

Network intelligence for physical assets in a virtualized enterprise

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As enterprise IT groups continue to embrace virtualization as a solution for leveraging their hardware budgets, the question becomes, "How are virtual networks, servers, storage arrays, and workstations managed at the physical layer?" Or, as a CIO would ask of his IT organization, "How do you know what type of services are running on this port and what is the value of each to the organization?"

The answer in most existing cabling installations is — "They are neither managed nor documented," or, "They are manually documented in a patch and report spreadsheet." The trouble with the first is obvious; the trouble with the latter... with even one undocumented change, the spreadsheet becomes out of date and correction leads to a manual audit and trace of cables. In a non-virtual environment, where operating systems and applications tend to be fairly static, this may be acceptable. A major value proposition of virtual environments is that they give you flexibility to move applications, computers, networks and storage across physical assets — at will, dynamically and on the fly.

Virtualization morphs into several forms of existing Enterprise IT physical assets:

- Aggregated pools of virtualized x86-based server resources
 - Example: VMware vSphere
- Virtual volumes within the network storage array
 - Example: EMC VNX Virtual Storage Appliance
- Virtual machine access switches running Cisco NX-OS operating system, providing policy-based virtual machine connectivity
 - Example: Cisco Nexus 1000v
- Delivery of Windows and Web applications or even full virtual desktops to workstations, laptops and thin clients
 - Example: Citrix XenDesktop

These are just a few examples of systems that were once tied to specific physical assets. Implementing virtualization at any of these can also have an impact on the physical layer cabling requirements in support of an IT organization's current and future needs. Consider the type of data that is now running over a single physical cabling channel at any given time — whether in a desktop space, retail space, enterprise office telecommunications room, or corporate data center.

An example of converging different data streams with varying QoS levels was the implementation of VoIP, which consolidated voice and data onto a single interface and increased the bandwidth requirement of the channel. Common server virtualization strategies include 10-40:1 consolidation of operating systems onto a single physical piece of hardware. The bandwidth requirements for each OS stay static while the aggregate bandwidth requirements of the networking and/or storage ports on the server multiply.

Unfortunately, the business needs driving virtualization can't wait for the best cabling to be implemented. And since the cabling industry has yet to invent a "virtual" cable where bandwidth can be increased with a click, IT organizations must assess their physical layer for their virtual implementations. It's complicated enough to try and implement L2 and above in virtual environments — why make it more difficult by not knowing if the physical layer can support it? Knowing what, where, how much, and how robust the physical layer is can be important to the limitations of how far virtualization can be pushed.

Typical cabling installations run 3x the lifespan of the electronic equipment in the data center. In the instance where a 10-Gigabit Ethernet (10GbE) and 8-Gigabit Fibre Channel (8G FC) Storage Area Network (SAN) connection (times at least two for redundancy and/or failover) are required at a physical device, multiple approaches based on one's cabling architecture can be achieved. 10GbE today can be run over fiber or copper, while FC at a level greater than 1G requires fiber. The approach today where Category 6 (CAT6) cabling exists means that 10 individual 1GbE connections are required. Category 6A (CAT6A) cabling allows for 10GbE over a single cable if there are switch ports and network interface cards (NICs) that can support 10GBASE-T; otherwise, 10 individual cables are still required. Fiber also has different grades or types of cabling that may be mixed within a physical layer. Single-mode (SM) and multi-mode (MM) fiber require different types of optical transceivers, and varying types of MM fiber (OM1/2/3/4) have different rules regarding distance and number of connection points.

The physical layer is the only part of the network that currently cannot be virtualized.

- Physical cabling media are the foundation for both non-virtualized and highly virtualized IT environments
- Migration from non-virtual to highly virtual environments requires physical media that can support the bandwidth capabilities of the physical asset
 - Convergence of voice, data, and building management systems (BMS) to IP networks leverages the capabilities of virtualization

Managing varying types of physical media is an ongoing process. Server, storage, network, office refreshes and consolidation efforts all typically necessitate new cabling — with a mix of new and old types of cabling that need to work the same across business applications. Internal and external service level agreements (SLAs) can be directly impacted if service needs to be moved to a channel that cannot support it. Additionally, physical-layer infrastructure has evolved beyond media types and performance specifications to intelligent solutions that can aid and enhance operational efficiency.

These intelligent solutions have even attracted the attention of standards groups in TIA and ISO/IEC with efforts toward the standardization for physical layer management, with new chapters on Automated Infrastructure Management (AIM) that include areas such as:

- Basic and advanced network security
- Discovery and documentation of network devices as well as LAN/SAN switches
- Location identification of IT assets, whether physical or virtual
- Improving process management and workflow efficiency
- Common models for data exchange across industry solutions

In virtual IT environments the value of the physical asset increases as multiple virtual machines consolidate onto the asset. So, too, does the Layer 1 connectivity via twisted-pair copper or fiber-optic cabling, as it must be able to support the aggregate bandwidth both today and as virtualization occurs. Knowledge of what type of cabling actually exists in your network will allow you to plan for and implement changes from a traditional to virtual IT environment — whether today or in the future. Automated Infrastructure Management platforms give you that control and confidence to know what exists in your network.

Intelligent physical layer networks enhance the ability of IT groups to migrate from non-virtual to highly virtual networks. Real time documentation of existing channels provides confirmation that the ability to server adequate bandwidth to server, switch, and storage devices is there. Additional bandwidth is typically provided by upgrading server, switch, and storage networking cards during and cutting over an application and not all legacy cabling can support next generation networking speeds.

- Typical SLAs for migrations are tight and usually performed during off-hours when cabling personnel are not onsite
- Change control requires end-to-end physical layer port mapping prior to the start of the migration
- Blown SLAs due to incorrect Layer 1 port assignments can cause frustration, lack of confidence, or service disruption to both internal and external customers

Never in the past have IT groups been asked to do more with their technology that currently exists today without ability to upgrade everything all at once. Separation of operating systems from hardware allows these groups to respond to once expensive implementations by pooling shared and virtualized applications. Re-cabling is typically looked at as disruptive and labor intensive and rarely considered, however with the use of structured cabling and intelligent physical layer networks upgrades can be achieved effectively and within the internal requests of the business.



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