HP Networking

FOR DUMMIES®

Learn:

- About today's networking challenges

- How HP is changing the rules of networking through its FlexNetwork architecture

- What innovations make HP Networking different

Lawrence C. Miller

About HP Networking

Building on HP's long-standing history of innovation in networking, HP's FlexNetwork architecture delivers the industry's only unified architecture for the data center, campus, and branch, enabling enterprises to fully harness the power of rich media content, virtualization, mobility, and cloud computing. Combined with HP's servers, storage, and services and as part of the HP Converged Infrastructure, HP Networking protects businesses from day-zero threats across both physical and virtual environments, delivers application services in minutes versus days, and achieves breakthrough economics with its unified, standards-based approach to networking.

About HP

HP creates new possibilities for technology to have a meaningful impact on people, businesses, governments and society. The world's largest technology company, HP brings together a portfolio that spans printing, personal computing, software, services and IT infrastructure at the convergence of the cloud and connectivity, creating seamless, secure, context-aware experiences for a connected world. More information about HP (NYSE: HPQ) is available at `http://www.hp.com`.

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DUMMIES®

by Lawrence C. Miller

WILEY

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HP Networking For Dummies®

IDC information cited in this book can be referenced in the IDC White Paper sponsored by HP, ROI of a Complete Networking Portfolio: Delivering Value from the Network Edge to the Core, #224773, September 2010 and IDC Asia Pacific Switch and Router Tracker, Sept 2011. Gartner information cited in the book can be referenced in the following: Gartner, Inc., Debunking the Myth of the Single-Vendor Network, Mark Fabbi and Debra Curtis, 17 November 2010; Gartner, Inc., Your Data Center Network Is Heading for Traffic Chaos, Bjarne Munch, 27 April 2011; Gartner, Inc., Emerging Technology Analysis: How Virtual Switches Are Solving Virtualization Issues in the Data Center, Severine Real, 16 November 2010. Dell'Oro information cited can be referenced in Dell'Oro, Ethernet Switch Report, 2Q11, Aug. 2011, No. E22A.

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Publisher's Acknowledgments

Introduction

The outrageously high cost of IT operations due to legacy network limitations is sapping businesses' ability to invest in innovative new services and products. According to *InformationWeek Analytics,* more than 70 percent of IT budgets are dedicated to keeping the lights on, which leaves less than 30 percent to invest in business-critical innovation.

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

Management tools have grown organically, too, leaving IT with a mix of disaggregated tools — many of which were the result of acquisitions that were never fully integrated into a true management solution. Instead of having a single point of control for all networks, IT has adopted the dizzying practice of swivel-chair management. They have invested in various third-party management tools in an attempt to address this complexity or worse, have given up entirely and resorted to using scripts at the command-line interface.

Securing the legacy network is even more problematic. 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. No company can afford a security misstep or the tarnished reputation.

Although many enterprises have gone down the path of a single-vendor network, they have found that networks built on legacy networking platforms and, often enough, propri-etary implementations ultimately limit their own choice and business agility. Legacy architectures make the customer subservient to a vendor's priorities, rather than to their own business objectives.

About This Book

This book introduces HP networking's wired and wireless portfolio of open, standards-based solutions that help businesses of all sizes simplify their network architecture and management, while reducing capital investments and operating expenses. HP's FlexNetwork architecture delivers unified architecture for the data center, campus, and branch — enabling enterprises to fully harness the power of media-rich content, virtualization, mobility, and cloud computing. Combined with HP's servers, storage, and services, HP Networking protects businesses from automated zero-day threats across both physical and virtual environments, delivers application services in minutes versus days, and reduces total networking costs up to 66 percent. This book was written in collaboration with HP.

Icons Used in This Book

Throughout this book, I occasionally use special icons to call attention to important information. No smiley faces winking at you or any other cute little emoticons, but you'll definitely want to take note! Here's what you can expect.

This icon points out information that may well be worth committing to your nonvolatile memory, your gray matter, or your noggin — along with anniversaries and birthdays!

You won't find a map of the human genome or the secret to cold fusion here (or maybe you will, hmm), but if you seek to attain the seventh level of Geek-vana, perk up! This icon explains the jargon beneath the jargon and is the stuff legends — well, geeks — are made of!

This icon points out helpful suggestions and useful nuggets of information.

Chapter 1

HP Networking 101

In This Chapter

▶ Recognizing new challenges in the networking landscape

▶ Discovering HP's history of innovation

▶ Understanding the core value of HP Networking

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 advantages and capture new opportunities in the global marketplace.

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

In this chapter, you learn about some of the trends that are pushing today's networks to their limits. I reintroduce you to one of the pioneers of technology innovation (HP, in case the title of this book didn't tip you off), and help you understand HP Networking's approach to delivering real business value with its innovative networking solutions.

Networking Is At an Inflection Point

The world has raced forward and dealt many challenges to the networking infrastructure for businesses and enterprises of all sizes, everywhere.

As new, integrated collaboration applications for voice, video, and data are deployed, these multiple (or converged) networks create complexity and risk in the network. IT departments must support consistent security policies across wired and wireless networks, as well as an ever-increasing number of mobile devices and applications.

In the data center, virtualization dramatically increases complexity at the server edge. The challenge is to build a consistent and efficient infrastructure that can handle a heterogeneous environment.

Campus networks must be prepared to support new types of traffic and patterns. Video, collaboration, and voice applications require multidimensional availability and performance to ensure the highest quality of service for the user.

