Brochure

Change the rules of networking

HP FlexNetwork Architecture

A new dawn of technology innovation is driving unprecedented change. Mobility, virtualization, high-definition video, rich-media collaboration tools, and cloud computing are reinventing how businesses—and people—work. Enterprises that can harness these innovations will have new tools to drive business advantage and build new opportunities in the global marketplace.

When legacy networks are pushed to the limit, they become fragile, difficult to manage, vulnerable, and expensive to operate. Businesses whose networks are at this breaking point, risk missing the next wave of opportunity.

Application-driven, service-oriented architectures (SOA), and virtualization have banished the client-server model from the data center. Cloud computing, too, makes heavy use of server virtualization, which reshapes data center traffic flows and increases bandwidth demands at the server edge. By 2014, network planners should expect more than 80 percent of traffic in the data center's local area network (LAN) to be between servers.[1]

These efforts at flexibility can be hampered by legacy data center networks. They cannot provide high enough bandwidth and low enough latency between server connections to support highly mobile virtual workloads.

As business volumes rise, traffic levels are exploding. Virtualization has taken root across businesses of all sizes. Today, roughly 20 percent of workloads are virtualized, and Gartner expects that this will hit 50 percent by year-end 2012, and continue to grow beyond this level.[2] Traffic within the server rack is expected to grow by 25 times. Steeped in technology at home, business workers have quickly acclimated to a rich-media experience and are using video and interactive collaboration tools. By 2013, more than 25 percent of the documents that workers see in a day will be dominated by pictures, video, and audio.[3] New video applications will push network capacity needs by four to ten times above current average levels.[4]

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 oversubscribed, low bandwidth and high latency—the exact opposite of what video collaboration requires.

Mobility has quickly become a right, not a privilege. By 2013, the combined installed base of smartphones and browser-equipped enhanced phones will exceed 1.82 billion units.[5] The preferred way to connect will be through wireless LAN (WLAN), rather than lower speed 3G or 4G networks. Workers need to access applications and content from anywhere to stay productive, and that means applications must be delivered flawlessly from a virtual data center to a virtual workplace.

By 2013, the combined installed base of smartphones and browser-equipped enhanced phones will exceed 1.82 billion units.

Gartner, Inc., "Gartner's Top Predictions for IT Organizations and Users, 2011 and Beyond: IT's Growing Transparency," Brian Gammage et al, 23 November 2010

Yet many enterprises 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 will also break the traditional models for identity management and security that allow access based on a network port, rather than a user's identity.

[1] Gartner, Inc., "Your Data Center Network Is Heading for Traffic Chaos," Bjarne Munch, 27 April 2011.

[2] Gartner, Inc., "Emerging Technology Analysis: How Virtual Switches Are Solving Virtualization Issues in the Data Center," Severine Real, 16 November 2010.

[3] Gartner, Inc., "The Gartner Enterprise Content Management and Related Technologies Vendor Guide, 2010" 9 August 2010.

[4] Gartner, Inc., "Hype Cycle for Networking and Communications" August 2010.

[5] Gartner Inc., "Gartner's Top Predictions for IT Organizations and Users, 2011 and Beyond: IT's Growing Transparency," Brian Gammage et al, 23 November 2010.

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 will result in market differentiation and competitive advantage. HP estimates that more than 70 percent of IT budgets are spent to keep the lights on, which leaves less than 30 percent to deliver business-critical innovation.

Much of this waste can be attributed to IT infrastructure that doesn't change with the business. Legacy networks were architected to meet application traffic patterns that were common years ago, and this outdated and fragile architecture cannot meet the dynamic requirements of service-oriented architectures, virtual machine mobility, and multimedia.

Management tools have grown organically too, leaving IT with a mix of disaggregated tools—many of which were the result of vendors' acquisitions and were never integrated into the solution. So instead of having a single point of control for all networks, IT suffers from swivel-chair management. They have invested in third-party management tools to address this complexity or have given up entirely and resorted to using scripts at the command-line interface.

Securing the legacy network is no different. IT is stuck with a mishmash of point security tools to manage different security components. This fractured control drives up cost and introduces risk in an era of increasingly sophisticated threats and expanding regulations. Few companies can afford a security misstep.

