

New ISP's and Operators Leverage CWDM in Unbundling Local Loops

ITU standard-based sub-systems enable drastic OPEX and CAPX reductions
by Francis Nedvidek of Cube Optics and Rene Avi of Next Layer Telekom GmbH



Francis Nedvidek, Cube Optics' Chief Executive Officer (CEO).

His career progression boasts over two decades of experience spanning technology innovation, product and market

development and general management roles. Prior to joining CUBO, Dr. Nedvidek held senior positions with corporations in Canada, the USA and Europe including the Raytheon subsidiary ELCAN Optical Technologies, Leica, Black & Decker, the Electrical Division of von Roll ISOLA and the SOMOS Consulting Group. Dr. Nedvidek holds a Ph.D. in Laser Physics and M.E.Sc. and B.E.Sc. degrees in Electrical and Electronic Engineering. Dr. Nedvidek also holds a P. Eng. designation.



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Next Layer Telekom GmbH, which focuses on system integration and design in the metro fiber environment.

Fascinated by the opportunities of converged networks with nearly unlimited capacity he planned, built and operated several fiber and unbundling networks during his career. Prior to that he earned experience at various executive engineering and product management positions in EUnet, KPNQwest and Tiscali.

National level deregulation, the relentless expansion of demand for broadband Internet access and new high-speed data transmission, data storage, voice / VoIP, and video services continue to drive growth of network capacity via traditional incumbents and ISP's. As networks grow in

geographic reach, subscriber counts and service offerings, Wave Division Multiplexing (WDM) has clearly become the preferred method for cost effectively increasing the bandwidth of existing optical networks while providing scalability for newly installed or Unbundled Local Loops (ULL's). Wavelength access platforms utilizing Coarse Wave Division Multiplexing (CWDM) enable cost-effective solutions for expanding and managing fiber services between metropolitan area network co-location facilities and enterprise LAN or SAN extensions. A CWDM approach offers very significant benefits of low CAPEX and OPEX while simultaneously providing incremental scalability with maximum flexibility during expansion drives or as market growth trends change.

During the 1980's, CWDM technologies were introduced in order to transport multiple channels within the 850 nm multimode fiber Local Area (LAN) window at typical spacing of 25-20 nm. At that time, applications included multi-channel video distribution and fast bi-directional telemetry with associated management and control information transmitted over single fiber strands. Today, ITU G.694.2 standardized CWDM technology operates over the complete fiber optical communication spectrum from 1270 nm to 1610 nm at a standardized wavelength spacing of 20 nm. Typically, CWDM equipment can provide multiplication of data transfer capacity of a single fiber by factors of 4, 8 or 16 to a maximum of 18 depending on required or anticipated traffic flow and fiber specification. Individual data streams are multiplexed (MUXed meaning allocating a different wavelength for each channel) upon entering the fiber and then de-multiplexed (DMUXed or rendered again as separate data channels) at the fiber termination end.

Cube Optics was founded with the intent of producing low cost CWDM and other types of passive optical networking wavelength expansion components and modules. We address the bandwidth capacity demands and economic challenges of optical networks embracing new

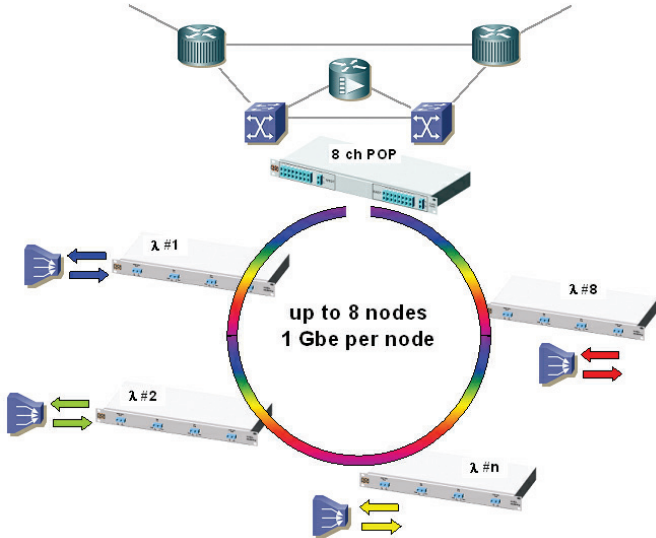
broadband and triple-play services such as voice, Internet, TV and interactive video.

Internet Service Providers (ISP's) and Operators, in the wake of recent telecom deregulation efforts, have gradually developed strategies to effectively compete with Incumbent Carriers. These new and aggressive ISP's and Operators adapted the traditional business model. New entrant Carriers focus execution to capture customers and cost efficiencies. New entrants exploit their agility and leverage their financial means and their relative freedom from legacy infrastructure to enhance maneuverability in the market.

