

Zone Distribution in the Data Center

By Jennifer Cline, RCDD

As data centers face the continued need to expand and grow, the fundamental concerns and needs remain constant. Key concerns of the data cabling infrastructure in the data center must provide reliability, scalability, manageability and flexibility in order to meet the ever-changing requirements of the data center network.

DATA CENTER NEEDS

To ensure essential reliable performance, data center cabling infrastructures must provide stability and enable 24 hours x seven days per week uptime. Uptime requirements are segmented by the “tier” level implemented in the data center, ranging from Tier 1 to Tier 4, as

defined by the Uptime Institute. Tier 4 data centers have uptime requirements of 99.995 percent, less than one half-hour per year.

Cabling infrastructures must also support data center growth, both in the actual addition of system electronics, whether servers, storage or switch ports, as well as providing for a migration path for increasing of data rates. As technology evolves and standards are completed to define data rates such as 40 and 100 Gigabit Ethernet, as well as Fiber Channel data rates of 16 Gigabits per second (G/bs), 32 G/bs and beyond, the cabling infrastructures installed today must provide scalability to accommodate

the need for more bandwidth in support of future applications.

In addition to reliability and scalability, the management of the infrastructure is also crucial. Infrastructure design, cabling solutions and deployment are areas where flexibility and manageability go hand-in-hand. With a constant in data centers being change, the cabling infrastructure must be modular to accommodate changing requirements. With the technology and system equipment upgrades on the horizon, the infrastructure deployed today must be flexible in order to easily adapt and accommodate the changes that will be required. While the infrastructure is designed and

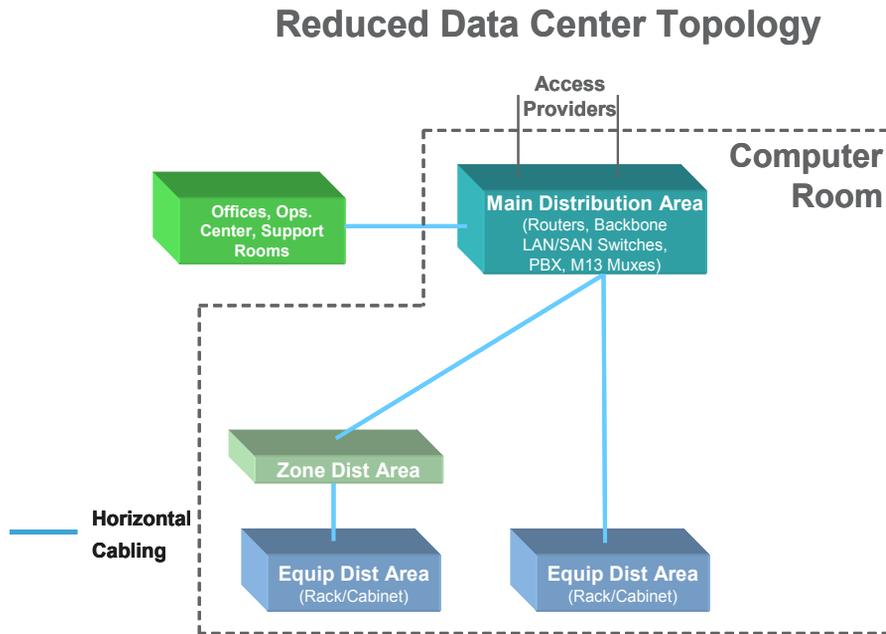
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installed in a way that easily accommodates change, it must also be easy to manage. When moves, adds or changes are required, it is essential to be able to make these adjustments with minimal downtime.

DESIGNING THE CABLING INFRASTRUCTURE

When designing a data center to meet the aforementioned needs, best practices should be followed. ANSI/EIA/TIA-942 Telecommunications Infrastructure Standard for Data Centers addresses recommended design practices for all areas of the data center, including pathways and spaces and the cabling infrastructure. The standard defines the following spaces and cabling for typical enterprise, or reduced, data center topologies. An additional topology is also defined in TIA-942, where the horizontal distribution area is included as a separate space, rather than collapsed back to the main distribution area.

Utilizing a structured cabling architec-



ture to provide connectivity as defined by TIA-942 facilitates a flexible, manageable infrastructure. An important component in the recommended topology is zone distribution. Zone distribution is not only a design topology recommended in TIA-942,

