LAMBDA OPTICALSYSTEMS SOLUTIONS

LambdaNode™ 2000

All-Optical Switching

The LambdaNode 2000 is the industry's only integrated all-optical switch. Unlike other "optical" switches that have to convert optical signals into electrical signals and then back to optical format for transport, the LambdaNode 2000 executes all switching in native optical format. This "all-optical" approach eliminates the requirement for organizations to maintain expensive OEO conversion equipment on their networks. What does this mean for carrier and enterprise customers? Lower signal delays, reduced cost, higher performance, improved reliability, and enhanced manageability. The LambdaNode 2000 utilizes 3-D MEMS (micro-electro-mechanical-systems) for reliable, rapid switch time and low signal loss for effective optical switching. 3-D MEMS have met the rigorous Telcordia GR-63 design standard that protects systems against extreme temperature, humidity, vibration, etc., and have shock tested to over 2,000 Gs (G for gravitation unit of measure).

Integrated DWDM

Built for ring, mesh, and ring/mesh metro and regional networks, the LambdaNode 2000 fully integrates Dense Wavelength Division Multiplexing (DWDM) technology, which multiplies fiber capacity and allows diverse packet formats (SONET/SDH, IP, ATM, etc.) to travel together at the same time on one optical fiber. This integrated functionality eliminates the need for expensive transponders to convert signals back to 1310nm wavelengths and the associated optical switch ports, which are typically deployed in metro and regional networks.

Express Traffic

The LambdaNode 2000 supports optical circuits of up to 1,000 kilometers without electronic regeneration. More than 50 percent of network traffic does not need to stop at each node in the network, however traditional switches require all signals to stop in order to route them to their next location. Because it is all-optical and does not require signal conversion, the LambdaNode 2000 bands wavelengths, allowing network traffic to take the "express" route – traveling at the speed of light to its final destination.

GMPLS Advantages

Protocol agnostic, the LambdaNode 2000 is compatible with GMPLS (Generalized Multi-Protocol Label Switching), a standard that enables a broad suite of new communications applications. GMPLS provides enhancements to the Multi-Protocol Label Switching (MPLS) standard, supporting optical networks for time, wavelength, and space/packet switching. GMPLS adoption improves switching and photonic networking device performance, providing service providers with a scalable, cost-effective means to automate network management and facilitate the deployment of new services.

Multiple Degrees of Flexibility

In a typical metro network, DWDM terminals reside where the fiber ends and are interconnected by a manual fiber patch panel or an OEO junction switch. While most OEO switches enable traffic flow through two locations, the LambdaNode 2000 enables network traffic to flow through seven interfaces – maximizing network efficiency. Because the LambdaNode 2000 integrates an all-optical switch with DWDM, it allows network operators to interconnect up to three metro rings without the need to deploy an OEO switch at the junction of each DWDM terminal . It also readily supports a migration path to mesh topology. This minimizes redundancy inherent in traditional OEO networks – eliminating the need for excess equipment, reducing cost, and maximizing network performance.

Mesh Networking

Data networks can run logical mesh topology overlays on transport ring architectures, but burgeoning traffic demands on IP routers over-run threaded multi-ring transport networks. As such, survivability is a growing challenge. Mesh networks can rapidly scale to meet the demands of these networks and offer the necessary survivability. The LambdaNode 2000 is designed to support physical mesh topology to meet the growing transport needs of high-speed packet networks and offer the robust survivability required on these converged networks.

The LambdaNode family is also fully integrated with the LambdaCreate network management software suite.

LambdaNode™ 5000 Optical Services Platform

Pioneering AdvancedTCA® in the Optical Network Layer

The LambdaNode 5000 Optical Services Platform leads the way in the rapid provisioning of optical services for access, metro, and regional applications, offering customers flexibility and investment protection. Based on the Advanced Telecom Computing Architecture (AdvancedTCA®), the LambdaNode 5000 platform takes a lead role in the rapid provisioning of optical services for access and metro applications. The AdvancedTCA shelf supports standardization of optical transport systems and provides increased flexibility via a competitive blade (circuit pack) environment.

