

The Case for a Unified Network Fabric

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Introduction

Historically, technology innovation began in the enterprise, where the IT organization would evaluate and slowly integrate it into corporate business processes. A subset of that technology would then make its way to consumers. Today, the cycle has largely reversed (Figure 1). Now technology innovation increasingly tends to occur in the home first, then makes its way into the enterprise via the employees, not the IT organization. Instant messenger, cell phones, Skype and other communication technologies were this first wave of the "consumerization" of the enterprise. These consumer technologies have been instrumental in increasing productivity by enabling workers to fully integrate their personal and professional lives.

Web 2.0 and social computing are driving the next wave of consumerization. Here, the IT organization shifts from being a creator of applications and information to a facilitator that allows users to create and share content with whom they want in the format they want. This trend will have the following impact on network design:

- User-generated content will increase value across the network, so the wiring closet eventually becomes as important as the data center
- Traffic becomes much more unpredictable as it moves not only from user to data center but also user to user, frequently bypassing the data center all together
- Performance of network equipment is assumed and overall network reliability becomes the key metric in vendor selection

This paper will explore emerging consumer trends and the impact on enterprise productivity and corporate network design. It will also profile leading network vendor Force10 Networks and analyze the company's ability to provide the solutions that will enable enterprises to build a unified network fabric that delivers consistent features and services from the data center to the wiring closet.

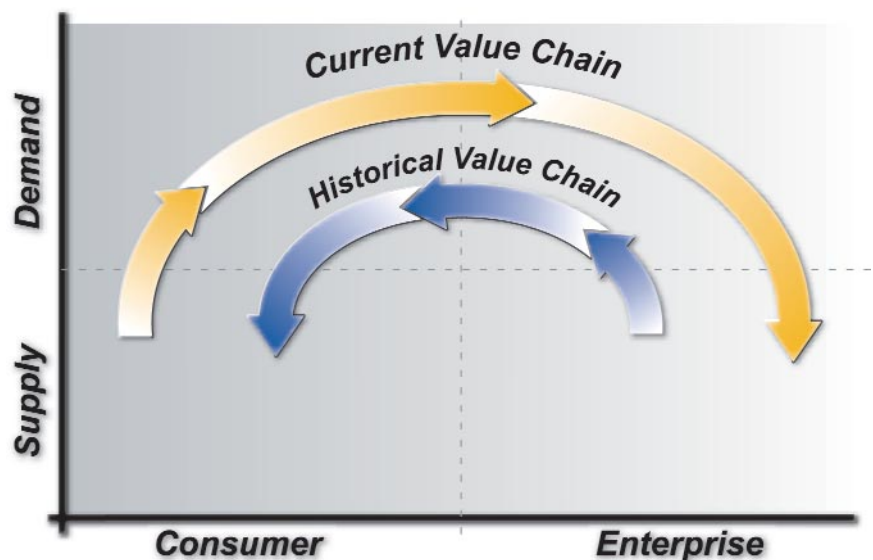


Figure 1. Technology innovation is now moving from the consumer to the enterprise.

Traditional Network Design

Traditionally, networks have been designed based on the theory that value in the network is highest in the data center and diminishes as it moves outward (Figure 2). In response, network managers spent time and money to optimize data center architectures to meet business objectives. Commensurate with declining perceived value, they spent less time and money in the LAN core and typically left the wiring closet to low-cost, commodity equipment. Looking at the historical role of each part of the network can help us understand why this theory has prevailed.

Data Center

Historically, the data center is where a company's most important assets reside, including multi-million dollar databases, high value storage area networks (SANs), blade servers and business-critical corporate applications. To protect their investment in the data center, network managers typically seek equally high value network equipment.

To this end, IT managers implement a comprehensive due diligence process to ensure the equipment has the features and performance to meet rigorous corporate demands. That due diligence generally dictates that network managers deploy large, modular-based systems that are fully redundant and have a robust set of scalability, reliability and security features.

When vendors compete for data center business, the historical measure of market leadership has been performance. As a result, the data center has been

among the most competitive markets from a vendor evaluation perspective and has allowed an environment for smaller, performance-focused vendors — such as Force10 Networks — to succeed.

LAN Core

The LAN core, or aggregation edge, is where the data center and wiring closet meet. Some organizations treat it as an extension of the wiring closet, and some treat it as an extension of the data center. In either case, the primary role is to aggregate wiring closet switches into a smaller set of links that pass the traffic to the data center.

