TeleSoft
NEWS
TELECOM DATACOM INTERNET

A WORD FROM THE FIRM

TeleSoft had another big year in 2000, achieving significant new milestones. We launched TeleSoft-2 and have received its SBIC license. Total capital commitments in T1 and T2 are approximately $575 million. Cumulatively to date, TeleSoft has made investments in 40 portfolio companies, including three acquisitions, three IPOs (some underwater), and two write-offs. Our team has grown to approximately 25, and we are in the process of launching offices in Israel and Europe. The TeleSoft brand continues to gain momentum, and our telecom keiretsu is growing, which should help source and add value to the portfolio.

TeleSoft's focus on next-generation network infrastructure remains the same for the new millennium. Broadband multiservice networks are becoming a reality. These networks are the driving force behind carrier investments in new technologies to enable voice, video, and data packets to travel over newer optical and wireless networks. Note this issue's From the Front Lines feature article, "Riding the Optical Wave," on TeleSoft's investments in 12 companies enabling optical systems and networks.

Thank you to the attendees of the last annual Limited Partner meeting (we even captured the moment on film—see the above photo). Please save November 9, 2001, on your calendar for this year's annual LP meeting. We wish you a happy and prosperous new year!

Arjun Gupta

SAVE THE DATES
TeleSoft Annual LP Meetings

November 8–11, 2001
October 24–27, 2002
October 23–26, 2003

TeleSoft Partners

From the Front Lines
Riding the Optical Wave

During the holiday season, we use lights to cheer people's spirits during the dark winter months. For investors, optical networking technology remains an attractive option to cheer up portfolios during dark times. Optical technology has emerged as a means to increase bandwidth throughout a network, to lower the cost per bandwidth per mile, and to create service-agnostic networks.

Optical networking technology is being applied to all segments of telecommunications, from transmission systems to semiconductors, in addition to optical wireless systems and software development for the provisioning of wavelengths. (See Figure 1.)

The reach of optical networking technology has encouraged TeleSoft Partners to invest in a continuum of solutions from materials to carriers. This strategy allows for synergy between investments, provides insight into the evolution of the industry, and assists in the guidance of portfolio companies into proper market segments and product definitions. This issue of "From the Front Lines" will highlight some of the companies developing optical networking solutions. (See Figure 2.)
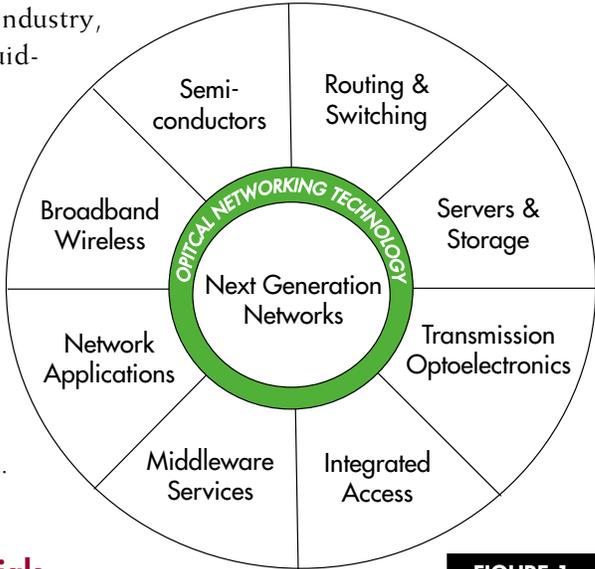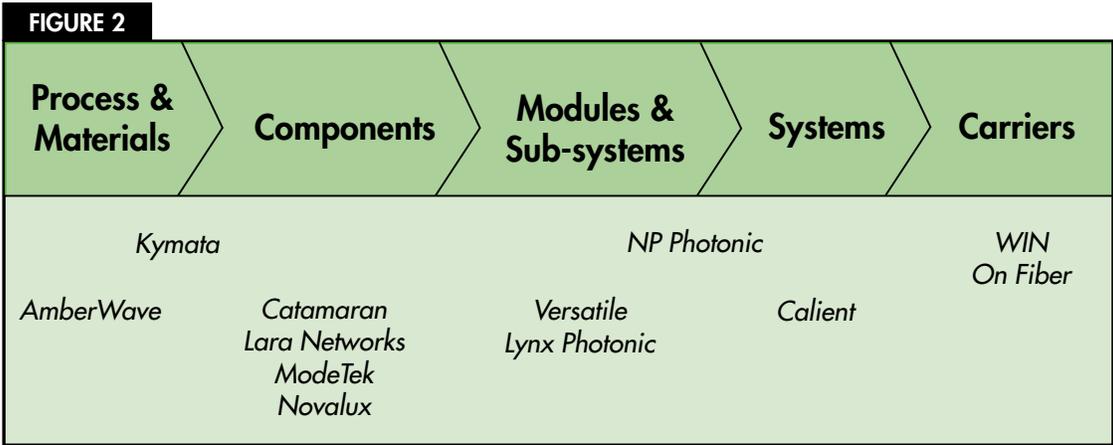
Process and Materials

A key characteristic of optic networking technology is the broad range of materials and process technologies required to create a solution. Standard silicon (Si) semiconductor materials are used for the processing of digital signals. Indium Phosphide (InP) is the base material for semiconductor lasers. Gallium Arsenide (GaAs) and Silicon Germanium (SiGe) are utilized for high-speed mixed signal—analog and digital—processing. The transport and manipulation of light is typically done with silica (i.e. glass) and polymer technologies, as well as lithium niobate ($LiNbO_3$).