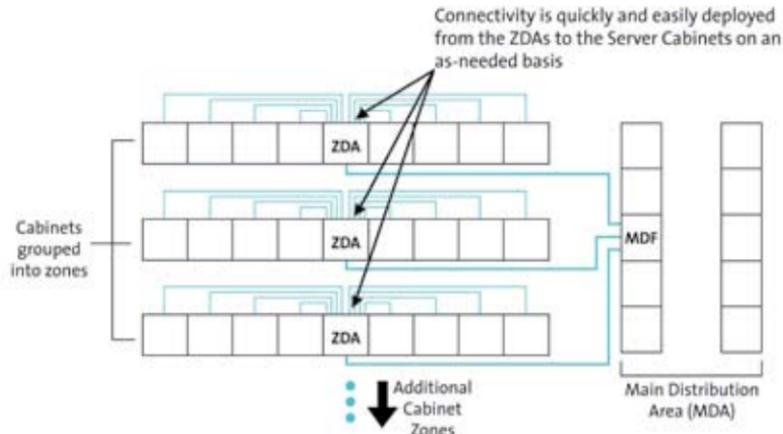
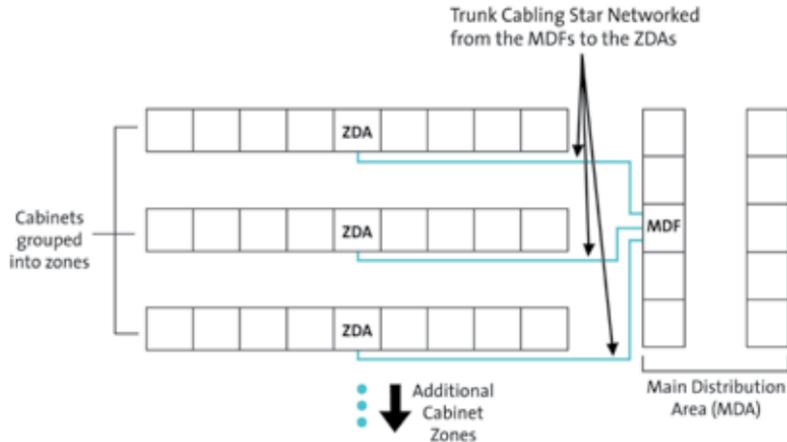
but it is also one that is incorporated into many data centers operating today. TIA-942 defines the space used to implement zone distribution as the zone distribution area (ZDA). The ZDA acts as a consolidation point for high-fiber-count cabling from

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the main distribution area (MDA) or horizontal distribution area (HDA) to regional areas or zones within the data center. Incorporating this architecture into one's data center cabling design allows for a one-time installation of the backbone cabling and provides flexibility to accommodate frequent reconfigurations at the zone required for moves, adds and changes.

To implement ZDA, one should identify zones throughout the data center and locate points of distribution within these zones. A common implementation of zone distribution includes the connectivity between the main distribution area and the server rows in the data center. High fiber-count cabling is installed from the MDA to each ZDA within the server rows, and low fiber-count cabling is then distributed from the ZDA to the server racks or cabinets in the equipment distribution areas (EDAs) within the zone. Zone distribution can also be implemented within data center topologies with horizontal distribution areas (HDA). When an HDA is used, high fiber-count cabling is deployed from the HDA (rather than the MDA) to each ZDA.

In addition to being a topology included in TIA-942 guidelines, the ZDA also provides many benefits when incorporated in the data center cabling infrastructure.



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An alternative method of deploying connectivity to EDAs is to homerun cabling from the MDA or HDA to each rack or cabinet. When compared to this method, the use of zone distribution reduces pathway congestion and limits data center disruption between the main distribution area and end equipment cabinets, eases implementation of moves, adds and changes and enables a modular solution for a “pay-as-you-grow” approach to cabling the data center.

SOLUTIONS FOR ZONE DISTRIBUTION

For data centers utilizing a zone distribution architecture, common product solutions from the zone distribution area to the equipment distribution area racks or cabinets, include extender trunks, harnesses or multiple patch cords for connectivity to the end equipment, such as servers or storage devices.

An alternative to using these products between the ZDA and EDA racks or cabinets is the integrated trunk module (ITM). A solution ideal for the zone distribution application, the ITM includes a pre-terminated, 12-fiber MTP™ trunk assembly inside of an LC or SC breakout module. Each ITM includes a trunk cable of 40 feet or 80 feet in length and yields six ports with SC duplex or LC duplex adapters for interconnecting into electronics, such as servers. The ITM has a sliding tray, which rotates to one side and is designed for easy access for deployment of the pre-terminated MTP trunk cable.

The ITM provides a value-add pre-terminated, modular solution for addressing dynamic cabling requirements, making data center design and installation easier. In data centers employing the zone distribution architecture within server rows, the ITM is placed within a rack or cabinet in the server row EDA. The trunk cable within the ITM is terminated with a pinned MTP connector and is installed from the rack or cabinet to the ZDA, where the pinned connector is mated to the trunk from the main distribution area. The remaining excess

cable can be stored within the sliding tray of the ITM for simple slack management. LC or SC jumpers interconnect from the ITM into the electronics within each rack or cabinet.