The key challenge in the branch is to reduce the number of devices yet deliver new services from remote data centers or the cloud. IT needs a highly integrated solution that converges connectivity with services and can be managed centrally.

In the security realm, the need for automated zero-day threat protection is critical. Rather than finding and fixing security issues after the fact, IT managers must proactively protect their infrastructure from malware, viruses, and many other threats, before the damage is done.

Finally, IT budgets are shrinking almost as quickly as demands for more IT performance and projects are growing, and the pressure to deliver green, energy efficient infrastructures across the entire enterprise is — well, heating up.

Any one of these issues creates a challenge. Together, they form a perfect storm — and band-aids and tactical fixes aren't the answer. The current network status quo leaves networking too complex, too rigid, too costly, and unable to accommodate business change.

The Third Wave of Networking Is Here

The first wave was all about connecting and sharing. During the 1980s and 1990s, companies such as 3Com, DEC, HP, IBM, Nortel, and Cisco dominated networking. Throughout the industry, small islands of networks with various proprietary protocols (that weren't interoperable) were created. Various vendor-specific gateways started to appear, in an attempt to interconnect them.

Cisco ushered in the second wave early in the 21st century, leveraging their strength in routing to push the industry toward a common approach built on Ethernet and TCP/IP. They created a successful business and ecosystem, and even focused on new markets like IP telephony, on the proposition that networking should be built on a common highway.

A third wave of enterprise networking is beginning, in which complete alignment between business objectives and IT resources is critical for businesses to survive in today's environment. Converged networking is a critical trend, moving away from strict operational and technology silos to enable IT to rapidly deliver new services on behalf of the business. This new wave is about orchestrating services, such as mobile access, virtualization, cloud computing, and rich media.

Introducing HP Networking

Some of the most successful and innovative technology companies today, from Apple to Facebook, proudly tell of their humble beginnings in a California garage or a college dorm. But the original garage band — sorry, garage company success story — began in 1939 when Bill Hewlett and Dave Packard started the Hewlett-Packard Company, affectionately known today as simply HP.

The HP Networking story

Throughout its long history, HP has distinguished itself as one of the most innovative and accomplished companies in the computing industry. From electronic test instruments and calculators to large and small computer systems, printers, and networking technologies, HP has led the way.

In the early 1980s, HP opened the doors on its networking business in Roseville, California. HP's networking division focused on providing advanced, competitive, and timely technology to give its customers reliable and compelling value.

In 1987, HP development engineers invented key elements of 10Base-T, and drove the twisted pair standard that helped promote Ethernet to commercial viability by enabling it to run on low-cost telephone wiring already installed in commercial buildings — and the networking market took off.

Other important innovations from HP followed, including the industry's first stackable 10Base-T hubs in 1990. HP quickly became a leader in 10/100Base-T Ethernet switches, and in 1998 the HP ProCurve 4000 series switch broke below the $100 per port 10/100 price barrier.

In 1998, HP's networking division became ProCurve Networking. By 2003, ProCurve Networking became the second-largest global enterprise networking vendor in terms of revenue and ports (both PoE and non-PoE). According to Dell'Oro, the Ethernet switching market has grown by 76 percent between 2000 and 2010, while HP Networking has grown by more than twice that, with 166 percent growth over the same period.

In 1998, HP recognized that traditional networks with expensive, complex core devices surrounded by less expensive and less sophisticated access devices couldn't support the performance, security, and multimedia application requirements coming to the network. Thus, HP created the HP Adaptive EDGE Architecture (AEA), which was introduced in 2000. This revolutionary (for the time) architectural model recognized that network device intelligence needed to be distributed throughout the network, including at the network edge. HP AEA became the architectural root of what has evolved into the HP FlexNetwork Architecture; and has been embodied in every networking product as well as every generation of HP custom-designed networking ASIC (application-specific integrated circuit) since 1998.

Innovation true or false

Innovation is the heart and soul of technology. For that reason, it's important to know a little about some of the leaders in technology innovation and recognize some of their contributions to computing and networking history over the past 40 years. So sharpen your pencils because I've prepared a short true or false quiz for you!

✔ 3Com founder Bob Metcalfe co-invented Ethernet in 1973.

✔ 3Com developed Etherseries, the world's first commercial networking operating system, as well as the first commercial version of TCP/IP for Unix in 1980 and the first PC Ethernet adapter in 1982.

✔ HP invented key elements of the 10BASE-T networking standard in 1987.

✔ HP introduced the industry's first 10BASE-T stackable hubs in 1990.

✔ 3Com developed the world's most successful 10BASE-T network adapter card, the 3C501.

✔ ProCurve Networking became the first networking technology company to offer a lifetime warranty on its network hardware in 1993.

✔ 3Com introduced the NBX Phone System, the first commercially available IP PBX in 1998.

✔ HP was the first company to ship a 1000BaseT (gigabit copper) switch in 1999.

✔ HP invented Auto-MDIX and standardized it in 1999, to automatically connect using either a straight-through or cross-over cable.

✔ HP was the first company to develop a "switch on a chip" with HP ASIC technology in 2000.

✔ HP was the key driver behind the LLDP and LLDP-MED discovery protocol standards and first vendor to support these in 2005 and 2006.

✔ HP was the first vendor to ship a switch supporting the PoE Plus standard (up to 30W per port) in 2010.