To integrate all the functionality of an "optical circuit" in a single monolithic material and process is an ambitious industry goal. An ideal monolithic optical circuit would

FIGURE 1

Optical Networking Technology — Next Generation Networks: Semiconductors, Routing & Switching, Servers & Storage, Transmission Optoelectronics, Integrated Access, Middleware Services, Network Applications, Broadband Wireless

FIGURE 2

Process & Materials	Components	Modules & Sub-systems	Systems	Carriers
Kymata		NP Photonic		WIN On Fiber
AmberWave	Catamaran Lara Networks ModeTek Novalux	Versatile Lynx Photonic	Calient	

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enable high volume production, lower device cost, and reduce component size. However, this goal may not be achieved in its entirety due to no single material supporting all key requirements of an optical circuit. Over the next several years, there will be integration of groups of functionality into fewer materials as processing of these materials improve. TeleSoft has invested in two companies that are leading the development of materials for high-speed electrical circuits (AmberWave) and for the manipulation of optical signals (Kymata).

■ **AmberWave** is commercializing relaxed SiGe semiconductor alloys for a host of high-speed microelectronics and communications applications. Si is robust and inexpensive but slow for high-speed applications. GaAs is an inherently fast electronic material but extremely brittle and expensive in a bulk wafer form. SiGe is effectively a solution between Si and GaAs in terms of speed, cost, and strength in device and IC applications, and also serves as a materials bridge that accommodates GaAs on an underlying Si substrate. InP is the primary material used for the production of telecom semiconductor lasers and is considered a potential alternative for high-speed circuits. It is the proposed solution for many OC-768 components. It has the advantage

over other materials to potentially integrate high-speed electronics and optics (lasers and photodiodes) in a single material. However, InP process technology for high-speed electronics has not reached maturity yet, and like GaAs, the material is brittle and more expensive than Si.

■ **Kymata** manufactures planar opto-electronic devices for DWDM telecommunications and data communications applications using silica-on-silicon technology. Silica-on-silicon provides a platform for optical device integration. The manufacturing process consists of doped silica sprayed onto a silicon wafer, then masked and etched to produce silica waveguides. Waveguides are the conduits that are used to transport the light generated by laser sources. A cladding layer then buries the waveguides. Optical gratings can be written onto the waveguides to produce various passive properties, and switches may be added to perform active functions. Other technologies in the optical chip market include LiNbO3, polymers, silicon-on-silicon, and III-V materials. The silica-on-silicon process technology is expected to emerge as a leading technology option because it has the potential to be the lowest cost solution for multichannel devices and offers low coupling losses. The

current challenge for silica-on-silicon is to continue improvements in high-volume manufacturing.

Market Players: Besides the leading component manufacturers (Lucent, Nortel, Alcatel, JDS Uniphase), other companies working on integration of optical components include Bookham, Cirrex, CogNet Microsystems, Gemfire, IONAS, Lightwave Microsystems, Lumenon, Metro-Photonics, Microphotonix, Nu-Wave Photonics, Opient, Orchid Lightwave, and Symmorphix.

Components

There are a number of components required for the development of optical transmission systems. In SONET/SDH terminals, ATM switches, and IP routers, chipsets for Physical Media Dependent (PMD) functionality connect to Physical Layer (PHY) chipsets, which transfer data signals to Framing and Protocol Handling (Layer 2) chipsets. These chipsets are speed specific; they support transmission bandwidths from OC-3 (155 Mbps) to OC-192 (10 Gbps) and, in the future, OC-768 (40 Gbps).

Layer 2 chipsets connect to Network Processor chipsets that hand off and receive data from switch fabric chipsets connecting to the backplane of the system.

SONET terminals, ATM

switches, and IP routers connect to Wave Division Multiplexing (WDM) systems that optically combine the optical signals from these network devices into a single optical signal with several wavelengths or colors. WDM systems will contain PMD chipsets as well as Wavelength Division Multiplexing optical components and typically an optical amplifier to amplify the optical signal being launched into the fiber optic cable or being received from the cable. (See Figure 3.)

### FIGURE 3

Optical Layer Components

Optical layer components consist of passive and active devices that combine, separate, filter, switch, groom, and amplify the optical signals generated or received by the PMD components. TeleSoft Partners has invested in several companies providing optical layer solutions.

■ **Kymata** designs and manufactures planar opto-electronic devices for DWDM telecommunications and data communications applications. Kymata is developing Arrayed Waveguides (AWGs) used to separate and combine light signals. Other methods of multiplexing light signals include thin film filters (TFFs) and fiber bragg gratings (FBGs). AWGs are expected to emerge as the most economical solution for systems combining a large number of wavelenghs (40 and higher). Kymata is also using its process technology to provide wavelength performance monitors and variable optical attenuators (VOAs) to improve optical signal quality.

