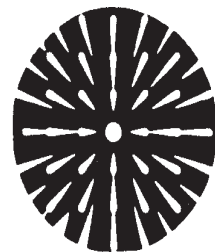


FIBER OPTICS and COMMUNICATIONS

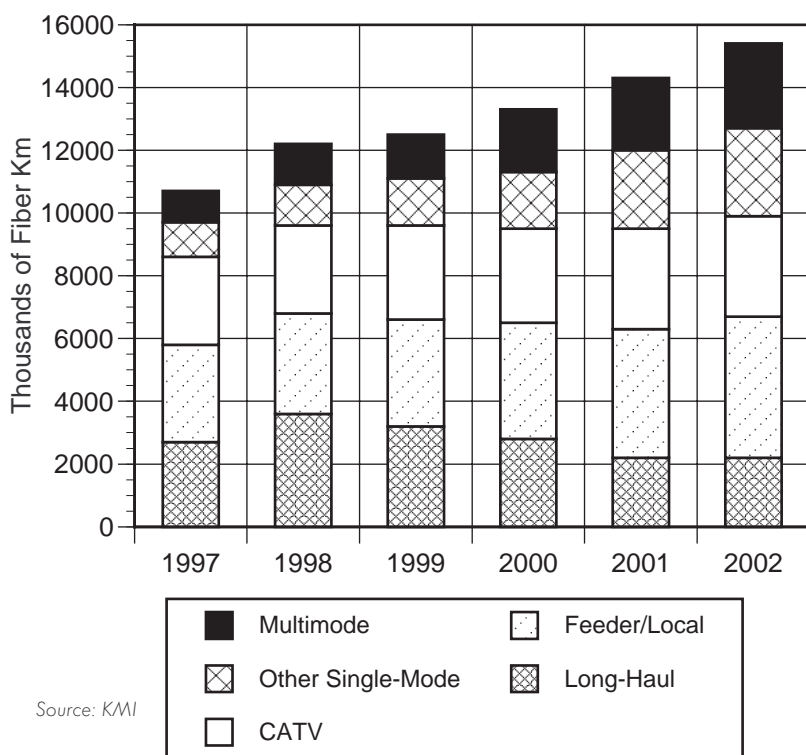


Monthly Newsletter Covering Domestic & International News on Fiber Optic Communications and Related Fields

Vol. 22 No. 1

January 1999

US Fiber Optic Cable Market By Application Volume, 1997-2002



In This Issue...

Tyco Submarine Systems to Upgrade Global Crossing's AC-1 Cable System 4

Ericsson Selected by BT to Provide DWDM Transport Solutions 8

GST Wins DARPA Contract to Construct Next-Generation Internet Network 12

Optical Cable Corp. Announces Plans to Establish Internet Subsidiary 16

RCN Continues to Blaze Competitive Trail in Local Phone, Cable Markets 20

GlobeNet Communications Group Ltd. Announces Launch of the ATLANTICA Cable Network

GlobeNet Communications Group Ltd., a Bermuda-based, facilities-based international telecommunications carrier and the owner and operator of the BUS-1 submarine cable system through

Fiber Optics and Communications Newsletter is published monthly by Information Gatekeepers, Inc. 214 Harvard Avenue, Boston, Massachusetts 02134, USA. Fax: (617) 734-8562. Editorial telephone: (617) 738-8088.

Circulation telephone: (617) 232-3111. (800) 323-1088 (Outside MA)

Publisher/Editor: Dr. Paul Polishuk **Managing Editor:** Nomi Burstein

Circulation Mgr: Roberta Hirschfield **Subscription rates:** \$595 dollars per year in the US and Canada; \$650 per year elsewhere.

Discounts available for multiple subscriptions.

© Information Gatekeepers Inc. 1999. All rights reserved. (ISSN 0275-0457)

No part of this publication may be reproduced, stored in a data base or transmitted without prior written permission of the publisher.

For photocopying authorization information, contact the Copyright Clearance Center, 222 Rosewood Dr., Danvers, MA 01923, Tel: (508) 750-8400.



its wholly-owned subsidiary, TeleBermuda International Ltd. (TBI), recently announced the development of the ATLANTICA cable network. This network will provide direct connectivity between North America, South America and Europe. ATLANTICA-1, the first phase of the ATLANTICA network, will interconnect New York, Bermuda, Brazil, Venezuela and Florida by extending the BUS-1 cable system, which connects Tuckerton, NJ, and Bermuda. ATLANTICA-1 will utilize advanced fiber optic cable technology combined with WDM channels technology, and it is designed as a self-healing ring to provide up to 320 Gbps of service capacity over two fiber pairs. The full ATLANTICA-1 network will be comprised of approximately 15,000 km of optical fiber cable and five landing points in four countries.

ATLANTICA-1 is a private investor-owned system, offering attractive and flexible capacity purchase packages. TD Securities Inc. serves as GlobeNet's financial advisor on the ATLANTICA-1 project and will lead the overall financing activities. The initial lead investor is TD Capital Group.

ATLANTICA-1 is the first private system to be deployed between North America and Brazil and will address pent-up demand for bandwidth that has been driven by a number of factors, including the explosive expansion of the Internet/data market, the continuing global deregulation of the telecommunications industry and the privatization of government-owned telecommunications enterprises. Current demand forecasts indicate an annual growth rate of 75-100 percent for capacity in both North and South America. This is being driven by the exponential growth in Internet users, increasing by close to 100 new users per month in Latin America. In addition, pent-up demand for telephony services will generate significant bandwidth requirements. Teledensity growth rates for Brazil alone are predicted to increase 10-30 percent by 2003.

The ATLANTICA-1 cable network will be accessible to customers both at the cable landing stations and in major cities via prearranged backhaul facilities. GlobeNet will undertake, as part of the ATLANTICA-1 project, to provide independent backhaul facilities to key major cities. Initial targeted cities are Miami, FL, Atlanta, GA, Boston, MA, New York, NY, Caracas, Venezuela, São Paulo and Rio de Janeiro, Brazil, and major European business centers in western Europe via TAT-14 extensions. In Bermuda, capacity will be provided at TBI's cable station in St. David's, where foreign companies can set up hubbing operations for least-cost routing and electronic-commerce activities, taking advantage of the favorable tax regime and secure telecommunications services made possible in Bermuda with ATLANTICA-1.

The system design contemplates ATLANTICA-1 being interconnected with several existing and planned cable systems at each of its landing points. In particular, ATLANTICA-1 will be interconnected with TAT-14 at Tuckerton, which provides connectivity from the US to Northern Europe; with ARCOS in Florida and Venezuela, which provides connectivity throughout the Caribbean; and with PAN-AMERICAN and MAYA-1 in Venezuela, providing connectivity between South and Central America. ATLANTICA-1 is expected to be ready for service (RFS) by the end of 2000. The completion of the ATLANTICA network contemplates the addition of the ATLANTICA-2 cable by the year 2002, which will connect Bermuda with Spain, Portugal, Italy and the UK, in a collapsed ring formation that will be integrated with ATLANTICA-1.

GlobeNet, through TBI, has been providing a full range of international telecommunications services in Bermuda since April 1997. It currently carries over one-third of all traffic generated in Bermuda and is rapidly establishing the necessary infrastructure to position the island as a premier offshore location for supporting the explosive growth in electronic commerce.

Corning Inc. Takes Legal Action Against Fibercore Ltd. for Infringing Corning's Optical Fiber Patents

Corning Inc. announced that it has filed suit against Fibercore Ltd. of Southhampton, Hampshire, UK, for infringing two of Corning's optical fiber patents and for unfair competition. Corning filed suit in the Northern District of Illinois in Chicago. Corning is seeking an injunction and unspecified damages.

According to Corning officials, Fibercore Ltd. has been using Corning's US Patents 4,339,173 and 4,447,489 to manufacture optical fiber and then sell that fiber in the US. The first of these patents is related to Corning's invention of silica-based fiber containing germania and phosphorus. US Patent No. 4,478,489 relates to one of Corning's polarization-maintaining fiber inventions.

The unfair competition claim relates to Corning's assertion that Fibercore is misleading customers to believe they are not purchasing infringing fiber from Fibercore by posting on its Intent Website "Corning has no quarrel with Fibercore Ltd."

APPLICATIONS**Space Launch Transmits Digital TV**

For the first time ever, a space shuttle launch was recorded and transmitted in digital format over fiber. The transmission was the first all-digital transmission where the camera sends a digital signal, and the only conversion to analog takes place at the TV. Total digital transport eliminates linear waveform distortions due to the processing gear and transport gear.

Force Inc.'s DTVLinx series Model 2653 serial digital components video transmission links were used to transport the signal from the transmission center over NASA fiber to NASA Headquarters and the VIP Center. The Model 2653 handles NRZ asynchronous data rates of 1.5 Gbps up to a distance of 50 km. The DTVLinx product line was designed to offer a direct SMPTE 292M-compatible interface. The unit is designed for broadcast applications such as intra-studio contribution quality, studio to post-production, switched digital video networks, network affiliate STL links, final production distribution, D-1/D-5 camera-to-deck remoting, and D-1/D-2/D-3/D-5 deck-to-deck remoting.

Cameras at the transmission center record the activity on the launch pad. This video, along with audio sources, are run into a video/audio multiplexer for embedded AES/EBU audio. The resulting signal is then sent into the Force Model 2653 transmitter where it is converted into an optical signal. This system has two optical transmission paths - one goes to NASA Headquarters and the other to the VIP Center. Each path uses a DTVLinx Modem 2653 fiber optic transmission link. The video signals run over NASA fiber and are received by the Force Model 2653, which converts the optical signal back into an electrical signal. The resulting electrical signal runs through a video/audio demultiplexer. The only digital-to-analog conversion takes place after the signals are demultiplexed, resulting in component video to the remote-location TV.

UNDERSEA**Project OXYGEN Landing Parties Meet to Finalize Agreements**

Seventy-five representatives from approximately 50 Project OXYGEN landing parties met in Barcelona, Spain, recently to finalize Landing Party Agreements for the construction of the OXYGEN

network. By the end of the meeting, agreements for nearly two-thirds of the 99 landing points in the full first phase of the network were either signed or ready for final approval by the landing parties' management. This was the largest meeting for submarine cable landing parties ever held.