Generally, enterprises are facing a constant aggregate increase in their bandwidth needs by approximately 30% growth annually, due to general increased application and Internet use.

Gartner, Inc., "Is Your Data Center Edge Network Ready for Virtualization?", 21 Apr 2011 | ID:G00210549

While many enterprises have chosen a single-vendor network solution, they have found that networks built on proprietary protocols ultimately limit their own 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.

Segmenting the network into modular building blocks

Industry analysts predict that these trends—service-oriented architectures, server virtualization, video and collaboration, and widespread mobility—will bring a legacy network to a breaking point if proactive steps are not taken to prepare. According to Gartner, businesses that don't segment their network infrastructure will suffer higher costs and increased vendor lock-in.[6]
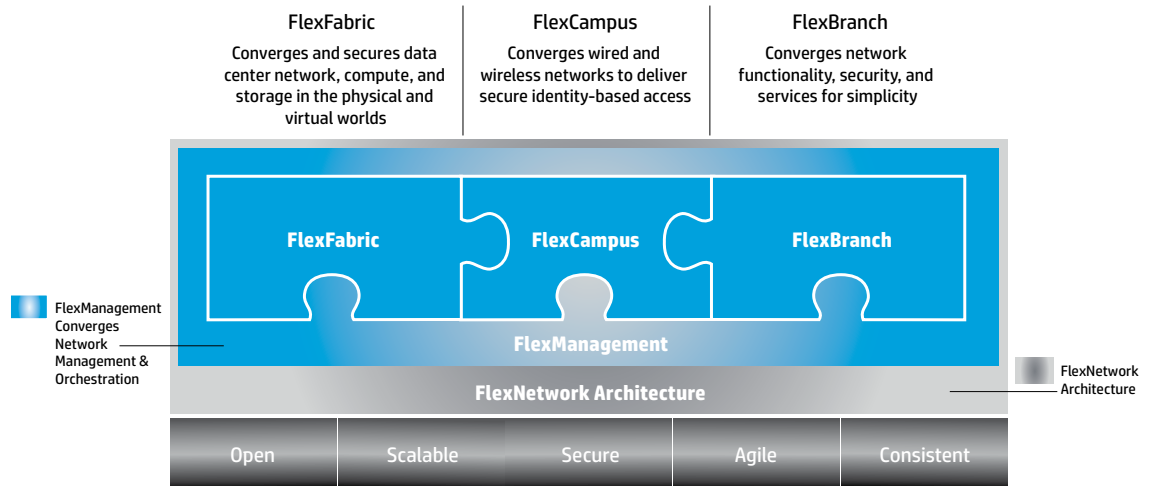
No longer can the network exist as a single, homogenous entity. There are simply too many variables to consider at any one time. Instead, networks must be designed to meet the unique requirements of the data center, corporate campus, and branch office. By segmenting their networks, enterprises will be able to more easily align business initiatives with the underlying network requirements. Instead, enterprises can create functional building blocks that will 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. By using standard protocols at the boundaries, businesses can enable interoperability among the network segments and gain both agility and scale.

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[6] Gartner, Inc., "Clients That Don't Segment Their Network Infrastructure Will Have Higher Costs and Increased Vendor Lock-in," Tim Zimmerman, 15 March 2011.

Figure 1: FlexNetwork Architecture

Industry's only network architecture converging data center, campus, and branch

FlexFabric	FlexCampus	FlexBranch
Converges and secures data center network, compute, and storage in the physical and virtual worlds	Converges wired and wireless networks to deliver secure identity-based access	Converges network functionality, security, and services for simplicity

FlexManagement Converges Network Management & Orchestration

FlexNetwork Architecture

FlexFabric   FlexCampus   FlexBranch

FlexManagement

FlexNetwork Architecture

Open   Scalable   Secure   Agile   Consistent

An architectural blueprint for flexibility

The HP FlexNetwork Architecture and its functional building blocks (Refer figure 1) are a key component of the HP Converged Infrastructure. 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.

Even with the shift to the cloud, the HP FlexNetwork architecture is ideal for supporting this move. 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. HP FlexNetwork helps enterprises to securely deploy and centrally orchestrate video, cloud, and mobile-optimized architectures that scale from the data center to the network edge.

