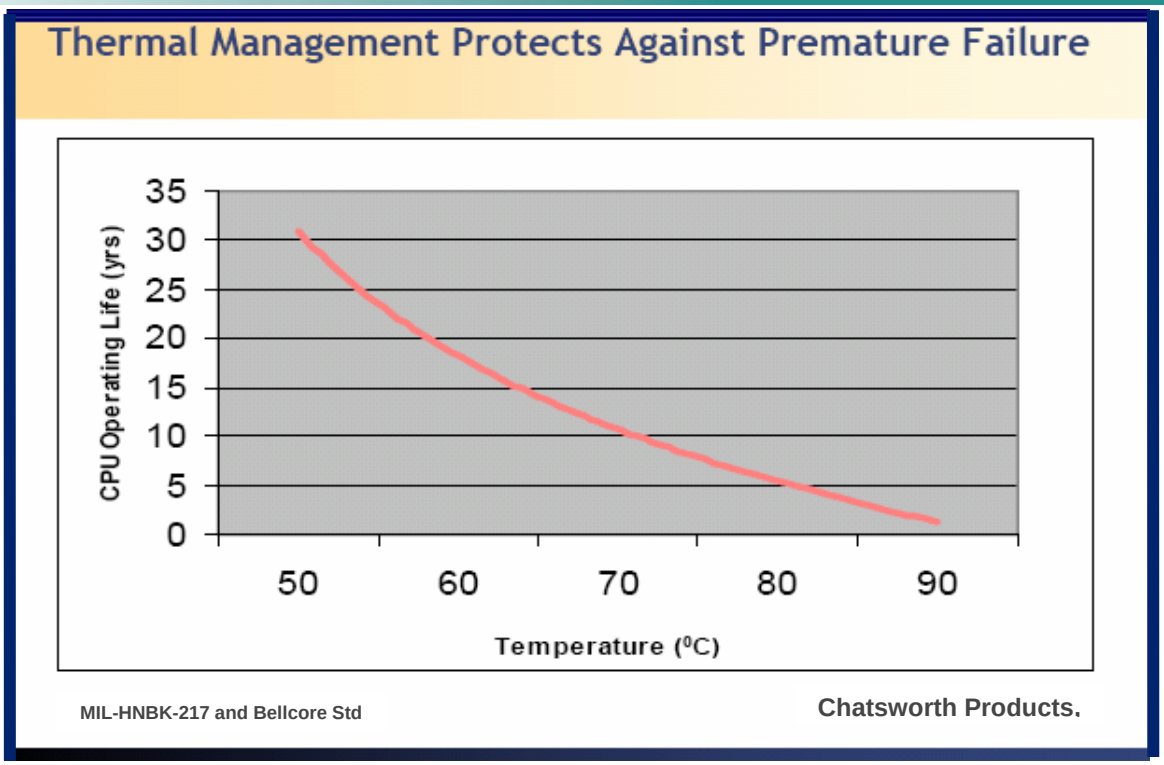
**It's Time to Be GREEN: Saving Energy and $$$ in the Data Center.**
**By: Eric Leichter, Fiber Training Manager and Mike Barnick, Senior Manger Solutions Marketing, CommScope Enterprise Solutions**

The topic of the day has turned "green." For corporate America, the green movement includes the entire spectrum of using less energy and materials at the start, being more efficient during a building's lifecycle and extending that lifecycle to reduce the replacement of components and associated waste. The global growth of data centers has led companies to focus on the resources utilized in the storage and routing of data. Indeed, even cable providers and installers will be doing their part to reduce energy usage and waste while building a network cabling infrastructure system. The good news is that while taking green steps, you can save the *other* green – yes, dollars – as well.