During the meeting, representatives of landing parties and Project Oxygen Ltd. negotiated technical and commercial issues in such areas as the construction of landing sites, design and construction of terminal stations, installation and maintenance of the network, applications for landing licenses and customers clearances, establishment of systems and procedures for backhaul and restoration, and coordination and oversight of all of these activities.

The Landing Party Agreements, signed or ready for final approval, include those for the entire Phase 1A1 of the network, a 25,644 km Atlantic ring scheduled to begin operation in late 2000. This sets the stage for the construction of the network, to begin in early 1999.

PROJECT OXYGEN will be the world's first global, primarily undersea, fiber optic network, with a fully switchable point-to-multipoint design and a minimum capacity of 640 Gbps per segment. Cable installation is scheduled to begin in 1999, with the major transatlantic and transpacific links operational in 2000 and 2001, respectively.

The completed first phase will be comprised approximately 168,000 km of fiber optic cable. Estimated to cost more than \$10 billion, it will connect 99 landing points in 78 countries and locations across six continents and will be completed in early 2003.

Tyco Submarine Systems to Upgrade Global Crossing's AC-1 Cable System

Tyco Submarine Systems Ltd. has signed a contract valued at approximately \$50 million with Global Crossing Ltd. to increase the capacity of its ATLANTIC CROSSING (AC-1) cable system. The AC-1 system is the first project originally designed for in-service upgrades to double its installed capacity for in-service from 40 Gbps to 80 Gbps. Full city-to-city connectivity of voice and data communications over its first segment is already in service between the US and the UK.

North American Gateway Buys US\$200 Million in Project Oxygen Capacity

North American Gateway Inc. has agreed to purchase US\$200 million worth of capacity on Project OXYGEN Network, the global optical fiber undersea cable network, over the next few years.

North American Gateway and Project Oxygen Ltd. officials, who reached a preliminary agreement on the purchase during the Project OXYGEN Data Gathering Meeting held in Rome, Italy, September 7-9, 1998, recently signed an agreement in Toronto, Ontario, Canada.

North American Gateway is an international service provider based in Toronto, with offices in the UK and the US. The company has grown rapidly in the last four years, providing competitively priced international telecommunications services to other service providers in Canada and the US. North American Gateway plans to begin offering both retail and wholesale services in the UK and other European countries in the near future.

The US\$200 million capacity purchase will give North American Gateway 100 Gbps of capacity to use between any two landing points on the OXYGEN network. The first part of the OXYGEN network to be constructed will be a 25,644 km Atlantic ring linking 22 landing points in North and South America, the Caribbean and Europe and is scheduled for completion in late 2000. The entire first phase of Project OXYGEN, which will be completed in early 2003, will connect 99 landing points in 78 countries and locations and will link six continents.

Project OXYGEN Ship Supplier Selected

Project Ozone Ltd. has selected Daewoo Heavy Industries Ltd. of Seoul, Korea, to supply cable ships for the maintenance of Project Oxygen Network, the global optical fiber undersea cable network. The companies have begun detailed commercial and technical negotiations aimed at finalizing a supply contract in the near future.

The contract will call for an original order of six ships, with options to buy up to a total of 23 vessels as further phases of the network are built. The ships will be stationed at strategic locations that will enable them to quickly reach and repair undersea cable making up the OXYGEN network. Project Ozone Ltd. will supply the repair service under contract to Project Oxygen Ltd., the company building and operating the network.

Daewoo was chosen from a short list of three companies. The three had been selected from among 16 ship builders throughout the world that submitted bids for the contract. "We have selected a builder who has a worldwide reputation for excellence and meeting deadlines," said Larry Cahill, president of Project Ozone Ltd. "As with all elements of the OXYGEN network, a top-quality provider has been selected to serve our users' needs."

The ships are each 127 m in length, with a weight of 8,000 deadweight tons. They will have a cargo-carrying capacity of 4,500 tons and will be capable of carrying remotely operated undersea vehicles (ROVs).

The ships will include features never before available on cable ships. They will use state-of-the-art LANs connecting computers containing information such as cable repair and ship operation data. This is the first time on-board LANs have been connected to ship propulsion systems. This is also the first time that each ship will have a real-time video feed, which will allow the OXYGEN network owners to observe repair operations over the Internet.

Global Crossing Secures German Rights-of-Way and Conduits for PEC System

Global Crossing Ltd. announced that it has secured rights-of-way in Germany for its PAN-EUROPEAN CROSSING (PEC) network. Global Crossing has entered into an agreement with GasLINE, a joint venture of 15 German natural gas distribution companies, to provide and construct conduits connecting all major German cities on PEC and the associated crossborder links.

Securing German rights-of-way and conduits marks a significant step in the development of Global Crossing's state-of-the-art fiber optic PEC system, being developed to connect the top metropolitan centers in Europe with the US, Asia and Latin America.

Global Crossing's CEO, Jack M. Scanlon, said, "With this agreement, we have secured the rights-of-way to the key German cities of Frankfurt, Hamburg, Dusseldorf, Koln and Hanover. This will allow us to provide connectivity to these cities ahead of our previously-announced schedule."

Under the agreement, Global Crossing will receive the following:

- Dedicated long-term rights of use for GasLINE's conduit network in Germany connecting the major cities of Hamburg, Hanover, Dusseldorf, Koln and Frankfurt with a total length of approximately 1,200 km

- Provisional dark fiber capacity from Hamburg to Strasbourg and their connection with other parts of the network

- The option to extend the network in Germany to connect to additional cities such as Berlin, Munich and Stuttgart

- Procurement and installation of cable
- Sites for repeater and regenerator stations, telehouses and POPs

Global Crossing's PEC system will interconnect 18 European cities, including London, UK, Amsterdam, the Netherlands, Frankfurt, Germany, and Paris, France, with initial service targeted for 1999. In October 1998, Global Crossing reached an agreement with VersaTel for rights-of-way and conduits for the Netherlands and Belgium.

JAPAN-US Cable Network Announces Capacity Sales Program for Carriers

The JAPAN-US Cable Network has announced a special capacity sales program in which the consortium will provide an opportunity for additional carriers to acquire network capacity on an ownership basis.

The sales program provides an opportunity for carriers wishing to acquire capacity on the network. Wholly-owned, self-healing STM-1 (155 Mbps) rings are currently available for ownership through March 15, 1999, or until the limited capacity sales pool is depleted, whichever happens first.

TSSL Signs Contract for the Upgrade of Global Crossing's AC-1 Cable System

On December 10, 1998, Tyco Submarine Systems Ltd. (TSSL) announced that it has signed a contract valued at approximately \$50 million with Global Crossing Ltd. (GCL) to increase the capacity of its ATLANTIC CROSSING (AC-1) cable system.

The AC-1 cable system is the first project, originally designed for in-service upgrades, to double its installed capacity from 40 Gbps to 80 Gbps. Full city-to-city connectivity of voice and data communications over its first segment is already in service between the US and the UK.

As a result of the unprecedented demand for transatlantic service, this upgrade has been contracted even before the entire network is complete. "The upgrade of AC-1 is the most recent example of the explosive growth and increased demand for undersea cable capacity. TSSL is committed to supporting Global Crossing as its network expands, and it is currently planning upgrades for a number of other TSSL customers throughout the world," said Neil Garvey, president of TSSL.

INTERNATIONAL

AT&T Canada Brings Long-Distance Competition to Quebec

AT&T Canada Long Distance Services Co. recently began offering voice long-distance services to business and residential consumers across Eastern Quebec.

AT&T Canada is delivering the same high-quality customer service and overall total value that have helped to build its strong reputation with customers throughout the country. For residential consumers, AT&T Canada offers a range of savings plans to choose from, including an unlimited long-distance plan, DimeTime Unlimited, offering 10 cents per minute evening and weekend calling rates across Canada, to a maximum of C\$20.

The following options can be combined with any AT&T Canada savings plan:

- Rewards programs such as Aeroplan, Zeller's Club Z and, coming in April 1999, Air Miles, which will allow customers to earn miles or points based on their monthly long-distance spending
- For overseas callers, customers can select the My Country option of low per-minute rates to

the customers' countries of choice, for example, 39 cents per minute to France or 45 cents per minute to Germany, anytime of day.

AT&T Canada will begin serving the business community of Eastern Quebec with its Unison voice long-distance service. Unison gives customers the freedom to configure their long-distance service to suit their particular requirements. Customers can choose from a variety of features designed to save money, simplify billing and give them greater control over calling options.

Denis Trudeau, AT&T Canada's vice president for Quebec, said that AT&T Canada will begin offering its portfolio of toll free (800/888) services early next year. These business applications are delivered over AT&T Canada's coast-to-coast, fiber optic and digital microwave network, the only truly national network in Canada.

Over the past two years, AT&T Canada has invested heavily in expanding and improving this network, which is now powered by the very latest technology and incorporates the most advanced design features on the market today, according to the company.

Nortel Networks Acquires Cambrian Systems Corp. for \$300 Million

Nortel Networks will acquire Cambrian Systems Corp., a privately-held fiber optic company based in Kanata, Ontario, Canada, for \$300 million. The acquisition is expected to close within 30 days and comes three months after their acquisition of Bay Networks. Rival Newbridge Networks Corp. has agreed to sell its 40 percent stake in Cambrian but would continue to have access to Cambrian's key DWDM products.

Upon completion of the acquisition, Nortel Networks will combine its optical technology with Cambrian Systems' OPTera product line to deliver ring-based DWDM solutions for metropolitan applications.

JDS Fitel Inc.'s Stock Falls 9.3 Percent After 52 Week High

Stock of JDS Fitel, a Canadian producer of fiber optic components, finally dropped a bit, despite recently announced expansion plans. JDS will construct a 239,000 square foot research and development manufacturing facility at its site in the Ottawa suburb of Nepean. The stock recently reached a 52 week high of \$34.95 but has fallen 9.3 percent since.

Akzo Nobel Divests Photonic Business to JDS Fitel

Akzo Nobel has signed an agreement to divest the assets of the Akzo Nobel business development photonics project to JDS Fitel Inc. of Canada. The divestment is in line with Akzo Nobel's strategy of concentrating on innovations that fit or enhance the company's main product market combinations, Akzo said.