Network managers typically focus less attention on the LAN core than on the data center but more than on the wiring closet. Network equipment in the LAN core tends to be of middling performance and cost but can easily scale should the enterprise require it. Organizational preferences and requirements dictate whether the equipment that is deployed in the LAN core is a modular configuration, as in the data center, or a fixed configuration, as is more common to the wiring closet.

Wiring Closet

The wiring closet has been one of the most neglected parts of the network. In fact, the physical wiring closet itself is often a small dusty maintenance closet with no air conditioning that is often filled with equipment unrelated to IT. Unlike the data center, these locations are often left unlocked, so the level of physical security is low as well.

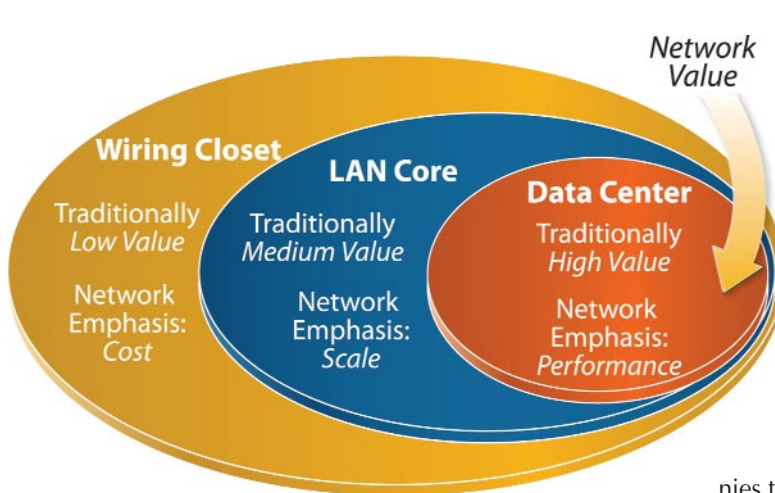


Figure 2. The enterprise network has traditionally been designed according to perceived value with emphasis on the data center.

The primary purpose of the wiring closet is to connect corporate end points into the network. The actual end points themselves tend to be commodity-based equipment such as laptops, printers and desktops. Since the wiring closet is at the edge of the network and connects many commodity items, network managers often deploy low cost network equipment here. For many organizations, the main criterion for vendor selection is acquisition cost.

There is, however, a small minority of companies that treat the wiring closet as strategic and deploy data center-class equipment. This is normally done departmentally within an organization where the

workers' connection to the network is deemed to be highly valuable to the business. For example, the equity trading desk of a brokerage firm demands constant access to the network. As a result, the wiring closets of brokerage firms often look like miniature data centers and are secured, powered and cooled in a similar manner.

It's our belief that there are many trends shaping the network today that will make this example more the norm than the exception.

The Impact of Web 2.0 and Social Networking

The phrase, "Web 2.0," and social networking tools are the latest technologies to enter the enterprise from the home and will have a significant impact on the way corporate networks are designed and managed.

The phrase Web 2.0 was initially used to describe the second generation web. At its core is the concept of community, where website content is generated by members of the community rather than website owners. Wikis, blogs and podcasts are some of the tools used to help facilitate content generation.

This concept of community-generated content is the primary value proposition of sites such as Facebook, YouTube and Wikipedia. The Linden Labs virtual world Second Life confirms the rapid consumer acceptance of Web 2.0 technologies, with estimates that over 60 percent of its members generate content. This is a staggering number considering less than 10 percent of users create content for the traditional web.

There are many reasons for this transition, including:

- Users are more technically savvy. For the most part, Web 2.0 is generational; college students and teenagers use social computing tools as part of their everyday activities.
- The shift to IP has created a common network. IP enables many things, including the ability to assimilate communications and collaboration tools in a way that allows users to have a conversation with multiple people on different networks using different communications tools.
- Web 2.0 tools are easier to the web. It's no surprise that so few people create content for the traditional web. Although there are plenty of off-the-shelf web development tools, creating traditional web content

requires a high degree of technical knowledge. With Web 2.0, most of the content creation tools are built into the sites themselves, making it easy for almost anyone to contribute.

While this transition is well under way on the consumer side, it is only now beginning to impact the enterprise. As college students, among the largest users of Web 2.0 technologies, graduate and enter the workforce, they bring with them new communications habits and tools. People who use Facebook as a way to build social networks will want a similar experience in the work force. Before Facebook, the same transition occurred with instant messenger and mobile phones. Today, people communicate through Web 2.0.

