Optimizing User Experience Requires an Enterprisewide Network Fabric

November 2011

Prepared by:

Zeus Kerravala

Optimizing User Experience Requires an Enterprisewide Network Fabric

by Zeus Kerravala

November 2011

° °
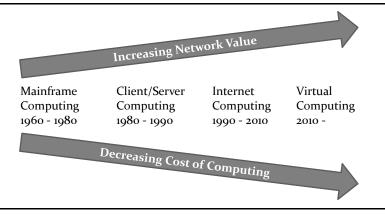
Introduction

Consumerization, mobility and device evolution have all contributed to IT transformation. However, no technology has been a bigger disruptive force than virtualization. Virtualization has reached a tipping point where there are more virtual workloads than physical ones. It is the norm, not the exception. Over the past decade, virtualization has had the following impact:

- Virtualization has changed the way applications are designed, deployed and licensed. Applications are no longer deployed on dedicated hardware. Application developers must consider resource use and performance.

- Processors and servers have become virtualization-optimized. Virtualization puts new demands on the physical hardware it runs on, changing the way the leading server manufacturers build the hardware.

- Other compute resources are virtualized. While the majority of virtualization today revolves around server virtualization, other areas of compute such as I/O, storage and memory are being virtualized.

Virtualization is now moving into the next phase of maturity — being able to take any virtual resource and move it to where it is needed, based on business policy. This era of virtual computing will continue to lower the cost of computing and raise the value of the network (see Exhibit 1).

Exhibit 1: The Shift to Virtual Computing

Source: ZK Research, 2011

In fact, with virtual computing, the network becomes a strategic point of competitive differentiation. Businesses can align application-oriented decisions with networking architectures to support consumerization, virtualization and mobility, and still meet the expectations of even the most demanding users. However, network architecture has not changed much in the past 20 years. For organizations to fully leverage this era of IT, the network must now evolve.

zeus@zkresearch.com

Cell: 301-775-7447
Office: 978-252-5314

ZK Research
A Division of Kerravala Consulting

Influence and insight through social media

Section II: The Role of the Network in the Virtual Computing Era

The role of the network changes dramatically with virtual computing. The network shifts from being a tactical resource at the bottom of the IT stack to the center of IT ecosystem (see Exhibit 2).

Exhibit 2: IT Value Shifts to the Network

Source: ZK Research, 2011

As virtualization matures and plays a bigger role in IT evolution, the network will evolve as follows:

- Over time, more and more compute resources will be virtualized and located in pools. The network is the only component that can connect all of these resources, and it effectively becomes the back plane of the virtual enterprise.

- The influx of consumer technology has caused IT managers to shift the management and security control points away from the end point. The network is the most scalable place for these control points. Securing and managing devices from the network is increasingly important as the number of devices per user continues to grow. There are currently three devices for every worker today, and ZK Research estimates this ratio will reach seven to one by 2015.

- The network will have the biggest impact on delivering a high-quality, consistent user experience across the network.

- Virtualization, video, VoIP and other multimedia traffic is now the norm and the network plays a prominent role in delivering and optimizing real-time traffic.

The network needs to transform to handle its increased importance and become a point of strategic differentiation. The architectures used to design current campus and data-center networks have the following limitations:

- Legacy infrastructure was designed for static, best-effort environments. Networks were architected for traffic that flowed primarily north-south — from the end client through each network tier and back. Virtualization, mobility, real-time communications and peer-to-peer traffic significantly increase east-west traffic. A change is needed in network elements and architecture to effectively meet new demands.

- Multitier network design adds too much latency to support real-time or large workloads. Legacy network design dictates that all traffic between servers or between the client and server traverse each network tier, to the core and then back through each tier to its destination. Each network hop adds latency that can impact performance. Traditional multitier design is insufficient for the real-time, low-latency performance a virtual, real-time enterprise requires.

- Security is an overlay technology. Network and security have long been related, but architected and deployed independently. As more mobile and virtual devices make their way onto the corporate network, separate security and network domains will not protect the enterprise or the worker.