■ **Novalux** is developing high-power NECSELs (Novalux Extended Cavity Surface Emitting Lasers) for amplification of the optical signal. There are a number of methods of amplifying optical signals to compensate for degradation of optical power as the wavelengths travel through fiber cable, passive components, or switch fabrics. For longer distances, Erbium Doped Fiber Amplifiers (EDFAs) or Raman Amplifiers are used. These devices require high-power light sources to add optical power to the transmission signal. Novalux's unique approach uses surface-emitting laser structures in place of edge-emitters or fiber lasers to reduce costs, both through manufacturing yields and packaging. The challenge facing NECSEL pump lasers is to deliver
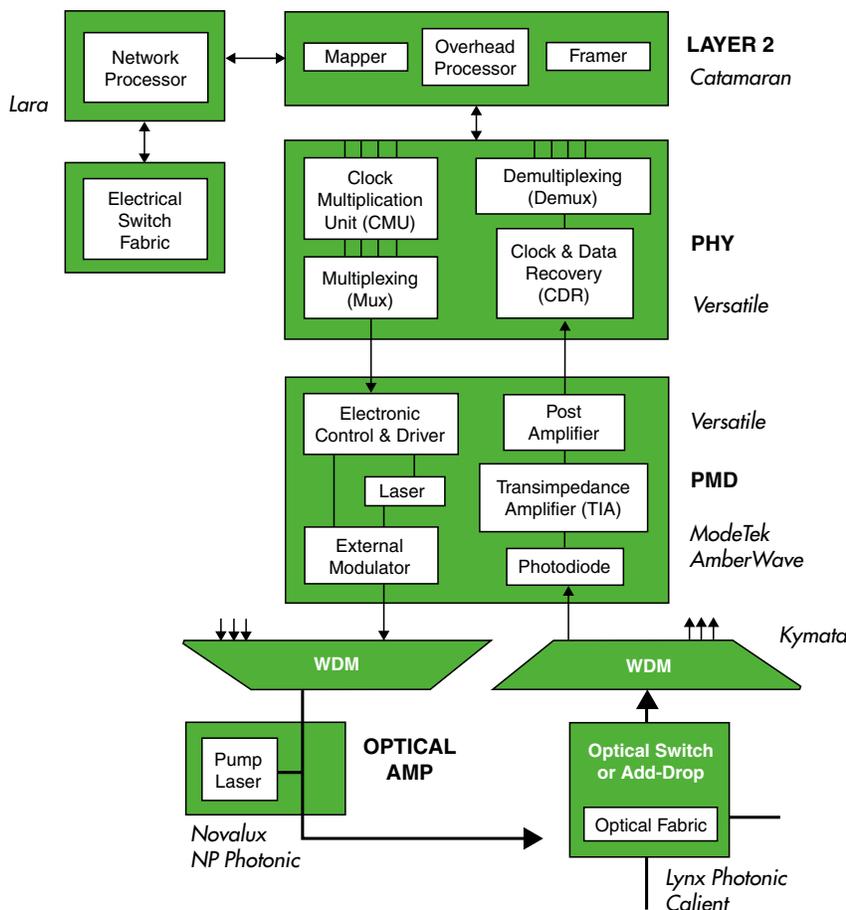
Riding the Optical Wave

power specifications on par with conventional laser structures.

■ **NP Photonics** is manufacturing optical amplifiers using special glasses as low-cost components. These amplifiers are used for short transmission distance applications and to compensate for optical power loss as signals pass through passive components and optical switches.

■ **Lynx Photonic** is developing a waveguide based photonic switch with built in VOA capabilities, multicast/broadcast modes and fast switching speeds. There are several technologies that will be developed to switch light signals from an input port to a specific output port. At the core of the network, MEMS technology using micro-mirrors to steer light will be used due to ability to scale up to support thousands of wavelengths. Calient is utilizing its internally developed MEMS technology at the core of its optical switching system. Several companies such as Lucent, Nortel (Xros), and C-Speed are also developing MEMS solutions. However, for smaller switch matrices in optical add-drop multiplexers (OADMs), optical crossconnects, optical monitoring, and optical path protection applications planar waveguide switches will be used. Thermo-optic waveguide switches on silica substrates will compete with

electo-optic switches using LiNbO3, liquid crystal based switches (i.e. Chorum, SpectraSwitch), bubble switches (i.e. Agilent), semiconductor optical amplifiers (i.e. Alcatel), and opto-mechanical switches (i.e. JDS Uniphase).

Market Players: Leading public manufacturers of active optical components (lasers, modulators, photodiodes, wavelockers, and pump lasers) are JDS Uniphase, SDL, Corning, Lucent, Nortel, and Alcatel. Leading public manufacturers of passive optical components (wavelength filters, couplers/splitters, isolators, interleavers, circulators, attenuators, and dispersion compensation) are JDS Uniphase, Corning, Lucent, Oplink, New Focus, and Avanex.

Figure 4 on page 6 highlights some of the companies developing optical layer components based on functionality.

PMDs
PMDs are chipsets that perform optical-to-electrical conversions. They amplify the electrical signal on the receive side and code the optical signal on the transmit side. When send and receive components are combined in a single module, it is referred to as a transceiver. The majority of system interfaces are currently OC-48 (2.5 Gbps) with significant growth in OC-192 (10 Gbps) interfaces.

