by Alan Ugolini

Cabling solution improves TCO

Small-diameter, laser-optimized trunk cabling allows migration to high data rates.

Data center networks play an increasingly important role in the success of businesses today. Businesses that can easily deploy, manage and scale new applications and technologies enhance the capital expenditure (capex) and operating expenditure (opex) efficiencies in the data center. Data center migration to new solutions, however, such as blade servers, Fibre Channel over Ethernet (FCoE), 10-Gigabit Ethernet, virtualization and high-performance clusters (HPC) can put pressure on the physical layer to the point where even newly installed network cabling can become an aging liability to a business.

OM3 cabling offers the flexibility to operate multiple applications at various data rates over the same backbone cabling system.

A closer look into the data center's cabling shortcomings when migrating to these new solutions may point to problems that include ineffective physical topology, inadequate media bandwidth, reliability issues and the inability to conduct quick and easy networking moves, adds and changes (MACs).

Available solutions include high-density mechanical transfer pulloff (MTP)-based, laser-optimized 50/125 µm multimode fiber (OM3) cabling. The MTP-based OM3 trunk-cabling solution is deployed throughout the data center in a star network configuration from the main distribution area (MDA) in accordance with the TIA-942 Telecommunications infrastructure standard for data centers.

An OM3 trunk cable has a small outside diameter and is terminated on each end with high-density array MTP connectors. At the trunk cable termination points, the MTP connector is transitioned to traditional duplex-style connectors with a choice of various transition assemblies, such as breakout modules and harnesses chosen to facilitate the patching into system equipment.

The advantages of deploying this type of cabling solution in the data center include rapid initial deployment time, high-density packaging, modularity for quick MACs and the ability to easily migrate to high data rates, such as future 40-Gigabit Ethernet and 100-Gigabit Ethernet. Another advantage to deploying an MTP-based OM3 fiber solution throughout the data center is its transparency to the application being transmitted over it. Applications such as Ethernet, Fibre Channel and InfiniBand can be transmitted over the solution. Deploying the OM3 cabling offers the flexibility to operate multiple applications at various data rates over the same backbone cabling system.

An additional solution to incorporate with the MTP-based OM3 infrastructure is a high-density media converter module (MCM). The MCM can be placed on one end or both ends of the fiber link as an alternative to utilizing an optical transition assembly, such as a breakout module or harness, at the link endpoints. A high-density media converter module can be utilized to bridge the gap between operating current gigabit speeds and future 10/40/100-gigabit speeds.

The high-density MCM is configured with 12 modular RJ-45 ports on the front and two high-density MTP-based connector ports on the back. Each of these ports converts an IEEE 802.3ab-compliant Gigabit Ethernet 1000BASE-T to 1000BASE-SX over fiber, providing a high-density media-conversion solution with the scalability, reliability and rapid-deployment advantages of MTP-based preterminated systems.

Use of these MCMs allows IT managers to benefit from a high-density MTP-based fiber backbone cabling system, while at the same

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time leveraging existing copper port-based electronics. Using the MCMs, 1U and 4U rackmount housings provide 24-port and 96-port capacities, respectively. Since the media converter modules share the same footprint as standard all-optical breakout modules, the 1U and 4U housings can share optical and copper port connectivity in the same housing or be migrated to an all-optical solution in the future.

An example application would be deploying an MTP trunk from an MDA to a row of server cabinets. At the server cabinets, some of the fibers in the trunk cable are transitioned with an optical breakout module to duplexed LC connectors and patched into server host bus adapter cards for the storage area network. Additionally, some of the fibers in the MTP trunk cable at the server cabinets are transitioned to copper RJ-45 ports utilizing the MCM and interconnected to the server NIC card.

Future migration to FCoE may include deploying top-of-rack FCoE switches at the server cabinets. In this situation, the network cabling can easily migrate with little cabling disruption by replacing the MCM module with an all-optical breakout module and utilizing the fiber for the FCoE switch uplink.

Replacing copper cabling in the data center with high-density, lightweight optical cabling provides an improvement in cable tray utilization, while providing greater data center cooling efficiency. For example, two CAT 6a cables with maximum cable diameters of 0.35 inches have an effective area equivalent to a 216-fiber ribbon cable.

Computational fluid dynamics modeling of a 10,000-square foot data center showed that replacing under-floor copper cabling with an MTP-based fiber solution decreased computer room air-conditioning pressure by 13.6 percent, improving airflow by 36,828 cubic feet per minute. By using a rate of 10 cents per kilowatt hour, this results in an annual power savings of $138,000.

Creating a reliable, definable network cabling migration path leads to an increase in the cabling infrastructure lifecycle and total cost of ownership. By utilizing high-density MCMs, networks can leverage existing 1000BASE-T copper port-based gigabit electronics, while providing a reliable migration path for supporting high data rates such as 16-Gigabit Ethernet to 128-Gigabit Fibre Channel, 10-Gigabit Ethernet to 100-Gigabit Ethernet and 10-Gigabit Ethernet to 120-Gigabit InfiniBand. Recabling costs and troubleshooting expenses are negated since fiber-optic transmission is immune to issues such as alien crosstalk. ❑

Reprinted from *Communications News*, January 2009

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