high speed/high capacity T-3/E-3 networking multiplexers, SONET optical fibre interfaces, and LAN/WAN internetworking is carried out. In addition, the company is improving network partitioning capabilities, integrating with common carrier Operations Support

Systems (OSS), and expanding maximum network size. The VIVID division has recently developed ATM products for LANs.

Newbridge Networks has established alliances with many major companies to co-develop products including Hewlett-Packard, MPR Teltech,

In 1989, Newbridge acquired Calmos Semiconductor resulting in the formation of Newbridge Microsystems division. This division designs, manufactures, and sells semiconductor components and related OEM board level telecom products, including a range of encryption devices. Newbridge Microsystems has a 600-page product catalogue.

Newbridge, whose clients include more than 170 telephone companies, has offices in Canada, the US, Latin America, Europe, and Asia.

Broadband Products

VIVID - a low cost ATM LAN switch that supports 12 ports using ATM, Ethernet gateway, Token Ring gateway and FDDI gateway protocols, The port speeds range from 45M to 155 Mbps and interface to T1 direct, T3, E1, E3, OC-3, and OC-12.

36120 Packet Transfer Exchange switch - provides frame switching capacity of more than 100,000 frames per second with full redundancy, alternate routing, and standards-compliant frame-relay interfaces on both the access and trunk sides. This device supports Frame Relay protocol with RS232C, RS-449, ITU V.35, T1, RS-530, X.21 E1 and E3 interfaces. The port speed is 1.544 Mbps with trunk speed of 45 Mbps. Can be configured with 4 to 4096 subscriber ports.

36150 ATMnet switch - has four main elements: control card, switching card, interface card, and adaptor card. The switching card can be arranged to provide 16x16, 8x8, 6x6, or 4x4 switching with 4 to 32 subscriber ports. This ATM Network compatible switch supports ATM, Ethernet gateway, Token Ring gateway and FDDI gateway protocols. The following interfaces can be used RS-232C, T1 direct, E1, T3, E3, OC-3, OC-12, SMF, MMF and SONET. The port speed is 155 Mbps.

36170 MainStreet ATMnet Backbone Switch -provides 96 subscribers ports at 155 Mbps using ATM, Ethernet gateway, Token Ring or FDDI gateway protocols. A variety of interfaces are supported including RS-232C, T1 direct, E1, T3, E3, OC-3 and OC-12.

3601 Mainstreet Frame Relay Network Adapter - supports SNA/SDLC, X.25, HDLC and Frame Relay with a port speed of 115.2 Kbps.

3600 Bandwidth Manager - networking node that combines an intelligent channel bank, a digital cross-connect switch, and an integrated voice and data multiplexer. It allow a range of configurations to accommodate growth from 6 to 32 T-1/E-1 links.

3630 Primary Rate Multiplexer - drop-and-insert multiplexer which supports two T-1 or E-1 links for up to 32 voice or 128 data interfaces.

3645 High Capacity Bandwidth Manager - WAN switching shelf with support for T-3 and E-3 which provides concurrent circuit and packet switching. It can be configured for up to eight times the capacity of the 3600 and used the same I/O and signal processing cards

8231 MainStreet Ethernet Router - bridge/router which provides a single 10Mbit/s ethernet interface and up to four WAN ports (X.25, T1, E1 and Frame Relay)

8251 MainStreet Token Ring Router - bridge/router which provides a single 4/16Mbit/s token-ring interface and up to four WAN (X.25, T1, E1 and Frame Relay).

ACC 4500 - enterprise hub which is scalable that supports up to 40 LAN and 20 WAN connections. Ethernet, token-ring, and FDDI topologies are all supported.

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Corporate Profile

Established in 1895, Northern Telecom is a publicly traded company on the New York, London, Tokyo, Montreal, Toronto, and Vancouver stock exchanges with 1994 revenues of $8.87 billion (US), and employs 58,000 people worldwide. BCE Inc., a management holding company, owns 52.4 percent of Northern Telecom Ltd.

This leading global provider of communication solutions introduced digital technology to the telecommunication industry in 1976 and has more than 125 million digital lines in service or on order in 90 countries in North America, the Caribbean, Europe, the Middle East, Asia and Pacific Rim. Northern Telecom provides product and services to the telecommunications and cable television industries, business, universities, government and other institutions worldwide. It operates 55 manufacturing plants in Canada, the US, Malaysia, Ireland, Thailand, Australia, China, Mexico, the UK, and France. The corporation's products are sold in more than 90 countries segregated in 2 major sales divisions: Americas (North/South/Latin) and International (Europe, Asia, Middle East). It has four operating groups and two major technology subsidiaries.