"The waveguide technology developed at Akzo Nobel Photonics will further strengthen our ability to address network functionality issues as optical networks continue to grow in complexity," said Jozef Straus, president and CEO of JDS Fitel Inc.

"By adding this technology to our portfolio, we will enhance our ability to address customer requirements from a multitude of technologies, further strengthening our position as a one-stop shop in optical networking," said Straus.

Tellabs Supplies MetroRED with Access Technology for its Fiber Optic Network in Argentina

Tellabs announced that it will supply access technology to MetroRED for its business services network in Buenos Aires, Argentina. MetroRED will employ Tellabs' Matris DXX system for its optical fiber access network for low- and medium-capacity data transmission links.

MetroRED is one of Argentina's main data transmission suppliers, providing links for medium- and low-speed data transmission, high-speed transmission in SDH and LAN network interconnections in campus mode and ring ATM at 155 Mbps.

Corning Acquires Partnership Interest of Optical Fibres from BICC

Corning Inc. announced that it is acquiring the remaining 50 percent equity ownership of Optical Fibres from BICC PLC of London, UK, for consideration of approximately \$70 million. This consideration includes a cash payment of \$44 million and the assumption of BICC's guarantee of half of Optical Fibres' debt. Currently, Corning and BICC each own 50 percent of Optical Fibres, having jointly established the partnership in 1981. As a result of the acquisition, Optical Fibres will become a wholly-owned subsidiary of Corning Inc. In addition to the sale, Corning and BICC have entered into certain long-term arrangements to advance the deployment of Corning optical fiber and BICC optical cable in several important international markets.

Optical Fibres, located in Deeside, North Wales, UK, produces single-mode optical fiber for optical cable manufacturers worldwide. Corning's other 50:50 equity company with BICC, Optical Waveguides Australia (OWA), will be unaffected by this transaction.

Ericsson Selected by BT to Provide DWDM Transport Solutions

Ericsson announced that it has been selected by British Telecommunications PLC (BT) to provide transport solutions for the carrier's UK international backhaul network to manage the explosion in bandwidth demand. The contract will form the basis for the next major step in managing both BT's domestically generated and overseas data information into the next century.

The enormous invasion of information through the telecommunications network is based on the accelerated use of the Internet, graphics and video communications now finding commercial applications, and global business that emphasizes global telephony. The potential for bottlenecks in international cables and within international backbone networks poses a major challenge to telecom operators such as BT - particularly with the recent surge in Atlantic cable deployments scheduled to reach land in 1998. By working in partnership with Ericsson Ltd. in the UK and the Ericsson business unit Transport and Cable Networks, a solution has been created for BT. From the Ericsson Transport Network Architecture (ETNA), a package of solutions has been chosen that will include Ericsson's STM-16 ADMs, 4/4 Synchronous crossconnect systems, network management systems and dense WDM (DWDM) technology.

DWDM enables carriers to use the same fiber with far more capacity by splitting light into wavelength components, each one acting as an individual channel. Ericsson Optical Networking solutions (ERION), which will be deployed by BT, offers the first scalable DWDM system.

Cable & Wireless to Buy Fiber Optics

Expanding its presence in Europe, Cable & Wireless of the UK has agreed to buy more than US\$100 million worth of fiber optic lines from Global Crossing Ltd., a small international communi-

cations carrier that went public in August 1998, said executives close to the deal.

The companies could announce an agreement, which the executives said could be worth up to US\$400 million, at any time.

Cable & Wireless is also interested in acquiring more than US\$300 million worth of high-capacity communications pipes in the US from Qwest Communications International and possibly other carriers. Coming after the acquisition in July 1998 of MCI's Internet business for US\$1.75 billion, the British company's aggressive moves to expand its network on both sides of the Atlantic could give it a big boost in its rivalry with MCI Worldcom and British Telecom.

Irish Operator Selects Tellabs for Broadband Deployment; Telecom Eireann Delivers Internet and Other Solutions with MartisDXX Solution

Tellabs announced that Irish public network operator Telecom Eireann will deliver multiple high-speed services throughout Ireland over a new SDH access network using the Tellabs MartisDXX-managed transport and access network system.

The SDH network deployment project, already under way, involves the installation of STM-1 fiber rings around each town in Ireland, with multiple rings in larger towns and cities. The first fiber ring was installed in Enns, County Clare, dubbed Ireland's "Information Age Town," in which homes, businesses and schools will have access to broadband communication services such as high-speed Internet access and videoconferencing.

Services to be delivered over the new network are high-speed (2 Mbps) leased-line, frame-relay, ISDN, LAN interconnect and PBX interconnection services. Telecom Eireann already uses the MartisDXX solution for the provision of its existing 64 Kbps and Nx64 Kbps digital leased-line services.

Lucent Technologies Secures DWDM Contracts with European and Asian Service Providers

Lucent Technologies announced that it will supply more than US\$90 million worth of dense wavelength division multiplexing (DWDM) systems to four service providers across Europe and Asia.

Included in these contracts are the Netherlands' national communications company, KPN Telecom BV, Spain's Telefonica de España, Korea Telecom in Korea and the Posts and Telecommunications Administrations in several provinces in China, who will deploy Lucent's systems to increase network capacity or evolve to digital networks for voice and data.

Lucent will be the exclusive supplier of backbone DWDM systems to Korea Telecom, which will deploy Lucent's 16 channel WaveStar system between Seoul, Daegu, Daejeon, Kwangju and Pusan.

Lucent signed contracts with the Guangdong PTA for the use of the WaveStar OLS 80G DWDM on its provincial backbone and with the Jiangsu PTA for the supply of ADMs, DXCs and NMS to double overall capacity of its network. Telefonica will make its first national installation of DWDM using the WaveStar OLS 80G on the 540 km optical link, which was originally built for the Barcelona Olympics by PKI, between Madrid and Seville, Spain. Lucent valued the combined Asian contracts at approximately US\$25 million but did not give a figure for the Spanish contract.

GTS to Acquire Esprit to Form US\$4.1 Billion Euro-Operator with US\$482 Million in Sales

Global TeleSystems (GTS) of McLean, VA, an independent owner and widely diversified operator of telecommunication services throughout Europe, has made an offer in stock for all the shares

of Esprit Telecom of Reading and London, UK, a pan-European operator currently building a 9,000 route km SDH and dense WDM (DWDM) fiber optic network through six European countries, with links to Washington, DC, and New York, NY, through a transatlantic circuit owned by other carriers. Esprit's shares were valued at \$37.16, a 22.8 percent premium to their market value, on December 7, 1998. Combined, the two groups would be capitalized at approximately US\$4.1 billion, have 3,000 employees, 35,000 customers, annual sales of approximately US\$482 million, own 9,200 km of currently operational European backbone fiber, offer a wide range of services and be operational in 12 European countries.

By the end of 1999, the Hermes Europe Railtel B.V. network is planned to be deployed in 16 countries and 45 cities, totaling 18,000 route km.

Esprit Telecom Accelerates Pan-European Broadband Network

Esprit Telecom Group PLC, an independent European telecommunications company, announced that its entire pan-European optical fiber network, a 9,000 km system covering six European countries with direct connections in 14 major cities, will be complete and operational by mid-1999, which is six months ahead of schedule. The company also announced that the network will be managed by a new independent business unit called Esprit Telecom Networks Ltd.

Esprit Telecom Group PLC said that it has contracted with Nortel Networks for the financing of SDH and dense WDM (DWDM) equipment and network development services for the roll out of the Esprit Telecom network. On October 19, 1998, Esprit selected Nortel Networks as a single supplier for the development and implementation of the remaining phases of its network.

Esprit Telecom Networks builds, manages and sells carrier's carrier services along Esprit Telecom's pan-European broadband fiber network. The network stretches 9,000 route km across six European countries, with origination/termination POPs in 14 European cities - Amsterdam, the Netherlands, Antwerp and Brussels, Belgium, Barcelona and Madrid, Spain, Bordeaux, Lille, Lyon, Paris, Strasbourg and Toulouse, France, Dusseldorf and Frankfurt, Germany, and London, UK. The network, which is 90 percent leased fiber, will run at speeds of 2.5 Gbps (STM-16) to 10 Gbps (STM-64) and will use advanced SDH transmission and equipment supplied by Nortel Networks.

The 1,275 route km London-Paris network (Ring 1) became operational in April 1998. The 1,230 route km France-Belgium-Netherlands-UK network (Ring 2) was completed recently and will go into service in January 1999. The Netherlands-Germany-France network (Ring 3), the French national network (Ring 4) and the Spanish national network (Ring 5), measuring a combined 7,220 route km, will be completed by mid 1999.

Ericsson Chosen by Telefonica S.A. to Increase the Capacity of Transport Network

Ericsson has been chosen by Telefonica S.A. to expand the company's existing network capacity. The solution is based on DWDM technology, which uses optical signals with different wavelengths in order to increase the capacity of the optical fiber.

One year ago, Ericsson signed the first contract for the supply of its optical networking system, which is called Ericsson Optical Networking (ERION), with Telecom Finland, which is now called Sonera. It was one of the first DWDM technology installations in Europe.

Telefonica has chosen an expandable 16-32 channel system, called ERION Networker, with applications including point-to-point and self-healing rings.

Colt Opens for Service in Milan, Italy, with Nortel as First Customer

As of September 30, 1998, US-owned, London, UK-based pan-European business fiber network telco Colt Telecom Group, which currently serves the financial and business centers of 12 European cities, including Milan, Italy, had installed 1,064 route kms of fiber optic cable, provided 1,216,000 private wire voice-grade equivalents, had 1,908 buildings connected to its networks, 1,913 directly-connected customer accounts and planned to be providing service in 24-26 cities by the end of 2000.

Colt confirmed that its Italian subsidiary had launched its international switched voice service for customers in Milan and that its first customer was Nortel Networks. Once the relevant interconnect testing had been completed on the basis of the national license awarded to it, Colt would start to provide local and national switched services as well.

China's First WDM Fiber Optic Trunk in Use

The Xi'an-Wuhan fiber optic trunk, a key communications project in China's Ninth Five-Year Plan (1996-2000), was put into operation recently in Wuhan.