Market Players: The leading public suppliers of electronic PMD components (i.e. amplifiers, TIAs, modulator drivers) are AMCC, Conexant, Infineon, Lucent, PMC-Sierra, and Vitesse. The leading public suppliers of optical PMD components (i.e. lasers, modulators, photodiodes) are JDS Uniphase, Lucent, Nortel, Fujitsu, Sumitomo, and Alcatel Optoelectronics.

As the market for higher speed interfaces emerges (i.e. OC-768 or 40 Gbps) over the coming years, there is an opportunity for new companies to get a foothold in this fast growing market. In addition to the established players, companies targeting high speed modulators are CyOptics and Codeon. TeleSoft has invested in ModeTek and AmberWave that will participate in this market segment.

■ **ModeTek** is developing ultra-high speed modulators for the OC-192 and OC-768 markets based on LiNbO3 materials. The company is optimizing its manufacturing processes to produce higher-performance, lower-voltage, and lower-cost components relative to its competitors.

■ **AmberWave's** process solution has the potential for companies to develop high-speed PMD components.

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PHY Chipsets

PHY chipsets control the speed for the signal, breakdown and combine signals, and condition signals to reduce noise. PHYs are mixed signal semiconductors that process both analog signals (from the PMD) and digital signals. Clock and Data Recovery (CDR) components classify the traffic packet in its correct time domain to minimize signal disruption. Multiplexing components speed up the signal to OC-48, OC-192, or higher speed on the transmission side, while demultiplexing components slow the signal down and break it up into slower data streams on the receive side of the network.

Market Players: The market for PHY components is dominated by AMCC and Lucent, with several additional established players participating such as Vitesse, Intel (Giga), Broadcom (NewPort), Conexant, Infineon, PMC-Sierra, Transwitch, Triquint, and Multilink.

Layer 2 Chipsets

Layer 2 chipsets do the policing of data, including checking for errors or lost data. The chipsets also format the signal for the appropriate network protocol such as ATM, IP, or SONET/SDH. The framer takes in each packet and checks that the bytes are correct and no data has

FIGURE 4	OPTICAL LAYER COMPONENT MARKET PLAYERS		
WAVELENGTH FILTERS FOR WDM	**WAVELENGTH MANAGEMENT**	**PUMP LASERS AND AMPLIFIERS**	**OPTICAL SWITCH OR ADM FABRIC**
Kymata	**Kymata** **Lynx-Photonic**	**Novalux** **NP Photonics**	**Lynx-Photonic** **Calient (internal use)**
Other companies developing optical layer components			
AWGs Lightwave Microsystems, SDL (PIRI), Alcatel, Bookham, JDS Uniphase **FGBs** 3M Telecom, Bragg Photonics, CiDRA, Corning, Highwave Optical, JDS Uniphase, RedC, Redfern, TeraXion **TFFs** ADC Telecom, Alcatel, Cierra, Corning, DiCon, JDS Uniphase	ADC Telecom, AOC, Avenex, Chorum, Corning, DiCon Fiber Optics, DigiLens, FONS, IPITEK, JDS Uniphase, LaserComm, Lightwave Microsystems, Lucent, MOEC, New Focus, Nortel, NZ Applied Technology, Oz Optics, Phaethon, Santec, Yafo	ADC Telecom, Alcatel, AlphaLight, Corning (Lasertron), ExceLight, JDS Uniphase (SDL), Lucent, MOEC, nLight Photonics, Nortel, Princeton Lightwave, Spectra Physics, Teem Photonics	ADC (Altitune), Agilent, Arroyo Optics, Axsun, Bookham, Brimrose, Chorum, CiDRA, Clarendon, Corning, C-Speed, DiCon, DigiLens, JDS Uniphase (Cronos), Highwave, Intellisense, iolon, ITF Optical, K2 Optronics, Kionix, LightConnect, Lightwave Micro., Litton, Lucent, Microcosm, MegaSense, Memlink, Nanovation, Nortel (Xros), OMM, Onix, Oplink, OSC, Sercaio, SpectraSwitch, Standard MEMS, TeraOptics, Trellis Photonics

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been left behind. The overhead processor is a second traffic controller that (in some protocols) performs byte adjustment to maintain data integrity. The Mapper places the traffic into a SONET payload for further transmission.

Market Players: Leading developers of Layer 2 chipsets are PMC-Sierra, AMCC (Cimarron), Broadcom (NewPort), Conexant, Exar, Lucent, TriQuint, TranSwitch, Versa, Vitesse, and ZettaCom. The opportunity exists for companies to provide higher transmission rates and support for multiple protocols (i.e. ATM, packets, TDM). TeleSoft Partners has invested in Catamaran Communications to support these market directions.

■ **Catamaran Communications** is developing solutions to support high speed SONET (40 Gbps), packet over SONET, forward error correction (FEC), Digital Wrappers, and multiservice solutions.

Network Processors

Network processors check incoming data and determine the appropriate exit port for the transmission. Network processors are primarily ASIC-based, and solutions vary from simple single function devices to broad range programmable devices.

Market Players: Some of the companies participating in the market are AMCC (MMC, Chamelion), AlcriTech, Broadcom (SiByte), Cognigne, Conexant (Maker), Infineon, Intel (Softcom), Lucent (Agere), Motorola (C-Port), PMC-Sierra (Quantum Effect), Vitesse (SiTera), Ezchip, TeraGen, NETsilicon, StarGen, and xStream Logic.

