Simplifying and orchestrating the network for performance

Innovation is driving unprecedented change. Social media, cloud, mobility, and Big Data are redefining how IT is purchased and consumed. High-definition video, rich-media collaboration tools, and cloud computing are reinventing how businesses—and people—work. Enterprises that harness these innovations are able to drive business advantage and build new opportunities in the global marketplace.

Bring your own device (BYOD), Big Data, mobility, and the other trends have significantly increased the amount of traffic on the network, as workers access applications and content from anywhere to stay productive.

For many consumers, smartphones and tablets are fast replacing PCs as the default computing device. This is causing a shift from fixed to wireless networks as the preferred way to connect. Organizations are also competing to address this rapidly growing consumer segment with a slew of services that provide a rich-media experience based on video and interactive collaboration.

By 2018, more than half of all traffic from mobile-connected devices (almost 17 exabytes) will be offloaded to the fixed network by means of Wi-Fi devices and femtocells each month. Without Wi-Fi and femtocell offload, total mobile data traffic would grow at a CAGR of 65 percent between 2013 and 2018 (12-fold growth), instead of the projected CAGR of 61 percent (11-fold growth).

Through 2018, the growing variety of devices, computing styles, user contexts, and interaction paradigms will make “everything everywhere” strategies unachievable. The unexpected consequence of bring your own device (BYOD) programs may double or even triple the size of the mobile workforce.

Mobile network connection speeds more than doubled in 2013. Globally, the average mobile network downstream speed in 2013 was 1,387 kilobits per second (Kb/s), up from 526 Kb/s in 2012.

Network traffic levels are exploding. Legacy networks, with their decade-old architecture, will be crushed by the onslaught of applications, virtualization, and rich media. Conventional three-tier data center networks cannot meet the security, agility, and performance requirements of virtualized cloud computing environments. The legacy three-tier network architecture is constrained by oversubscription, low bandwidth, and high latency—the exact opposite of what video collaboration requires.

Many enterprises that have deployed networks to address the increase in wireless traffic have experienced disappointing results with their existing WLAN deployments, because of a poor user experience and a network that doesn’t scale to meet the demand for mobility. The embrace of smartphones and tablets at work also challenges the traditional models for identity management and security that allow access based on a network port, rather than a user’s identity. Keeping the lights on in IT is costly.

The outrageously high cost of IT operations due to legacy network limitations is sapping businesses’ ability to invest in innovative new services and products that can result in market differentiation and competitive advantage.

Much of this waste can be attributed to IT infrastructure that doesn’t change with the business. They become fragile, difficult to manage, vulnerable, and expensive to operate. The legacy networks architected to meet application traffic patterns that were common years ago is not scalable, flexible, and agile and is ill equipped to meet the dynamic requirements of mobility, cloud, service-oriented architectures (SOA), virtual machine mobility, and multimedia.
Management tools for this now outdated and fragile architecture have grown organically too and are most often a mix of disaggregated tools that control vendor-specific infrastructure. Third-party tools too do not meet the expectation of having a single point of control for the network. IT departments have resorted to command-line interface and scripting as the best alternative for network management.

Many have invested in third-party management tools to address the complexity and have been stuck with a fractured control that drives up cost and introduces risk in an era of increasingly sophisticated threats and expanding regulations. Few companies can afford a security misstep.

While many enterprises have chosen a single-vendor network solution, they have found that networks built on proprietary protocols ultimately limit choice and business agility. Proprietary architectures make organizations subservient to the vendor’s priorities, rather than to their own business priorities.

Open networks are the way forward as we look toward the cloud. Enterprises need a network that can easily move applications and services to the cloud in a seamless, open, and multivendor way.

Software-defined networking is where many of the manual “human middleware” interventions required for provisioning are either minimized or eliminated. It features a programmable, open, and unified interface across the data center to deliver dynamic and rapid deployment of applications, based on load and business demand. It is extensible to third-party technologies.

