Nexans

Technology Watch

LAN Newsletter

1st Quarter 2011

DATA COMMUNICATIONS COMPETENCE CENTER

Nexans

TECHNOLOGY WATCH

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1.0 General Market Trends

There have been a number of mergers and acquisitions within the enterprise LAN and data center markets over the past year. As new partnerships evolve and solidify, we will closely watch for the inevitable growing pains that could either hinder progress within the industry or accelerate its growth. There are, however a few specific trends that deserve to be monitored as 2011 unfolds.

There is the continuing move towards protocol convergence, especially as 10G transmission takes hold within the data center. Top of rack switching configurations and Fibre Channel over Ethernet (FCoE) as an architecture are gaining traction. This acceptance has led to the adoption of specific interconnects as system designers strive for greater efficiency and less complexity. If this trend continues, and server/ switch ports continue to utilize SFP or QSFP connectivity, this could put downward pressure on potential BASE-T cabling solutions. The hope however is that with Solarflare, Cisco and others shifting to10GBASE-T solutions there will actually be increased demand for twisted-pair solutions within the data center as bandwidth use solidifies around 10Gb for 2011 and beyond.

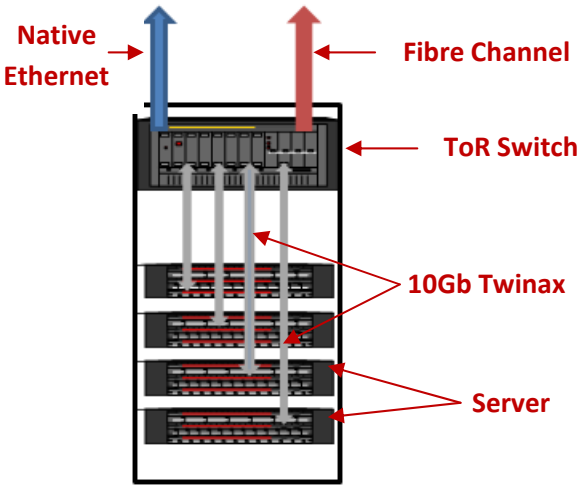
In addition, several other immediate market trends are particularly noteworthy:

a) The trend towards Top-of-Rack (T-o-R) switching in data center networks.
b) The continuing disagreements on the fiber-optics side over the advantages or disadvantages of bend-insensitive fiber.
c) The challenge posed by the slow migration of passive optical networks (PON) within the enterprise LAN space.

2.0 Copper LAN Cabling

2.1 Top of Rack Switching vs. End of Row

As new architectures are developed to increase efficiency and reduce costs within the data center, the use of top-of-rack (T-o-R) switching has gained prominence. A key benefit to this technology is that it offers a faster data center roll-out since each rack can be pre-configured with server, swtiches and cables, ready to roll. However, while this architecture does have its benefits, a passive structured cabling approach should not be overlooked especially when considering the total cost of ownership (TCO). *The schematic below shows a typical T-o-R schematic.*



Surveys suggest that the type of deployment used is usually closely tied to the size of the data center. Medium to large data centers seem to work best with a T-o-R switch deployment when there are large

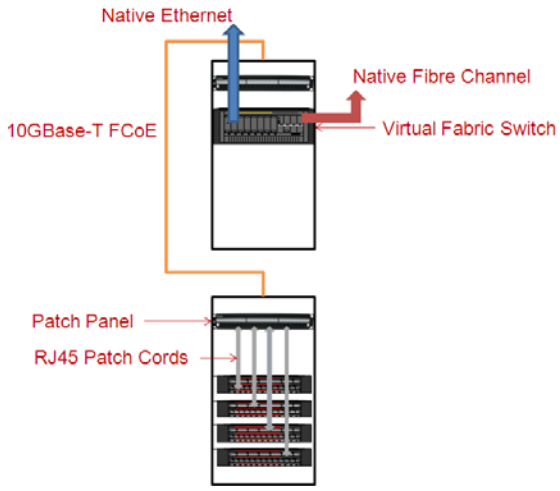
numbers of uniformly filled racks to support the architecture, but there are some significant drawbacks to consider, namely:

a) Poor port utilization;

b) Higher power and cooling costs because a switch is used in each rack;

c) Extra maintenance and administration costs because of the number of switches to maintain.

The structured cabling approach which incorporates an EoR switch is more serviceable and gives a lower overall TCO for larger data centers. Because there is typically a single switch located at the end of the row, cable management is easier. Also, much lower cost twisted-pair cabling with backward compatibility is readily available. In comparing the total cost of ownership, the T-o-R architecture is almost twice as expensive as structured cabling (End-of-Row) architecture. *See schematic below for EoR.*



Some additional benefits of using structured cabling include:

a) Using a twisted-pair solution provides backwards compatibility to legacy equipment.

b) The extended reach and distributed servers and switches enhances power distribution and cooling efficiency.

c) Provides more flexibility for Blade-type switches in future upgrades.