Research and development is conducted by Bell-Northern Research (BNR), a subsidiary that operates R&D facilities in eight locations in Canada, the US, the UK, France, Australia, and Japan. See separate listing. Northern Telecom also conducts engineering and other product development at 25 plants worldwide.

Northern Telecom designs, manufactures, and supplies one of the industry's most complete lines of fully digital switching and transmission systems. Northern Telecom products include equipment for both public and private communications networks: the Magellan Edge Switch, Concorde and Passport broadband switching systems, the Magellan Cornerstone Access Mux and DPN-100 packet switching system; S/DMS SuperNode public network switching system; the S/DMS TransportNode and S/DMS AccessNode fibre-optic transmission systems; the Meridian 1 line of business communication systems; the Norstar small digital business communications system, the VISIT desktop videoconferencing system; digital high-capacity, cellular mobile telecommunication switches and radios; the Companion family of wireless business and public personal communication systems; digital business and residential telephone sets.

Northern Telecom and FORE Systems, Inc., the worldwide leader in local area network products based on asynchronous transfer mode (ATM) technology, have entered into a joint agreement

with the goal of delivering seamless, end-to-end ATM solutions.

Recognizing the critical need for vendors and carriers to work closely together to ensure the successful wide-scale deployment of ATM technology and services Northern Telecom has signed a contract with Bellcore to become a charter member of its ATM Interoperability Laboratory.

Major Achievements

Active leader in Frame Relay Forum which Nortel helped establish in 1990

World leader in establishing the ATM Forum and in defining ATM standards

Broadband Products

Magellan Family

The Magellan family of products consists of

- the Cornerstone Access Mux for customer premises deployment
- the Passport multimedia switch focused on enterprise networking
- the Edge Switch being developed jointly with Fore Systems
- the Concorde network backbone ATM switch
- the DPN-100 data networking system
- a comprehensive network management system

The range of network performance and platform sizes that the Magellan family can provide is matched only by the variety of traffic types that can be integrated within a single network architecture. Different performance is allocated to appropriate traffic types via the Multiple Priority System which segregates, prioritizes and manages different types and bundles of traffic. This enables carriers to offer different grades of service and corresponding tariffs to their customers.

The network management system includes support for IBM's NetView, SNMP device management, OSI interworking and Application Program Interfaces (APIs). Its impressive breadth of features includes configuration, security, performance, accounting and fault management.

Through NT's relationship with FORE Systems, all Magellan ATM switches will incorporate elements of ForeThought software. Carriers can therefore build seamless wide-area ATM neworks that reach right to the desktop through FORE Systems' customer premise equipment.

Cornerstone Access Mux

Cornerstone is an ATM access multiplexer that supports video, voice and data intefaces from a single network element. It provides access to DV45 and MPEG-2 video, as well as major data services, including Ethernet, Frame Relay, Token Ring and SMDS. It encapsulates these services

into ATM cells and concentrates them into a broadband digital network via the ATM Forum standard OC-3c User Network Interface, UNI.

Passport
Passport provides smooth, incremental transition to ATM and the multimedia future whilst protecting existing network investment. It can dynamically allocate bandwidth on demand using its unique FrameCell architecture that supports the integration of data, voice and video networking. It reduces the overhead of separate overlay networks by creating a single managed environment. The 1.6 Gbps of throughput can be divided amongst the following interfaces:

frame relay: UNI, NNI, interworking with DPN-100

voice support: cell based switching, ADPCM compression at 32, 24, 16 Kbps, speech activity detection, fax/modem detection and echo cancellation

V.35, V.11, DS1, E1, DS3, E3, HSSI, FDDI, ethernet, token ring, OC-3.

future ATM developments include: OC-3 ATM trunking, PNNI, UNI

Edge Switch
Designed specifically to provide economic ATM access in carrier markets, the Magellan Edge Switch offers scalable throughput from 2.5 to 10 Gbps, support for both switched and permanent virtual circuits, central office packaging and multiple ATM interfaces, including T1/E1, J2, T3/E3, OC-3c/STM-1 and OC-12/STM-4. It complements the Passort and Concorde to provide a complete multi-layer ATM network solution for carriers.