The inter-city optic trunk is the first of its kind equipped with WDM technology.

The operation of the WDM fiber optic trunk jacks up capacity from 700 circuits to tens of thousands of circuits.

Global Crossing and Marubeni to Build Terrestrial Fiber Optic Network Connecting the Major Cities in Japan

Global Crossing, a provider of worldwide fiber optic telecommunications networks, and Marubeni Corp. of Japan recently announced that definitive documentation has been signed for the formation of Global Access Ltd. (GAL) to construct a terrestrial fiber optic network for Japan. Global Crossing will own 49 percent of GAL, an increase from the originally contemplated 35 percent ownership, and Marubeni will retain a 51 percent interest in the company. The network of approximately 1,200 route km will link Tokyo, Osaka and Nagoya and with the cable stations of PACIFIC CROSSING (PC1), thus linking these cities to the US, Europe and Latin America. The three cities constitute more than 90 percent of Japan's international telecommunications traffic. Construction started in September 1998 for the US\$110 million project, with network operation expected to begin in the first quarter of 2000.

This is the second terrestrial network announced by Global Crossing. In October 1998, the company announced PAN EUROPEAN CROSSING, a terrestrial network interconnecting 18 European cities to each other and to the GLOBAL CROSSING global network.

OzEmail Joins Canberra Broadband Network

OzEmail Ltd., a provider of comprehensive Internet services in Australia, has announced that it is providing high-speed Internet access services as a partner in the TransAct Broadband Communications Pilot in Canberra, Australia's national capital.

"This pilot will demonstrate the future of high-bandwidth services to the home," said OzEmail's CEO, Sean Howard. "For OzEmail, working with the Australian Capital Territory Electricity and Water Corp. [ACTEW] to provide Internet access reflects our commitment to bringing the Internet into all homes at a speed and performance [level that] will ensure it becomes a part of daily life."

The ACTEW is provisioning a full-service network in Aranda, a suburb of Canberra, as the first

stage in establishing a citywide network providing high-speed, high-performance connectivity to all homes in Australia's capital. The pilot is designed to test the technical performance of the fiber optic network before it is rolled out across Canberra. Participants in the pilot will be using the fastest domestic network currently available in Australia, operating at speeds of 10-20 Mbps. The services available will include telephony, video-on-demand, videoconferencing and on-line content and data services.

OzEmail is working with AdvaTel in establishing efficient and economic deployment strategies for its network expansion to support the ACTEW pilot. OzEmail is deploying AdvaTel-supplied xDSL technology used for high-speed services over telephone lines, in the absence of fiber.

BUSINESS

Global Crossing Offering of Preferred Stock

Global Crossing Ltd. has announced that its subsidiary, Global Crossing Holding Ltd., is in the process of completing its unregistered offering for \$500 million aggregate principal amount of 10.5 percent Senior Exchangeable Preferred Stock, due in 2008. The preferred stock was issued on December 2, 1998.

The net proceeds from the offering are expected to aggregate approximately \$483 million. The net proceeds from the offering will be used by Global Crossing principally to fund investments in projects that will complement its announced digital fiber optic cable systems and for general corporate purposes. The preferred stock has not been registered under the Securities Act of 1933, as amended, and will be offered and sold pursuant to Rule 144A under that Act.

GST Wins DARPA Contract to Construct Next-Generation Internet Network

GST Telecommunications Inc., in conjunction with the National Transparent Optical Network (NTON) Consortium, announced that GST will provide the West Coast network backbone of the Next-Generation Internet (NGI) SuperNet Program as part of a multiagency program being led by the US Department of Defense's Advanced Research Projects Agency (DARPA).

GST, along with members of the NTON Consortium, which includes Nortel Networks, Lawrence Livermore National Laboratories and Sprint Communications, is responsible for managing a research and development platform for developing and showcasing high-bandwidth applications and field testing emerging technologies, including new optical devices, new protocols and new management paradigms. The West Coast network will span from Seattle, WA, to San Diego, CA.

GST will serve as the access point to the backbone for each of the organizations conducting research on the network. Nortel will deploy prototype switches and routers to sample advanced architectural concepts. The NGI project is valued at more than \$10 million over the next three years.

SuperVision Signs Marketing and Joint Development Agreement with Cooper Lighting

SuperVision International Inc., a manufacturer of fiber optic lighting systems, has entered an agreement that gives Cooper Lighting exclusive marketing and distribution rights in North America for SuperVision's fiber optic products serving the architectural lighting market.

Under the terms of the agreement, Cooper will acquire approximately 10 percent of SuperVision's outstanding stock for \$2 million and receive a seat on SuperVision's board of directors.

Pirelli to Supply WDM Fiber Optic Equipment to Frontier Corp.

Pirelli SpA announced that its cable and systems division secured a contract from Frontier Corp. to supply hyper-dense WDM fiber optic cables to the company's US Frontier Communications unit. Its cables would be used by Frontier to connect 20 of the US' largest cities. At this time, no financial details regarding the contract have been disclosed.

NEC Launches Eluminant Technologies for Development of Next-Generation Broadband Access Products

NEC America Inc.'s access products division (APD) has been spun off into a new individual corporation called NEC Eluminant Technologies Inc. This company will continue to market and support APD's established product lines of asynchronous multiplexers, digital-loop carrier systems and SONET multiplexers.

NEC provided the financing for the new company and will be represented on eLUMINANT's seven member board. Curtis L. Benton, who has held senior executive positions with AT&T and Westell Technologies, has been named president and CEO of eLUMINANT.

The company's product line, which is sold primarily to local-exchange carriers who install the products as part of their access networks, include multiplexer products that combine low-bandwidth signals into a higher-bandwidth signal and are used to connect central offices and to provide services from the central office to the subscriber, digital loop carrier systems that consolidate subscribers' copper pair lines into higher bandwidth circuits and SONET multiplexer products that use newer digital technology for greater flexibility and better command and control features.

RCN Reports Record Results for Third Quarter '98

RCN Corp. recently reported third-quarter results for the period ending September 30, 1998, reflecting record revenues and strong increases in both advanced fiber connections and homes passed. RCN's pro forma total revenues for the quarter were \$68.6 million, up more than 15 percent from the previous quarter. For the nine months ended September 30, pro forma total revenues were \$171 million, up more than 86 percent from \$91.8 million over the same period a year ago.

Advanced fiber optic network connections grew 72 percent to 82,842 in the quarter ended September, from 48,212 at the end of June. On-net voice, video and Internet connections increased 83 percent, 66 percent and 131 percent, respectively. Total customer connections increased 98,199 to 808,177.

RCN's homes passed increased to 213,983 in September, an increase of 91,006, or 74 percent, from the previous quarter. Homes passed is an important construction measure of the company's advanced fiber rollout. Additionally, RCN has begun to report marketable homes, which represents the segment of homes passed that are being marketed the full suite of on-net products. The distinction between homes passed and marketable homes recognizes the transition from network construction to service penetration. As of September 30, marketable homes were 181,353, an increase of 70,166 from the second quarter of 1998.

Williams Declares Intention to Enter Switched Services Market in 1999

Williams recently announced that it will provide switched voice services, including a full suite of long-distance services, to the wholesale carrier and reseller market using Nortel Networks' high-speed

voice and data switches.

The company plans to make switched services available nationwide by June 1, 1999. Williams, under the trade name WilTel, had become the leading provider of wholesale switched services by 1995, until the sale of that business unit to LDDS/WorldCom in January of 1995.

“The current long-distance market in the US is approaching \$100 billion, of which the wholesale segment represents roughly 20 percent, and is projected to grow at a compound rate of 21 percent each year for the next three years. Switched long-distance services are an integral part of our commitment to offering a comprehensive set of products and services to our wholesale customers,” said Gordon Martin, senior vice president of sales and marketing for the Williams network.

Williams plans to use Nortel Network’s DMS-250 long-distance switching system, which includes integrated OC-3 and ATM bunking capability and the Service Builder Intelligent Networking portfolio in its backbone network.

Williams has one of the largest nationwide fiber optic networks in the US, reaching 18,000 miles and 63 cities in 1998, and is scheduled to expand to 32,000 miles connecting 120 cities by the end of 2000. The network being constructed employs the latest in fiber optic technology and won the top award at SuperComm ’98 for innovative network design.

Williams is the first carrier to introduce a fully-integrated multiservice broadband network. This next-generation architecture couples intelligent switches with an ATM backbone to give Williams’ customers a full feature set over the platform they choose.

Using OC-192 transport systems with dense WDM (DWDM), the Williams network delivers up to 160 Gbps in 16 waves on a single fiber. Williams typically installs 96-144 fibers in every Williams build with multiple conduits, leaving open conduits to meet future needs.

Uniphase Acquires Broadband Communications Products Inc.

Uniphase Corp. announced that it has acquired Broadband Communications Products Inc. (BCP) of Melbourne, FL. BCP designs, develops, manufactures and markets high-performance fiber optic transmitters and receivers and test instrumentation for manufacturers of telecommunications systems and related equipment. Broadband Communications Products will be operated as a business unit of Uniphase under the name of Uniphase Broadband Products. BCP has 79 employees, including 25 professionals engaged in research and development and other engineering functions. The firm manufactures high-speed and high-bandwidth fiber optic products, such as transmitters, receivers and multiplexers used to extend the reach of fiber optic transmission into MANs and LANs.

BCP is delivering products providing high-bandwidth analog RF and digital transceivers that are tolerant of harsh environments and capable of adjusting to various bit rates up to 10 Gbps. These products include transceivers for SONET/SDH capable of OC-48/STM-16 speeds over the temperature range of -40^o-85^oF, permitting installation in non-temperature-controlled environments that are common in access networks. They also manufacture Gigabit Ethernet extenders.

As consideration for all of BCP’s outstanding shares and other securities, Uniphase issued a total of approximately 730,000 shares and assumed options for an additional 418,000 shares of Uniphase common stock. The acquisition will be accounted for as a pooling of interests, and Uniphase will report consolidated results for the current quarter ending December 31, 1998. It will restate prior periods on a consolidated basis to reflect this acquisition. The negotiated purchase price includes approximately \$5,500,000 in transaction costs that will result in a charge in the current quarter. These

transaction costs consist primarily of fees incurred by BCP and payable to their financial advisors in connection with the acquisition.