✔ HP introduced the industry's first switch with Energy Efficient Ethernet standard in 2011.

✔ 3Com introduced IRF, originally called XRN, the industry's first stacking technology that revolutionized the manageability and resiliency of networks.

✔ 3Com's Intelligent Management Center (IMC) was built from the ground up as a services-oriented, architecture-based network management platform that controls resources, services, and users of HP as well as thousands of third-party platforms.

If you answered "True" to all of the preceding facts, then congratulations! Your innovation IQ is irreproachable! If you missed any, at least now you know!

In 2010, HP acquired long-time networking innovator 3Com, solidifying its number two position in the Ethernet switch market and augmenting its networking portfolio from data center to branch. Founded by Ethernet co-inventor Bob Metcalfe in 1979, 3Com was instrumental in the development and standards acceptance of such crucial technologies as Ethernet, TCP/IP, and Unix. 3Com offered the first commercial version of TCP/IP for UNIX in 1980 and the first PC Ethernet adapter in 1982.

With the combined portfolio of HP and 3Com, along with a rich history of innovation, HP now offers a comprehensive core-to-edge portfolio of networking solutions for the data center, campus, and branch.

Understanding the Value of HP Networking

Gone are the days when businesses must settle for networks based on proprietary protocols that are difficult to manage and expensive to maintain.

Open and agile

Proprietary and non-standard protocol implementations limit customers' freedom to choose, which ultimately restricts business agility and drives up costs.

With an open, standards-based solution, enterprises can migrate from legacy architectures to advanced architectures so they can meet new business challenges, including cloud computing, federated applications, virtual machine mobility, high-performance mobile access, multimedia, and video. Open, industry-standard protocol implementations mitigate the risk and cost of change when the network needs to adapt to new business requirements, giving the customer the flexibility to choose a great solution. And using standards-based networks will make it simpler for enterprises to move their applications to public and private cloud services.

Open standards and service-oriented architectures (SOA) for management and orchestration change the rules as well. The

use of standard protocols enables business agility as IT staff can easily and efficiently make changes in existing networks. Customers using SOA-based management and orchestration tools can federate applications and even create mash-ups to perform new or more tightly integrated functions.

Finally, with the HP FlexNetwork architecture, IT can put an end to *swivel-chair management,* where they're forced to use an array of different tools to manage the entire network.

Instead, with the HP FlexManagement solution a single pane-of-glass management application can be used 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 architecture, they will have a single control point for both their HP and legacy networks.

REMEMBER

Industry standards-based technologies enable consistent management and administration, delivering application services in minutes versus days.

Open standards make it easier to integrate and leverage partner solutions. Selected applications are put through a rigorous certification process to ensure solution effectiveness (see Chapter 4 to learn more about HP's AllianceONE Partner Program), so whether you're deploying Unified Communications from Microsoft, Avaya, or Aastra, WAN optimization from Riverbed, or mobility solutions from AeroScout, AirTight Networks, or Ekahau, HP stands behind these and many more combined offerings.

Scalable and Secure

Large organizations frequently have sophisticated needs in connectivity and capacity but require basic connectivity in other parts of their networks. One-size-fits-all solutions really don't fit very well. Organizations end up paying for functionality they don't need and often don't get the scale they require. HP estimates that companies waste over $2.5 billion annually on unnecessary aggregation and distribution tiers in their networks, due to constraints imposed by legacy architectures.

In contrast, the HP FlexNetwork architecture scales on three dimensions: functionality, connectivity, and capacity. HP offers network solutions for organizations of any size that scale from:

✔ The most basic functionality to the most feature-rich

✔ Limited connectivity to multisite large-scale connectivity

✔ Megabit to terabit capacity

This flexibility lowers costs in bigger networks that require large numbers of access switches with basic functionality, while smaller networks can use feature-rich functionality to create a competitive advantage. Businesses can continue to scale up in features, port count, and capacity without sacrificing performance or wasting capital along the way.

Turning to security, the sophistication of attacks on operating system and application vulnerabilities continues to rise. One small misstep can result in theft of private customer data, tarnish the corporate brand, and risk substantial regulatory penalties and fines. Enterprises must secure more applications and operating systems than ever before, not only within the data center and cloud, but across the entire network and even with individual user's personal devices.

The HP FlexNetwork architecture gives customers 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 HP FlexNetwork architecture delivers both perimeter security and interior protection. Network threats are mitigated with user identity and network access controls. Security is assured from the data center to the edge, through deep packet inspection of network traffic and comprehensive protection of the physical, virtual, and cloud infrastructure.

The HP FlexNetwork architecture provides multi-dimensional network scalability with automated zero-day protection for your business.

HP network security is based on industry-leading research from HP DVLabs. HP DVLabs automatically delivers Digital Vaccine filters to customers without requiring time-consuming human interaction. The HP FlexNetwork architecture minimizes downtime and disruption, and eases management of security threats from the user to the data center and cloud.

Proven Business Value

Despite a tough global economy, demands on networking infrastructure have continued to accelerate. Key market trends driving performance demands on networks include:

- ✔ **Emergence of social networking:** Enterprise adoption of social networking is growing quickly and will place increasing burdens on the network.

- ✔ **Intelligent networks supporting new applications and services:** The many demands on networks to perform and adjust to the needs of the business at certain hours of the day require networks to be more agile, flexible, and "smart."