Concorde
Magellan Concorde delivers scalable throughput, carrier-grade reliability and traffic and network management. It is a high performance ATM system with common memory buffer and throughput scalable between 10 and 80 Gbps. From its central position in a broadband multimedia network, Magellan Concorde supports:

ATM UNI access at DS-3, OC-3c and OC-12c rates.

ATM NNI trunking at OC-3c, OC-12c and OC-48 rates

ATM switching

Management of signalling, routing and connectivity

Monitoring, surveillance and fault isolation

DPN Packet Switches
All DPN support multi-line routing, port selection/contention, user/network line testing, performance measurement, network configuration control, billing/accounting functions. The DPN

product line supports SNA/SDLC; Async; X.25; X.75 gateway and Frame Relay protocol networks.

SONET/SDH Transport Systems

S/DMS Transport Node fibre optic rings at speeds up to SONET OC-48, 2.4 Gbps, enable network providers to deploy today's broadband services while ensuring a "service ready" network flexible enough to provide the new wave of tomorrow's integrated services.

Northern Telecom S/DMS AccessNode Synchronous Optical Network (SONET) technology allows for voice and data transmission over standard telephone lines. It also allows the phone company to offer high-bandwidth services, including video-on-demand and Integrated Services Digital Network (ISDN). Business customers can use dedicated data lines up at to 45 Mbps, and eventually compressed video and broadband data services. S/DMS AccessNode can be managed remotely through Service Adaptive Access line card technology. It offers self-testing, diagnostics, and fault sectionalization capabilities.

Transmission Management System's Network Manager allows "single-ended" management of multiple network elements and multiple fibre optic rings.

Northern Telecom has a complete range of optical fibre transmission and cable products, including Synchronous Digital Hierarchy (STM1-4-16) FiberWorld transmission equipment and SONET STS1 to STS 48 equipment.

LANMaximizer

LANMaximizer products are designed to handle heavy volumes of data traffic on LANs and servers, as well as be a key component in the migration of mainframe systems to client-server architectures. The line includes high-performance FDDI dedicated Ethernet hubs and adapter cards. The LANMaximizer Mx-DEB supports as many as 4,096 media access control (MAC) addresses on eight 10 Mbps Ethernet LAN on one side and a 100Mbps connection on the other using either unshielded twisted-pair wire or fibre-optic cable. The hub supports protocols such as Internet Protocol (IP) and spanning tree.

Northern Telecom has developed a Management Information Base (MIB) for the LANMaximizer Mx-DEB that will enable users to manage
the hub from the vendor's SNMP-based network management system.

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John Virden, VP, Sales & Marketing

Corporate Profile

Plaintree Systems Inc is a publicly traded company on the Toronto Stock Exchange that was established in 1988. It develops, manufactures, and markets computer Ethernet switching network products which improve the performance and simplify the management of LANs. The company offers products with FDDI and Fast Ethernet connectivity. Plaintree products enhance networks by allowing customers to retain existing Ethernet equipment from the desktop to the wiring closet, while incorporating new technology to connect hubs, servers and workstation over high-speed FDDI, ATM or Fast Ethernet links.

The company is researching complementary products to its principal offerings. Plaintree is further developing its switch technology to increase switching speed from 400 Mbps to 1 Gbps. The WaveBus Long-Link CTM will extend the limit on the distance between a WaveBus CTM from 500 metres to 5km. Plaintree jointly developed the MSL product with Novell of Provost, Utah.

Plaintree's R&D and manufacturing facilities are located in a suburb of Ottawa and its head office is in Waltham, MA. Plaintree products are sold through a channel of authorized re-sellers and major distributors worldwide. Strategic partnerships with nationally and internationally known OEM's are also providing WaveSwitch products under private label.

Broadband Products

WaveSwitch 100 is a family of Ethernet switches, available in an 8 port or 16 port base unit, each with 2 optional high speed (100 Mbps) ports for FDDI, ATM and Fast Ethernet. All WaveSwitch 100 products use an ASIC-based fast bridging technology developed by Plaintree. WaveSwitch 100 switches connect multiple Ethernet segments using an ASIC switching technology, and also links multiple 100 Mbps connections to file servers or high-speed network backbones. Fast bridging technology combines the speed of switching with the operational simplicity of bridging, and enables WaveSwitch 100 to conform to industry bridging standards. All WaveSwitch 100 products support Fast Ethernet standards, 100VGAnyLAN and 100BaseT.