**Segmenting the network into modular building blocks**

Industry analysts predict that these trends—SOAs, server virtualization, video and collaboration, and widespread mobility—will bring legacy networks to a breaking point if proactive steps are not taken to prepare. Networks must be designed to meet the unique requirements of the data center, corporate campus, and branch office. By segmenting their networks, enterprises can more easily align business initiatives with the underlying network requirements.

Enterprises can create functional building blocks to meet the requirements of the specific application or business service. With this segmentation of functional building blocks, businesses can choose best-in-class solutions that fit their needs, rather than being locked into a one-size-fits-all solution. And by using standard protocols at the boundaries, businesses can enable interoperability among the network segments and gain both agility and scale.

**Figure 1:** HP FlexNetwork Architecture
An architectural blueprint for flexibility

The HP FlexNetwork Architecture and its functional building blocks (refer figure 1) are key components of the HP Converged Infrastructure. The HP FlexNetwork Architecture delivers simplicity with a unified and consistent standards-based architecture. Enterprises can align their networks with their business needs—even as they change—by segmenting their networks into four interrelated modular building blocks that comprise the HP FlexNetwork Architecture: FlexFabric, FlexCampus, FlexBranch, and FlexManagement.

FlexManagement converges network management and orchestration. FlexFabric converges and secures the data center network with compute and storage. FlexCampus converges wired and wireless networks to deliver media-optimized, secure, identity-based access. And FlexBranch converges network functionality and services for simplicity in the branch office.

The HP FlexNetwork Architecture is designed to allow IT to manage these different network segments through a single-pane-of-glass management application, HP Intelligent Management Center (IMC). And because the FlexNetwork Architecture is based on open standards, enterprises have the freedom to choose the best-in-class solution for their businesses.

Enterprises deploying private clouds must implement flatter, simpler data center networks to support the bandwidth-intensive, delay-sensitive server-to-server virtual machine and workload traffic flows that are associated with cloud computing. They must also be able to administer and secure virtual resources and orchestrate on-demand services. FlexNetwork helps enterprises securely deploy and centrally orchestrate video, cloud, and mobile-optimized architectures that scale from the data center to the network edge. Furthermore, Virtual Application Networks (VAN) automate network operations using our industry-leading software-defined network (SDN) technology to deliver the agility required for business to create or change cloud functionality in minutes, rather than months.

Watch the HP Networking overview video to learn more: hp.com/videos/overview

Benefits of the HP FlexNetwork Architecture

The HP FlexNetwork Architecture delivers five primary benefits:

1. **The FlexNetwork Architecture is an open and standards-based solution.**
   At HP, we believe that proprietary protocols and non-standard protocol implementations limit your freedom to choose, which ultimately restricts business agility and drives up costs.
   
   With an open, standards-based solution, enterprises can migrate their networks from legacy architectures to advanced flexible architectures, so they can meet contemporary business challenges, including cloud computing, federated or unified applications, virtual machine mobility, high-performance mobile access, unified communications multimedia, and video. Organizations can choose best-in-class solutions that will meet their business needs. Using open, industry-standard protocol implementations mitigate the risk and cost of change when the network needs to adapt to new business requirements. And using open networks would make it simpler for enterprises to move their applications to public and private cloud services.

2. **The FlexNetwork Architecture scales on three dimensions—functionality, connectivity, and capacity.**
   Long gone are the times when a small business meant limited capacity or functionality. Often enough, large organizations have sophisticated needs in connectivity and capacity, but require the basics in other parts of their networks. One-size-fits-all solutions really don’t fit very well, and enterprises end up paying for functionality they don’t need and often don’t get the scale they require.
   
   In contrast, HP offers network solutions for organizations of any size that scale from the most basic functionality to the most feature rich—from limited connectivity to multisite large-scale connectivity and from megabit to terabit capacity. This allows, for instance, operators of the largest networks to use basic functionality to lower costs for the volume of access switches they need, while operators of smaller networks can use feature-rich functionality to create a competitive advantage. However, businesses can continue to scale up in features, port count, and capacity without sacrificing performance or wasting capital along the way.
3. **The FlexNetwork Architecture is secure.**

   The sophistication of attacks on vulnerabilities within operating systems and applications continues to rise; and one small misstep can result in theft of private corporate data, tarnish the corporate brand, and risk regulatory non-compliance. Enterprises must secure more applications and operating systems with the user and within the data center, campus, and branch.