In this segment, TeleSoft has invested in Lara Networks.

■ **Lara Networks** develops silicon to optimize applications such as business and financial transactions, policy enforcement, VPNs, QoS and CoS through hardware acceleration. Its Network Application Processor (NAP) family of products (i.e. search engines, packet classification processors, and co-processors) are integrated into gigabit and terabit switches and routers supporting line rates up to OC-192.

Switch Fabrics

Switch fabrics are ASICs that take packets from network processors and transfer the information to the proper port on the network box.

Market Players: Some of the companies participating in this market are Allayer, Altima, AMCC (Yuni), Broadcom (Altima), Cisco (Growth Networks), Conexant (NetPlane), Entridia, Galileo, HyperChip, Intera, Mitel (Vertex), Net Insight, OptiX, Pericom, PMC-Sierra (Abrizio), Power X, Silicon Access, SwitchCore, TeraCross, TranSwitch (Alacrity), and ZettaCom.

Modules and Sub-Systems

The trend in the optical component industry is to combine discrete optical components and increasingly electronic components into modules that allow system manufacturers to reduce time to market, design and assembly, and cost. There are several methods to accomplish this including monolithic integration of passive and active components onto a single wafer, silicon optical bench technology using silicon wafers as a platform to integrate passive and active components, and hybrid integration of components manufactured with various techniques into a single package.

Monolithic integration is a complex, long-term solution being pursued by companies such as Alcatel, Lucent, Hitachi, Phillips, Siemens, Kymata, and AmberWave. It is highly dependent on breakthroughs in material processing technology.

Digital Optics, Furakawa, Hitachi, Lucent, and NEL are developing innovative silicon optical bench technology. It will provide more compact solutions to current packaging techniques.

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However, the majority of component integration and sub-system development is being done today using hybrid integration of components made from a number of different manufacturing technologies. The companies excelling in hybrid module and sub-system development (i.e. JDS Uniphase, Corning, Lucent, Nortel, Oplink, Avenex, New Focus, Bookham, Finisar, OCP, Alvesta, Axsun, LightLogic, PicoLight) have strong packaging expertise. TeleSoft Parters has invested in several companies that are developing optical sub-systems that combine multiple functions into a single package.

■ **Versatile Optical Networks** is developing semi-custom all optical and opto-electrical sub-systems for telecommunications system manufacturers. Versatile purchases components from other manufacturers to produce a family of sub-systems. It targets applications where it can increase density, miniaturize solutions, and reduce cost through automation.

■ **Lynx Photonic** is developing a waveguide based photonic switch with built-in VOA capabilities, multicast/broadcast modes, and fast switching speeds. Lynx's solution includes the switch's drive electronics and control interface.

■ **ModeTek's** high-speed optical modulators are packaged with the electrical drivers.

■ **NP Photonics** is manufacturing optical amplifiers using fiber and waveguide technologies.

Systems

There are a number of companies producing optical systems to aggregate, distribute, transport, amplify, and switch wavelengths of light. The market for optical transmission systems can be segmented into core long haul systems, metro systems connecting carrier facilities across metropolitan areas, access systems providing fiber to buildings, optical amplifiers positioned in transmission lines to condition and increase optical signals, and optical switches that connect the different networks. Figure 5 on page 9 is a partial list of some of companies in each segment.

TeleSoft Partners has invested in one developer of optical switching systems (Calient Networks). An optical switch works as "traffic cop" for cross-connecting optical streams in network hubs, and to provision bandwidth on a per-wavelength basis, enabling carriers to manage services at an optical layer. As optical networks and optical network elements mature, carriers will rely on OXCs for core networks restoration as well.

■ **Calient Networks** is manufacturing optical layer switches that will scale from eight to 4096 ports per system for service providers. It has developed ultra-dense, pure photonic switching systems and software for core optical networks. DiamondWave reduces operating costs, improves operational efficiency by eliminating the need for opto-electronic conversion, and enables service providers to effectively scale its networks.

Carriers

A number of companies are building fiber optic networks and facilities to provide high bandwidth, multiservice applications to subscribers. These carriers are laying fiber in the network core (i.e. Qwest, Level 3, Williams, IXC, Enron), in the regional or metro networks (i.e. MFN, incumbent LECs and RBOCs, utilities, and local municipalities), and in the last mile connection to subscribers (RBOC, incumbent LECs, cable companies, CLECs, and overbuilders such as RCN, Knology, 21st Century, Seren, Digital Media Systems, American Fiber Systems, Sphera Optical Networks, and Reversi Networks).

TeleSoft Partners has invested in two carriers that are providing high-bandwidth, fiber-based bundled

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services directly to business subscribers (OnFiber) and residential subscribers (WIN).

■ **OnFiber Communications** provides facility-based, broadband fiber connectivity to businesses and service providers. It is focusing on deploying last-hop fiber spans to provide ISP access, backhaul, private peering, transparent LANs, and ILEC bypass.

■ **Western Integrated Networks (WIN)** is a full-service, facilities-based provider of voice, video, and data services using fiber-to-the-curb/fiber-to-the-home technology. It is building a broadband network to serve residential and business users by deploying fiber deeper into network. The final connection to home will be a bonded coaxial cable and fiber optic cable. Telephony and data will be provided over fiber and video over coax.