- ✔ **Cloud computing, Software as a Service (SaaS), and desktop virtualization:** Geographic dispersion of computing and storage environments demands greater resiliency, capacity, and control.

- ✔ **Migration of voice and video to IP:** Increasing amounts of voice and rich multimedia traffic create new challenges due to high bandwidth, high reliability, and low latency requirements.

- ✔ **IT infrastructure convergence:** Increasing need for reliable integration of all networking and data center devices in support of mission-critical applications (any problems on the network can have an immediate and highly negative impact on both employee productivity and company revenue).

✔ **Consumerization of IT:** Organizations are challenged with the rapid growth in both the number of users, and the number and types of devices that must be supported.

And because of the tough global economy, enterprises and businesses of all sizes have sought innovative new ways to limit and control investments in network infrastructure. According to Gartner, many businesses are increasingly considering adding a second network vendor. In fact, adding a second network vendor can significantly reduce capital costs, but if not done correctly, it can drive up operating costs due to interoperability issues and increased management complexity. For these reasons, it's important to choose a network vendor that is committed to open standards and interoperability and to reducing complexity where possible — while providing feature- and functionality-rich solutions where appropriate.

Traditional three-tiered network architectures (consisting of a core, distribution/aggregation, and access layers) are giving way to simpler, one- and two-tiered designs that are optimized for performance (see Figure 1-1). Simplifying data center and campus networks from the legacy three-tiered design to optimized one- and two-tiered architectures increases performance and resiliency — and reduces latency and complexity. The result is a significant reduction in capital and ongoing operational costs.

TIP

Learn more about HP's Intelligent Resilient Framework (IRF) at `www.hp.com/videos/IRF`.
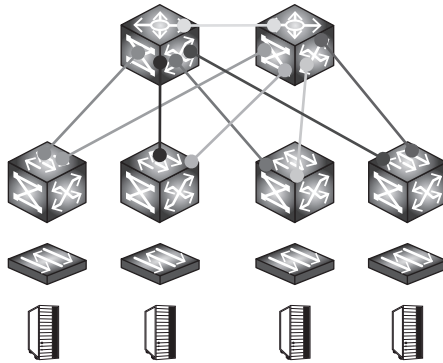
Legacy network design
(STP, PVST, VRRP)

- Switch-by-switch mgmt
- Hierarchical design
- Active/Stand-by
- Protocol complexity
- Network downtime

85% Reduction in complexity

+ Higher Performance   *+ Enhanced Resiliency*

Virtual Switch

Virtual
Switch
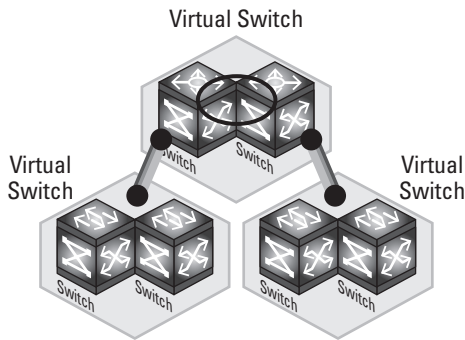
Virtual
Switch

HP network design
(with IRF)

- Single IP virtual switch mgmt
- Flat, two-tier design
- Active/Active performance
- Protocol consistency
- Millisecond failover

Figure 1-1: Radically simplify design and operations.

According to an IDC white paper sponsored by HP, businesses that deployed HP Networking solutions reduced networking costs by 66 percent (see Figure 1-2) and achieved an average annual benefit of $62,883 per 100 users. Download the complete IDC White Paper at `hp.com/networking/idc`.
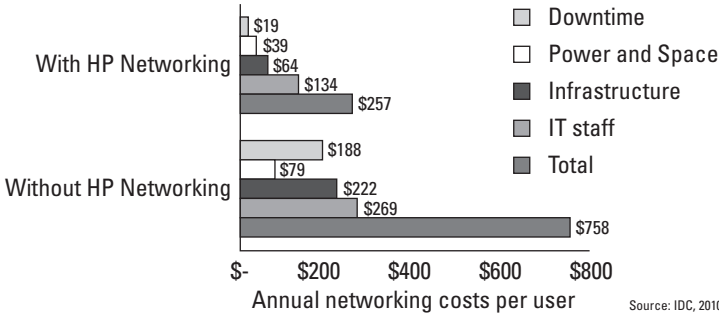
Figure 1-2: HP Networking benefits for customers.

REMEMBER

HP Networking is based on open, standards-based solutions that can help reduce the cost of networking by up to 66 percent.

Chapter 2

HP FlexNetwork Architecture and Design Principles

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*L*egacy three-tier networks are at a breaking point as new applications and key technology trends push these overly complex networks beyond their operational limits. In this chapter, I introduce you to HP's FlexNetwork architecture, an open, standards-based, scalable, secure, agile, and consistent modular architecture for today's business and technology demands — and beyond.

Applications Are Changing: Networks Too Must Change

Application-driven, service-oriented architectures (SOA) and virtualization have banished the client-server model from the data center. Cloud computing is yet another key trend that makes heavy use of server virtualization, thereby reshaping data center traffic flows, introducing new security challenges, and increasing bandwidth demands at the network edge. Gartner predicts that "by 2014 more than 80 percent of traffic in the data center's local-area network (LAN) to be between servers."

