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Optimizing the SAN Fiber Optic Physical Layer in Your Data Center

“Deploying a structured cabling system for the SAN provides measurable results and long term value, whether you are building a new data center or upgrading an existing site”

**Kevin Ehringer, DCS
President & CEO**

The State of the Union of the Fiber Optic Physical Layer

Growth of the data center SAN has exploded over the last five years, presenting a unique challenge to IT managers. This complexity has illuminated issues that are inherent in point-to-point connected SANs. As such, companies are migrating their fiber optic cabling from a point-to-point direct connection to a structured cabling system.

The Devil is in the Design

Owners and operators of data centers with structured fiber cable know that, in the end, it's not "Fiber" that provides the value, but in fact how the structured cabling solution is designed and implemented that will enable the data center to reduce risks, save time and money, and effectively evolve the data center. In addition to these primary benefits, these data centers are experiencing environmental benefits and other valuable secondary rewards from their properly deployed fiber connectivity solutions.



Figure 1. Does your SAN infrastructure look like this?



Figure 2. Cluttered, long sub-floor cable runs are hard to manage, generate immense heat, waste space, and make it increasingly more difficult to manage the SAN cable infrastructure over time.

There's no point to Point-to-Point

The rapid rate of technological evolution can often inhibit effective long term planning when it comes to the physical layer of your data center. While direct connections are expedient and initially have a lower cost, they typically create a problematic, difficult to manage system over time.

If you are using a point-to-point approach, or if your structured cabling system has not been maintained, there is a way to migrate the system to a properly designed structured system. A true structured cabling system will provide reliability, scalability, and flexibility while enabling one to better manage the size of these SANs.

Successfully manage the vast amounts of fiber in your data center.

A methodical approach based on a central patching area where you document and manage all your connections, allows you to document your cable runs thereby enabling you to quickly and efficiently manage any Moves, Adds, or Changes that occur in your facility.

What are the benefits of having a structured fiber optic physical layer?

A structured fiber optic cabling system will reduce the overall time it takes to manage connections and provide scalability for future provisioning.

Structured cabling systems directly impact your return on investment.

There are certain elements you will invest in that make up your ROI. A well thought out infrastructure will do the following:

- Reduce the total time to turn around a project
- Reduce the costs for future upgrades
- Minimize system outage time
- Foster longevity within the fiber infrastructure
- Improve system availability

Most hardware management teams require days and sometime weeks to fulfill requests for pulling fiber and making end to end channel connections. In addition to this, any outages they have to deal with along the way can take a long time to diagnose and have a direct impact on the business. A well thought out structured fiber optic cabling system will drastically decrease the amount of time it takes to fulfill fiber request as well as trouble shoot and diagnose outages.

Take Control with a Structured Approach

Following are critical steps towards taking control of your fiber optic system and harnessing its full potential:

1.) Take Stock. Are You Really Structured for Success?

Whether you have a structured cabling environment or not, it's always best to begin at the beginning by asking yourself the tough questions: Do I know all my points of connectivity at a glance? Do I know where the cabling under the raised floor is connected? Do I really know my true capacity? Do I have room to grow? Even though I have trunk cables and zone cabinets, is it truly structured or do I still have a point-to-point environment?

2.) Don't Reinvent the Wheel. Design a Solution Based on Tier IV Best Practices.