- Wired and wireless infrastructure is not integrated. There's no arguing the fact that wireless LAN is becoming the primary access method for workers today (see Exhibit 3). However, the wired network is still important for many applications that are high bandwidth and low latency, such as video, CAD and VDI. When wireless and wired infrastructures are deployed independently, security and management policies can easily be out of sync. This means users could be restricted from joining the network over wireless LAN in a conference room but could have full access over wired connections, limiting the value of the work done with secured wireless. Securing the enterprise is almost impossible to do with infrastructure deployed independently.
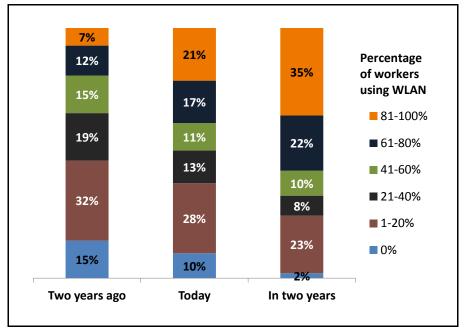
Exhibit 3: Wireless LAN is the Norm

Source: ZK Research, 2011

- High total cost of ownership (TCO). Many market-share leaders for network infrastructure have built their portfolios through acquisition. This means managing an end-to-end network could require several management tools. Additionally, it's possible certain features are only available on certain devices, often causing decision-makers to buy a more expensive version of a product to get consistent features. All of this leads to a higher TCO to run the network.

To truly create a network that can support a real-time, virtualized, mobile enterprise that is manageable and secure, CIOs and IT leaders need to focus on building an enterprisewide network fabric.

Section III: Defining an Enterprise Network Fabric

An enterprise network fabric is a network that can deliver any application to any device no matter where the worker is located with a consistent and secure user experience. This is in stark contrast to current networks, where users often have to choose the access method that provides the best experience or change location to access certain applications. Today's legacy networks dictate that the user is the integration point of access complexity; an enterprise fabric uses the network to make intelligent decisions and mask the complexity from the user.

To optimize user experience, the network fabric must extend from the data center out through the access edge (see Exhibit 4). This enables not only the optimization of network infrastructure, but provides a high quality, consistent, optimized experience for workers no matter where they are.
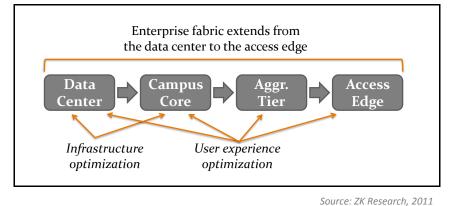
Exhibit 4: Enterprise Network Fabric

Source: ZK Research, 2011

While the network fabric must be enterprisewide, the characteristics in different spots do vary. Data-center and campus-core fabric characteristics include:

- A flat network: Unlike a traditional multitier network where all traffic must go through several tiers, a data-center fabric is flat (see Exhibit 5). A large, flat network is simple to deploy and traffic is never more than a single hop from its destination, making transport time very fast.
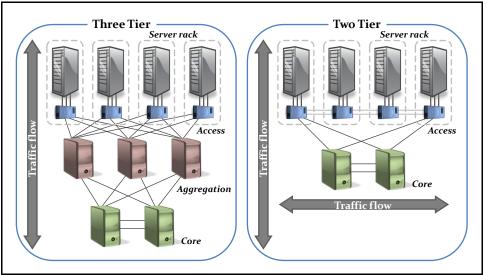
Exhibit 5: Legacy Network vs. Network Fabric

Source: ZK Research, 2011

- Operational simplicity: Legacy networks are highly complex and difficult to manage. A fabric has a consistent set of features, making administrative tasks much simpler. A flat network typically has up to one-third fewer devices, reducing administrative overhead.

- Optimization for east-west and north-south traffic: Legacy data-center networks are architected to have all traffic flow in a north-south direction; from the edge of the network, through each tier, through the core and then back on a similar path. This creates a significant amount of congestion on the interswitch links and adds extra latency to the traffic flow. A network fabric can be thought of as a single entity where traffic can move east to west and is never more than a single hop from its destination. This is crucial for the movement of virtual workloads, where any latency can cause disruption to the business.

- Active-active connections: Spanning Tree Protocol (STP) is widely deployed in data centers today to prevent network traffic loops and broadcast storms. This can happen when multiple links are used between network switches for redundancy purposes. STP operates by disabling one of the two active connections and putting the redundant link in a passive, standby mode until the primary connection fails. While STP does indeed prevent traffic loops it is highly inefficient in that up to half of the ports can be disabled. In a network fabric, all of the ports are always active and able to pass traffic simultaneously. This leads to a more efficient network that is lower cost and performs better.