WaveBus, Plaintree's fibre optic fast Ethernet, provides 100 Mbps connection between WaveSwitch 100 devices or between WaveSwitch devices and file servers. WaveBus network adapters connect ISA, EISA and Micro Channel computers to 100 Mbps optical fibre cable. WaveBus hubs provide a high-speed interconnection point for as many 18 WaveBus fibre optic cables. WaveBus hubs may be connected hierarchically to support many hundreds of devices.

Mirrored Server Link (MSL) provides a high-speed (over 100 Mbps) communication link between a pair of Novell NetWare SFT III servers. MSL consists of two fibre optic adapter cards, software driver, written to Novell's SFT III specifications, and a standard dual optical fibre cable of up to 500 meters in length, with options for longer distances.

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Vern Little, Manager, Product Marketing
Glenn Bindley, Manager, Product Marketing
Ralph Bennett, VP, Sales & Marketing

Corporate Profile

PMC-Sierra Inc, formerly the Pacific Microelectronics Centre (PMC) of MPR Teltech, was formed in 1992 with a 65% investment by Sierra Semiconductor Corporation of California. The company develops, manufactures, and markets chip-sets and module level products for transmission, switching and networking applications. With over 100 major customers worldwide, Its specialty is developing and supplying broadband networking components including ATM, SONET/SDH, T1/E1 and T3/E3 interface chips. These are used in video conferencing, medical imaging transmission and interactive multimedia equipment. The company also develops ASIC-based products with Sierra Semiconductor.

PMC-Sierra has over 25 IC and module products for use by its clients in North America, Europe, and Asia.

Major Achievements

PMC-Sierra has an 80 percent market share of installed ATM chips.

Recognizing that equipment interoperability would be key to the success of ATM-based products, PMC-Sierra, with Sun Microsystems, founded the SATURN (SONET/ATM User Network) Development Group in 1992. The SATURN Development Group facilitates the development of components for ATM LANs and WANs based on interoperability specifications published by the ATM Forum. The Saturn Group is now composed of more than 100 equipment vendors.

One of PMC-Sierra's contribution's to SATURN is its Compliance Verification Lab, where its partners and customers can test broadband products. A broad range of equipment for testing compliance including: an HP VXI ATM Analyzer, HP 300MHz Pulse Generator, HP 26.5GHz Spectrum Analyzer, Marconi 1GHz Signal Generator, MicroWave Logic Jitter Analyzer, Tek 500 Ms/s DSO, Tek 6GHz DSO, Tek Optical Power Converter, Tek Bit Error Rate tester, W&G DS3/DS1 Analyzer, W&G PCM Analyzer, and W&G SONET/SDH Jitter Analyzer. PMC-Sierra is also beta site for HP's ATM test equipment.

Broadband Products

PM5345 S/UNI-155 (Saturn User Network Interface) is an ATM PHY device operating at the

STS-3c/STM-1 rate of 155.52 Mbps. It provides an 8 bit or 16 bit cell interface, 4 cell FIFO buffers, A SONET/SDH framer and high speed serial interface. The S/UNI-155 is SATURN compatible and has become the industry standard ATM PHY for 155 Mbps applications, adopted by more then 100 companies world wide.

PM5346 S/UNI-155-LITE is a second generation SATURN compatible ATM PHY device operating at the ATM-Forum approved rates of 12.96, 25.92, 51.84 and 155.52 Mbps for ATM LAN applications. It incorporates SONET/SDH compliant on-chip clock recovery and clock synthesis, synchronous 8-bit UTOPIA-compatible cell interface, 4-cell FIFOs, ATM processing and SONET/SDH framer.

PM5347 S/UNI-155 PLUS is a WAN optimized second generation SATURN compatible product. Enhancements to the original S/UNI-155 include the addition of integrated clock and data recovery (fully compliant to SONET/SDH jitter specifications) on-chip, support for 51 Mbps, a synchronous 8/16 bit UTOPIA-compatible cell interface, individual serialized interface to all overhead functions, integrated protection switching support (K1, K2), section and path trace and link level GFC.

PM5355 S/UNI-622 is a SATURN compatible ATM PHY transmission convergence device intended for STS-1, STS-3c/STM-1 and STS-12c/STM-4 at speeds up to 622 Mbps for LAN or public network applications. It provides a synchronous UTOPIA compatible cell interface operating at up to 50Mhz using an 8-bit or 16-bit bus, 4-cell FIFOs, ATM cell processing and a SONET/SDH framer.