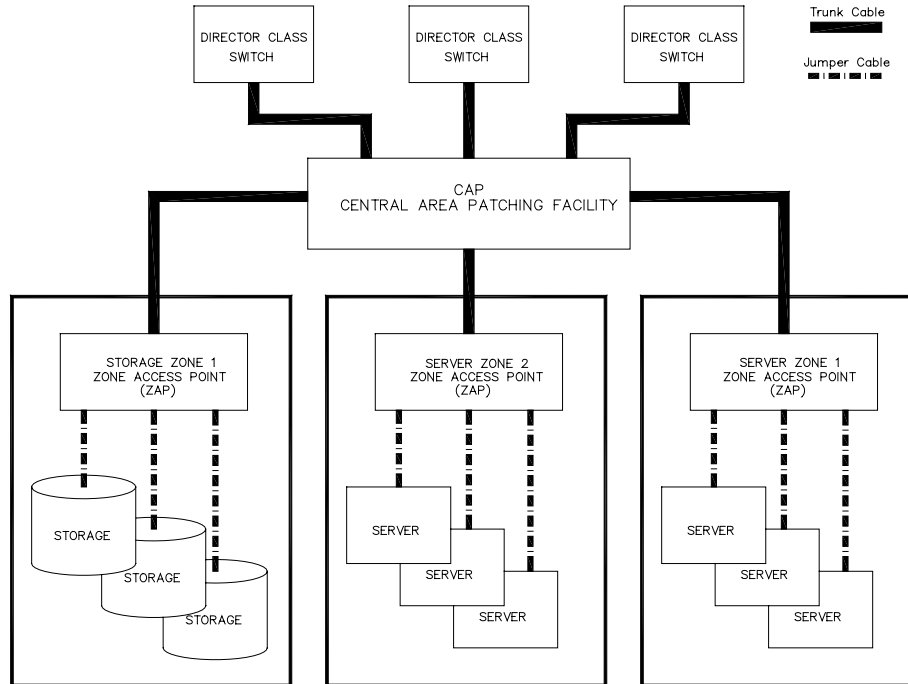
At the core of a sound structured cabling system, DCS implements a Central Area Patching facility and Zone Access Points throughout the data center as demonstrated in Diagram 1 on the following page.

Zone Access Points (ZAP) and a Central Area Patching (CAP) facility are the main components to a structured cabling system:

1. Zone Access Point(s) (ZAP) - Server and storage devices are grouped into "zones". All device ports in each area are represented by a port on a patch panel in the associated ZAP. The physical device ports are connected to the front of a patch panel via jumper cables.
2. Central Area Patching (CAP) facility – All patch panels in each ZAP are mirrored in the CAP and are connected via trunk cable(s) to the back of each panel. All switch ports are pre-cabled with trunks to the back of a corresponding patch panels at the CAP.

Diagram 1: CAP to ZAP Topology

Designated cabling connection points relocate the device ports away from the active equipment.



With this approach, IT personnel never have to get into active equipment (such as director class switch cabinets) unless there is a hardware change needed. Also, documenting cables and connections are much easier due to known pathways and designated connection points.

Now all physical ports on the switches, servers, and storage equipment throughout the data center are represented by individual ports on the front of patch panels in the CAP facility. Connecting two devices together is accomplished quickly and easily with a simple jumper cable connection on the front side of the patch panels at the CAP, which instantly achieves connectivity from device to device.

Let Standards be Your Guide

IBM introduced the concept of a fiber optic structured cabling system in the mid 90's to support its ESCON mainframe and other devices utilizing optical fiber technology. IBM termed this the Fiber Transport System (FTS). IBM's FTS utilized a central patching location, which is the origin for what is now referred to as the CAP. This concept has evolved from the mainframe to incorporate the open system SAN environment as well. The FTS approach laid the ground work for the open system and mainframe physical layer which is defined within TIA's Telecommunications Infrastructure Standard for Data Centers.

The TIA-942 Data Center Specifications provides guidance on design and implementation of fiber and copper structured cabling systems to support today's demands on the physical layer. It is important to understand the connectivity technology that can seamlessly support these demands. Following these specifications will help ensure your data center/SAN solution will support multiple generations of equipment for the maximum cabling system lifecycle.

3.) Stay on Point for MACs.

While maintaining flexibility, data centers are expected to operate 24 hours a day and 365 days a year without disruption. Any change in the data center configuration must be planned carefully and must be synchronized with other activities to help limit outages. This synchronization must be fully supported by the design of the structured cabling system.

Typically MACs can take hours or days to fulfill in a point-to-point environment. A structured cabling system drastically reduces time to execute MACs.

Less cables under the raised floor makes documentation much easier. This positively contributes to MAC activity by providing a clear picture of the cabling and capacity at the time of a specific MAC.

4.) Create an Implementation Plan with the Long Term in Mind.

Developing a structured cabling solution that works today and into the future requires a logical systemic approach. The ultimate goal should be to achieve reliability with flexibility and scalability.

Reliability

Clear visibility and documentation of your connectivity reduces risk of error during MACs. Further, the entire structured approach eliminates the need to physically touch the equipment when making changes, and if built correctly provides redundancy to mitigate outages during MACs.