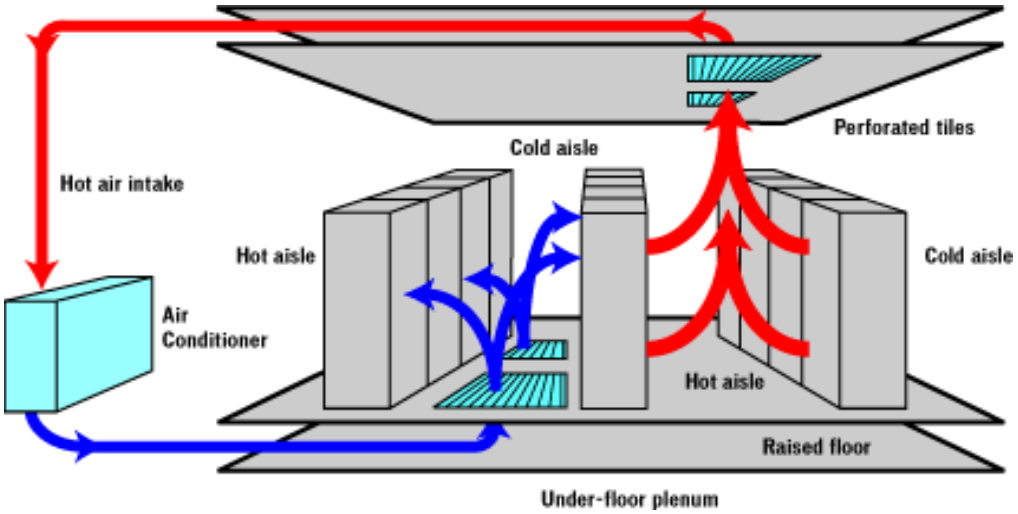
The dramatic increase in Internet usage (the usual suspects: video downloads and uploads with YouTube, file and image sharing with Shutterfly, social networking with Facebook) and the resultant demand for bandwidth has led to an equally dramatic increase in the number, size and density of data centers. Although data centers undergo upgrades, they are having trouble keeping pace with new media demands. On average, 63 percent of IT decision-makers report that their data center has run out of space, power or cooling without notice. Another 43 percent reported that at their current rate of growth, they could only stay in their current infrastructure for six months with no changes. Not surprisingly, 36 percent are currently planning or building new data centers.*

***System Reliability: Is it Getting Hot in Here?***
These data centers have grown to consume about 2 percent of the nation's total electrical usage and are predicted to consume a whopping 9 percent of the nation's usage by 2020.** A large portion of this power is required to run the electronics and building operations. These technologies generate large amounts of heat, which is one of the major issues within a data center. IT hardware reliability is greatly reduced as temperatures rise. It is estimated that a 10°C (18°F) increase in temperature reduces the long-term reliability of the electronics by 50 percent. Ironically, the technologies at the heart of a data center's operations are creating the very heat that will reduce their effectiveness and longevity – doing so at the rate of 1W of cooling required for every watt of power consumed by electronic devices.




Frequent replacement of these components leads to added waste in the nation's landfills and higher costs of operation. As high-density electronics, like blade servers, are becoming prevalent, it is estimated that the cost of a typical server will be outweighed by the cost of running the cooling to support it by 2009.

To control the flow of air, most data centers have adopted a pattern of cold (electronics) and hot (passive patching) aisles. Cold air can be added and hot air removed in a very controlled pattern, which leads to better efficiencies from the cooling equipment. Notably, passive cabling, both UTP and optical fiber, is less affected by heat than the active equipment.




Energy wasted on cooling equals wasted resources and dollars. Large data centers provide up to 270 percent of the cooling needed by the equipment due to inefficient airflow management. In order to reduce this waste, follow some of the golden rules of thermal management:

- Use blanking panels to stop recirculation of the hot air
- Use vented doors with at least 60 percent open area
- If possible, spread your blades around rather than putting all of them into one rack
- Size the air conditioning for the computer room on a typical average