PM7321 PLPP is a SATURN compatible Physical Layer Convergence Protocol (PLCP) device for DS1 and DS3 which conforms to Bellcore TA-TSY-000773 and TA-TSY-000772 and IEEE 802.6-1990 standards. For E1 and E3, the PLPP implements the PLCP according to the ETSI Draft Standards T/NA(91)17, and T/NA(91)18. The PLPP provides on-chip 4-cell FIFO buffers in both transmit and receive paths and supports arbitrary rate external transmission system interfaces up to a maximum rate of 52 Mbps. It provides an internal framer to support M23 or C-bit parity DS3 formats with path maintenance data link processing and bit-oriented code support for FEAC channel termination.

PM7345 S/UNI-PDH is a second generation, SATURN compatible, enhancement to the PM7321 PLPP. In addition to all of the functionality provided by the PLPP, the S/UNI-PDH also provides an integrated E3 framer (both G.751 and G.832), and supports E3 trail trace.

PM7344 S/UNI-MPH provides four DS1/E1, SATURN compatible, ATM PHY channels on one chip. It consists of DS1 framers, ATM cell processing, 4-cell FIFOs and synchronous UTOPIA Level 1 and Level 2 compatible 8-bit cell interface.

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Jacques Zekry, Director, International Business
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Corporate Profile

Established in 1970, Positron Industries Inc. designs, develops, and manufactures equipment for high reliability, critical service applications for the telephone, power, and financial industries. The corporate and engineering headquarters together with 160,000 sq. ft. manufacturing facility are located in Montreal. The US headquarters is in New York, with 6 sales support offices across the US. In addition to US, Positron exports to Asia, South America, the Middle East and Europe.

Positron is ISO 9002 registered and invests 16% of revenues in research.

Positron addresses a broad market for its SONET equipment, selling direct and also through RBOCs, Cable Companies and Competitive Access Providers. Its other products use focused marketing to address specific market niches for public safety, communications protection, communications consoles and trading turret products.

Major Achievements

Two IEEE awards for leadership in developing new technologies, plus Canada Export Award.

SONET capability with full features and sophisticated network management designed to provide low cost installation.

Major clients include North American Air Defense Command, NORAD, the US Department of Energy, Royal Canadian Mounted Police, US Air Force, US West, Pacific Bell, BellSouth Services, Sprint, the Mexican and Costa Rican governments, and Ameritech.

Broadband Products

OASIS (Optical Access SONET Interface System) provides full featured, third generation OC-3, SONET access including add/drop multiplexing and DS1 and DS3 interfaces. It is designed for path-protected ring networks and can operate on a collapsed ring (point to point) configuration. A PC-based graphical user interface permits remote system OAM&P.

In addition Positron has a range of products including trading turrets (dealerboards); answering positions; telephone/radio communication consoles with dispatching capability; teleline isolators for high-voltage ground potential rise protection of wire-line facilities entering power stations; surveillance and remote alarm reporting SCADA systems; and, enhanced emergency response (911) systems.

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Robert Davison, GM, Lentronics Products
Bill Weitzel, Marketing Manager

Corporate Profile

Prism Systems Inc, formed by two parent organizations, Nortel (51%) and BC Tel (49%), serves the global telecommunications market by offering customers advanced network systems, including transmission and network management products. The company operates out of two divisions: Lentronics Transmission Systems and Network Management.

In addition to its internal product development capabilities, it draws upon the research resources of BNR and MPR Teltech.

The marketing strategy for transmission systems is to utilize a direct sales force in Canada and US plus sales agents internationally. Electric power utilities and pulp and paper companies have been major customers. Prism Systems is currently expanding its market both geographically and in terms of the industries served. Currently approximately 2/3 of the market is in US.

Lentronics Division designs, manufactures and markets fibre optic, multiplex and microwave systems, primarily for private telecommunication networks and complements these products with comprehensive engineering services to manage system integration projects worldwide.

Major Strengths

The close affiliation with a major equipment vendor and with a leading telephone operating company gives Prism Systems a unique ability to draw upon their combined strengths whilst operating independently.

The SONET products are robust and insensitive to harsh electromagnetic environments.