   The FlexNetwork Architecture gives organizations a consistent approach to securing all segments of the network—data center, campus, and branch. In the data center, the network security architecture addresses the needs of both physical and virtual compute platforms as well as public and private clouds.

   In the campus and branch, the FlexNetwork Architecture delivers both perimeter security and interior protection. Network threats are mitigated at the very point of connectivity with user identity and network access controls. The architecture helps assure security from the data center to the edge through deep-packet inspection of the network traffic and comprehensive protection of the physical, virtual, and cloud infrastructure.

   HP network security is based on industry-leading research from HP DVLabs. With over 1,500 global security researchers providing security intelligence around the clock, HP DVLabs automatically delivers Digital Vaccines or filters to install security appliances, without time-consuming human interaction. The HP FlexNetwork virtually helps eliminate downtime, disruption, and management of security threats from the user to the data center and cloud.

4. **The FlexNetwork Architecture delivers agility.**

   Let’s face it, proprietary protocols and multiple disjointed management tools make networks fragile. Simplifying data center and campus networks from legacy three tiers to optimized one- and two-tiered architectures increases performance and reduces latency. This also means simplifying planning and management, increasing scale and functionality, and lowering operational and capital cost.

   Open standards and SOAs for management and orchestration change the rules as well. The use of standard protocols enable business agility, as IT staff can easily and efficiently make changes in existing networks as business needs change. Therefore, enterprises using SOA-based management and orchestration tools can unify them and create mash-ups to perform new functions.

   Enterprises moving applications to the cloud will find that it is critical to have a network that can accommodate the move in a way that is open, heterogeneous, and federated. It is critical to allow users to securely, efficiently, and seamlessly connect to applications in the cloud, whether they’re in remote offices, branch offices, or on the campus.

5. **The FlexNetwork Architecture delivers a consistent operating experience.**

   IT can put an end to swivel-chair management, where administrators are forced to use an array of different tools to manage the entire network. The FlexNetwork Architecture delivers single-pane-of-glass management. IT can use this single-pane-of-glass management application across all modular network building blocks—data center, campus, and branch—for a common operating environment. IT can manage the breadth of HP networking products and protocols, as well as over 2,600 network devices from more than 35 other manufacturers—with the same tool. As enterprises migrate to HP FlexNetwork solutions, they will have a single control point for both their HP and legacy networks.

Flexible management and orchestration

FlexManagement (refer figure 2), a core building block of the FlexNetwork Architecture, allows IT to gain new efficiencies and higher levels of control by converging network management and orchestration. Instead of turning to a collection of discrete network management tools, IT staff can use IMC for single-pane-of-glass management across heterogeneous networks. IMC provides full fault, configuration, accounting, performance, and security (FCAPS) management and scales easily from small to very large deployments. IMC bridges the gap between managing physical and virtual networks—which is a significant challenge—and also provides converged management for wired and wireless LAN management across the campus. IT can enforce consistent, identity-based security controls with a single system for both network access
control and identity management. And IT staff can use IMC to manage both their HP and legacy networks, providing greater flexibility. This gives enterprises the ability to manage over 6,000 network devices from 220 manufacturers, including Cisco.

Figure 2: HP FlexManagement: Intelligent Management Center

Watch the HP Intelligent Resilient Framework video to learn more: hp.com/videos/IRF

Read the HP Networking IRF white paper

Converged network and compute infrastructure

FlexFabric (refer figure 3), also a building block of the FlexNetwork Architecture, converges and secures the data center network with compute and storage. This, in turn, enables Converged Infrastructure with shared pools of interoperable resources. FlexFabric’s advanced architecture is the only network solution that delivers optimized one- and two-tier networks—as well as integration with legacy three-tier networks—resulting in simplified and scalable switching, network security, and network services.

Figure 3: FlexFabric Switching Architecture

FlexFabric supports core switching from 10 Gigabit Ethernet (GbE) to 100GbE ready and supports access switching up to 40GbE that leverages industry-leading HP Virtual Connect technology. Integrated network security services include intrusion prevention and firewall.