Increased flexibility, lower cost, and investment protection

Incorporating leading edge technology, the LambdaNode 5000 platform provides unprecedented switching capability that extends from two-degree ring topologies to multi-degree mesh topologies. Among the benefits offered by the LambdaNode 5000 platform:

- Reduce CapEx costs through standardization of integrated optical systems such as Wavelength Selectable Switching (WSS) and ROADMs (reconfigurable add/drop multiplexers) on AdvancedTCA
- Reduce OpEx costs through GMPLS control-plane with auto discovery, automated inventory, provisioning, and fault management
- Improve optical network flexibility with a path from rings to mesh topology and dynamic reconfigurability
- Rapidly customize specific applications just by changing circuit packs.
- Simplify management through common control and management software

Complementing the LambdaNode 2000 and LambdaCreate™ software

The LambdaNode 5000 platform complements the features of the LambdaNode 2000, the industry's first integrated, all-optical switch, while continuing to offer:

- simplified network engineering and operation
- dynamic, flexible network configuration
- high-availability service protection
- differentiated transport services
- elimination of costly O-E-O conversions
- scalability to 40 Gbps
- carrier-class fault and performance management
- protocol and bit-rate independence.

Based on these attributes, the LambdaNode 5000 platform is the ideal choice to support legacy ATM and Sonet/SDH networks as well as converged IP, IPTV, Internet-based video, interactive gaming, storage area networking, Ethernet, Lambda Grid, WSS, and ROADM applications.

LambdaNode™ 3000

Intelligent Optical Cross-Connect Dramatically Reduces CAPEX and OPEX

Lambda OpticalSystems' intelligent optical cross-connect incorporates an all-optical fabric with dynamic GMPLS control plane for metro, and long-haul locations. The all-optical cross-connect and software will:

- Provide bit-rate independent and transparent switching to any protocols.
- Enables carriers to provide unique all-optical services such as optical virtual private networks (O-VPNs).
- Rapidly switch fiber to increase network resiliency.
- Add dynamic fiber and wavelength support to static WDM transport networks.
- Reduce CAPEX and OPEX by using lower-power all-optical technology and dynamic control plane.

Intelligent All-Optical Cross Connect

The LambdaNode 3000 is a new intelligent, all-optical cross-connect with integrated GMPLS control plane. Designed for metro, long-haul carrier locations, it offers the ability to switch traffic in native format without converting to electrical format which saves on space and power. The GMPLS software has been tested for interoperability with leading router and multi-service provisioning platforms (MSPPs).

Creates Dynamic and Survivable Optical Networks

Adding the LambdaNode 3000 to an existing WDM network creates the ability to provide intelligent path routing, mesh network protection that make networks more dynamic and survivable. The system is designed to upgrade an existing static single or multi-wavelength optical transport network into a dynamic application-driven optical network. Optional protection mechanisms include: 1+1,1:1 and 1:N.

Carrier Grade Design

- Fully redundant system control and switch fabric for high-availability operations.
- Supports 1+1 path protection.
- Optical ports are scalable to any speed from 50Mbs to 40Gbs. No need to upgrade fabric for higher port speeds.
- Optical ports can handle single or multiple lambdas.
- High density of 128x128 full duplex ports for medium and large switch applications.
- Scalable to 256x256 port fabric within the same system bay.

Transparency Simplifies Operation

- No need to encapsulate traffic into a common protocol.
- Optical signals remain in native format and switch in an all-optical manner to decrease latency and provide a deterministic path which are required for grid networks and eScience applications.
- Can support any protocol: Ethernet, ATM, IP, Fibre Channel, FICON, Video.

Intelligent Service Delivery

- Single management plane with point-and-click LambdaCreate Services Delivery System.
- Fast single person end-to-end remote provisioning/rearrangement and rapid automatic restoration for the entire network.
- Single LambdaCreate Optical Control Plane across all LambdaNode optical switch products.

LambdaNode™ 200

Intelligent Optical Switching System

Lambda OpticalSystems' intelligent optical switching system incorporates an all-optical fabric with dynamic GMPLS control plane for metro, access and campus locations. The all-optical switching system and software will:

- Provide transparent switching to any protocols
- Switch bands or groups of lambdas on each switch port
- Add dynamic fiber and wavelength support to static WDM transport networks
- Enable education and government labs to research optical networks
- Add all-optical switch function to OEO-based OXC junctions

Intelligent All-Optical Switching System

The LambdaNode 200 is a leading intelligent all-optical switching system with integrated GMPLS control plane. Designed for metro, access and campus locations, it offers the ability to switch traffic in native format without converting to electrical format which saves on space and power. The GMPLS software has been tested for interoperability with leading router and multi-service provisioning platforms (MSPPs).