Broadband Products

The Lentronics division line of SONET equipment is called Junglemux, an OC1/OC3 SONET transmission system that may be arranged in various configurations using standard building blocks. It supports point-to-point, linear add/drop, self healing bi-directional ring plus spur(s) network topologies. SONET management capabilities are supported by a proprietary PC-based network management system that allows network visibility down to the individual DS-0 level at every node, remote provisioning (configuration and monitoring), alarm logging and manual path switching. Built in test capabilities save the cost of purchasing separate test equipment. The product line includes:

OC-1 Add/Drop Multiplexer System
OC-3 Unit, for capacity upgrade to 155 Mbps
Wide selection of modular interface units:

- 2 wire and 4 wire voice
- RS-232 asynchronous data
- RS-422/V.35 synchronous data
- DS-1 data
- 10 Mbps ethernet bridge
- analog telemetry
- transfer trip teleprotection
- pilot wire teleprotection

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Corporate Profile

Since its incorporation in 1972, Société de Téléinformatique RTC (STRTC) has been a leader in the field of data communications. Its engineers have developed a complete open wide area network concept where every component including switches, multiplexers, bridges and network management system, is designed by STRTC.

STRTC's corporate mission is research, design, manufacturing, marketing and installation of private packet switched communications networks.

The company specializes in the implementation of private X.25 and frame relay networks and can integrate SNA and DECNET traffic. STRTC's networks integrate LANs, central servers, terminals, and transport lines into a coherent package.

The marketing strategy for frame relay network equipment is to focus on specific industries such as (a) financial services for automatic teller machine networks and credit card validation networks (b) universities and (c) Internet access providers.

Broadband Products

STN5 and STN16 packet switching network nodes have up to 5 and 16 STA3 adaptors (respectively), each with 3 ports. They support frame relay permanent virtual circuits and X.25, in a modular architecture allowing easy component replacement. Between nodes a proprietary protocol is used. The STN16 can handle 2,000 packets per second among 10,000 virtual connections. The maximum frame length is 2100 bytes and frame sequence is preserved. Congestion notification bits are supported.

STA3 adaptor for STN5 and STN16 nodes has a MC68302 processor and 2 MBytes of RAM and provides an aggregate speed of 1.544 Mbps.

STCxxx concentrators are packet assembler/disassemblers with up to 26 ports. Downloaded software determines functionality including MSTC26 for synchronous and asynchronous protocols; SNA3270 for PU type 2 devices and their LU's; TPVPAD for POS terminals.

The STC4 gateway offers interfaces to interconnect with ethernet.

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Corporate Profile

Privately-held Transys Networks Inc develops, manufactures, and markets fibre-optic SONET/SDH and digital microwave radio products to telcos, competitive access providers (CAPs), electric and gas utilities and Cable Companies. The plant and offices (R&D, administration, final product assembly and testing, quality assurance, and shipping) are located just outside of Montreal in a 14,000 sq ft facility, 6km from the airport.

Transys integrates components reflecting the latest technology and the highest quality and also uses state of the art technology in its design and manufacturing processes, including computer aided design and materials requirements planning tools, LAN communications between R&D and manufacturing and automated test equipment. Products are backed by a comprehensive 2 year warranty. Transys operates in a total ISO9001 quality environment with certification planned for 1995.

The current broadband product line is based on SONET and is sold direct in the North American market. An SDH product incorporating E1 and E4 interfaces is planned for 4Q95 directed at Asia, Pacific, South America and Africa, with a distributor network to be developed

Broadband Products

OPTIK-N: an adaptive SONET/SDH network element upgradable and downgradable between OC-1 and OC-12 or STM-1 and STM-4 rates. It addresses the challenge of varying capacity requirements. Architectures are fully reconfigurable re-using the same equipment with minimal or no downtime. Its features include:

Terminal, linear or ring add-drop multiplexer and CPE
Ease of CPE installation
Wideband (DS-1 to STS-1) and broadband (STS-1 to STS-3) digital cross connection
Configurable for OC-1, OC-3/3c, OC-12/12c, STM-1, STM-4
DS1, DS3, STS-1, STS-3, OC-1, OC-3, E1, E4 add/drop interfaces
ATM readiness
Extended temperature capability
Secure craft access
Integrated network management system providing complete OAM&P functions.

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H. Glenn Rainbird, President & CEO
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Corporate Profile

TRLabs was founded in 1986 as a research consortium based on industry, university and government collaboration and specializes in pre-competitive telecommunications research in the following areas: Network Access, Networks & Systems, Photonics, Data Networking and Related Software, and Wireless; each of which is headed by a Research Director supported by a team of academic staff, industrial representatives, and postgraduate students.