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, according to Gartner, this will hit 50 percent by the end of 2012 and continue growing well beyond this level. Traffic within the server rack is expected to grow by 25 times. Accustomed to new technology at home, business workers have quickly acclimated to a rich-media experience and are rapidly adopting video and interactive collaboration tools. Other research predicts that by 2013, more than 25 percent of the documents that workers see in a day will be dominated by pictures, video, or audio. New video applications will push network capacity needs by four to ten times above current average levels.

In addition to the higher bandwidth requirements of these new rich-media applications, voice and video traffic must now travel in IP packets over the same network alongside standard computer data. The time-critical nature of this multimedia traffic poses new challenges on the network in terms of scalability, quality of service (QoS), and reliability. A voice over IP (VoIP) conversation can have brilliant audio quality — provided the network is ready.

Within the enterprise, the preferred way to connect to the network will soon be via a wireless LAN (WLAN or Wi-Fi), rather than more costly wired access ports. Workers need to consume applications and content from anywhere to stay productive, and that means applications must be delivered seamlessly from virtual data centers to virtual workplaces.

Performance improvements, convenience, and cost reductions, along with innovations to traditional Wi-Fi challenges such as seamless roaming, reliability, security, and manageability, are driving strong overall demand for Wi-Fi technology.

Segmenting the Network into Modular Building Blocks

Legacy data center network architectures can't provide sufficient bandwidth and low enough latency between server connections to support highly mobile virtual workloads and will be crushed by the onslaught of new applications, virtualization, and rich media.

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. Enterprises can segment their network, creating functional building blocks that can then directly meet the requirements of the specific application or business.

By segmenting networks into functional building blocks, businesses achieve more flexibility by allowing them to 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 between network segments, and in between the layers in those segments, businesses can ensure interoperability among the network segments. Such protocols also increase agility and scale and deliver significant cost savings while allowing IT to better align business initiatives with the underlying network requirements.

An Architectural Blueprint for Flexibility

The HP FlexNetwork architecture is a blueprint that enables enterprises to align their networks with their business needs — even as those needs change — by segmenting their networks. It is designed to allow IT to manage these different network segments through a single pane-of-glass management application. Enterprises can segment their networks into the four interrelated modular building blocks of the HP FlexNetwork architecture: (see Figure 2-1). The HP FlexFabric solution converges and secures the data center network with compute and storage. The HP FlexCampus solution converges wired and wireless networks to deliver rich media-optimized, secure, identity-based access. The HP FlexBranch solution converges network functionality and services for simplicity in the branch office, and the HP FlexManagement solution converges network management and orchestration.

And because the HP FlexNetwork architecture is based on open standards, businesses have the freedom to choose the best-in-class solution for their businesses.

This makes HP FlexNetwork architecture ideal to support the move to the cloud. 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 architecture helps enterprises to securely deploy and centrally orchestrate collaboration, video, cloud, and mobile-optimized architectures that scale from the data center to the network edge.

FlexFabric
Converges and secures data center network, compute, and storage in the physical and virtual worlds

FlexCampus
Converges wired and wireless networks to deliver secure identity-based access

FlexBranch
Converges network functionality, security and services for simplicity

FlexFabric | FlexCampus | FlexBranch

FlexManagement

FlexNetwork Architecture

Open | Scalable | Secure | Agile | Consistent

FlexManagement
Converges Network Management & Orchestration

FlexNetwork Architecture

Figure 2-1: HP FlexNetwork architecture.

Converged Network and Compute Infrastructure

The HP FlexFabric solution, a key building block of the HP FlexNetwork architecture, converges and secures the data center network with compute and storage, which enables the HP Converged Infrastructure with shared pools of interoperable resources.

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

> Virtual Connect for HP BladeSystem is an innovative technology that simplifies the set up of server connections to LANs and SANs. Virtual Connect allows server administrators to quickly add or replace servers and move workloads, simplify the data center, lower costs, and save valuable time. You can download a free copy of *HP Virtual Connect For Dummies* at `http://h18000.www1.hp.com/products/blades/virtualconnect/`.

Organizations can flatten their networks from legacy three-tier architectures to an optimized single-tier network using the HP FlexFabric switching solution. 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 per rack in networking equipment. HP estimates that more than $1 billion 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-to-server or VM-to-VM traffic dominates. In addition to saving on capital expenses, a flatter network means fewer devices to power, cool, and manage.

Plus, 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 the HP FlexManagement solution gives IT a way to control the sprawl. IT staff can use HP Intelligent Management Center (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.

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.

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 the HP FlexFabric solution, organizations can segment their networks for different functional needs. The use of industry-standard protocols and protocol implementations at the boundaries of these networks ensures interoperability among these segments.

Flexible Campus Networks

The HP FlexCampus solution, a modular building block of the HP FlexNetwork architecture, allows enterprises to converge and secure wired and wireless LANs to deliver consistent, voice-and-video-optimized, identity-based network access.

The HP FlexCampus solution is based on an advanced two-tier architecture that improves the performance of rich media and collaboration applications by reducing latency and accelerating the network as a whole. As with the data center network segment, simplifying the campus network by eliminating the distribution layer improves performance even in very large networks, simplifies the network, and cuts capital and operational costs. Half the ports in a legacy three-tier architecture are used to interconnect switches, and the architecture, along with the common practice of using Spanning Tree Protocol (STP) for resiliency, 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 FlexCampus solution, organizations are free to build their campus networks to support user requirements for flexibility and mobility. HP uses industry-standard protocols at the boundaries of these network segments, which ensures interoperability with the freedom to customize the network design to the specific functional requirements.