Watch the HP Networking Overview Video to learn more:
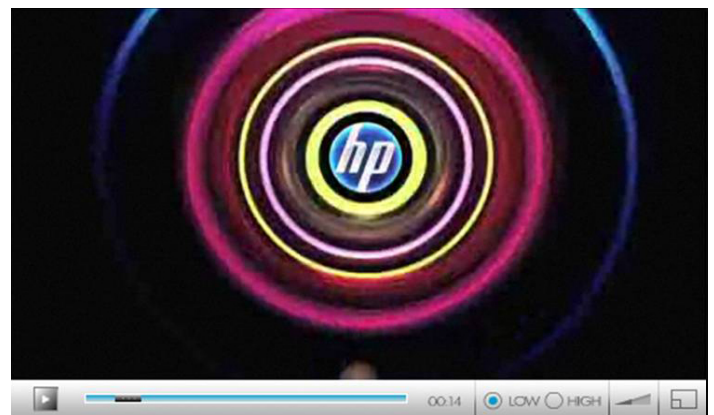
www.hp.com/videos/Overview

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Benefits of the HP FlexNetwork architecture

The HP FlexNetwork architecture delivers five primary benefits: an open and standards-based solution with scalability on three dimensions: security, agility, and consistency.

1. **The FlexNetwork architecture is an open and standards-based solution.** At HP, we believe that proprietary protocols and non-standard protocol implementations limit organizations' 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 will 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. HP estimates that the global market wastes over $2.5 billion USD annually on unnecessary aggregation and distribution tiers in their networks, due to constraints imposed by legacy architectures and one-size-fits-all solutions.

   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 the 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. Security is assured 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. HP DVLabs is consistently number one in vulnerability discovery as a result of their Zero Day Initiative[7] with over 1500 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 eliminates the downtime, disruption, and management of security threats from the user to the data center and cloud.

> Today, roughly 20% of workloads are virtualized, and Gartner expects that this will hit 50% by year-end 2012 and continue to grow beyond this level.
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> Gartner, Inc., "Emerging Technology Analysis: How Virtual Switches Are Solving Virtualization" Issues in the Data Center. Gartner Research Note, 16 November 2010

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[7] Frost & Sullivan, "World Vulnerability Research Market Report," March 2011

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 while lowering operational and capital cost.

Open standards and service-oriented architectures 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 they are forced to use an array of different tools to manage the entire network. The FlexNetwork architecture delivers a 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.

By 2013, more than 25% of the documents that workers see in a day will be dominated by pictures, video, or audio.
Gartner, Inc., "The Gartner Enterprise Content Management and Related Technologies Vendor Guide 2010", 9 August 2010

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 myriad of discrete network management tools, IT staff can use HP Intelligent Management Center (IMC) for a 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.

IT staff can use IMC to manage both their HP and legacy networks, providing ideal flexibility. This gives enterprises the ability to manage 2,600 network devices from 35 manufacturers, including Cisco.

Figure 2: HP FlexManagement: Intelligent Management Center v5.0

Watch the HP Intelligent Resilient Framework Video to learn more:

www.hp.com/videos/IRF

Read the HP Networking IRF White paper[8]