Affiliated with universities in Western Canada, TRLabs provides student training at he graduate level. Its output in people and technology contributes to the business, research, education and economic development objectives of its sponsors: industry, university and government. TRLabs operates facilities in Edmonton, Calgary, Regina, Saskatoon and Winnipeg and has plans for expansion in Western Canada.

Networking and collaboration with industry and institutions is a key corporate priority. Major industrial sponsors include: AGT, AT&T Canada, BNR, Digital, Ed Tel, ISM, LSI Logic, MTS, Northern Telecom, NorthwestTel, SaskTel. In addition TRLabs has a number of Small Business Associates, Strategic Alliances and Government and University sponsors.

Major Achievements

Receives highest proportion of industry participation compared to similar research institutes in Canada in terms of (a) proportion of industry funding (b) number of active industry members, and (c) level of industry involvement in research and personnel support.
Conference organization: Multi-Media to the Home in Regina and Saskatoon, ATM in Vancouver, Wireless Data in Vancouver and Wireless95 in Calgary to disseminate research results.

All 1994 graduates were either gainfully employed in the technology sector or pursued doctoral programs.

Research Programs

Data Networking & Related Software - establishment of an ATM Research Testbed utilizing an AT&T GlobeView 2000 20 Gbps ATM switch. The testbed also includes a FORE Systems ASX-200 ATM LAN capable of providing 155 Mbps to the desktop. The testbed will leverage research efforts in broadband services such as telemedicine, distance learning, LAN interconnect and videoconferencing. Work in these areas will be used to determine new traffic control, routing, congestion control strategies, new network architectures and signalling protocol enhancements. The testbed represents the largest ATM switching fabric in Canada and will serve as the cornerstone of the Winnipeg Broadband Research Network.

Network Access - ATM networks for multimedia applications, systems support & performance, copper/fibre and wireless access technologies, spread spectrum, ISDN, and BISDN, video-to-the-home using copper and fibre.

Photonics - high-speed transmission, broadband switching, optoelectronic signal processing, optical backplane, optical sensing, and subcarrier multiplexing, optical switching, fibre/radio interface, hybrid integration, planar optical waveguides, erbium doped waveguides

Networks & Systems - survivable SONET and DS-3 network planning and self-healing protocols, SONET network synchronization and jitter, traffic adaptive networks, VLSI testing & floor planning algorithms, ATM congestion control, advanced multiplexing, active & variable resolution teleconferencing, new service concepts, and DS-1/DS-3 error-correcting VLSI, simulation tools for ring/mesh network design, forward error correction, bandwidth allocation mechanisms.

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Daniel Rusheleau, President & CEO
Roger Magoon, VP, Marketing & Business Devt

Corporate Profile

West End Systems Corp. was founded in 1993 by Daniel Rusheleau of Newbridge Networks. Newbridge Networks Corporation owns 30% share in this privately held company which specialises in developing equipment for broadband local loop applications for telephone and cable companies including hybrid fibre/coax products.

West End's products are in field trial in Europe and United States. In Canada the major telephone companies through the Beacon initiative will be adopting Hybrid Fibre Coax networks as the standard for delivering video-on-demand, banking and shopping services to the home.

The R&D staff will concentrate on real-time system software, high-speed digital design, communications protocols, and protocol conversion mechanisms to allow LAN and WAN X.25 and SNA networks to link into the fast packet frame relay and ATM public networks.

West End's head office is co-located with Newbridge. The R&D facilities are in nearby Arnprior ON. European operations are located in Newport South Wales.

Broadband Products

WestBound 9600 BroadBand Access Platform- Hybrid Fibre/Coax access system which uses digital signal processing to provide WAN/LAN interconnection, loop access & transport of integrated telephony, data and video signals, circuit & packet switching, fractional T1/E1, 512 Mbps non-blocking switching matrix, digital cross-connect and channel grooming. It supports up to sixty DSOs and associated signalling in increments of 1 MHz bandwidth, that can be combined into 6 MHz NTSC channels, (or 8 MHz PAL channels) or multiples thereof to support video-on-demand and other services.

WestBound 9645 BroadBand Manager- a high-capacity bandwidth manager with integral support for information, communication and entertainment services. It supports high order interfaces such as T-3 and E-3, combining the functions of an intelligent channel bank, a digital cross-connect switch, an integral voice and data multiplexer, a high-order multiplexer and a digital loop carrier system. The 9645 provides concurrent circuit and packet switching and can be configured to interwork with a variety of products.