As the new generation of employees begins to create content and applications within the workforce, the consumerization of IT forces the enterprise to grapple with a host of new network challenges. The more significant consumer technologies that will impact network design include:

Peer-to-peer Technologies

File sharing, instant messaging and many voice over IP (VoIP) services and products work via peer-to-peer applications. As organizations orient business processes around collaborative technologies, peer-to-peer applications and traffic will continue to rise. For network managers, this means an increase in unpredictable traffic patterns as more traffic moves between end users rather than from the end user to the data center.

User-generated Content

Wikis, blogs and other similar tools provide a facilitation mechanism for users to create and share content with others. The relative ease with which such content can be created is fueling the adoption of these technologies. The advent of more users acting as content creators moves the emphasis of the network from the data center to the wiring closet edge.

Software as a Service (SaaS)

The concept of hosting critical applications is nothing new, however, software as a service (SaaS) is the first successful implementation of the model. Nearly every software company has a strategy to deliver its software as an Internet-based service. Like peer-to-peer technologies and wikis, SaaS applications make the wiring closet more important and increase the unpredictability of traffic on the network by enabling users to bypass the data center.

A New Architectural Approach: The Unified Network Fabric

Social networking, Web 2.0, peer-to-peer or whatever the latest term is for these emerging tools, has forever changed the way we work. And this workflow change necessitates a significant network design change. The concept of user-generated content has moved the "important stuff" from the data center to a number of locations including the data center, branch offices, employees' PCs and mobile devices.

In a traditional network design, traffic from the data center to the end user and vice versa is highly predictable. This predictability makes designing the enterprise network relatively simple with most of the intelligence in the data center and fewer features as you move through the LAN core and the wiring closet.

With the new paradigm of embracing user-generated content, flow patterns become much more unpredictable as traffic can now travel to and from one of many destinations. Essentially, all parts of the network become valuable. The unpredictability of the traffic coupled with the greater value placed across the network requires IT managers to build a consistent set of features and performance metrics into the network (Figure 3), creating a "unified network fabric" from the data center through the wiring closet.

Building a unified network fabric requires a different approach to network design, but doing so can provide higher uptime, more consistent network performance and overall better reliability from the network.

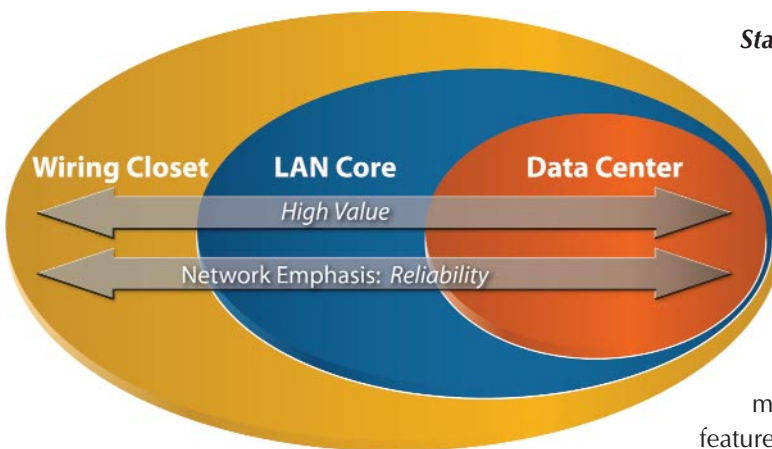


Figure 3. A unified network fabric introduces the same performance metrics to all parts of the network.

- Providing a uniform set of services at the data center, LAN core and wiring closet is critical to the success of the unified network fabric. Since the value of the network is equal across its parts, so must be the network features.
- A common management system and operating system across all products is essential for simplifying configuration management and operational support across the network. Studies have shown that up to 37 percent of network downtime is related to human error, much of this coming from operational errors. Management and operating system consistency will greatly reduce these errors and their associated costs.
- Traditional data center products scale down much easier than wiring closet products scale up. The complexity of network and system-level design gives an edge to vendors that have expertise in the data center since the current set of features in the data center are the ones that are needed in the wiring closet as well.
- Performance is no longer the key differentiator for network vendor evaluation. In traditional network design, the vendor that boasted the biggest throughput was often thought to be best-in-class. Performance at a fair price should be assumed today with emphasis placed on overall service reliability instead.