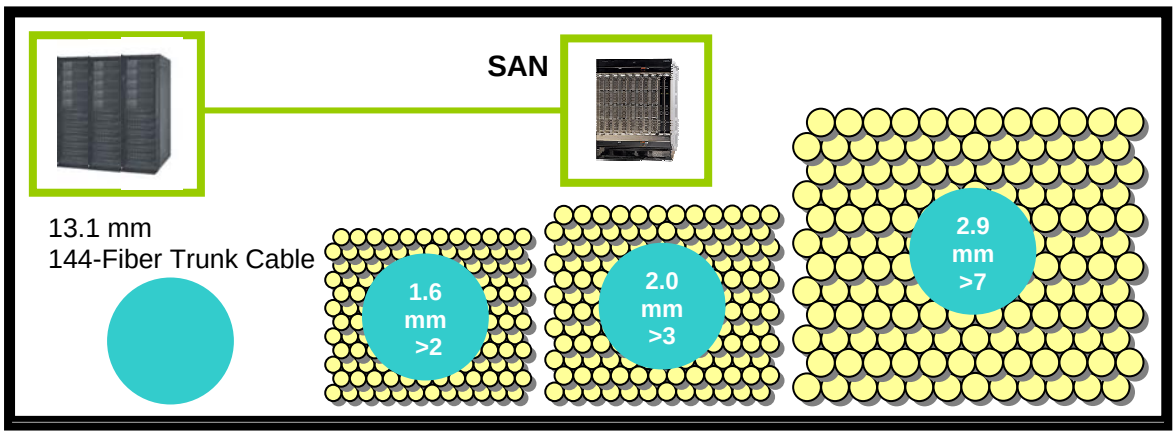
- Turning down the air conditioning temperature will not solve a heating/cooling problem
- Modularize the thermal solution to limit initial investment
- Utilize a structured cabling system to limit the blockage of airflow

**Think Structured: The System You Choose Today Affects the Performance You See Tomorrow**

There are many areas in which waste can be attacked. In the passive system, utilizing structured cabling will greatly reduce the volume of cable that is congesting passages and blocking airflow. The more room there is for air to flow, the less energy is expended removing hot air and circulating cooling air. Structured cabling involves the use of backbone trunks that bring a large number of optical fibers or copper pairs to an area before breaking out into smaller segments at the electronic devices.

Cables that are “home run” not only add more cable mass, they also cause a problem with any moves, adds or changes. It is very difficult to remove a cable from its tray when it’s surrounded by other cables carrying live traffic. Not wanting to risk a disruption in traffic, system operators typically decide to pull in new cables on top of the old. This problematic solution clogs up the pathways for airflow, increasing the HVAC workload. Utilizing a backbone trunk provides a link that does not have to be disturbed; the entire configuration is done at a patching field close to the electronics. With limited risk of system disruption and less overall work, this set-up is highly preferred.

High-fiber-count optical cables have the additional benefit of a greater density than running multiples of one- and two-fiber cables. Traditional 2.9 mm cabling for SC optical fiber connectors take up seven times the space of a trunk cable solution, and even the smaller density 1.6 mm diameter cables used with LC connections occupy twice the coverage area. Loose-tube cables provide the best density among today’s trunk cable designs.




*Cabling issues are consistently ranked as the **leading contributor** to poor cooling in the data center environment*

Although cabling is resistant to heat, with operating temperatures to 140°F (60°C), the blocking of airflow can lead to localized “hot spots” – where temperatures are much higher than the room’s average. Utilizing structured cable to reduce the consumed space will help keep the equipment operating within acceptable margins.

**Think Long Term: What are the System Needs Today AND Tomorrow?**

Once the trunk cabling is in place, it becomes the backbone for a system that will be operating for many years. Although it is expected that electronics and software are replaced every three-to-five years, the cabling is expected to last much longer since it is difficult to pull cable in and out of a live system. That means the cabling installed today has to meet the requirements of tomorrow. Most data centers are planning for – if not already utilizing – speeds of 10Gb/s. OM3 optical fiber and Category 6A copper cabling are rated for these speeds at distances typical in a data center.

