Nexans

Technology Watch

LAN Newsletter

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DATA COMMUNICATIONS COMPETENCE CENTER

Nexans

TECHNOLOGY WATCH

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1.0 General Market Trends

There are two main topics filling the airways these days and they are:

1. "Green" operations prompted by requirements for lower energy consumption in the LAN and data center.
2. Migration in data rates from 10Gb/s and beyond, through 40Gb/s and 100Gb/s transmission.

Energy consumption in the data center has become a major concern for the IT/ DC manager ever since bill HR2829 was passed by congress authorizing the EPA to analyze growth in energy consumption in data centers. One might say that this is a distraction from the real culprits in the nation's energy consumption equation, since only 1.3% of the US energy costs is attributable to data centers. As the demand for more bandwidth hungry applications increase, the cost of running a data center is more heavily weighted on the energy required to keep it cool.

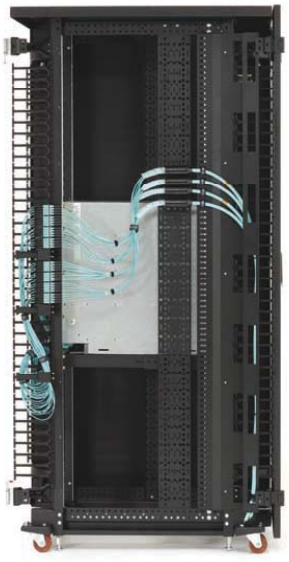
Techniques such as Server Virtualization are now being used as a means of balancing equipment usage and costs with the energy needed to run the data center; i.e. energy is dynamically increased or decreased based on the volume of data being transmitted with the use of commodity servers.

The need to conserve energy is also being addressed by the type of cable interconnects now being introduced in the data center.

Active copper and active fiber cable assemblies which are smaller, lighter, faster, and require lower power and latency are now in vogue. Manufacturers are advertising these active cables as being more energy efficient because they use less power; and because they are smaller, they enhance air flow within the data center equipment. Several manufacturers have introduced products within the last three to five months including: Intel, Luxtera, Zarlink, Tyco, Finisar, Molex, Amphenol and Gore. Those with active fiber products have targeted markets requiring data rates of 10Gb/s and beyond with transmission distances up to 300 meters.

2.0 Corning and Chatsworth Alliance

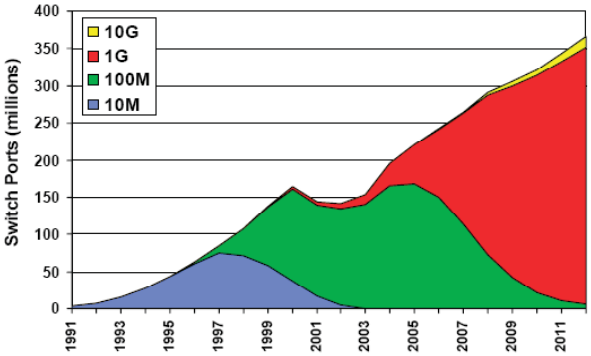
In early January, Corning Cable Systems and Chatsworth Products, Inc. teamed up to introduce new data center products with the hope of simplifying the data center design and installation process. The product incorporates Corning's Zero-U system into Chatsworth's TeraFrame family of cabinets to achieve high density connectivity and cable management for storage area networks (SANs). This system manages optical fiber trunk cables, harnesses and modules within the data center cabinets that house SAN electronics. In traditional installations, jumper cables had to be routed along the side of the cabinet in order to make port connections. The Zero-U system incorporates MTP connector brackets which facilitate patching, thus reducing the amount of rack space taken up by cables. Harnesses are customized for integration with Cisco's MDS 9513 and Brocade's 4800 SAN directors. Speed of deployment and the enhancement of efficient air flow are being touted as benefits of this new system.



3.0 Copper LAN Cabling

3.1 Market

Aggregated 10G Ethernet links are being deployed by network providers as a means of keeping up with ever increasing traffic from applications such as streaming video, HDTV, IPTV, etc. Studies suggest that the market will be requesting at least 100G by 2009, although Google reported at the recent OFC/NFOEC conference (Feb. 24 – 28) that they need 100G now. If the adoption rate of 10G Ethernet is any indication, however, very few 100G links should be in play initially. Most data center servers are networked with 1G Ethernet today with 10G enabled servers just ramping up. *(Graph from Dell'Oro Report - Cu & Fiber Shipments)*



Although work under IEEE 802.3ba is addressing 40G and 100G Ethernet speeds, a somewhat slower than expected migration to these speeds in the server environment is expected because of the trend towards server virtualization. The IEEE 802.3ba will specify 100G Ethernet to support 10km and 40km SMF links, a 100m OM3 Multi-mode fiber link and a 10m copper link.