Central to the unified network fabric is the concept of reliability. It is a metric that has many meanings to many people. Some think of it strictly as a measure of hardware reliability while others view reliability as it relates to failover capabilities. For the vision of the unified network fabric to become a reality, reliability needs to be defined as follows:

Stable Software – The software on the platform itself needs to be mature and robust enough that it's relatively "bug free." This normally means that it has been proven in production networks and has gone through several updates to eliminate bugs. Additionally, stable software tends to be modular, and is often built on top of a Unix-like operating system.

Resilient Hardware – The hardware that makes up the product must have resiliency features built into it. Nonstop hardware performance and failover technologies are crucial to maintaining network reliability.

Manageability – Since so much of network downtime is related to human error, the manageability of products is extremely important. To manage the unpredictability of traffic, network managers need to be able to easily configure and troubleshoot the network without bringing it down.

Network Visibility – In order to manage and secure a network, it's important to understand what's actually occurring on the network. Historically, network managers have had very few visibility tools available to them. The more unpredictable network traffic becomes, the more crucial it is that the visibility tools are there.

Flexibility and Extensibility – The products used to build a unified network fabric will be in an environment where change is the norm, and they need to be flexible and extensible enough to meet the known challenges of today and unknown challenges of tomorrow.

The Force10 Approach to Building a Unified Network Fabric

Force10 Networks is a leading manufacturer of high performance network switches and routers. Its products can be found in the most demanding environments, where the business comes to a screeching halt if the network fails. The company boasts an impressive customer list that includes Netflix, CERN, Facebook, eHarmony and Yahoo! — companies where the network is the business. These customers rely heavily on Force10's expertise in high performance, reliable networking to keep the business running.

Force10 has built its business around meeting the needs of the most demanding customers and has established a reputation for the following strengths:

Strong Network Economics – The high density and resiliency of Force10's product portfolio coupled with the ease of management leads to an overall lower total cost of ownership (TCO) than many of its competitors. Too often, TCO is incorrectly confused with acquisition price, neglecting operational costs such as power and cooling and maintenance. On a true TCO calculation, Force10 delivers favorable metrics.

Knowledge of "Always On" Environments – Force10 initially entered the market at the high end with some of the most demanding, mission critical environments as its earliest customers. In these environments, not only is

the network the business but the business doesn't exist without the network. With these customers, Force10 hardened its product portfolio. As more organizations rely on their networks, this will become an increasingly strong differentiator.

FTOS – The modular Force10 Operating System (FTOS) powers Force10's product portfolio. This is a very different strategy from other networking companies that have built their product lines through acquisition, so operating systems tend to vary between products. A consistent operating system allows Force10 customers to more efficiently adapt to changes in the network and to manage those changes in a much easier way. Additionally, the modularity of FTOS provides inherent stability and performance.

High Touch, 24/7 Support – Support has been a differentiator for Force10 since its inception. Downtime is not an option for the majority of Force10's customers, so the support team must be available nearly on demand. To that end, Force10 has built a worldwide high touch service and support organization geared to rapid escalation and problem resolution.

An Understanding of the Importance of Ecosystem – Many network vendors try to do everything and the result is a company who does many things okay but few things well. Force10 has created a strong ecosystem that allows it to focus on the things it does well and rely on a best-of-breed ecosystem to build out other network services.

Enterprise networks are facing significant changes, and organizations require a network partner to help wade through the many challenges they will face. Force10's superior understanding of the requirements of demanding networking environments makes them a strong candidate as organizations look to meet the challenges of the Web 2.0 world.

The Force10 C-Series Resilient Switches

As the enterprise network shifts to requiring a unified network fabric, Force10 has taken the knowledge it gained in the data center and moved into the wiring closet with the C-Series resilient switches. The Force10 C-Series is an enterprise-grade product line capable of delivering the same levels of reliability and services to the wiring closet as to the data center.

The C-Series are power and cooling efficient with leading reliability, scalability and network control features. Measuring the C-Series along these three measures reveals the following:

Reliability

- Hardened FTOS software that is also found on the flagship E-Series family of switch/routers
- Hot insertion and removal of all components
- Redundant key components with failover technologies
- Graceful PoE power reduction during power failure

Network Control

- Modular FTOS software with memory protection for fault isolation
- In-line diagnostics and serviceability
- Power prioritization

Scalability

- Up to 1.536 Tbps switching capacity
- Up to 384 line-rate PoE and non-PoE Gigabit Ethernet ports
- Up to 64 line-rate 10 Gigabit Ethernet ports
- Line-rate throughput regardless of traffic conditions
- 96 Gbps slot capacity for future expansion

The addition of the C-Series gives Force10 an end-to-end product line capable of supporting enterprises of all sizes (Figure 4).