Interpath Selects Nortel to Deploy Multiservice Next-Generation, Carrier-Class Network

Interpath Communications Inc. has announced that Nortel Inc. will supply its next-generation core network, architected to support end-to-end Internet-optimized applications for businesses. Under the three year, \$125 million contract, Nortel Networks will provide leading-edge networking technology, dedicated resources and professional services to assist Interpath in its aggressive expansion of its service portfolio and geographic reach in the Mid-Atlantic and Southeastern US, according to the company.

Nortel Networks will provide transport equipment, Internet equipment and core-switching technology, leveraging solutions in the Nortel Networks portfolios. In addition, Nortel Networks will work with Interpath to develop an overall network management solution for the entire Interpath network.

This agreement also signifies a new class of customer relationship for Nortel Networks. Interpath will be a lead customer for introduction of new Nortel Networks products and services and will serve on Nortel Networks' Customer Technical Advisory Committee. Interpath, which has managed the Nortel Networks Website for several years, will assist Nortel in the development and delivery of business functionality via the Web.

Antec Releases New Details Regarding Hub Site Block Converter System

Antec Network Technologies announced further details of its previously-announced Hub Site Block Converter System, which combines up to 18 return bands in a single laser transmitter handing off 18 separate, phase-locked bands at the receive system side, thereby consolidating signals and decreasing network complexity.

The subsystem is said to be ideal for expanding architectures and areas where each node serves a large subscriber base. Antec's system eliminates SONET rings, offering from 5-40 and 5-42 MHz bandwidth processing in the same unit.

MCI WorldCom Moves Quickly to Cut Costs

MCI WorldCom Inc. is moving to cut billions of dollars in expenses by undertaking a sweeping cost-cutting program expected to include as many as 3,750 layoffs.

The effort comes as WorldCom embarks on absorbing MCI, its most significant acquisition yet. Almost three months after the \$37 billion merger closed, Bernard J. Ebbers, MCI WorldCom's CEO, is making good on his promise to slash the company's expenses sooner than expected.

The telecommunications concern, based in Jackson, MS, had said earlier that it would cut \$2.5 billion in expenses in 1999. Most of those savings will be achieved by combining the MCI and WorldCom networks, a step that will reduce the cost of transmitting voice and data traffic, according to company executives, who declined to be identified.

The emerging phone company also intends to reduce general overhead costs, including executive perks and travel expenses, the executives said. General overhead had increased to as much as 30 percent of MCI's revenue, while it totaled only 18 percent at WorldCom and about 24 percent at the larger AT&T Corp.

MCI WorldCom is likely to announce layoffs of 3-5 percent of its work force of 75,000, par-

ticularly in areas where there is duplication between the companies, people close to the situation say.

The most significant savings are expected from the integration of the two companies' networks. For example, MCI WorldCom can carry domestic and international calls through its own network instead of leasing capacity from others. Both companies are attempting to identify the most cost-effective methods of handling traffic.

Combined, the MCI's and WorldCom's former local network connections currently gain access to markets that cover 70 percent of US business operations. Prior to the acquisition, MCI intended to spend approximately \$700 million to build more of its own local connections.

Optical Cable Corp. Announces Plans to Establish Internet Subsidiary

Optical Cable Corp. announced its plans to establish an Internet subsidiary to offer one-stop shopping to global purchasers of communication materials.

Working with IBM's electronic-commerce division, Optical Cable is currently in the initial stages of site design but expects to be operational sometime in the spring of 1999. Initially, the venture will be part of the company's existing Website, <http://www.occfiber.com>, and will include only the Optical Cable product line. Optical Cable intends to look for opportunities to establish strategic alliances with other leading suppliers of communications equipment to expand the Website's future offerings and eventually create an independent communications superstore. Optical Cable is currently recruiting experienced Internet professionals for key positions to help manage its new Internet venture.

AT&T Acquires IBM's Global Networks for \$5 Billion

On December 8, 1998, AT&T and IBM announced a series of strategic agreements under which AT&T will acquire IBM's Global Network business for \$5 billion in cash. As part of the acquisition, the two companies will enter into outsourcing agreements, in which IBM will outsource a significant portion of its global networking needs to AT&T. AT&T will outsource certain applications, processing and data center management operations to IBM. The transactions could represent \$2.5 billion in additional revenue to AT&T in the first full year of operation. The IBM Global Network business that AT&T will acquire serves the networking needs of several hundred large global companies, thousands of mid-sized businesses and more than 1 million individual Internet users in 59 countries.

AT&T will take over approximately 5,000 IBM operating staff, and the two companies will mutually outsource functions to each other. IBM will outsource a significant portion of its own internal global networking needs through a \$4 billion, 10 year outsourcing contract that is said to be the largest ever awarded, and AT&T will outsource certain applications processing and data center management operations. As a result of this, 2,000 AT&T staff members will also be offered jobs with IBM.

Ciena Corp. Reports \$3.9 Million Loss for Fiscal Fourth Quarter

Ciena Corp. has reported a \$3.9 million (four cents per share) loss for the fiscal fourth quarter, compared with its income one year earlier of \$37.9 million, or 35 cents per diluted share. Revenue fell 30 percent to \$91.2 million. The company attributed this loss to lower revenue and pricing pressures.

Lithium Niobate Supplier IOC Reports First Half Sales Below 39 Percent and Loss of \$5 Million

Integrated Optical Components (IOC), one of two global suppliers of lithium niobate optical components, reported that sales down 38.8 percent to \$6.9 million in the first half of 1998, due to the

loss of a major order that resulted in eroded margins and an interim loss of \$5 million. The company said it probably would report a loss for the full year.

Communications Systems Pays \$8 Million for System Converter Transition

Communications Systems of Hector, MN, a supplier of copper and fiber connectors to the voice and high-speed data communications markets, has acquired Transition Networks of Minneapolis for \$8 million. Transition Networks had sales of \$17 million in 1997 and has anticipated sales in 1998 of \$24 million.

The company designs and markets media conversion technologies across a broad spectrum of networking protocols, including Ethernet, Fast Ethernet, FDDI and ATM, and defines its mission as that of enabling network planners to migrate their cabling infrastructure to fiber.

PSINet Activates OC-48 Dark Fiber Capacity in New York, NY, Metropolitan Area

PSINet Inc. announced that it has installed and activated a portion of its dark fiber network capacity previously acquired from Metromedia Fiber Network Inc. In May 1998, PSINet acquired dark fiber optic strands that cover the New York, NY, metropolitan area, the route between New York and Washington, DC, and the Washington, DC, metropolitan area. The recently activated fiber in New York will operate at OC-48 speeds of 2.4 Gbps.

“Ownership of fiber and the related transmission technologies allows PSINet to quickly take advantage of expected advances in transmission speeds, bandwidth reliability and quality,” said Pete Wills, president and COO of PSINet Inc. “This fiber allows for virtually unlimited capacity among our Manhattan, [NY] facilities. Even though we have activated the fiber at OC-48 to start, the same fiber could be used for multiple connections at much higher speeds, such as OC-192. Advancements in technologies such as dense WDM [DWDM] will increase data transmission speeds to hundreds of gigabits, and even terabits, per second in the near future.”

The New York fiber will anchor network capacity on several of PSINet’s most trafficked data corridors and will also link to other critical PSINet fiber capacity currently being activated in the US and abroad. These facilities include the remaining dark fiber serving metropolitan areas in the New York/Washington, DC, corridor, PSINet’s transcontinental North American OC-48 fiber backbone currently being deployed in OC-12 stages by IXC Communications Inc. and PSINet’s OC-3 transatlantic submarine cable system acquired from Global Crossing Ltd. PSINet’s transatlantic fiber connects the US, the UK and continental Europe.

The successful activation of this dark fiber represents another critical step in PSINet’s strategy to own its fiber and global POP switching facilities. With an existing continuous fiber optic Internet data network between Europe and the Asia-Pacific region through North America, PSINet is successfully linking regional fiber strands to this global network. Newly-activated fiber optic capacity allows PSINet to achieve a much lower cost of operation by replacing more expensive leased-bandwidth circuits.

Sentient’s Multiservice Access Switch Chosen for Williams’ National Fiber Network

Sentient Networks of Milpitas, CA, a supplier of carrier-class, multiservice access switches, with what the company describes as its breakthrough ASAP@ architecture, announced a \$10 million contract from Tulsa, Oklahoma-based Williams, which is currently building one of the largest high-

capacity fiber networks in the US. Williams said it chose the Sentient switch because of its scalability, exponential port density and guaranteed performance capability.

The GTS/Esprit deal has generated one contender from two medium-sized operators, at least at the regional level, with companies such as WorldCom, AT&T and BT. The company has significant momentum, but pro forma losses in 1997 were \$135 million and the GTS CIS business appears too broadly based and fragmented.

Michigan CLEC Focuses on Five States, Picks Siemens' EWSD and FastLink SONET Products

Pontiac, Michigan-based US MidTel Corp., a facilities-based competitive local-exchange carrier (CLEC) authorized to provide a diverse range of communications services to residential and business customers throughout Michigan, announced that it has selected Siemens EWSD switching platform to be installed together with Siemens' FastLink SONET products.

MidTel said its long-term strategy is to provide competitively priced products and services to business and residential customers in Illinois, Indiana, Michigan, Ohio and Wisconsin, where it plans to deploy additional Siemens switching technology over the next five years.

Siemens designed its FastLink SONET product line specifically to meet the requirements of the fiber market's access feeder requirements through unidirectional path-switched ring (UPSR) ADMs, which can be equipped with either OC-3 or OC-12 optical line interfaces, and with compatible NGDLC and FTTC versions and components capable of supporting a full range of narrowband, wideband and broadband services.

SDL Optics Expanding to Meet Explosive Growth of DWDM

SDL of San Jose, CA, broke ground in Victoria, British Columbia, Canada, where its SDL Optics subsidiary already manufactures 980 nm pump modules and fiber Bragg gratings, for a new expandable 41,000 square foot facility from which it expects to be shipping products beginning in the fourth quarter of 1999.