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 HP 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. FlexFabric supports core switching from 10 Gigabit Ethernet (GbE) to 40GbE—and is 100GbE ready—and supports access switching up to 10GbE that leverages industry-leading HP Virtual Connect technology. Integrated network security services include intrusion prevention and firewall.
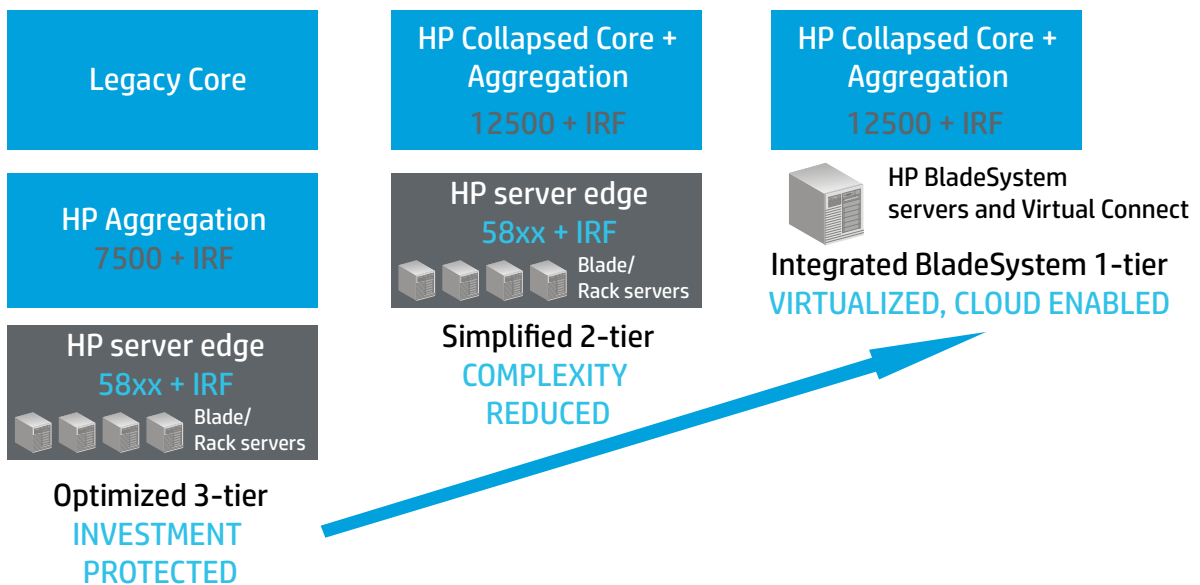
Organizations can flatten their networks from a legacy three-tier architecture to an optimized single-tier network using the FlexFabric switching architecture. By eliminating the need for an aggregation layer, organizations can improve the performance of data center networks, simplifying virtual machine mobility, enabling virtual domain security, and federating applications that are based on SOA and Web services.

Eliminating the aggregation layer frees up stranded capital and can reduce network elements by up to 85 percent, saving over $180,000 USD per rack in networking equipment. HP estimates that more than $1 billion USD is spent annually on the aggregation layer of the data center network, and 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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[8] **http://h17007.www1.hp.com/docs/reports/irf.pdf**

[9] **http://h20195.www2.hp.com/v2/GetDocument.aspx?docname=4AA1-4855ENW&cc=en&lc=en**

Figure 3: FlexFabric Switching Architecture

View the HP Networking Series Guide to learn about our expansive portfolio.[9]

"Overall, we were given a lot more architectural options with the HP Networking product line."
— Andrew Rosser, SHI's Principal Architect

To read more, visit:

SHI International pioneering data center design for cloud services with HP Networking[10]

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.

By 2014, network planners should expect more than 80% of traffic in the data center's local-area network (LAN) to be between servers.

Gartner, Inc., "Your Data Center Network Is Heading for Traffic Chaos", Bjarne Munch, 27 April 2011

IMC also 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.

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 NETWORKING
The rules have changed

www.hp.com/videos/SHI

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[10] **SHI International pioneering data center design for cloud services**

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

HP 12518

HP 8212

HP 10508

HP 7510

Flexible campus networks

FlexCampus (refer figure 4), 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.

New video applications will push network capacity needs by four to ten times above current average levels.
Gartner, Inc., Hype Cycle for Networking and Communications, August 2010.

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 costs. 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, which 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.[11]

With the HP FlexNetwork Architecture, organizations are free to build their campus networks. They can support user requirements for flexibility and mobility, design their data center network, and access network 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.

[11] Enterprise Management Associated, "HP IRF Simplifies Networks and Operations," July 2011