FIGURE 5	OPTICAL SYSTEMS MARKET PLAYERS
Optical Switch/ OXC	Accelight, Alcatel, BrightLink, Calient, Chiaro, Ciena, Cinta, Cornet, Siemens, Jasmine, Laurel Networks, Lightchip, Luminous Networks, Luxcore, Cisco (Monterey), Network Photonics, Astarte, Sycamore, Tellabs, Tellium, Nortel (Xros), Glimmerglass Networks, Hitachi, Teraburst Networks
WDM Core	Alcatel, BigBear Networks, Ciena, Cisco (Pirelli), Corvis, Fujitsu, Siemens, Latus Networks, Marconi, Nortel, ONI Systems, OptiMight, PhotonEx, Solinet, Solstis, Xtera,
WDM Metro	Alidian, Atoga, Aurora Networks, Calix, Ciena (Cyras), Centerpoint Broadband, Cisco, Coriolis, ECI Teleocom, Ericsson, Fujitsu, Kestral, Lucent, LuxN, Mahi, NEC, Nortel, Opthos, Tellabs, Tropic Networks, Wavesmith, White Rock, Zaffire.
Optical Access	Adva Optical, Amber Networks, Lucent, Corvis, Equipe, Lantern, Luxn, Maple Optical Systems, Mayan, Quantum Bridge, Sycamore, Tenor
Optical Amplifiers	Alcatel, AOC, BaySpec, Calmar Optcom, Corning, Ditech Communications, Fitel Technologies, GenOA, Highwave Optical, IPG Photonics, Lucent, MOEC, MPB Technologies, NTT Electronics, Nortel, Oplink, Oprel, Xtera, Southampton Photonics, Super LightWave, Teem Photonics, Trillium Photonics, Harmonic

@Link Network
http://www.atlinknetworks.com

- @Link introduces @LinkPERISCOPE™, a revolutionary online performance reporting system (12/5/00).

- @Link selects Telcordia and SAIC to provide next-generation network solutions (11/14/00).

- @Link launches vertical marketing program (11/14/00).

- @Link promotes Monish Kundra to Chief Strategic Planning Officer (10/18/00).

AmberWave
http://www.AmberWave.com

- AmberWave adds Russ Bell to its team as Vice President of New Business Development (12/1/00).

Athene Software
http://www.athene.com

- Athene sponsors Outstanding Student Paper at Machine Learning Conference (12/6/00).

- Athene sponsors the Peppers & Rogers Group Europe's first European Executive Conferences, which focus on bringing the business case of multi-channel one-to-one marketing to Europe's top business executives (11/15/00).

BayPackets
http://www.BayPackets.com

- BayPackets is accepted as a Cisco Ecosystem partner (11/1/00).

- BayPackets completes a successful lab trial with a leading network element provider (11/1/00).

Calient Networks
http://www.calient.net

- Calient and Tellabs achieve successful all-optical network interoperability (12/6/00).

ClickRadio
http://www.clickradio.com

- ClickRadio names Shira Berk as Vice President of Media Relations (11/6/00).

- ClickRadio signs Memorandum of Understanding with Phillips Electronics North America that will result in the bundling of the ClickRadio Tuner as the pre-installed interactive music application on the next-generation, Internet-enabled cable TV set-top boxes (10/24/00).

COLO.COM
http://www.colo.com

- COLO.COM opens new facility in Orlando, FL (12/18/00).

- Space4rent announces a strategic relationship with COLO.COM to provide "netsourcing" services. This relationship will significantly extend COLO.COM's scope from a regional to a national provider in the expanding managed IT services industry (12/12/00).

- COLO.COM opens new facility in Las Vegas (12/6/00).

- COLO.COM appoints William A. Opet as President (11/10/00).

- NTT America partners with COLO.COM to implement the expansion of its Los Angeles facility (11/7/00).

- Williams Communications plans to offer Internet and communication services in COLO.COM colocation facilities (11/6/00).

CoSine Communications
http://www.cosinecom.com

- CoSine's IP Service Delivery Platform is selected by Covad to provide private networking devices to its growing subscriber base (12/18/00).

- CoSine's InGage product is awarded "Product of the Year" by *Internet Telephony* Magazine (12/18/00).

- CoSine is named first in market share for IP service platforms delivering network-based VPN services (11/21/00).

- CoSine empowers service providers to deliver advanced IP services to businesses in multi-tenant units (11/14/00).

- CoSine enhances fault and alarm management capabilities of its IP service delivery platform (11/13/00).

- CoSine is granted Encryption Import License by DCSSI for French territory (10/26/00).

- CoSine announces third quarter earnings (10/25/00).

- CoSine opens EMEA Customer Centre (10/23/00).

empowerTel Networks
http://www.empowertel.com

- empowerTel expands technology team: Mark Miller is to serve as Vice President of Carrier Operations (11/17/00).

The Feedroom
http://www.feedroom.com

- The Feedroom is chosen as finalist for "The Bandies" Award (11/21/00).

- The Feedroom brings television commercials alive on local and national news Web sites for TiVo (11/13/00).

- Feedroom's Jonathan Klein explores broadband content space (11/10/00).

- WCMH-TV launches narrowband site in Columbus, OH (10/30/00).