Donald Scifres, chairman and CEO of SDL, said the new facility would allow the company to continue its explosive growth in the dense WDM (DWDM) market and to meet its strong commitment to being a top-tier supplier of optoelectronic solutions for the communications market.

"The demand is playing to our strengths. Our high-power, grating-stabilized pumps are enabling the growth of DWDM from 16 channels per fiber to between 40 and 80 channels," said Greg Dougherty, president and COO of SDL Optics.

Frontier Claims Speed Record Through Directly-Connected Ascend GX550 ATM Switches

Frontier Communications claims that, by using switches from Ascend Communications, the company is currently the fastest network in the world, transmitting its ATM traffic at 2.5 Gbps directly over dense WDM (DWDM) equipment that is 16 times faster than the typical ATM technology currently in use.

Thomas DeCanio, vice president of Ascend's product marketing core switching division, confirmed that by connecting Ascend's GX550 ATM switches directly to DWDM at OC-48/STM-16 speeds, thereby eliminating an entire layer of traditional transmission equipment, Frontier was deploying the most efficient network architecture possible at the fastest ATM speeds available.

Frontier confirmed that its Optronics Network was already moving data at OC-48 rates over its

coast-to-coast IP network layer and at speeds up to 1.28 Tbps per strand over its recently-announced network express lane for its 20 top markets.

According to statements attributed to Frontier, following the recent installation of Pirelli's 32 channel TeraMux DWDM on key parts of its network to give the company up to 1.28 Tbps throughput, the company is considering a further upgrade to OC-192 as early as January 1999.

Frontier Communications Creates Network Express Lane

Frontier Communications and Pirelli Cables and Systems announced that Frontier will deploy Pirelli's hyper-dense WDM (HDWDM) equipment on the Frontier Optronics Network.

As part of its plan to build a next-generation network, Frontier is the first in the industry to use this new DWDM system to create gigabit routes on its existing fiber between its 20 most heavily trafficked markets. The end result is the network equivalent of non-stop flights for network traffic, allowing the Frontier Optronics Network to become the fastest optical network in the world.

Frontier will initially deploy a 32 channel Pirelli TeraMux HDWDM system on the Frontier Optronics Network, which is on schedule for completion in spring 1998. Pirelli's feature-rich TeraMux system is scalable to 128 channels carrying OC-192 capacity, which translates into 10 Gbps per channel. Its industry-leading, standards-based open architecture will interface readily with the SONET, IP and ATM layers of the Frontier Optronics Network.

GST Telecommunications Activates First Phase of Next-Generation Network

GST Telecommunications Inc. recently announced the completion of the first phase of its next-generation Virtual Integrated Transport and Access (VITA) network, with the turn-up of 13 cities on the network. The company also reported that it is on schedule to complete installation of the West Coast backbone by the end of the year. The VITA network combines GST's voice and data networks onto a single networking platform, providing for improved economics and versatility of services.

"Our deployment of the VITA network is at the forefront of the latest technological developments within the industry," said Joe Basile, president and CEO of GST. "With the VITA network, we are building on our extensive fiber optic networks, utilizing next-generation transport capabilities that enable us to carry traffic more efficiently and provision customer services faster. Our cell-based architecture provides for a virtual network that leverages extremely high-bandwidth IP services with a quality of service that is superior to the current architectures deployed."

The VITA network utilizes a combination of IP, packet, frame and cell technology and next-generation switching equipment in conjunction with the central office switches the company already operates throughout its territory in the western US.

GST is leveraging its high-bandwidth fiber optic technology by using ATM-based technology in conjunction with SONET technology. The new architecture, which uses Internet routers, frame switches and voice switches as enhanced processors off of the cellbased ATM backbone, allows high-bandwidth interfaces to the customer for virtual transport and switching. "As an integrated communications provider, this next-generation technology significantly improves the cost models for network deployment," said Basile. "The VITA network allows for versatility of services and high-bandwidth over our existing circuits so that we can dramatically increase our traffic before additional circuits need to be installed."

"The deployment of this next generation network positions GST ahead of all the other telecom-

munications service providers,” said Kevin Wright, chief technology officer of GST. “Now that we have deployed a next-generation architecture, our objective is to deliver differentiated services and applications that will provide value to our customers. While many companies are struggling to decide how they can provide basic telephone services and compete with the incumbent phone companies, GST has positioned itself as the total communications service provider for business.”

The 13 cities deployed on the VITA network to date include Portland, OR, Vancouver, British Columbia, Canada, Spokane, WA, San Francisco, Los Angeles, Fresno, San Luis Obispo, Palmdale, Riverside, Ontario and Walnut Creek, CA, Phoenix, AZ, and Honolulu, HI. The second phase of the network, which is expected to be fully operational in early 1999, will include Oakland, CA, Tucson, AZ, Seattle, WA, Boise, ID, and Albuquerque, NM.

Tellabs Confirms \$100 Million Supply of Next-Generation AN2100 Voice/Data Switch to Sprint

Tellabs has entered a \$100 million, multiyear agreement with Sprint to supply them with its AN2100 Gateway Exchange system, a next-generation voice/data switch that blends Tellabs’ echo canceller and TITAN 5500 DXC technology with packet and cell technologies to perform multimedia adaptation and switching, and on whose feature set the two companies have been cooperating for three years.

SpecTran, Lucent Sign Patent Agreement

SpecTran Corp. and Lucent Technologies announced that they have signed a patent licensing agreement to exchange worldwide, non-exclusive rights to certain optical fiber patents. Under the agreement, SpecTran is licensed by Lucent to make optical fiber at SpecTran’s existing factories for use, sale and export worldwide.

SpecTran will pay Lucent a \$4 billion license fee in installments and, beginning in 2000, a royalty on sales.

RCN Continues to Blaze Competitive Trail in Local Phone, Cable Markets

RCN Corp. announced that it was continuing to make significant progress in the deployment of its advanced fiber optic network and in providing competitive phone and cable services to residential customers in local markets from Boston, MA, to Washington, DC.

RCN also continues its efforts with regulators to obtain a more competitive marketplace and to curb the anticompetitive abuses of the incumbent telephone and cable monopolies. At the request of the FCC, RCN’s president and COO, Michael J. Mahoney, testified before the FCC’s En Banc Hearing on Telecommunications Mergers to address these competitive issues.

At the hearing, Mahoney criticized former local phone monopolies for failing to embrace competition as required under the 1996 Telecommunications Act and for failing to fulfill their obligations to competitors regarding interconnection, co-location, reciprocal compensation and other requirements.

RCN’s efforts to combat the incumbent cable providers’ anticompetitive behavior were rewarded in a recent court decision. Massachusetts’ highest court curbed Cablevision’s continuing attempts to block competition in the Boston market.

The court upheld the Massachusetts Department of Telecommunications and Energy’s (DTE) determination that Cablevision did not have standing to intervene as a full party in the DTE’s proceeding approving Boston Edison’s holding company structure as part of the RCN/Boston Edison joint

venture. RCN and Boston Edison, working together, are successfully bringing Boston-area residents competitive video programming, as well as local phone, long-distance and Internet services.

SpecTran Corp. Renegotiates Debt Covenants

On December 17, 1998, SpecTran Corp. announced that it has negotiated and signed an agreement to amend the financial covenants under its loan agreements with Fleet Bank and the holders of SpecTran's long-term debt. With the signing of this agreement, SpecTran has remedied all violations of certain financial covenants, and it has satisfied all payment obligations.

Compliance with the revised covenants remains a significant challenge to SpecTran. Its ability to meet them is dependent on several factors, some elements of which are not under its control. These factors include, but are not limited to, projected sales and profit levels that are ultimately driven by still-fluctuating marketplace conditions, internal costs reduction initiatives currently under way and successful implementation of the company's plans for expanded single-mode fiber production, beginning in the first quarter of 1999.

APA Optics Inc. Reports Eight-Cents-Per-Share Loss for Fiscal 1999 Second Quarter Attributable to Shift to Production

APA Optics Inc. recently reported a loss of \$660,228 for the second quarter of its 1999 fiscal year, ended September 30, 1998, as compared to the loss of \$178,816 posted in the same period for fiscal year 1998. Revenues for the second quarter of fiscal 1999 totaled \$246,437, down from the \$653,385 reported for the same period of fiscal 1998.

Anil K. Jain, the president and CEO of APA Optics, said the increased loss was a result of planned reductions in government contract research work, coupled with the costs incurred in establishing its fabrication and marketing operations. Increases in necessary consulting fees and research and development costs also contributed to the loss. Jain said that losses in the second quarter of 1999 were \$180,000 more than the losses in the previous quarter.

"We are hopeful that the products sales that we expect to materialize in forthcoming quarters will put us back in the black and help ensure a profitable future," said Jain.

As a spearhead to its efforts to promote its WDM components, the company recently shipped WDM evaluation units to three large companies. Two of the companies are major manufacturers of telecommunications equipment. "These products are the future [of] the company, and we have dedicated ourselves to meeting forecasted production demands," Jain said. Additionally, more than 35 companies have placed orders for qualification units of APA's new Gallium Nitride ultraviolet detector.

Dr. Jain said that the company has sold these new Schottky UV detectors to a wide range of customers for diverse applications, and APA currently has 2,000 of these detector units on demand. APA, on the advice of its outside auditors, has written off all labor costs on these units so as not to overstate inventories, said Jain. "Margins will be significantly higher when these units are sold because much of the cost has already been reflected," he said.

The company is also assessing the potential impact that Year 2000 computer issues could have on its reporting systems and operations. Its major suppliers and financial institutions have confirmed compliance. Internally, APA will be testing its computers and software in the coming months to weed out and safeguard against potential disruptions in the year 2000.

On a per-share basis, APA Optics' loss for the second quarter of fiscal 1999 was \$0.08 per share, as compared to the loss of \$0.02 per share in the second quarter of the 1998 fiscal year. The company's weighted average shares outstanding as of September 30, 1998, was 8,512,274, as compared to 8,307,831 on September 30, 1997.