In the UK, Austria, France, Holland and now Italy and Germany, ULL projects have become a pivotal theme. Several trend-setting projects have already been deployed and many important projects are either in progress or on the horizon. Cube Optics and its Partner Next Layer have participated in assisting ISP's and Operators by supplying passive CWDM components, subassemblies and rack-mountable modules and associated equipment as well as architectural guidance directly to ULL projects. Traditionally, OEM subsystem manufacturers and system level vendors would purchase these components and integrate them into higher level systems. Installers would normally be contracted to implement all or part of the infrastructure from head-end to co-location sites. Today Carriers, whether new ISP's or more established Operators, have increasingly turned to managing the design, procurement and deployment of network infrastructure themselves. They well appreciate the simplicity and dramatic cost savings of using off-the-shelf rack-mountable CWDM modules to realize fast, flexible and cost-efficient extension of existing fiber and bandwidth expansion of existing lines or newly leased fiber lines.

Local Loop Unbundlers deploying network infrastructure are deciding to take advantage of CWDM enhanced architectures. Decisions typically revolve around the following priorities:

- Low and predictable equipment and operating



cost - Network providers and operators are tending to finance expansion through cash flows generated by recently acquired subscribers and enterprise service contracts. The network solution and the equipment deployed therefore must promise both low CAPEX and economical OPEX. Quick return on investment is essential if revenue from newly installed co-location sites is to be used to fund the next phase of a roll out or if income is spent to satisfy traffic growth.

- Ability to upgrade parts or the entire network quickly and efficiently - Rapid response is key to both pre-emptively or defensively capturing and holding market share and to minimize the period from cash invested to revenues earned. Agility therefore has a major impact on the launch strategy and its timing. In our experiences with European ISP's, a network architecture exploiting CWDM building blocks can be installed and made fully operational within days. Upgrades from 4 to 8 or more channels per fiber have been realized within a day.
- Simplicity of specification, simplicity of deployment and simplicity of upgrade / reconfiguration - An inherent attraction of passive CWDM-centric solutions is that the technical expertise required to design, manage and upgrade or otherwise adapt the network are modest. By the same token, ISP's and Operators, in selecting system hardware and network management solutions, prefer approaches avoiding the risks and burdens of complex network design and planning. On the other hand, they are equally vigilant about preserving the highly desirable features of low and transparent operating and maintenance costs. Scalability options demonstrating clear and tangible upgrade paths are essential. Unbundlers do not wish to install or service networks laden with technical performance and

management features considered overkill. Advanced functionality may be regarded positively when optional. However, features inherently resident on more than one network building block are considered redundant, not appreciated, not wanted and will not be paid for.

- Solutions sufficiently flexible to facilitate rather than constrain future

expansions are mandatory - ISP's and network Operators are born with the purpose to bring new services to eager customers, extend geographical reach and supply ever more data traffic capacity. Certainly, many ISP's today utilize CWDM equipment to realize connection of new Points of Presence (PoPs) to their networks on a weekly basis. In addition, new Carriers strive to ensure that technical improvements and financial resources associated with upgrade scenarios remain decomposable into predictable and non-cost-prohibitive modules. In this way, ISP's and Network Operators reserve the freedom to roll out capacity, coverage and services as the changing demand and competitive landscape require, and cash flows permit.

- ISP's and operators want to remain in complete control of their technical and network development - Unbundlers are quickly accumulating the network knowledge and technical understanding necessary to play a major role in determining the architecture and the operation of their networks. They are mounting increasing resistance against being locked into any particular proprietary vendor approach or attendant service agreements. For example, the CWDM product line offered by Cube Optics operates unconstrained with any of the routers, switches, DSLAMs and even the WDM systems offered by major Telecom /

Datacomm vendors. As a passive element, CWDM modules are functionally transparent to all data transmission protocols and are immune to the incompatibility problems often encountered when connecting disparate equipment and accessories supplied by different vendors.

New ISP Operators and those unbundling local loops are changing the game. Certainly, they are champions of broadband connectivity and aggressive value added providers. They are also becoming innovative network architects, agile deployment specialists and savvy supply chain managers.

The CWDM products we design and manufacture at Cube Optics directly address the competitive wavelength management and bandwidth expansion needs of metropolitan and access markets. We have worked closely with European ULL pioneers in supplying rack-mountable CWDM modules and CWDM line cards, associated cables and fixtures to major projects in France, Austria and Germany. Cube Optics has become known for providing CWDM components exhibiting uniquely small footprints with low insertion loss and flat band-pass profiles spanning 4, 8 and 16 channel MUX and DEMUX ranges of applications. We supply a full line of passive optical networking components, modules and accessories suitable for direct installation into co-location racks and fully compatible and interoperable with systems and modules supplied by major vendors including switch, router and DSLAM vendors. Cube Optics is presently extending its expertise to integrating electro-optic components including detectors and sources with CWDM and beam management elements in complete miniature housings. Such miniature assemblies are being deployed in the next generation of optical Ethernet transceivers including the Xenpak and the X2 form factor.

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