- Choice in architectures: The most common topology post-migration to a network fabric is to move from a three-tier to a two-tier data network. Some organizations choose to stay with a three-tier architecture depending on the type of application flow. Network infrastructure should be able to support both deployment models.

- A high-density 10 Gbps Ethernet with a roadmap to 40 and 100: In a data center, speed matters and so does density. Organizations should not need to choose one over the other. Any network deployed today should support high-density 10 Gbps and provide an upgrade path to 40 and 100 when those standards are ratified and products are generally available. Ideally, this upgrade would be done without the need for a forklift upgrade, allowing for a minimal disruption.

For a consistent user experience, the network fabric needs to extend to the corporate access edge. Network requirements for the aggregation tier and access edge are:

- Consistent management across wired and wireless boundaries: Workers should not have to adjust their work habits based on whether they are connected over a wired or wireless network, but this is common in many companies today. This is because most mainstream network vendors have wireless technologies acquired or delivered through partnerships. In today's environment it's imperative network managers can manage their wired and wireless networks as a single network.

- Security integrated across wired and wireless network: A corporate security policy is only as good as its weakest link. With today's legacy networks, security capabilities across the wired and wireless networks are inconsistent. An enterprisewide fabric requires the same security features are available throughout the network across the wired, wireless or mobile edge.

- Unified management interface: ZK Research shows that 37 percent of network downtime is due to human error from misconfigurations, by far the single biggest contributor to downtime. A major contributor is that the management interface for many network vendors varies product-by-product, since the portfolio was built through acquisition. Updating operating systems and applying patches or configuration changes can be a long arduous process. A single, unified management interface is critical to optimizing network performance and uptime.

- Access control. Workers are using more and more consumer technologies in the workplace: ZK Research shows that, on average, workers utilize four consumer technologies in their day-to-day work environment. The network fabric is the only scalable place for access control, as it is the only resource that can reach a worker no matter where they are.

- User profiling and policy enforcement: An important function for the network fabric is to determine who a user is and what functions they can perform in that location. For example, a corporate policy may dictate that certain information can be viewed openly in a secured part of the network, such as an office, but not in a public area such as the company cafeteria. The network can do this through profiling the user and applying policy as the business dictates.

- Application optimization: The performance of applications can vary from location to location based on available bandwidth and type of access. The network fabric should optimize application performance to create a seamless, high-quality user experience.

Section IV: Business Benefits of an Enterprisewide Network Fabric

The network has become a strategic point of differentiation. Organizations that deploy an enterprisewide network fabric will gain all of the well-known technical benefits, such as operational simplicity and a faster overall network, but they will also realize the following business benefits:

- Optimizes user experience, not just infrastructure: Optimizing infrastructure provides limited value, as there is a finite amount of consolidation to do. Optimizing the experience of all users enables the entire company to be more productive and accomplish more tasks in more places. This creates almost unlimited potential.
- Allows for fast service creation without high infrastructure spend: A network fabric creates an underlying platform for organizations to leverage for fast service creation and delivery. This allows

IT leaders to say "yes" to business leaders, and accommodate requests quickly and accurately.

- Operational simplicity: One of the big benefits of simplifying network operations is lowering the overall TCO of running the network through streamlined operations and cost containment. However, there are other more significant benefits, such as increased corporate margins. Customers will also notice the improvement in service. Better customer service can directly improve existing customer protection as well.
- Risk reduction: A network fabric can significantly reduce business risk by enabling scalable consumerization. Shifting the security and management control points of end-user devices to the network lets IT maintain control while providing workers with the choices they desire. This can protect sensitive corporate and customer information, reducing many liability issues.
- Aligns CEO and CIO priorities: All of the above benefits ultimately allow organizations to align the priorities of the business with the priorities of the technology organization. Exhibit 6 shows how an enterprisewide network fabric can bring these priorities together.

Exhibit 6: CIO and CEO Priority Alignment

CEO Priorities	Business Goal	CIO Priorities
New products, new customer segments, acquisitions, mergers	Growth	Fast service creation without infrastructure spend, service acceleration
Increased margins, customer retention, service improvement	Profitability	Investment protection, operational simplicity, cost containment
Corporate responsibility, liability issues, customer protection	Risk	Managing customer technology, scaled growth, optimized management and control points

Source: ZK Research, 2011

Section V: What to Look For in a Solution Provider

An enterprisewide network fabric will play a critical role in determining the success or failure of an organization's ability to capitalize on the virtual computing era. This is a new role for the network and consequently, IT leaders must shed buying strategies based primarily on brand or vendor incumbency.