Another market trend that should bode well for copper in the data center is the migration from rack to blade servers. Shorter high speed copper links from server-to-switch will be required, prolonging the use of copper media in the data center as higher transmission speeds are introduced. However, green field operations may still opt for fiber as an edge to future proof their investments.

3.2 Technology

Researchers at Penn State, in conjunction with Nexans, have shown, at least theoretically, the possibility of data transmission of up to 100Gb/s over twisted pair (CAT-7A) cabling. Findings were presented to the IEEE.802.3 High Speed Study Group (HSSG) last November showing that copper still has additional capabilities which need to be explored. The study, presented by Dr. M. Kavehrad, shows that 100Gb/s is possible over 70 meters of CAT 7A copper cable. The major impediments to these high data rates are: the need for echo cancellation, an efficient way to mitigate alien crosstalk and the need for novel ways to reduce power dissipation of CAT cabling. Additional work is being pursued to address these concerns.

3.3 Power over Ethernet (PoE)

The ability to transmit data and power over the same cable is a technology that is gaining traction under IEEE-802.3af. The methodology involves simultaneously sending a 48VDC, onto an Ethernet cable, delivering almost 30 Watts of power to an end device at a distance of up to 100m. This technology is particularly useful when one considers that some applications, such as VoIP phones, security cameras, thin client devices, building automation systems (BAS), could thus become multifunctional devices.

In the area of thin clients, one interesting product that demonstrates the potentials of this technology is the PC jack. This commercially available product has been on the market for some time and is manufactured by Chip PC Technologies. It is designed as a wall-mounted unit with plug-in peripherals for specialized PC functions. Application software can be downloaded from a server so the PC can operate without a large hard disk. From this thin client wall panel, necessary functions such as keyboard, mouse, display screen and other peripheral devices can be accessed. The business opportunities for wiring offices, etc. with such

devices are endless.

The future for Power over Ethernet (PoE) is limited only by our imagination: the BBC predicted in 2005, "Power-over-Ethernet could end up being a universal power supply for much computer hardware as the cables and connectors for it are the same all over the world. By contrast, power sockets and plugs differ from country to country."

4.0 Optical Technologies

4.1 Market

Exploding traffic from IP based applications are driving the use of fiber in many instances to allow seamless performance under higher bandwidth requirements. Innovations in optical component design, accompanied by cost competitive active cable assemblies in the 10Gb/s and above range, are driving network and data center designers to seriously look at optical solutions. At the recent OFC/NFOEC event in San Diego (Feb. 24 – 28) many strong were made that optic technology was poised to assume the media of choice role in applications 10G and above. Fueling this sentiment is the proliferation of vendors offering high speed devices that are smaller, more easily manufactured and competitively priced with their copper counterpart at the higher data rates. More transceivers with an SFP/SFP+ small form factor are being offered. Ethernet is gaining popularity as the protocol of choice as IP platforms become more dominant. Reasons for this migration include lower cost of implementation and adaptability to increasing bandwidth demands. The business model Ethernet emulates is:

1. Standardization based on IEEE 802.3
2. Non-open source implementation (it is owned)
3. A fiercely competitive market
4. Interoperability from level-to- level
5. Rapid evolution (10x increase per generation)
6. Preservation of installed base (backward compatibility)

4.2 Technology

4.3 Finisar intros Laserwire (Active Optical cable)

The march towards smaller components and the conservation of energy in data transmission are genuine motivators for newly introduced technologies. CMOS manufacturing techniques are being implemented where values of scale are desirable. One example is Finisar's Laserwire cable assembly, an active fiber cable assembly incorporating Multimode plastic optical fiber (POF) or glass, with a proprietary connector design the size of an RJ-45 connector. The serial optics design targets 10G transmission over lengths of 30 meters. Its low power (<0.5 watts) and latency makes it a prime candidate for applications such as 1/10GbE, LAN on Motherboard (LOM), PCI express (PCI-e), and HDMI. Finisar perceives that as switch uplinks migrate from 1GE to 10GE, their solution might be most attractive in cost, power and density per port (48). Although this product is of an active optical cable design, it is not immediately challenging the markets targeted by Intel, Tyco, Zarlink or Luxtera, which employ parallel optics and are concentrated in the HPC-InfiniBand market. Finisar's goal seems to be a strategic move to replicate copper GbE transition and not necessarily to lower the cost of an optical solution, on the server level, as serial transport migrates from 1Gbps to 10Gbps.