IMPLEMENTATION OF ZONE DISTRIBUTION WITH AN ITM

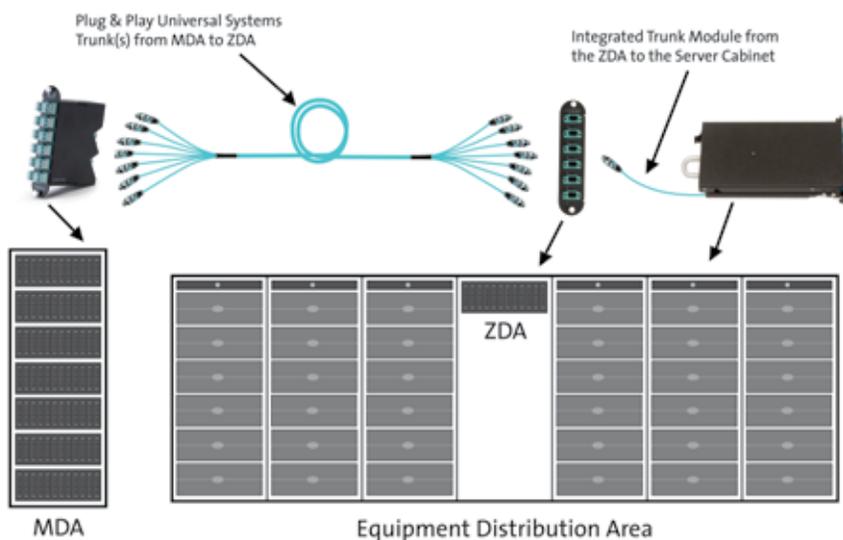
With a pre-terminated solution, whether a homerun architecture or zone distribution, a common challenge includes planning and distance measurement for cable assembly lengths, as well as slack management of any length overage within the channel. The ITM offers a unique solution to this challenge by incorporating a means to store the trunk cable within the module itself. By providing a means to store slack easily, the time required to measure channel lengths and plan the cabling within a zone is eliminated. Providing the maximum deployed length within a zone is less than 40 feet or 80 feet, the ITM can be used, and any spare length for shorter channels is stored within the module. With slack management integrated into the ITM, slack is virtually eliminated from the channel.

With alternative solutions for zone distribution, such as the extender trunk, a custom component is required for each location requiring connectivity due to the different length requirements from the ZDA to each rack. An ITM solution offers a

single component that can be installed at each rack or cabinet with the appropriate length of trunk deployed, eliminating many separate, custom components and simplifying materials management onsite and during installation.

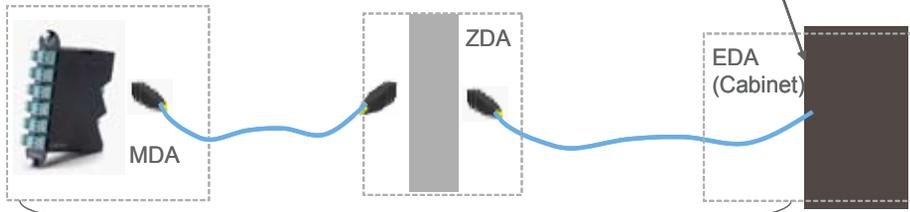
An additional consideration in deployment of cabling infrastructures within the data center is channel insertion loss. With current data rates deployed, and the need to provide a migration path for accommodating future data rates and insertion loss budgets, channel insertion loss must be addressed. At first glance, when compared to a homerun solution, zone distribution appears to require additional loss due to the connection point, or mating, at the zone. With previous solutions available for zone distribution, this is true. However, with the ITM, an MTP-mated pair is eliminated from the channel, and zone distribution can be implemented with the same channel insertion loss as a typical homerun solution between the MDA and EDA with a patch panel at each end of the channel.

Implementing zone distribution into the data center cabling infrastructure can addi-



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The ITM Eliminates one mated pair in the channel link



MM Link Loss = 1.5 dB + fiber loss (dB)

tionally reduce the time required for cabling installation. When evaluating, based on per foot of cable sheath installed, the total footage of cable to be installed is dramati-

cally reduced, thereby reducing the time required for installation. For example, in a data center with multiple server rows of 12 cabinets each where 24-fiber connectivity

is required to each cabinet, the estimated time and labor savings are shown as a function of distance.

Utilizing the ITM offers significant advantages over a homerun topology, as well as compared to alternative solutions available for zone distribution implementations. Use of the integrated trunk module in zone distribution applications:

- Eliminates the need for cable length planning;
- Eliminates slack with integrated slack management into the module;
- Reduces material management complexity by eliminating the need for multiple custom components;
- Eliminates one MTP-mated pair from the channel, lowering installed channel insertion loss; and,
- Reduces installation time and simplifies moves, adds or changes.

The integrated trunk module is available in 40-foot lengths, and with compatibility in 1U rack-mountable hardware; the solution is optimized for zone distribution architectures in the data center. With a capacity for three integrated trunk modules, a 1U rack-mountable solution provides up to 36-fiber connectivity per rack; with a 4U rack-mountable solution, capacity is increased to a maximum of 144 fibers. Additionally, 80-foot length solutions are available for use in 4U rack-mountable housings where longer distance capabilities are required. With reduced channel insertion loss, integrated slack management, simplified materials management and reduced time of deployment, zone distribution with integrated trunk modules is the ideal approach for data center design and deployment. ■

Jennifer Cline, RCDD, is the private networks market manager of data centers for Corning Cable Systems in Hickory, NC. In this role, one of her main responsibilities is the commercial leadership for data center applications. Jennifer joined CCS Research and Development in 1999 specializing in product development of flame retardant cables.

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