APA Optics had a cash balance of \$4,195,647 as of September 30, 1998, compared to a cash balance of \$5,184,215 on March 31, 1998. The cash decrease is due to the losses the company experienced during the first six months of fiscal 1999. APA believes that it has sufficient working capital to sustain operations through fiscal 1999 and beyond.

RCN to Explore Leveraging Excess Capacity of its Broadband Fiber Network in the Commercial Arena

Given its success in the residential market, RCN Corp. recently announced that it was exploring commercial opportunities in an effort to leverage excess capacity in its state-of-the-art fiber optic network. Richard C. Murphy, formerly of AT&T and Teleport Communications, has joined the company to evaluate potential commercial and wholesaling alternatives.

"RCN is increasingly being approached for access to our network, and it has come time to evaluate whether or not this business needs to be pursued. Our broadband fiber optic network, although focused on the residential market, is also capable of serving more than [250 million] square feet of commercial office space," said RCN's chairman and CEO, David C. McCourt. "While providing customers with phone, cable and Internet services in their homes will remain our primary focus, it is now appropriate for RCN to explore the tremendous revenue potential of selling commercial service in areas already passed by our network. With more than 30 years of commercial experience, Murphy is well qualified to explore this viable and lucrative market for RCN."

RCN has already deployed a network of more than 1,000 route miles in local markets from Boston, MA, to Washington, DC. In addition, RCN has more than 100,000 fiber miles that provide an enormous amount of capacity for both residential and commercial applications.

RESEARCH AND DEVELOPMENT

Europe's Communal SC Research and Development Center Shows High-Output LED for Optical Interconnect

In its recent annual technology review, IMEC of Leuven, Belgium, the communally-funded technology development center for the European SC and electronics industry, announced the development of a non-resonant microcavity LED with a quantum efficiency (measure of light emission compared to input) rating of 31.

This is claimed to be significantly higher than the best achieved by Bell Labs. IMEC has partially solved the problem of losing the majority of light created by internal reflection and dissipation of heat by roughening the SC-air interface to ensure a degree of random diffraction that substantially raises the external QE.

IMEC claims that switching speeds have been improved to encompass the 622 Mbps node, and researchers are currently studying the possibility of using the diodes as optical interconnects between chips on a PCB, thus eliminating surface-deposited metallic connections.

World Record in Sweden: 40 Gbps Soliton Fiber Optic Transmission Over 400 Km of Installed Fiber Lines

An optical transmission field experiment with record capacity using soliton pulses has been conducted on installed commercial optical fiber lines in Jonkoping, Sweden. The trial was conducted by a research group in the Department of Microelectronics at Chalmers University of Technology in Gothenburg, Sweden, together with the Swedish network operator Telia, and represents the final stage in the European Union's ACTS project, MIDAS.

Solitons are optical pulses that utilize a nonlinear effect in fibers to resist different pulse distortion mechanisms encountered by normal optical pulses. The key achievement is the successful, error-free transmission of solitons at the 40 Gbps bit rate over 400 km of installed fiber, which is a typical distance between major cities in Europe. The system is very simple, since it uses no in-line soliton control and has an amplifier spacing of 57 km. These results represent the highest-capacity field transmission experiment ever reported at a single wavelength bit rate beyond 20 Gbps. It is anticipated that the aggregate bit rate can be increased further by using WDM. The results clearly demonstrate the feasibility of using solitons at 40 Gbps for transmitting data over installed fiber.

Both orthogonally polarized, or polarization division multiplexed (PDM), and parallel polarized, single-wavelength solitons at 40 Gbps were studied, and PDM solitons were found to perform somewhat better. The transmission penalty was as small as 0.5 dB (no word length dependence), with an overall polarization dependent sensitivity of ± 0.3 dB caused by the relatively high polarization-mode dispersion (PMD) or 0.3 ps/ $\sqrt{\text{km}}$ in the dispersion-shifted fiber, which is the main capacity-limiting factor in the experiment. The actual differential group delay was measured at the operating wavelength to be 6 ps. The solitons were 10 ps wide, and the chromatic dispersion was 0.2 ps/kmnm. The researchers have, for the first time, experimentally proven that solitons are robust in the presence of PMD. Solitons are found to broaden less-than-linear pulses due to the self-trapping effect. This clearly suggests that solitons can provide higher capacity than linear, or dispersion compensated, systems in the case when PMD is an important limiting factor. The transmitter and receiver in the system involve a specifically-developed mode-locked fiber ring laser and an all-optical polarization-insensitive fiber-based demultiplexer, respectively.

Nanovation Technologies Moves Closer Toward Commercialization of Fully-Integrated Optical Circuit

High-tech start-up Nanovation Technologies Inc. announced that it has officially commenced the development and testing of a fully-integrated optical circuit that is up to 1,000 times smaller than today's electron-based semiconductor chips and has the potential to boost both the speed and information capacity of today's existing chip technology by a factor of 100-1,000. This fully-integrated optical circuit, which is being tested and developed in its lab on the campus of Northwestern University in Illinois, is complete with a photonic switch, optical waveguide and the company's patented microcavity laser.

"With patents now being issued for our photonic devices, Nanovation Technologies has entered the next phase in its transition from a research-driven enterprise toward one dedicated to the commercial development of photonic technologies and devices for industries demanding greater bandwidth, ranging from telecommunications and optical computing to data storage," said Bob Tatum, CEO of Nanovation Technologies Inc.

Nanovation Technologies' patented microcavity laser technology (MCT) achieves far greater efficiencies in capturing photons than today's electron-based chips. This promises to lower the cost and improve the quality and speed of communications, ultimately helping in the battle for zero latency as companies try to overcome everyday bandwidth issues associated with the exploding networks, such as the Internet. Many corporations and universities are actively researching the use of photonic technology due to light's capacity to carry up to 1,000 times more information on a single chip than today's existing chips.

Microgravity Fiber-Pulling Apparatus

A method to process optical fiber composed of glass systems has been developed in support of the space shuttle and space station programs. This process, known as the Microgravity Fiber-Pulling Apparatus, was designed to operate in a microgravity environment. It has the capability of producing heavy metal glasses through the reduction of nucleation and allows low viscosity to be handled more easily. Optical fibers, such as the heavy metal fluoride glasses, are usually very difficult to process in ground-based operations because the glass has inherent characteristics such as low viscosity, a narrow working range and a tendency to form crystallites during processing.

Operation in microgravity has demonstrated that some of the conventional methods used in Earth-based fiber-forming processes will not function properly in a weightless environment. For example, the gravitational force necessary to initiate the fiber draw is not present in space. The components of this fiber-pulling apparatus include a source of the glass (preform), a sting to initiate the fiber-drawing process, a coating applicator for ultraviolet-curable cladding, an ultraviolet lamp and a reel to place the drawn fiber on after it has been cooled.

Processing the glass system in microgravity is the most important step to forming more perfect fiber composed of the heavy metal fluoride glasses. In microgravity, processing glass systems requires a sting, which consists of a platinum wire with a flat plate or fingers at the extremity, to pull molten glass out from the drawing aperture. Since current drawing chambers designed for space platforms do not allow extremely large volumes for fiber drawing, this design uses a chill block to quench the glass melt into a solidified fiber.

STANDARDS

TIA Publishes Two New Optical Fiber Standard Test Procedures

The TIA has published two new standard test procedures.

The first, *Optical Fiber Standard Test Procedure-14A, Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant*, TIA/EIA 526-14A, is a revision of TIA/EIA-526-14.

TIA/EIA-526-14A can be used to measure the optical loss between any two passively connected points, including end terminations, of a multimode optical fiber cable plant. The optical fiber cable plant (as the term is used in the document) may consist of optical fiber cables, connectors, mounting panels, jumper cables and other passive components but may not include active components. An example of the cable plant could be a portion of a LED-based LAN. This could include optical switches or couplers, but would exclude gain elements in the connected path.

The second procedure is *Optical Fiber Standard Test Procedure-7, Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant*, TIA/EIA-526-7.

This procedure also can be used to measure the optical loss between any two passively connected points, including end terminations, of a single-mode optical fiber cable plant. The optical fiber cable plant may consist of optical fiber cables, connectors, mounting panels, jumper cables and other passive components but may not include active components.

TIA/EIA-526-14A was created by the TIA's FO-2.2 Subcommittee on Fiber Optic Local Area Networks, and TIA/EIA-526-7 was created by the TIA's FO-2.1 Subcommittee on Optical Fiber Telecommunications Systems. To obtain copies of the documents, contact Global Engineering Documents, Tel: (800) 854-7179 or WWW: <http://www.global.ihs.com>.

TIA Publishes Two New Fiber Optic Standards

The TIA has recently published two new fiber optic standards.

The first, *Fiber Optic Test Procedure-55, End-View Methods for Measuring Coating and Buffer Geometry of Optical Fibers*, TIA/EIA-455-SSC, is a revision of EIA/TIA-455-SSB.

TIA/EIA-455-SSC describes methods that are intended for off-line measurement of the dimensions of optical fiber coatings. The parameters covered are diameter, non-circularity, coating/cladding concentricity error and coating/core concentricity error.

The document also describes a manual method using an optical microscope and an automated gray-scale method that uses computer data processing techniques.

The second standard, *Fiber Optic Test Procedure-54, Mode Scrambler Requirements for Overfilled Launching Conditions to Multimode Fibers*, TIA/EIA-455-54B is a revision of TIA/EIA-444-54A.

TIA/EIA-455-54B describes light launch conditions to the test fiber for the purpose of achieving a uniform overfilled launch with a laser diode or other light sources. While Fiber Optic Test Procedure-54 (FOTP-54) can be used to establish overfilled launching conditions for the measurement of various fiber parameters, it is principally used in conjunction with FOTP-30 or FOTP-51 for measuring information carrying capacity. Light launch conditions are established through the use of a mode scrambler. The mode scrambler is positioned between the light source and test fiber to produce a radiation distribution overfilling the test fiber core and numerical aperture, regardless of the spatial radiation properties of the light source.

TIA/EIA-455-55C and TIA/EIA-455-54B were created by the TIA's FO-6.6 Subcommittee Optical Fibers and Materials. To obtain copies of the documents, contact Global Engineering Documents, Tel: (800) 854-7179 or WWW: <http://www.global.ihs.com>.