Flexible Branch Office

Enterprises can converge network services and connectivity for greater simplicity and higher functionality with the HP FlexBranch solution, a key building block of the HP FlexNetwork architecture. The HP FlexBranch solution provides all the necessary services to supply faster and highly available connectivity to branch offices for a headquarters-like user experience, while at the same time simplifying remote-site management. The architecture includes WAN routing, WLAN, and multi-layered security. It also includes AllianceONE-partner based services such as WAN optimization from Riverbed, UC&C (Unified Communications and Collaboration), survivable branch communication modules powered by Microsoft Lync, VBrick system, Enterprise IP Video from VBrick, and Session Border Controller (SBC) from Avaya powered by Acme Packet.

HP's FlexBranch solution is designed to allow enterprises to segment their branch networks to deliver the necessary services, while providing open-industry standard protocols that enable interoperability with the campus and data center networks.

Flexible Management and Orchestration

The HP FlexManagement solution, a core building block of the HP 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 network management tools, IT staff gain a single-pane-of-glass management. Within the HP FlexManagement solution, there are two solutions:

✔ **IMC:** For deployments across heterogeneous networks that require in-depth control and management of virtual environments, there is IMC. 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 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. IMC manages more than 2,600 network devices from 35 manufacturers, including Cisco. IMC integrates with HP software today, and its SOA architecture allows federation with other orchestration tools.

✔ **PCM+:** For more homogenous HP campus and branch deployments there is PCM+. PCM+ provides element management for networking devices and integrates with HP Network Node Manager — a key networking platform that integrates with other HP IT and business management tools.

Flex Your Network Power

As companies welcome the return of new market opportunities, they're leveraging mobility, collaboration, video, and other new tools and applications to erase the constraints of time and distance. As their customers and employees know, if it's not on in an instant, it's too late.

The HP FlexNetwork architecture gives businesses a flexible way to adapt to new business conditions and harness new ways to connect and collaborate. The HP FlexNetwork architecture delivers an application-optimized architecture that scales in connectivity, functionality, and capacity, and supports both wired and wireless infrastructures. Enterprises enjoy high performance from the data center or cloud to the user, no matter where they are or what device they use.

The HP FlexNetwork architecture provides a new, simple way to manage networks across each domain, giving IT staff what they've been asking for: agility, scale, security, and control of their entire network. And HP FlexNetwork architecture mitigates security risks by providing consistent security for both the physical and virtual worlds and from the cloud to the branch, eliminating the protection gaps that plague today's virtual environments.

Chapter 3

HP FlexNetwork Architecture

*A*s enterprises and businesses of all sizes evolve to meet new economic conditions and global business requirements, where and how business is transacted is changing faster than ever before and legacy network architectures are struggling to keep pace. In this chapter, I explore some of the unique challenges in the data center, on the campus LAN, and at the branch office, and introduce you to several HP FlexNetwork architecture solutions within the HP FlexNetwork architecture to help overcome typical networking challenges.

Data Center Network Transformation (HP FlexFabric)

The adoption of more virtualized, dynamic application environments is impacting traditional enterprise and hosted/multitenant data center designs, and enabling new cloud-based delivery models that drive a whole new set of technology requirements across servers, storage, and networking domains. These increasingly popular use models allow

enterprises to provision applications more flexibly within a private or internal infrastructure, and enable hosted application and service providers to build entire businesses based on delivering services via a public cloud model. Given the range of use cases and options, enterprises often deploy a combination of architectures to address varied requirements and to optimize operations.

Table 3-1 summarizes some of the most important networking focus areas that emerge as enterprises pursue these diverse deployment models. Although all these imperatives play some role across all the deployment models, certain initiatives figure more prominently in specific use cases. You can learn more about HP's FlexFabric solutions for these key networking focus areas in the sections that follow.

Table 3-1	Data Center Deployment Models and Corresponding Key Networking Imperatives	
Deployment Model	*Characteristics*	*Key Networking Focus Areas*
Traditional Enterprise Data Center	DC services are a critical complement to the core business	Converged Networking
		Virtualization Scale-out
	Complex application environment	Managing/ Provisioning the Virtual Environment
	Security, cost, and flexibility are key	Application Acceleration and Server Load Balancing
	Evolving toward private cloud over time	
Traditional Multi-tenant Data Center	DC services are the core business	Virtualization Scale-out
		Securing the Virtual Server Edge
	Complex application environment	Managing/ Provisioning the Virtual Environment
	Security, SLAs, and flexibility are key	
	Evolving toward public cloud over time	Application Acceleration and Server Load Balancing

Deployment Model	Characteristics	Key Networking Focus Areas
Multi-tenant XaaS/ Cloud Computing/ High-performance Data Center	DC services may be the core business Heavy use of blade servers Cost, latency, performance, and scalability are key	Virtualization Scale-out Securing the Virtual Environment Managing/ Provisioning the Virtual Environment Application Acceleration and Server Load Balancing

Converged networking

With the proliferation of virtualization and the escalating demand for communication and storage performance, I/O sprawl has today's networks at the breaking point. The traditional model of completely parallel, autonomous data and storage networks with dedicated interface cards, switches, and cabling plants can be costly and inefficient. Enterprises are looking to consolidate server and storage connectivity to reduce equipment and operations expenses, eliminate clutter and complexity, and make more efficient use of shared networking resources while ensuring continuity of service.