Creates Dynamic and Survivable Optical Networks

Adding the LambdaNode 200 to an existing WDM network creates the ability to provide intelligent path routing, mesh network protection that make networks more dynamic and survivable. The system is designed to upgrade an existing static single or multi-wavelength optical transport network into a dynamic application-driven optical network. Optional protection mechanisms include: 1+1, 1:1 and 1:N.

Transparency Simplifies Operation

- No need to encapsulate traffic into a common protocol.
- Optical signals can remain in native format and switched in all-optical manner to decrease latency and provide a deterministic path which are required for grid networks and eScience applications
- Can support any protocol: Ethernet, ATM, IP, Fibre Channel, FICON, Video

Optimal Design

- Optical ports are scalable to any speed from 50Mbs to 40Gbs. No need to upgrade fabric for higher port speeds.
- Optical ports can handle single or multiple lambdas.
- High density of 64 x 64 full duplex ports for small and medium switch applications
- Saves space and power. Only 5.25 inches tall (3 telco rack units), the **LambdaNode 200** can easily fit into a small telecom closet with a rated 640Gbps capacity if 10Gbs SONET or 10Gbs Ethernet protocols are used.

Intelligent Service Delivery

- Single management plane with point-and-click LambdaCreate Services Delivery System
- Fast single person end-to-end remote provisioning/rearrangement and rapid automatic restoration for the entire network.
- Single LambdaCreate Optical Control Plane across all LambdaNode 200s and 2000s.

LambdaCreate™

Single Point of Control

The LambdaCreate network management software suite enables remote, real-time, end-to-end control of all Lambda Node 2000 switches in the metro/regional network. The Lambda Optical Control Plane (OCP), the operating system running on the Lambda Node, fully integrates the Lambda Node switching family with the LambdaCreate software suite.

Comprehensive, Robust Functionality

Fully FCAPS (Fault-Management, Configuration, Accounting, Performance, and Security) compatible, the LambdaCreate software suite provides a robust functionality in all management disciplines, including:

- **Topology and Connection Management** – Addresses all the steps necessary to discover, manage, and improve the reliability of the network. More specifically, the topology manager allows network operators to auto-discover the physical topology of the network, including Lambda Node 2000's connectivity. The connection manager utilizes the topology data to create bandpaths, bundle bandpaths into logical links, and provision end-to-end optical circuits with different service levels (1+1, auto-restore, 1:1, and 1:N)

- **Fault Management** – Provides real-time fault detection, isolation, identification and correlation, as well as historical alarm and client information. This functionality enables remote troubleshooting services that allow network operators to identify and correct current and potential network problems, minimizing network downtime and making the network more reliable

- **Configuration Management** – Allows network operators to configure the Lambda Node 2000 integrated optical switches and dynamically manage inventory

- **Performance Management** – Allows network operators to track performance of circuits to manage service level agreements (SLAs) and provides optical and SONET/SDH performance monitoring counts

- **Security Management** – Allows network operators to protect the network from unauthorized users and/or sabotage by controlling user access

- **Network Engineering Tool** – Allows network operators to plan ahead for changes in network traffic and allocate bandwidth on existing equipment, or add new equipment to ensure SLAs are upheld. This includes examination of network grooming, capacity planning and traffic growth, failure simulation, resiliency designs, and end-to-end path protection schemes

Intuitive Graphic Interface for Efficient Provisioning

LambdaCreate allows network operators to efficiently provision and optimize Lambda Node 2000 resources throughout the network. The software suite's intuitive point-and-click graphic interface provides a single view of the entire network and each Lambda Node, allowing network operators to manage the all-optical network remotely from any location, at any time. This functionality reduces the need for manual provisioning and network management – speeding service delivery and boosting network performance. LambdaCreate also includes a TMF-814 compliant CORBA interface to allow for easy integration with other network and service management systems.

For media inquiries, please contact: press@lopsys.com.

or

Rosanne E. Desmone
Mt. Vernon PR & Communications
PO Box 215
Mt. Vernon, VA 22121
703.799.8165
703.946.3820 (cell)
rdesmone@mtvernonpr.com
www.mtvernonpr.com