For data centers currently operating at speeds of 1Gb/s and 4Gb/s, CAT 6 cable may seem appropriate for today's needs. This follows along with the guidelines of TIA-942, *Telecommunications Infrastructure Standard for Data Centers,* as the minimum level of cabling to install. However, if one considers upgrading the network in the next three-to-five years, then installing higher bandwidth CAT 6A cabling would meet current and future needs, providing a high level of performance for roughly eight years.

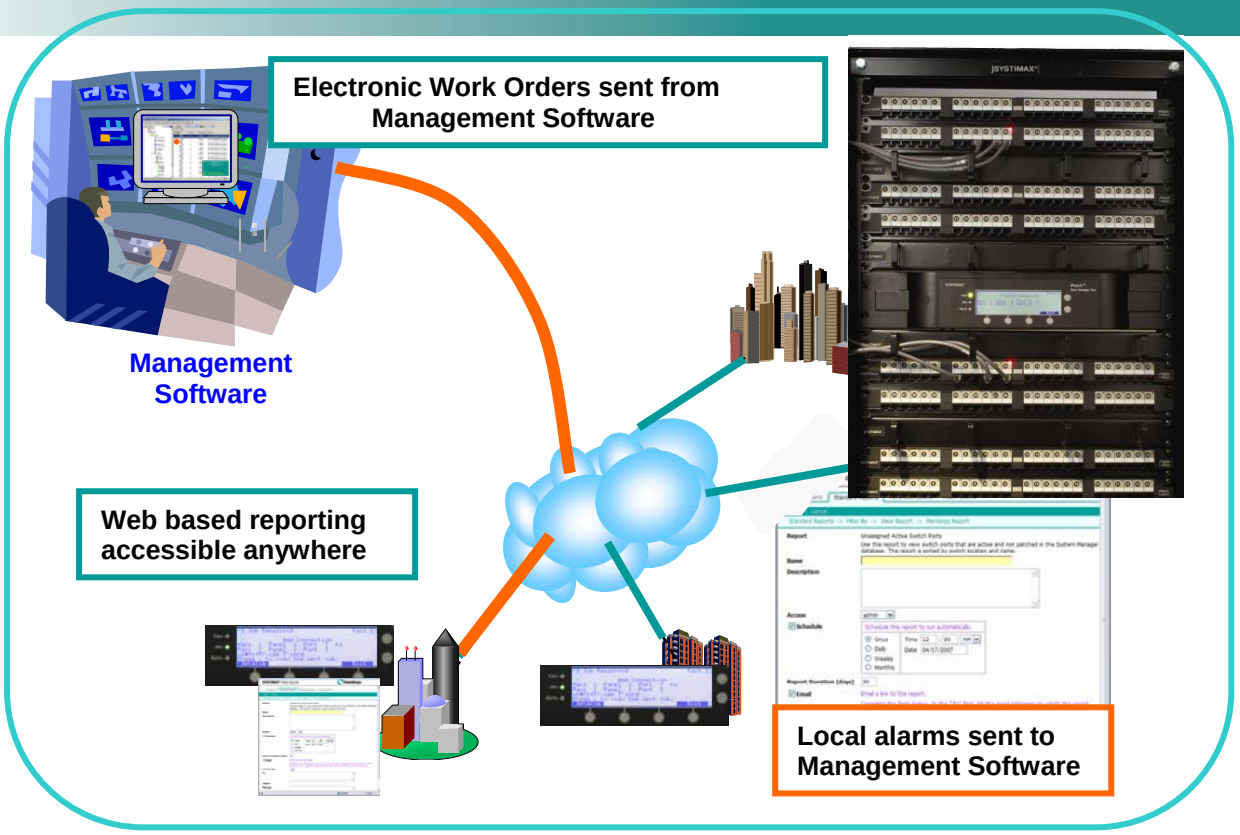
Many network designers are seeking long-term solutions. If the cabling is expected to last for 20 years through several iterations of technology, then clearly we must start predicting the requirements of future technology. Data rates of 40 and 100Gb/s are already being reviewed within the standards bodies (IEEE), and a new standard is expected to be published in 2010. To achieve these higher data rate solutions, standard 62.5 and 50 um optical fibers will not be adequate. It is expected that OM3 50 um optical fiber will be the minimum optical fiber recognized for use with these upcoming, high-speed applications. Extended-range OM3 fiber, currently achieving 10Gb/s Ethernet performance to 500-plus meters, will likely go into the standards with an OM4 designation and also will likely work with 40 and 100Gb/s Ethernet. OM3 optical fiber should be the minimum level of optical fiber cabling considered when designing the passive system if high data rate applications are in your future.