Figure 4: HP FlexCampus
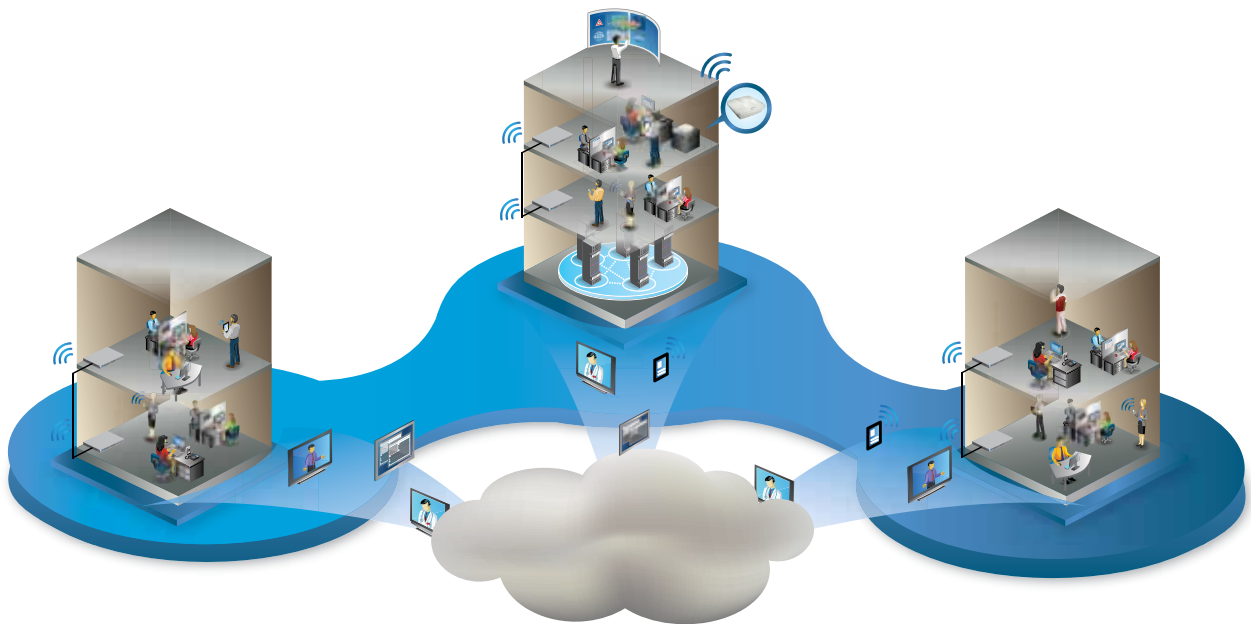
Flexible branch office services

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.

One of our top predictions of 2007 was that enterprises would significantly overspend on network equipment and services. Since most organizations rarely understand their specific requirements they tend to overprovision and "overengineer" just in case.

Gartner, Inc., Six Ways to Optimize Network Infrastructure Expenditures
16 July 2010 | ID:G00200354

FlexNetwork: Changing the rules

Customers 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 a single pane-of-glass management. Customers can benefit from the open, standards-based approach that provides their business scalability, security, agility and a consistent user experience.

Hear more about what customers are saying about HP Networking:

www.hp.com/videos/AnalystSummit

Additional Resources:

FlexCampus: Powering the Multimedia Campus Network[12]

FlexBranch: Transforming the Branch Experience[13]

HP Redefines Network Energy Efficiency[14]

The Total Economic Impact of HP Network Security[15]

Debunking the Myth of a Single Vendor Network[16]

Performance Validation for the High-Performance Campus[17]

Assuring Interoperability for Heterogeneous Networks[18]

Global citizenship at HP

At HP, global citizenship is our commitment to hold ourselves to high standards of integrity, contribution, and accountability in balancing our business goals with our impact on society and the planet. To learn more, visit **hp.com/hpinfo/globalcitizenship**, and for information about the HP Eco Solutions program, go to **hp.com/ecosolutions**.

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[12] http://h20195.www2.hp.com/v2/getdocument.aspx?docname=4AA3-5220ENW.pdf

[13] http://h17007.www1.hp.com/docs/mark/4AA0-9231ENW.pdf

[14] http://h17007.www1.hp.com/docs/mark/4AA3-3866ENW.pdf

[15] http://h20195.www2.hp.com/v2/GetPDF.aspx/4AA2-6398ENW.pdf

[16] http://www.gartner.com/technology/media-products/reprints/hpprocurve/article7/article7.html

[17] http://h17007.www1.hp.com/docs/mark/lcUS22726611.pdf

[18] http://www.hp.com/networking/ntreport/

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4AA3-6037ENW, Created August 2011; Updated June 2012, Rev. 2