HP takes a pragmatic approach to converging data center networks that allows enterprises to adopt an evolutionary strategy — one that yields the most benefits over time, in keeping with continued maturation of related convergence technologies and the need to ensure continuity of operations.

Enterprises start by leveraging Fibre Channel over Ethernet (FCoE) technology at the server edge to consolidate server and storage network I/O and gradually transition to end-to-end convergence as FCoE (and Converged Enhanced Ethernet — CEE) protocols mature and become more practical. Complementing other storage networking technologies such as network-attached storage (NAS), direct-attached storage (DAS), and iSCSI, FCoE-based solutions provide even greater flexibility to meet varying storage networking demands.

With Top of Rack (ToR) data center switches and Virtual Connect HP FlexFabric solution modules, enterprises can consolidate LAN and SAN I/O connectivity onto a common FCoE server edge fabric within the rack while preserving and protecting investments in extended LAN and SAN infrastructures. This approach allows enterprises to remove expense and complexity and improve network performance without impacting the installed LAN/SAN infrastructure or disrupting existing management practices.

REMEMBER

HP has played a key role in driving FCoE and the set of emerging CEE standards. By delivering standards-based solutions, HP Networking products give customers a path to data center network consolidation that delivers convergence within the rack today, and provides an orderly migration to a fully converged LAN/SAN infrastructure.

Virtualization scale-out

Server virtualization provides flexible tools for migrating virtual machines within the data center to optimize operations and improve availability. These use models dictate very specific network design requirements. Networks must be *flat* — designed to connect potentially hundreds of physical servers hosting thousands of virtual machines within a single Layer 2 network domain. Network platforms and architectures not built to scale to these levels can limit deployment flexibility and increase management complexity.

With hundreds or even thousands of virtualized applications across multiple, consolidated data centers, network resiliency and high availability take on a new, heightened level of importance. Network platforms and designs must be able to recover quickly from hardware and software faults to maintain continuity of service and business operations.

Enabling distributed workloads and replicating data and applications across multiple, geographically-dispersed data centers can be a challenge. Conventional Layer 3 WAN solutions can't meet the stringent performance and latency requirements — and server virtualization technologies require contiguous network domains. Enterprises seeking to extend and connect Layer 2 networks across data centers require connectivity and technologies that stretch those networks across multiple, physical sites.

HP's virtualization-optimized network designs deliver high-performance, direct-flight server-to-server connectivity for high-volume server-to-server communications and enable large Layer 2 domains for flexible virtual server migration. These designs also enable high-performance scalability and the means to seamlessly extend Layer 2 domains across multiple data center sites.

HP Virtual Connect is an innovative server edge solution that delivers direct server-to-server connectivity within the rack, enabling wire-speed, machine-to-machine communications for delay-sensitive, bandwidth-intensive traffic. HP Virtual Connect Flex-10 and HP FlexFabric solution modules further allow enterprises to dynamically fine-tune application-specific performance — across server and storage networks — to make best use of shared connectivity resources and improve scale.

To support inter-data center virtual machine mobility, HP Networking offers options for flexibly and reliably extending large-scale Layer 2 domains across geographically dispersed sites. Leveraging legacy approaches to multi-site connectivity, HP Networking supports today's most popular LAN extension technologies including Ethernet over MPLS, Virtual Private LAN Service (VPLS), and GRE tunneling.

WAN acceleration solutions from AllianceONE partners such as Riverbed and SilverPeak ensure optimal use of WAN links between data centers.

Securing the virtual environment

Server virtualization introduces a new *virtual edge* that significantly impacts traditional network and server security systems and practices. Previously, database, application, and web-hosting workloads were deployed on discrete physical servers. Traffic flows between workloads were wholly-contained within a single physical server, allowing straightforward, physical-network-based threat management using traditional intrusion prevention tools.

Server virtualization introduced the ability to host multiple workloads on a single physical server and initiated the concept of a virtual switch (vSwitch) to facilitate intra-server communications. VMs can communicate directly with each other and pass traffic in a manner that never traverses the

physical network fabric and is transparent to conventional security systems. Practically speaking, the virtualized nature of these intra-server communications makes applying security policies or monitoring the network very difficult. Existing security tools and practices built around physical servers and physical switches are unaware of these traffic flows.

Specifically, virtualization introduces a wide variety of new security challenges:

- ✔ **Hypervisor security:** New security procedures are needed to safeguard the VM hypervisor.

- ✔ **VM-to-VM threats:** Traffic moving from one virtual machine to another inside the same physical host isn't visible to the external network, meaning the traffic can't be subjected to security, QoS, management, or mirroring policies.

- ✔ **VM mobility:** Security policies must be preserved as VMs migrate from host to host within the data center.

- ✔ **Host-to-host threats:** Virtualization increases host-to-host communications. Cost-effective solutions are required to inspect and control server-to-server traffic. Deploying an intrusion prevention system (IPS) in front of every server is impractical.

The HP TippingPoint Secure Virtualization Framework (SVF) extends industry-leading HP TippingPoint security capabilities to virtualized data centers — delivering consistent, unified security across virtualized and physical domains, enabling enterprises to secure VM-to-VM as well as inter-server and inter-network traffic from a common platform. Learn more about HP TippingPoint SVF in Chapter 4.

