Long-Haul DWDM: Market & Technology Outlook

EXECUTIVE SUMMARY

Over the first half of this decade, the long-haul and ultra-long-haul dense wavelength division multiplexing (DWDM) markets lacked the energy, steady growth, and rapid innovation of metro optical networks, but in 2006 they began to show significant signs of improvement. Growth out-paced even the most sanguine forecasts, and the improving health of the wavelength services market, combined with ever-growing bandwidth demand, has set the stage for an ongoing surge in core DWDM investment by network operators.

Long-Haul DWDM: Market & Technology Outlook provides a detailed look at this expanding market through an extensive and exclusive survey of network operators worldwide; a forecast of the equipment market; and information gathered from direct interviews with carriers and suppliers. The report analyzes an optical market segment that has been in the shadows of the higher-profile metro and regional markets of late. The findings of this latest research reveal a market in the midst of an impressive recovery, as operators not only shore up capacity on their installed base of long-haul DWDM gear to keep up with demand, but also overlay routes or entire backbones with new gear to take advantage of the latest generation of equipment.

The key questions now facing network operators include:

- At what pace will backbone bandwidth demand continue to grow, and is there any way to "future proof" a core DWDM network?
- How can network operators take advantage of new technologies to improve provisioning times and lifecycle costs, given their capital constraints?
- How will the trend in the metro-aggregation network toward Ethernet and packet networking affect network operator decisions in the core?
- Will growth in the core network be cyclical or linear?
- Will wavelength services migrate to optical transport network (OTN) services? And will OTN migrate to a true networking layer, beyond Sonet/SDH?
- Will 40-Gbit/s transport be squeezed out of the market by 100-Gbit/s Ethernet?

Long-Haul DWDM: Market & Technology Outlook explores each of these questions in detail, with some answers provided by an exclusive worldwide survey of 88 service provider employees, designed to elicit their core DWDM deployment plans and feature requirements. The survey was supplemented by direct interviews with DWDM operators and vendors.
Network operators interviewed for and analyzed in this report are:

- AT&T Inc. (NYSE: T)
- Interoute Communications Ltd.
- Level 3 Communications Inc. (Nasdaq: LVLT)
- Verizon Communications Inc. (NYSE: VZ)

Equipment vendors interviewed for and analyzed in this report are:

- Alcatel-Lucent (NYSE: ALU)
- Ciena Corp. (Nasdaq: CIEN)
- Ericsson AB (Nasdaq: ERIC)
- Huawei Technologies Co. Ltd.
- Infinera Corp.
- Nortel Networks Ltd. (NYSE/Toronto: NT)
- Siemens AG (NYSE: SI; Frankfurt: SIE)
- Xtera Communications Inc.
- ZTE Corp. (Shenzhen: 000063; Hong Kong: 0763)

In 2006, the long-haul DWDM market – including those systems designed for backbone networks, with spans in excess of 1,000 km – grew more than 30 percent, to approximately $1.8 billion. This growth benefited nearly every long-haul DWDM vendor worldwide. There are many drivers, but the market is clearly ramping quickly to a cyclical peak, driven by converging factors of intense bandwidth demand from broadband Internet and mobile applications; a healthy, stabilized wholesale bandwidth and wavelength services market; new core overlays to address the requirements of newly merged operators; and generational upgrades due to aging DWDM infrastructure that is no longer economical to expand incrementally.

The vast majority of network operators either are upgrading, or soon will upgrade, their DWDM backbones. In our service provider survey, 52 percent of respondents said their company is currently expanding its DWDM backbone; another 42 percent said their company will expand in 2007 or 2008.

**Excerpt 1: Operator Plans for Backbone DWDM Upgrades**

<table>
<thead>
<tr>
<th>Expansion Plan</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currently Expanding</td>
<td>52%</td>
</tr>
<tr>
<td>Will Expand in 2007</td>
<td>42%</td>
</tr>
<tr>
<td>Will Expand in 2008</td>
<td>0%</td>
</tr>
<tr>
<td>No Expansion Planned</td>
<td>0%</td>
</tr>
<tr>
<td>Don't Know/Not Sure</td>
<td>0%</td>
</tr>
<tr>
<td>Will Expand in 2009</td>
<td>0%</td>
</tr>
</tbody>
</table>

Source: Heavy Reading
**Report Methodology**

The methodology of *Long-Haul DWDM: Market & Technology Outlook* was designed to gather information critical to equipment suppliers and service providers in the core DWDM transport market. Our primary research was conducted in two stages:

First, *Heavy Reading* conducted a series of one-on-one interviews with employees of network operators – typically senior network planners, directors of R&D, and network architects. Subjects covered included a review of current core DWDM deployments, transport requirements for future services, feature requirements for next-gen core DWDM, and timing of deployments.

Second, *Heavy Reading* conducted a global online survey of telecom operators to gather information on their current core DWDM strategies and future technology plans. The survey elicited 88 quality responses from employees of 88 unique service providers, including incumbent and competitive operators of every stripe.

The majority of respondents were from incumbent PTTs and ex-PTTs, interexchange carriers (IXCs), Internet service providers (ISPs), and competitive local exchange carriers (CLECs).

**Excerpt 2: Survey Respondents by Type**

*Source: Heavy Reading*

**Report Scope & Structure**

*Long-Haul DWDM: Market & Technology Outlook* is structured as follows:

**Section I** is an introduction to the report, with complete report key findings.

**Section II** assesses the long-haul DWDM market, analyzing its current strength and growth prospects, and offers a five-year growth forecast, drawing on supplier data and carrier interviews.

**Section III** details the results of *Heavy Reading*’s service provider survey on technology requirements for long-haul DWDM deployments.
Section IV considers evolving service provider architectures for long-haul DWDM deployments.

Section V profiles select service providers with long-haul DWDM plans of particular interest.

Section VI examines the equipment vendors in the long-haul DWDM space.

The report is essential reading for a wide range of industry participants, including the following:

- **Telecom equipment suppliers**: How will the DWDM equipment market take shape over the coming months and years? How will expected revenue shifts affect your products? How will the rise in demand for DWDM technology affect your revenue prospects and opportunities? How will the ongoing evolution of gigabit-class Ethernet affect your product plans? Which suppliers are in the best position to maintain and grow market share?

- **Gigabit Ethernet subsystem vendors**: How is the evolution to 100-Gbit/s Ethernet likely to occur in core networks? Does your product line match the anticipated demand curve? How will the emergence of 100-Gbit/s Ethernet affect demand for 40-Gbit/s products?

- **Telecom service providers**: How is the DWDM sector evolving to meet your needs? Which suppliers are taking an approach that fits best with your company's strategy? Are your current suppliers the best option, or are there other choices that are better aligned with your plan?

- **Investors**: Which equipment makers are in the best position to thrive in this market sector over the coming years? Which companies are emerging as the early winners in this sector, and which ones are likely to struggle for market share? How significant will DWDM market growth be to the telecom equipment industry?

*Long-Haul DWDM: Market & Technology Outlook* is published in PDF format.