MARKET INTELLIGENCE

Nortel Networks Tops 1998 Shipments for SONET and DWDM in North American Market

Nortel Networks has topped shipments for SONET and DWDM systems in the North American market, according to two reports entitled *SONET and DCS, Technology and Market Analysis and WDM and Optical Networks: Technology and Market Analysis*.

Nortel Networks leads in both the SONET and DWDM sectors, with 34 percent and 29 percent market shares, respectively. The WDM report also concludes that Nortel is also in first place in the delivery of combined SONET/DWDM solutions in North America, with a 67 percent market share.

In addition, the report predicts that the OC-192 systems should experience a strong growth in

the incumbent local-exchange carrier (ILEC) and inter-exchange carrier (IXC) markets over the next four years.

US Exports of Telecommunications Equipment Up; Fiber Optic Cable Down

US exports of telecommunications equipment reached \$9.99 billion for the first six months of 1998, a 4 percent increase over the same period in 1997, according to statistics released by the TIA. While telephonic apparatus and parts represents the largest single market segment at \$2.3 billion, the greatest increases were in cordless telephones and telegraphic equipment, which jumped 46 percent and 31 percent, respectively.

**US Exports of Telecom Equipment by Sector
(In US\$ Thousands)**

	YTD June 1998	YTD June 1997	% Change
Telephone Sets and Parts	164,752	256,977	-38%
Telephonic Apparatus and Parts	2,349,581	2,097,701	12%
Telegraphic Apparatus and Parts	939,077	716,226	31%
Radio Transmitters	301,827	349,704	-14%
Radio Receivers	158,979	187,621	-15%
Radio Transceivers	899,062	917,062	-2%
Telephone Answering Devices	43,305	58,718	-26%
Communications Satellites/ Transmission Reception App.	2,346,484	2,271,995	3%
Cellular Telephones	945,813	903,420	5%
Fax Machines	27,238	25,260	8%
Cordless Telephones	796,551	546,494	46%
Modems	457,754	558,302	18%
Paging Alert Devices	2,248	4,068	-45%
Fiber Optic Cable	353,950	420,617	-16%
Other Cable and Parts	210,061	256,583	-18%
Total (All Categories)	9,996,682	9,579,747	4%

CONFERENCES

SMi to Host Submarine Fiber Optic Cables Summit February 23-25 1999

SMi will host a submarine fiber optic cable summit from February 23-25, 1999 at the Cafe Royal in London, UK.

This summit will focus on the impact of submarine fiber optic cables on telecom carriers. Speakers will explore the financial and economic issues affecting the submarine cables market. In addition, the summit will discuss whether telecom operators should install their own networks or lease them from other players.

ATP Announces 1999 Proposal Solicitation and Proposers' Conferences

The NIST Advanced Technology Program (ATP) is soliciting fiscal year 1999 proposals under a single ATP competition and announced public meetings (Proposers' Conferences) for all interested parties. The single competition is open to all technology areas and is structured to capture the advantage and momentum of focused program planning.

ATP encourages proposals from the many technical teams that have identified synergy between industry needs and ATP funding opportunities, accelerating the pursuit of critical elements of research that were identified in focused program plans. All fiscal year 1999 proposals received will be distributed to technology-specific source evaluation boards in areas such as advanced materials, biotechnology, electronics and information technology. An estimated total of \$66 million in first year funding for fiscal year 1999 is expected to become available from Congressional appropriation for new awards. The actual number of fiscal year 1999 proposals funded will depend on the quality of the proposals received and the amount of funding requested in the highest-ranked proposals. Outyear funding beyond the first year is contingent on the approval of future Congressional appropriations and satisfactory project performance. Only full proposals are being solicited under this single competition. However, abbreviated proposals (pre-proposals) may be submitted and are optional.

The due date for submission of full proposals is 3 pm Eastern time on Wednesday, April 14, 1999. Should NIST be closed on the specified due date, full proposals will be due at 3 pm Eastern time on the next business day that the NIST facility is open. Proposals received after this deadline will not be considered. Pre-proposals may be submitted yearround. In order to receive feedback for use prior to the submission of a full proposal, preproposals should be submitted at least 60 days prior to the due date for full proposals. Pre-proposals and full proposals should be sent to NIST, Advanced Technology Program, 100 Bureau Drive, Stop 4701 (Administration Building 101, R. A407), Gaithersburg, MD 20899-4701. For full proposals, mark the envelope ATP Pre-proposal. Pre-proposals or full proposals submitted by fax or e-mail will not be accepted. If a proposer's full proposal is judged to be of high enough quality to be invited in for an oral review, ATP reserves the right to submit a list of questions to the proposer that must be addressed at the oral review.

The ATP Proposal Preparation Kit dated November 1998, containing proposal cover sheets, other required forms, background material and instructions for preparing ATP pre-proposals and full proposals, may be requested by phone at Tel: (800) 287-3863, Fax: (301) 926-9524 or (301) 590-3053, e-mail: atp@nist.gov or by sending a letter to the address above. The kit is also available on the ATP World Wide Web at WWW: <http://www.atp.nist.gov> under the heading Publications. The ATP is mailing the new kit to all those whose names are currently on the ATP mailing list. Those individuals need not contact the ATP to request a copy.

CONFERENCE REPORTS**General Instrument Introduces its IP Telephony Solution over HFC at Western Cable Show '98**

General Instrument (GI) introduced its seamless, end-to-end Internet Protocol (IP) telephony solution, which will enable operators to offer advanced data, voice and video services over the hybrid fiber/coax (HFC) network. GI offered live theater production and product demonstrations at the Western Cable Show, held December 2-4, 1998, in Anaheim, CA, to highlight the benefits of this offering.

The production, entitled "A New World is Taking Shape," provided MSOs with a first-hand

look at the new world of advanced technology, broadband services and increased revenues made possible by GI's IP telephony technology. This presentation showed MSOs how, by utilizing GI's new IP telephony products, they can offer new services to increase their subscriber base to include new and existing subscriber markets - small office/home office (SOHO), high-end digital entertainment and residential telephony.

At the end of the presentation, a random audience member was invited to place a live long-distance telephone call over the HFC network. This phone call was placed from a telephone connected to GI's DCT-5000+ advanced digital interactive consumer terminal. The analog telephone signal was converted to digital packets that passed through the embedded cable modem and traveled over the HFC cable and through the Cisco Universal Broadband Router (uBR). The signal then traveled through a gateway and out onto the public-switched telephone network.

GI's IP telephony solution integrates GI's DCT-5000+ advanced interactive digital set-top terminal, Advanced IP Telephony cable modem and Broadband Telephony Interface solutions into one system to offer a more cost-effective alternative to traditional circuit-switched telephony systems. The IP telephony solution also utilizes Cisco's uBR, a cost-effective, scalable interface between subscriber cable modems and the backbone data network. This Internet gateway will enable consumers to simultaneously watch TV, surf the World Wide Web and talk on the phone.

If You Are a Current Newsletter Subscriber Try One or More of Our Other Newsletters At a 50% Savings Off of the Following Prices*

*Subscription agents and corporate library personnel do not qualify and orders must be sent to the same address. Discount on lesser value item

- | | | | |
|--|---|--|--|
| <ul style="list-style-type: none"> <input type="checkbox"/> 1394 Newsletter
12 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> ADSL news
12 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> Asia Pacific
12 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> ATM
12 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> Brazil Telecom
12 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> Cable Optics
12 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> China Telecom
12 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> European Telecom
24 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> Exchange: Australian Telecom
48 issues p.a. • \$695 <input type="checkbox"/> Fiber Optics Business
24 issues p.a. • \$595 US/Can (\$650 other) | <ul style="list-style-type: none"> <input type="checkbox"/> Fiber Optics and Communications
12 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> Fiber Optics Weekly Update
52 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> Fiber in the Loop
24 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> Fiber Optics Sensors & Systems
12 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> Gigabit News
12 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> India Telecom
24 issues p.a. • \$825 US/Can (\$870 other) <input type="checkbox"/> Information Superhighways
12 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> ISDN
12 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> ISDN user
6 issues p.a. • \$90US/Can (\$100other) <input type="checkbox"/> Internet Telecom
12 issues p.a. • \$595 US/Can (\$650 other) | <ul style="list-style-type: none"> <input type="checkbox"/> Internet Telephone
12 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> Japan Telecom
24 issues p.a. • \$825 US/Can (\$870other) <input type="checkbox"/> LAN
12 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> Mexico Telecom
12 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> Plastic Optical Fiber (POF)
6 issues p.a. • \$325 US/Can (\$350 other) <input type="checkbox"/> Premise Wiring
12 issues p.a. • \$595 US/Can (\$650 elsewhere) <input type="checkbox"/> Russian Telecom
12 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> SONET
12 issues p.a. • \$595 US/Can (\$650 elsewhere) <input type="checkbox"/> South American Telecom
12 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> Submarine Fiber Systems
12 issues p.a. • \$595 US/Can (\$650 other) | <ul style="list-style-type: none"> <input type="checkbox"/> Telecom Calendar
4 issues p.a. • \$325 US/Can (\$350 other) <input type="checkbox"/> Telecom Standards
12 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> Utilities Telecom News
12 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> WDM Newsletter
12 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> Wireless Cellular
12 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> Wireless PCS
12 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> Wireless Satellite & Broadcasting
12 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> Wireless Local loop
12 issues p.a. • \$595 US/Can (\$650 other) <input type="checkbox"/> Wireless Telecommunications
12 issues p.a. • \$595 US/Can (\$650 other) |
|--|---|--|--|

Please send me a subscription to the newsletter/s checked Please send a free copy of the IGI product catalog

Name _____
 Title _____
 Company _____
 Address _____
 City _____ State _____
 Postal Code _____ Country _____
 Tel. _____ Fax _____

Wire Transfer U.S. Dollars to Information Gatekeepers Inc
 Bank Boston • Swift Address FNBBUS33
 To: Information Gatekeepers Inc. • Account # 800 57194

Check enclosed
 Charge to my: MC VISA AMEX DISCOVER

Card No _____
 Cardholder Name _____
 Expires: _____ Signature _____

FOR FASTEST SERVICE CALL 1-800-323-1088 OR FAX: 617-734-8562