4.4 Mitsubishi Rayon & Firecomms Demonstrate IPTV over Plastic Optical Fiber (POF)

Plastic optical fiber has been gaining wide publicity lately in home networking applications. With data rates of up to 1 Gigabit, with good quality of service (QoS) to every device in the home, POF is proving itself to be the most robust media for 100Mbps Optical Ethernet and 250 Mbps Optical FireWire IPTV applications in the home. POF's ease of installation along baseboards, under carpet, in wall cavities, etc., is an attractive feature to home builders, installers, service providers and even consumers. Because of its immunity to electrical interference, installation alongside existing electrical cabling makes it a cost effective way of upgrading home networking.

Several POF compatible devices that take advantage of Firecomm's Transceiver design are a testament to how beneficial POF has become. For this demonstration, several manufacturers' products have been included, namely:

- Multi-Port POF switch by DiMoto
- Eight-Port Ethernet to POF switch by Nyce Technology, Inc.
- IPTV Gateway by Motorola
- IPTV Set Top Box by Digisoft
- Self install POF Kit by Technetix
- Optical Media Converter/Fast Ethernet Power Adapter by Homefibre
- Media Converter by NetGear

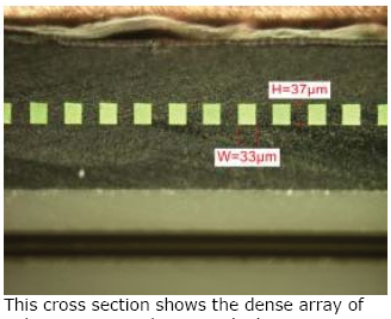
Quick and easy troubleshooting is possible with POF since eye-safe visible red LEDs are used as the light source for data transmission. For the emerging IPTV and triple play services now being offered for the FTTH market, POF could be a shoo-in for fiber applications within the residence.

4.5 IBM Unveils Green Optical Network Technology

This new technology (prototype stage) uses light instead of wires to create a very fast and highly integrated optical data bus. The design addresses the industry's need for transmitting terabits of data per second in an energy efficient manner. Bandwidth hungry applications such as pharmaceutical data manipulation, weather forecasting and high definition medical imaging for remote patient diagnostics will be greatly enhanced by this technology. When one considers the "green" revolution in computing today, this optical technology promises to save massive amounts of power in supercomputers. IBM reports that for a typical 100 meter link length, the power consumed is 100 times less than today's conventional electrical interconnects.

Unlike many research ideas of this magnitude that require one-of-a-kind lab components, the optical chips and optical data buses are packaged together from standard components. Practical applications for this "optochip" technology include:

1. High definition video: video sharing and video on demand
2. Real-time analysis and 3-D visualization in the medical arena: MRIs and heart scans
3. Enhanced consumer electronics: cell phones and PDAs with high-definition video capabilities



This cross section shows the dense array of polymer waveguides in IBM's demonstrator. On the printed circuit board, the databus of 48 of these waveguides uses a path only 3 mm wide. Previous systems would use four times as much space.
Credit: IBM

4.6 Microsoft Energy Saver for the Data Center

Microsoft has jumped on the bandwagon to address energy consumption in the data center. The Networked Embedded Computing group has devised new algorithms which will make it possible to put servers into sleep mode when traffic is light. Sensors would also identify which servers should be shut down based on the environmental conditions in different parts of the server room thus catering to more uniform distribution of air. By eliminating hot spots through better server management, Microsoft estimates that energy savings on the order of 30% could be realized in the data center. The sensor devices are sensitive to both heat and humidity and are Web-enabled to operate seamlessly within a network to provide a QoS that is both cost averse and conserves energy. In a data center, the interplay of servers within the building can have a significant effect on how the cooling system functions; it is well known that cooling consumes about half of the energy used in the data center. Any technique which could work in tandem with a web-based energy-saving application would be a boon to the industry. Another capability of the new algorithms is that they are designed to manage loads on the servers. Unlike traditional load-balancing algorithms which are used to keep the flow of traffic evenly distributed across a set of servers, the Microsoft system distributes the load to free up servers during off-peak times, thus reducing overall energy consumption.

Data Communications Competence Center

Nexans' Data Communications Competence Center, located at the Berk-Tek Headquarters in New Holland, Pennsylvania, focuses on advanced product design, applications and materials development for networking and data communication cabling solutions. The Advanced Design and Applications team uses state-of-the-art, proprietary testing and modeling tools to translate emerging network requirements into new cabling solutions. The Advanced Materials Development and Advanced Manufacturing Processes teams utilize sophisticated analytical capabilities that facilitate the design of superior materials and processes. The Standardization and Technology group analyzes leading edge and emerging technologies and coordinates data communication standardization efforts to continuously refine Nexans' Technology Roadmap. An international team of experts in the fields of cable, connectors, materials, networking, standards, communications and testing supports the competence center. The competence center laboratories are a part of an extensive global R&D network that includes eight competence centers, four application centers and two research centers dedicated to advanced technologies and materials research.

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