However, a full understanding of what to look for in a solution provider is not obvious, especially with the ongoing compute transition underway. Enterprise fabric vendors should provide the following:

- **Open and standards-based structure**: There are many ways for a network equipment provider to meet the challenges of network evolution. Some will choose proprietary, closed protocols to develop new products. In some cases, this can short-cut development time and allow the vendor to get products to market earlier than those that follow standards. However, over the long term, it causes vendor lock and impedes customers' ability to have a choice of technologies in the future. An open, standards-based solution guarantees interoperability and enables a wide variety of choice.

- **Unified wired and wireless access solution**: The era of having wireless as an overlay technology is rapidly coming to an end. There are simply too many wireless devices being brought into the enterprise to treat it as an augmentation to the wired network. Scaling the network fabric requires that the wired and wireless access edge be unified to enable consistent user experience, security and access controls no matter how the worker accesses corporate resources.

- **Single fabric management plane**: When evaluating network technology there is significant emphasis placed on the hardware, but it's not the only consideration. A single fabric management plane is important for the ongoing reliability and efficiency of the network.

- **End-to-end solution**: Since the network fabric extends out from the data center, the solution must provide infrastructure that can enable the fabric capabilities in the data center, branch office, campus core and access edge. This creates the consistency and seamlessness of experience critical to increasing worker productivity.

- **ASIC-based for purpose built innovation**: There is often industry debate around the use of merchant silicon or custom application-specific integrated circuits (ASICs). The right answer is strategic use of both. ASIC technology used specifically for purposeful innovation can deliver new features quickly and at a reasonable price.

- **Pervasive security**: Security cannot be compromised in this era of consumer mobile technology. The highest level of security needs to be delivered as a pervasive network resource to protect corporate information, workers and customers.

- **Design for power efficiency**: Power and cooling requirements vary widely between network fabric solution providers. A solution with power efficiency designed into it will deliver a faster ROI and enable faster scale without worrying about building facilities.

- **Operational simplicity**: Ultimately, no matter how much work the vendor does optimizing the solution for infrastructure cost-effectiveness, the solution needs to be operationally simple to maximize ROI. This means a unified management interface and a consistent operating system that spans all of the products.

Section VI: Conclusion and Recommendations

An enterprisewide fabric will create the scalable, flexible network platform organizations need to compete in this new era of IT. There are many technical and business benefits organizations will realize as a result (see Exhibit 7).

To realize its full potential, the network must undergo a major transformation. IT decision-makers must move away from the legacy mindset when it comes to network technology.
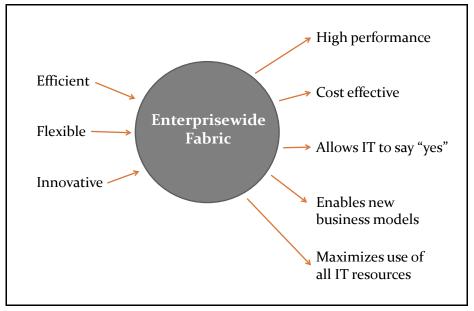
Exhibit 7: The Power of a Network Fabric

Source: ZK Research, 2011

With this in mind, ZK Research makes the following recommendations for companies looking to leverage the network as a point of competitive differentiation:

- Evaluate solution providers on criteria unique to a network fabric. This requires considering the entire network, not just a single box. A few of the questions that need to be raised to evaluate network fabrics are: How well the network handles virtual traffic, what is the port-to-port latency of traffic across the data center, and how consistent the user experience is.

- Do not compromise on the network even if it means shifting away from the incumbent. Choosing an incumbent vendor is often the path of least resistance and is often a good enough choice. However, in this era of computing, good enough is no longer good enough. Choosing the safe option often requires companies to make compromises it may regret in the future. Choose the vendor that best supports the company initiatives and will help drive it closer to the vision of virtual computing.

- Simplify the network. Companies should look to migrate away from architectural choices that add complexity. This includes utilizing multitier data-center networks, wireless overlays and point-product security technologies. An enterprisewide network fabric will deliver a robust end-user experience across the entire network, and do it simply.