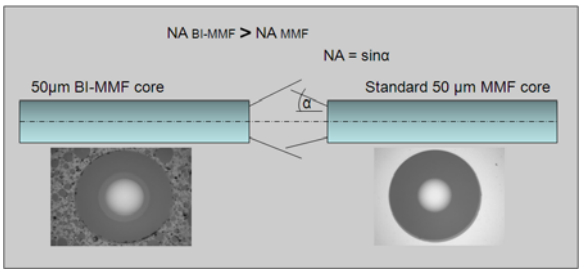
d) Virtual switching removes need for cross-connect (patching zone) with Base-T solutions.

3.0 Optical Technologies

3.1 Debate over Bend-insensitive Fiber

The industry continues to debate the merits of deploying bend-insensitive multimode fiber over traditional laser-optimized OM3/OM4 multimode fiber. Some manufacturers market their BI-MMF for data center deployments, touting its performance benefits over standard MMF in this environment. Other manufacturers claim there is no real benefit in most applications and in fact, it is risky to mix bend-insensitive fiber and standard OM3/OM4 multimode fiber in the same cabling channel. One OEM contends that for high- speed optical networks, the difference in fiber numerical aperture (NA) can interfere with good channel performance, particularly insertion loss budgets. Because the BI fibers have a larger NA than standard MM fiber, transmission from BI fiber (illuminated by an LED source) to standard MM fiber will result in additional losses at the

junction of connections between the two dissimilar fiber types. *See illustration below*

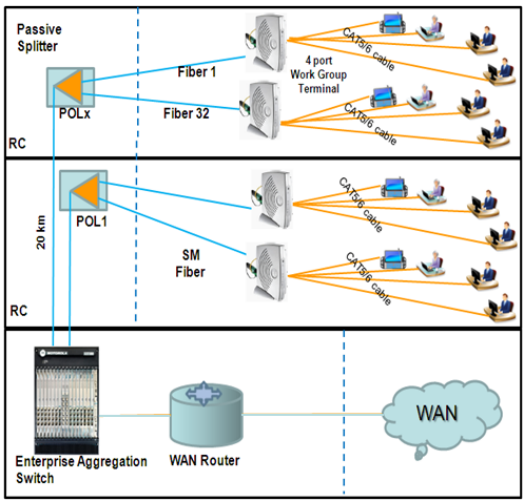


NA mismatch, BI fiber and OM3

In the illustration above the BI fiber on the left has a larger NA than the fiber on the right and the resulting mismatch will cause an increase in the insertion loss. Additionally, because BI-MMF guides more higher order mode groups, the bandwidth and system performance can be significantly reduced when the fiber is bent in an application. In essence, it's possible to get good insertion loss in a channel while using a BI-MMF, only to have reduced system performance and increased bit errors when the fiber is bent. There is also concern that the current method of measuring differential mode delay (DMD) or bandwidth, is inadequate because it ignores the energy in those higher mode groups. This problem is further exacerbated since there is no released industry standard for including these mode groups in the measurement. This factor alone inhibits the widespread use of BI-MMFs in today's demanding network applications. Any advantages of using BI-MMF over standard OM3/OM4 fibers in a given application can be quickly lost, and in some cases may cause degradation in system robustness if these issues are not properly addressed.

3.2 PON network in the Enterprise

Fiber to the home (FTTH) networks in the form of gigabit passive optical networks (GPON) have been very successful in the past few years and have challenged other traditional methods of getting data, voice and video to the average consumer. This success led the likes of Motorola , Verizon and others to revive the introduction of a similar technology to the enterprise LAN. Passive Optical LAN (POL) is slowly gaining some traction within governmental, university and hospital settings where a traditional LAN network existed. From a cabling perspective, the primary cable type is single mode optical fiber going from the main entrance room to the desktop. The PON (POL) system shares bandwidth by using a splitter to forward bandwidth to each user. For example, multiple users share a gigabit (less than 1G/user) connection instead of having dedicated bandwidth as in a traditional star network. Preliminary investigations indicate that a POL system might have a lower initial installed cost than traditional LAN (Star network) in an identical "Greenfield" deployment, but this benefit is only practical if the entire facility is owned by one entity, e.g., a university or governmental entity. *See network example below:*



Typical POL Network Diagram

Some considerations should be made before deploying a POL network:

a) The use of optical splitters outside designated equipment locations is not TIA568 compliant.

b) Maximum achievable bandwidth is 1.25Gbps upstream and 2.5 Gbps downstream.

c) There is limited flexibility in implementing any moves, adds or changes since this would require extensive electronics and cable re-installs.

d) There is also the added fact that back-up power is required at each individual work station outlet.

e) Upgrading to higher bandwidth in the future could be very expensive, negating any initial savings on infrastructure.

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 four research centers, three application centers and twenty-four development networks dedicated to advanced technologies and materials research.

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