Flexibility

A structured cabling design makes your SAN flexible on many levels:

- Simplified, efficient MACs – performed centrally at the CAP with short jumper cables
- Fiber agnostic – patch panels accept multiple types of fiber and terminations
- Easy and cost effective growth - built in capacity and an efficient design create flexibility for expansion

Scalability

A vital aspect of a data center or SAN operation is the ability to scale the environment up or down based on requirements. A structured cabling system provides scalability in two primary ways:

- **Built-in capacity** – By creating a central area, additional ports can be prepared to accept additional equipment at any time. New equipment can be easily added, and outdated equipment can easily be removed, based on simple connections at the central area and the zones.
- **Space optimization** – Less cable under the raised floors creates a smaller footprint requirement, enabling the entire data center to optimally utilize space for growth and expansion.

5.) You Don't Have to Rock the Boat. Transition to a Structured Cabling System Without Disruption.

Use a third party

Based on proven experience, using a dedicated team – typically a skilled third party – to plan and implement your structured cabling solution provides the best scenario for success. This enables a dedicated, highly-skilled team to deploy the new system in parallel to your daily management. In addition to creating a faster implementation, this approach gets the new system implemented, tested and operational without any disruptions to the existing environment.

Use a zone defense

DCS is able to develop and implement a plan based on the CAP to ZAP topology that transitions from existing point-to-point environments to a structured cabling system without downtime interruptions.

DCS recently worked with the site management team of one of the world's largest data centers to design and implement a structured cabling system that enabled them to migrate away from point-to-point connections. First, DCS determined the optimum location for the Central Area Patching facility as well as the Zone Access Points. DCS then documented and connected all open switch ports on all switches to corresponding patch panels at the CAP. Once this was done, DCS worked with the hardware management team to understand where the growth would take place near term as well as in the future. This information allowed DCS to determine the patch panel port count in each Zone Access Point for current and future requirements, and then these panels were replicated at the CAP and trunked together.

Once this was accomplished, any additional switches were pre-cabled to the CAP. From this point on, any MAC activity utilized the new structured cabling environment. Over time, this eliminated the inefficient point-to-point connectivity.

6.) Pull Cable for the Future

Planning available infrastructure for the future allows you to stay ahead of requirements, which can dramatically reduce long term costs while making expansion more efficient and effective.

Lack of infrastructure can lead to significant expense in retrofitting when the data center “bumps the ceiling” of its capacity. At the same time, having to add fiber cable often can result in temptation to not follow the data centers best practices and topology in favor of expediency. Over time this can lead to a disorganized, cluttered environment that would once again put the center at risk and offset many of the benefits of the structured fiber cable system.

By having available patch panel ports at the zone(s), adding additional equipment to your SAN happens quickly. Another benefit of having extra capacity at your zones is it greatly reduces how many floor tiles are pulled up for a particular MAC activity. A well designed structured cabling system takes the long runs out of the picture by pre-cabling the ZAPs to the CAP. If a piece of equipment is added to the SAN, the only floor tiles that come up are the ones from the equipment to the appropriate ZAP.

Adding additional patch panels trunked from the CAP to ZAP bring value with:

- Instant port availability for MAC activity
- Decrease in install costs
- Capacity for growth and expansion

During the life of a data center storage devices, switches, and even servers will be added and upgraded. The structured fiber optic cabling system approach can enable you to plan and implement these critical changes faster and with reduced risk.

Summary

Deploying a structured cabling system for the SAN provides measurable results and long term value, whether you are building a new data center or upgrading an existing site.

Whether you are just starting to plan a fiber system, have been using point-to-point fiber, or have a structured fiber cabling system that has not been well designed or maintained, there are effective ways to design/redesign and deploy a structured fiber cabling system to drive your data center into the future.

The ideal time to implement a structured fiber optic cabling system is when the data center is new. However, because this is not the case in most data centers the task of migrating a system from point-to-point to a structured cabling design should be implemented in steps.

An effective migration plan requires a structured fiber optic cabling solution partner that understands both the system equipment and the cabling requirements. Selecting the right cabling solution provider is critical to improving manageability of the data center, reducing both planned and unplanned outages, and maintaining data center uptime for the long term.



14802 Venture Dr.
Dallas, TX 75234

Tel: 214.239.2029
Fax: 972.620.4970

www.datacentersys.com