WestBound 9608 Multi Subscriber Drop (MSD)- provides user access to any combination of

information, communication or entertainment services through a unified twisted-pair/coaxial cable drop to the home. Subscribers have access to broadcast, dedicated or switched bandwidth. This allows homes to have combined telephone and television services over the same connection. This product was designed for urban deployment.

WestBound 9601 Single Subscriber Drop- is similar to the MSD but is designed for lower density deployment in rural areas.

WestBound 9696 Network Manager Software- provides advanced management for 9645 and 9608 products (above). Running on a Sun SPARCstation, it delivers network wide, end-to-end control for WAN, Integrated LAN/WAN, frame relay and telephony environments.

9300 Modular Packet Feeder - is a modular system that, from a base of 3 user ports and 1 network port, can grow with additional modules to support as many as 12 user ports. It provides high performance access to X.25, Frame Relay and ISDN networks. Applications include:
- Multi protocol Frame Relay Access Device (FRAD)
- Frame Relay concentration
- X.25 PAD
- X.25 Switched Traffic concentration (XSTC)
- X.25 Encapsulation over Frame Relay
- Managed integration into Newbridge Frame Relay and X.25 networks.

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Doug Kind, President

Corporate Profile

Xinex Labs Inc, incorporated in 1989, is a privately held company that has developed a low cost broadband network that uses cell switching without the overhead of the ATM protocol. The company's objective is to provide products that allow small organizations to broadband network PCs at a cost of less than 15% of the cost of the computers. These products also allow telephone and computer data (including MPEG video, images and sound) traffic over the same network providing a further savings to customers.

In order to meet this objective, the suburban Vancouver based company designs its own hardware, including semi-conductors, and carries out its own surface mount board assembly.

Xinex has filed 6 patents for its technology and MindSet (digital telephones) and Telan are registered trademarks of Xinex Labs. The company will have ISO 9002 certification in summer 1995.

Xinex products are distributed by BCTel and Sprint in Canada. They have dealers in US and other parts of the world. The bulk of the company's sales are in exports to Europe, Middle East and Asia.

Broadband Products

Xinex Labs designs and manufactures the PC network adapters, digital telephones and two versions of the LAN switch for the Xinex TELAN network.

TELAN Switch- 8 telephone lines including support for 155 Mbps SONET, 24 mindSet telephones and PC NICs. Each port has a speed of up to 100 Mbps with interlacing of telephone and computer data.

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Jacques (Jack) Kincler, President

Corporate Profile

Yamatech Scientific is a privately held company that designs, plans, markets and installs complete computer telecommunication networks for the office or factory environments. The company also manufactures board level products for local and wide area networks. Some of these products are developed, manufactured, and marketed by the company, some are supplied to OEMs, and others are jointly manufactured with manufacturers in the field.
YCS, the systems integration division of Yamatech, provides consulting, design, and turnkey integration services to customers worldwide. YCS designs cabling systems, efficient and fault-tolerant WANs; sources all required equipment; performs complete installation and ensures after sales service.

Yamatech has an alliance with Intel to provide value added integration of video conferencing systems over ISDN using Indeo technology.

Yamatech has been successful in developing several board level products which have been distributed to over 15 countries around the world mostly to government and not-for-profit business sector. They market their products using the Internet. They enter into OEM, VAR or distribution agreements for export sales and do not sell directly for exports.

They will integrate systems incorporating Frame Relay, SONET, ATM, FDDI, CDDI, and fibre/coax systems including digital video (MPEG or M-JPEG)and video conferencing based on H.320 and Indeo.

Broadband Products

YCS FDDI- Yamatech has two PC boards which interface to FDDI networks- one for PCI bus and the other for EISA bus.

YCS CDDI- PCI and EISA PC boards to interface to CDDI networks.

YCS 100BaseT -PCI and EISA boards that use Fast Ethernet protocol.

It also has LAN products based on the ARCNET, Ethernet, and Token Ring.

These products run in the ISA, EISA, and Micro Channel bus, as well as the full range of Macintosh computers and under such operating systems as Novell's NetWare, UNIX, Banyan

Vines, LAN Manager, and AppleTalk. Media supported are coaxial, twisted pair, and optical fibre. Cabling systems such as 10Base-T for Ethernet and IBM Type 1 or Type 3 for Token Ring are fully supported. Yamatech also offers a selection of OEM WAN products including bridges and routers to allow for the full configuration of large networks.

DATE DUE
DATE DE RETOUR