Also, getting the fiber count correct will be critical in delaying or eliminating the need to pull in new backbone cabling every time a new application is available. Applications with speeds of 40 and 100Gb/s will likely run over "parallel optics," which is simply the process of breaking up a high-speed data stream over multiple fibers, sending them over the passive system and recombining these signals at the end. Standards organizations, both national and international, are looking at various options. A likely scenario consists of having 12 fibers act as a transmit channel and another 12 act as the receive channel. For the system designer, it means that having 24 fibers going to many locations within the data center is a minimum requirement to ensuring the capability to run parallel optics applications in the future. Installing the correct cabling system will reduce material disposal in the future and limits the hassles and cost associated with cable replacement.

Along with the bandwidth that cabling can provide, when choosing copper and fiber media, the data center designer also must consider the cost of the initial investment in electronics versus the long-term costs associated with heat generation and maintenance. A components supplier that understands both copper and fiber media will be able to help sort through these issues.

**Think Smarter: Are you controlling the network or is it controlling you?**
With the size and dynamic of today's data center, we have to go beyond a system that simply works fast. It has to be manageable through all types of growth and changes. Deploying an intelligent infrastructure management system gives IT managers the vision and control of the network for more efficient utilization of energy, network assets and natural resources. An intelligent infrastructure gives you complete and instant knowledge of every available switch port in the network, enabling managers to minimize the number of switches deployed, thus, lowering the overall power usage of the network.

Some intelligent patching systems use Simple Network Management Protocol (SNMP) to communicate with networked devices, such as temperature sensors, and can send alerts notifying you of potential energy consuming problems. Since these systems can identify each asset on the network in real time, IT managers can monitor and enforce asset shut-down policies during non-business hours to conserve energy. Email notifications can be sent out remotely to shut down networked copiers, printers and desktop computers.




Utilizing an intelligent system will better utilize resources, reduce maintenance costs and, with faster changes and less downtime, increase revenues by offering a higher level of service performance.

There are many opportunities for reducing wasted materials and inefficient use of energy within the data center. Optimizing the passive system can be a big part of the effort in the "greening" of the data center. Bringing in your structured cabling provider during the design process, along with the providers of internal hardware, energy, HVAC and other intelligent building capabilities can lead to an efficient design that will reduce environmental waste, provide a higher performing system at a lower cost and produce a solution with longevity.

***OnStor, AFCOM, ARI, December 2007**
****EIA's Electric Power Annual Report 2006 & Annual Energy Outlook 2007**

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Eric Leichter is currently the Training Manager for CommScope Enterprise Fiber Solutions. In prior roles as an Applications Engineer and a Product Technical Support Engineer, he has helped customers implement connector solutions in the LAN, Data Center, and OSP spaces. He has more than 10 years of experience in the optical fiber industry, is a patent holder, and has over a dozen published articles and industry presentations. He received a Bachelor's of Science in Chemical Engineering from Virginia Tech and an MBA from Gardner-Webb University.

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Mike Barnick has played an integral role at CommScope for the past eighteen years. In his most current role as Senior Manager of Solutions Marketing, Mike provides strategic

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Prior to this role, Mike was Senior Manager of Marketing supporting the U.S. sales team. He directed the initiatives of a national team responsible for the development and delivery of product and solutions collateral, web site management, Business Partner program management and demand creation events activities.

Mike has also held a variety of other leadership positions within CommScope and his past responsibilities included business case development, product roll out and managing the growth and profitability of various product lines.

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