InfoLibria
http://www.infolibria.com

- NTT-ME announces plans to resell InfoLibria's Content Distribution and Delivery Solutions in Japan. NTT-ME, a wholly owned subsidiary of NTT, will resell InfoLibria's full line of CDD products throughout Japan (12/5/00).

- Getting a jump-start on satellite video streaming, InfoLibria announces one of the world's first large-scale commercial implementations of streaming Internet media via satellite to the edge of networks that serve high-speed users (*Inter@ctive Week,* 10/16/00).

iWitness
http://www.iwitness.com

- iWitness announces collaborative marketing initiative with Hewlett Packard (10/23/00).

Kymata
http://www.kymata.com

- IBM and Kymata team up to develop optical chips for high-speed networks (11/7/00).

- Kymata's round of funding totals $162 million to meet global demand for optical components (10/31/00).

Lara Technology
http://www.laratech.com

- STMicroelectronics and Lara Networks sign long-term agreement to develop network database search engine (10/23/00).

- Lara Networks secures $40 million in funding (10/23/00).

Novalux Inc.
http://www.novalux.com
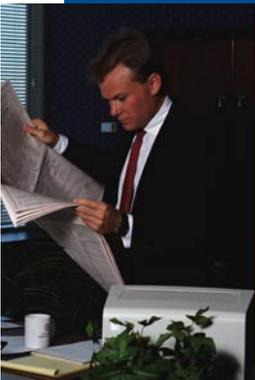
- Novalux announces the appointment of R. Douglas Norby to Chief Financial Officer. His responsibilities will include investor relations, financial management, and corporate development (11/4/00).

NP Photonic
http://www.npphotonic.com

- NP Photonics is working on a revolutionary new optical amplifier that will enable significantly higher levels of integration in optical sub-systems (12/14/00).

Seagull Semiconductor
http://www.seagull.com

- Seagull increases staff to 35 full-time employees worldwide, plus contractors (12/27/00).

- Seagull incorporates the company's new subsidiary in Herzilya, Israel (12/19/00).

SigmaTel
http://www.sigmatel.com

- SigmaTel announces AC'97 Design Win with Compaq (12/18/00).

- SigmaTel and Cirrus Logic agree to drop legal proceedings (12/4/00).

- SigmaTel announces support for Windows Media Digital Rights Management in soft audio solutions (11/6/00).

TollBridge Technologies
http://www.tollbridgetech.com

- TollBridge announces a laboratory trial with Korea Telecom (KT), the leading provider of integrated telecommunications services in Korea and the world's leading provider of digital subscriber line (DSL) services (12/5/00).

- Taqua Systems, Inc., a leading provider of next-generation Class 5 access switching platforms for voice and data convergence, and TollBridge sign an interoperability and joint marketing agreement (12/4/00).

- Ceon Corporation, the Broadband Service Fulfillment Company™, and TollBridge announce a partnership that combines Ceon's exclusive order management and flow-through provisioning solution with TollBridge's unique voice gateway offering (11/29/00).

- TollBridge and Syndeo announces that they will integrate their technologies and collaborate on sales efforts to deliver a fully featured, carrier-class voice-over-broadband system to next-generation communications carriers (11/28/00).

Triton Network Systems
http://www.triton-network.com

- XO Communications, formerly known as NEXTLINK/Concentric, announces it has successfully completed fixed wireless equipment field trials, and it has selected Triton Network as a nonexclusive provider of broadband point-to-consecutive point fixed wireless equipment in the United States (12/5/00).

- Triton Network announces an OEM agreement with Nortel Networks. Under the multi-year agreement, Nortel can incorporate Triton Network's Invisible Fiber® carrier grade network product portfolio and consecutive point architecture offerings into current agreements and new network design proposals (11/30/00).

- Triton Network receives full type approval from Telecom Engineering Center (TELEC), the radio regulatory arm of the Japanese Ministry of Posts and Telecommunications (MPT) (11/29/00).

- Triton Network revises previous fourth quarter 2000 financial objectives because a key customer, Advanced Radio Telecom, rescheduled product deliveries from the fourth quarter of 2000 into 2001 (11/14/00).

- Triton Network reports third quarter 2000 results. Revenues increase by 54 percent over second quarter 2000 (10/24/00).

Vina Technologies
http://www.vina-tech.com

- Gabriel Communications chooses Vina for bundled voice, data, video, and Internet access solutions. Gabriel will deploy Vina's suite of multiservice broadband access solutions in 30 markets in 13 states across the U.S. (12/19/00).

- Vina extends its multiservice broadband access solutions to the carrier's central office with introduction of next-generation aggregation platform. Vina's MBX Platform integrates functionality of three separate network devices in a single-access solution (12/13/00).

- Vina is named the #1 fastest growing private company in Silicon Valley by *San Jose Business Journal* (11/28/00).

- Vina expands its suite of multiservice broadband access solutions with acquisition of Woodwind Communications Systems (10/31/00).

VxTel
http://www.vxtel.com

- VxTel appoints Alcatel's COO Krish Prabhi to its board of directors (10/27/00).

- VxTel announces that it has closed a $62 million round of private equity financing, bringing total funding to more than $75 million (10/25/00).

- Intel Corporation's Dialogic subsidiary enters into an agreement with VxTel to supply the key building blocks to equipment providers for enhanced media gateways and media servers (10/24/00).