With the reliability, network control and scalability as outlined above, the C-Series brings a future-proofed product to the wiring closet. Typically, enterprises replace wiring closet equipment every three to five years. However, many organizations are now demanding a longer lifespan for products, with some designs stretching to 10 years. This requires a product that can meet the challenges of today at a fair price but also be architected for tomorrow.

All of the Force10 switching and routing products are designed with that future-proof architecture in mind. For example, the C-Series has a total switching capacity of 1.536 Tbps and a slot capacity of 96 Gbps, providing

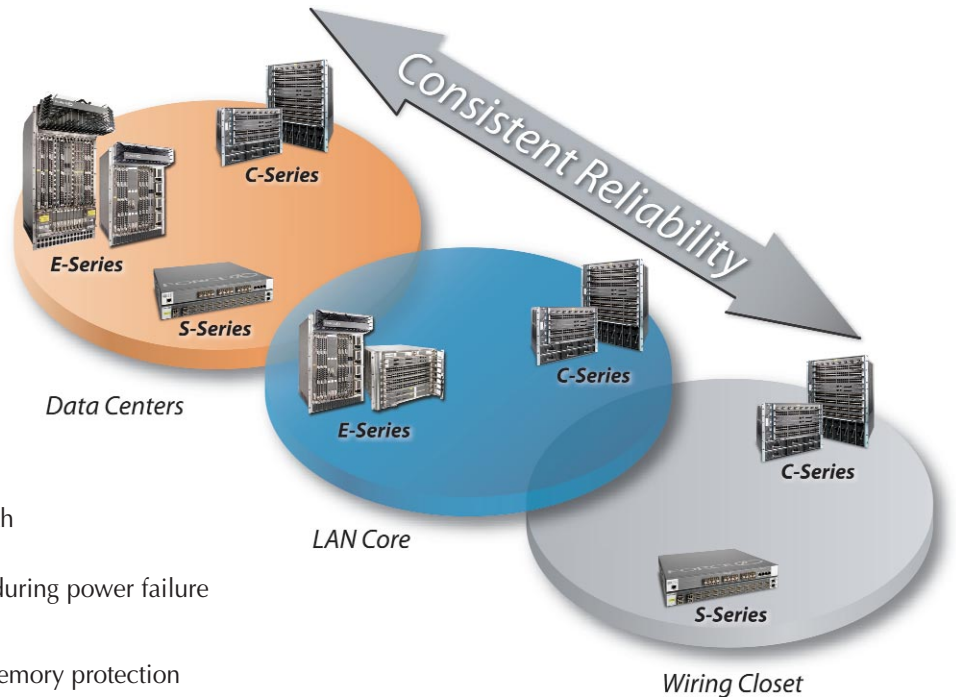


Figure 4. The Force10 Networks product portfolio

ample room for future expansion. Lower performing competitors will claim that those performance levels are not required in the wiring closets, and in some situations, that may be true. However, the proliferation of user-generated content, richer applications and video traffic will continue to put future demands on the wiring closet, and installing a product built for today's traffic patterns will only lead to problems in the near future.

In addition to delivering a degree of future proofing, an end-to-end Force10 environment provides a high level of application readiness by providing the following:

- Allows enterprises to build a unified network fabric with reliability, network control and scalability from the data center to the wiring closet
- Provides the flexibility that enterprises need to respond to evolving and emerging applications

Conclusion

Web 2.0, user-generated content and social networking have forever changed the role of the network. This change has raised the bar on the enterprise network and created the demand for a unified network fabric defined as:

- A seamless, end-to-end network fabric that provides a consistent set of features and services
- A network where performance is assumed and reliability becomes the key metric in choosing a vendor
- A network that is flexible enough to meet the demands of today but can scale and adapt as the organization grows
- A network that maintains performance as new, more advanced applications are brought online

The emergence of the unified network fabric raises the overall value of the network. What worked yesterday may not work today, and network managers need to ensure that they do the proper due diligence at every point in the network, not just the data center. Organizations that continue to deploy low-cost, feature-limited wiring closet products will run the risk of having their operational costs continually increase, as well as a much shorter upgrade cycle, resulting in greater network downtime and a network that does not meet the strategic objectives of the business.

Companies that choose vendors like Force10, with a proven history in demanding environments, will benefit by having a seamless, unified network fabric. This unified network fabric will be a core competence in moving organizations from static, transactional-based business to a fluid and dynamic interaction-based business that reaches unprecedented levels of worker productivity.



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