Organizations can flatten their networks from a legacy three-tier architecture to an optimized single-tier network using the FlexFabric switching architecture. By doing away with the need for an aggregation layer, organizations can improve the performance of data center networks—simplifying virtual machine mobility, enabling virtual domain security, and federating applications that are based on SOA and Web services.

HP estimates that more than $1 billion USD is spent annually on the aggregation layer of the data center network and that half the ports in a legacy three-tier network are used to interconnect switches. The three-tier architecture adds latency, which impedes performance, especially in environments where server-server or VM-VM traffic dominates. In addition to saving on capital expenses, a flatter network means fewer devices to power, cool, and manage.

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In addition, the Secure Virtual Framework delivers a single security architecture for the physical and virtual compute environments. Managing virtualized data centers is challenging for many IT organizations; but FlexManagement gives IT a way to control the sprawl. IT staff can use IMC to automatically discover virtual machines and virtual switches and map their relationship to the physical network. Administrators can also initiate and monitor virtual machine mobility with vMotion through IMC.

In addition, IMC provides a unified view of the physical and virtual network with easy-to-grasp status indicators for networks, workloads, and virtual machines, which allows IT to simplify operations and accelerate application and service delivery.

Moreover, IMC enables one-button cloud provisioning. It automatically synchronizes network connectivity information with Virtual Connect to automate the process of creating a server profile. With FlexFabric, organizations can segment their networks for different functional needs. The use of industry-standard protocols and protocol implementations at the boundaries of these networks enables interoperability among these segments.

Watch the SHI customer video: hp.com/videos/SHI

Figure 4: Mobility, virtualization, high-definition video, rich-media collaboration tools, and cloud computing are reinventing how businesses and people work.

Flexible campus networks

FlexCampus (refer figure 5), a modular building block of the FlexNetwork Architecture, allows enterprises to converge and secure wired and wireless LANs to deliver consistent, video-optimized, and identity-based network access.

FlexCampus is based on an advanced two-tier architecture that improves the performance of media-rich collaboration applications by reducing latency and accelerating network throughput as a whole. As with the data center network segment, simplifying the campus network by eliminating the distribution layer improves performance, simplifies the network, and cuts cost. Half of the ports in a legacy three-tier architecture are used to interconnect switches; and the architecture, along with the use of Spanning Tree, impedes performance and network availability. Simplifying the network can reduce the number of discrete network elements to purchase, deploy, power, cool, and manage by up to 85 percent.

With the HP FlexNetwork Architecture, you are free to build your campus networks. You can support user requirements for flexibility and mobility, and design your data center, and access networks to meet those unique requirements. HP uses industry-standard protocols and protocol implementations at the boundaries of these network segments, which enables interoperability with the freedom to customize the network design to specific functional requirements.
Flexible branch office services

Enterprises can converge and secure their wired and wireless LAN services for greater simplicity and higher functionality with FlexBranch, a modular building block of the FlexNetwork Architecture. FlexBranch provides all of the necessary services to provide connectivity to branch offices for a headquarters-like user experience, while simplifying remote-site management. The architecture delivers WAN routing, branch-in-a-box services including switching, WLAN, and unified threat management, as well as AllianceONE partner-based services such as WAN optimization and survivable IP telephony gateway.

The FlexNetwork Architecture is designed to allow enterprises to segment their branch networks to deliver the necessary services, while providing open, industry-standard protocols and protocol implementation that allow interoperability with the campus and data center networks.

FlexNetwork: Changing the rules

Businesses leveraging mobility, corroboration, video, and other modern applications know their legacy networks will reach a breaking point. The HP FlexNetwork Architecture gives businesses a solution that adapts to business conditions and enables a new way to connect and collaborate. The FlexNetwork Architecture is the only consistent architecture across the data center, campus, and branch with single-pane-of-glass management. You can benefit from the open, standards-based approach that provides your business scalability, security, agility, and a consistent user experience.

Learn more at www.hp.com/networking

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