Western Integrated Networks
http://www.winfirst.com

- WINfirst selects SCC Communication to provide 9-1-1 service to customers (12/11/00).

- WINfirst selects Siebel eBusiness applications to support residential fiber-to-the-home customers (11/28/00).

- WINfirst chooses MDSI Advantex r7 to offer superior service to new residential customers (10/30/00).

Executive Recruiting

The Executive Recruiting section highlights key job opportunities at our portfolio companies.

Bay Packets (Menlo Park, CA)
http://www.baypackets.com

- Vice President of Sales
- Vice President of Marketing

Calient Networks (San Diego, CA)
http://www.calient.net/employment.html

- Vice President of Service and Customer Support
- Sales Director

Catamaran Communications (Milpitas, CA)
http://www.catamarancom.com/

- Vice President of Marketing

ClickRadio (New York, NY)
http://www.clickradio.com/index1.HTM

- Director of Customer Acquisition

Lynx Photonic Networks (Tel Aviv, Israel)
http://www.lynx-networks.com/careers.htm

- Director of Human Resources

Seagull Semiconductor (Austin, TX)
http://www.seagull.com

- Vice President of Marketing

Versatile Optical Networks (Fremont, CA)
http://www.versonet.com/

- Vice President of Engineering

VxTel (Fremont, CA)
http://www.vxtel.com/e_co_fre_salemark.htm

- Director of Information Technology
- Director of Marketing Communications
- Director of VSLI

NEW INVESTMENTS IN 2000

COREON

WINfirst

AmberWave SYSTEMS

LYNX PHOTONIC NETWORKS

OnFiber

TSOLA

BayPackets®
Convergence Of Voice And Data

VERSATILE Optical Networks

TOLLBRIDGE

NP Photonics

CreekPath SYSTEMS

NOVALUX

ModeTek

kymata

Seagull semiconductor

2001 INTERNATIONAL CES
Las Vegas Convention Center
Las Vegas Hilton, Alexis Park &
   Riviera Hotel
Las Vegas, NV
January 6–9
Participating: SigmaTel

PTC 2001
Hilton Hawaiian Village
Honolulu, HI
January 15–17
Participating: COLO.COM

7TH ANNUAL WCA TECHNICAL SYMPOSIUM
San Jose, CA
January 17–19
http://www.wcai.com
Participating: Triton Network

SUPERNET 2001
Santa Clara Convention Center
Santa Clara, CA
January 16–19
Participating: Calient Networks, Lynx Photonic Networks, SigmaTel

COMNET 2001
Washington, DC Convention Center
Washington, DC
January 29–February 1
Participating: empowerTel

OPTIX 2001
Ritz-Carlton, Huntington
Pasadena, CA
February 11–14
Participating: Calient Networks, Kymata, Lynx Photonic Networks, Novalux

2001 WIRELESS SYMPOSIUM
San Jose Convention Center
San Jose, CA
February 13
http://www.eventshome.com
Participating: Triton Network

IP BILLING WORLD ASIA 2001
JW Marriott Hotel, Hong Kong
Hong Kong, China
February 14–16
Participating: empowerTel

COMPTEL
Marriott World Center
Orlando, FL
February 18–21
Participating: COLO.COM

Conference
Calendar

CLEC EXPO SPRING
Jacob K. Javits Convention Center
New York, NY
February 21–23
Participating: COLO.COM

INTERNET WORLD SPRING
Los Angeles Convention Center
Los Angeles, CA
March 14–19
Participating: COLO.COM

OFC 2001
Anaheim Convention Center
Anaheim, CA
March 19–21
Participating: Lynx Photonic Networks

SPRING 2001 VON
Phoenix Civic Center
Phoenix, AZ
March 20–21
Participating: empowerTel

CEBIT 2001
Hanover, Germany
March 22–28
Participating: SigmaTel

IPSCON SPRING
Baltimore Convention Center
Baltimore, MD
April 4–6
Participating: COLO.COM

INVESTMENT BANK ANALYSTS

Cisco Systems (acquired Cerent) [CSCO]—Banc of America (Chris Crespi / 415-913-2147), Salomon Smith Barney (Alex Cena / 212-816-6000), UBS Warburg (Nikos Theodosopoulos / 212-821-4000), WR Hambrect (Tim Savageaux / 415-551-8600).

Dell Computer (acquired ConvergeNet) [DELL]—Banc of America (Kurt King / 415-627-2820), Lehman Brothers (Daniel Niles / 415-274-5200), Salomon Smith Barney (Richard Gardner / 212-816-6000).

Nortel Networks (acquired Promatory) [NT]—Chase H&Q (Michael Neiberg / 212-207-1400), Goldman Sachs (Mary Henry / 650-234-3300), Morgan Stanley Dean Witter (Alkesh Shah / 212-761-4000), SG Cowen (James Kedersha / 617-946-3700).

Triton Network Systems [TNSI]—Credit Suisse First Boston (Marc Cabi / 415-836-7600), U.S. Bancorp Piper Jaffray (Samuel May / 650-233-2260).

Vina Technologies [VINA]—Lehman Brothers (Steve Levy / 212-526-2499), Thomas Weisel Partners (John Todd / 415-364-2500), U.S. Bancorp Piper Jaffray (Conrad Liefur / 612-303-6320).