Managing and provisioning the virtual server edge

Managing an increasingly virtual data center has become a daunting task for data center managers. Managing the assignment and allocation of highly dynamic and mobile virtual servers across physical and virtual networks has added tremendous complexity to overall data center network operations and administration. The configuration of servers, virtual machines, and physical and virtual networks (vSwitches) can often be

complex and difficult to coordinate. Server adds, moves, and changes can be time-consuming and error-prone. The lack of a single-pane view of the virtual and physical network infrastructure makes troubleshooting difficult, if not impossible. Virtualization introduces new network management challenges and requirements:

- ✔ Configuring servers, virtual machines, and physical and virtual switches is a complex, time-consuming undertaking requiring coordination between network and server teams.

- ✔ Implementing additions, moves, and changes is a manual, error-prone process involving multiple applications and data center teams.

- ✔ Isolating and resolving problems is an arduous process involving multiple management systems with overlapping functionality.

HP Intelligent Management Center (IMC) unifies physical and virtual network management and helps IT overcome the challenges of administering the new virtual server edge. The solution provides a unified view into the virtual and physical network infrastructure that accelerates application and service delivery, simplifies operations and management, and boosts network availability.

TIP ➤ According to an IDC white paper sponsored by HP, HP Networking helped medium-to-large businesses reduce their total cost of networking by 66 percent and achieve a 466 percent return on investment; a three-year (discounted) benefit of $147,250 per 100 users; and an 8.4 month payback period.

Unified Campus (HP FlexCampus)

Campus networks must evolve to support user requirements for interactive and on-demand rich media applications and services, such as collaboration from Microsoft Lync or video streaming from VBrick. Managing identity and security needs to be at the forefront and backed by industry-leading vulnerability research. And campus networks must transform to easily support the delivery of applications and services to wired and mobile workers alike.

The HP FlexCampus solution delivers a superior user experience, simplifies network architecture and management, and ensures performance and agility at the network edge to meet today's business realities. Enterprises deploying an HP FlexCampus solution gain a secure, flexible, and agile campus LAN infrastructure that can deliver interactive voice, video, and other demanding applications, whether hosted in a corporate data center or the cloud, to wired and wireless users anywhere on the corporate campus.

The HP FlexCampus solution is based on an advanced two-tier switching architecture that improves the performance of rich media collaboration applications. With the HP FlexCampus solution, enterprises can eliminate or reduce the distribution layer, which improves network performance and reduces capital and operational cost. Modular switches provide scalable, high-throughput hosting for an organization's choice of applications by integrating them on modules with direct backplane access to heighten performance.

Energy-use intelligence is also built into the switch, turning network ports on and off either manually or automatically, to reduce power costs and consumption.

REMEMBER

For greater simplicity and savings, IT staff can manage the entire network from a single pane-of-glass network management platform.

The HP FlexCampus solution is part of the HP FlexNetwork architecture that gives enterprises the agility they need by segmenting their networks to align their network solutions with their business needs.

Converged Branch/WAN (HP FlexBranch)

The branch office plays an important role in an organization's ability to attract, service, and retain customers and increase revenue. Branch office employees, the "face of the corporation," can significantly impact customer satisfaction and loyalty; particularly if fast, accurate service is delivered by accessing the corporate knowledge base and productivity tools. In addition, with today's increasing security vulnerabilities, enterprise security is only as strong as the weakest link. With branch offices sharing

office buildings and data closets with other tenants, branch office networks must be protected by comprehensive security from perimeter security with firewalls. And internal security must be maintained with identity based access and consistent policies and enforcement to help ensure business continuity.

Despite the critical nature of the branch office, legacy infrastructures often impede customer service with slow, unreliable access to information and applications. Poor WAN performance can prompt employees to store data locally, preventing it from being backed up and putting the business and regulatory compliance at risk if a local device fails.

The HP FlexBranch Solution converges network functionality with services, enabling branch office employees to enjoy the same fast and reliable access to data and applications as workers at the main office (see Figure 3-1).

This superior user experience includes use of data, voice, video, and unified communications, as well as collaboration tools. HP FlexBranch solutions provide optimized application delivery, integrated services, and unified management, including:

- ✔ **HP's energy-efficient modular switching platform** is the cornerstone of delivering a highly integrated services platform. The AllianceOne applications are integrated and certified on the module, simplifying deploying services like unified communications (UC), WAN optimization, security, and VoIP while eliminating the need for appliances, reducing carbon footprint, cabling, and power. This scalable open platform supports advanced L2/L3 features and POE/POE+ for powering WLAN access points and VoIP handsets.

- ✔ **HP A-MSR routing platforms** deliver a myriad of WAN connectivity options to deliver services to branch offices, including T1/E1, ADSL-2, and 3G.

- ✔ **Integrated WAN optimization module** enhances the performance of virtualized or consolidated remote applications hosted in the corporate data center; WAN bandwidth usage controls enable local Internet access, as opposed to back hauling Internet traffic to the corporate data center.

- ✔ **Built-in firewall, URL filtering, anti-spam, and anti-virus solutions** deliver a secure computing environment with perimeter and interior threat management.

 ✓ **WLAN APs** can be managed by controllers in the corporate or regional data center; these can also provide temporary yet secure guest access.

 ✓ **Survivable branch communications module** delivers VoIP services and fails over to PSTN in case of WAN link failure ensuring continued voice capability.

 ✓ **SIP trunking** supported by the HP Services zl Module with Avaya Aura Session Border Controller enables unified communications and collaboration.
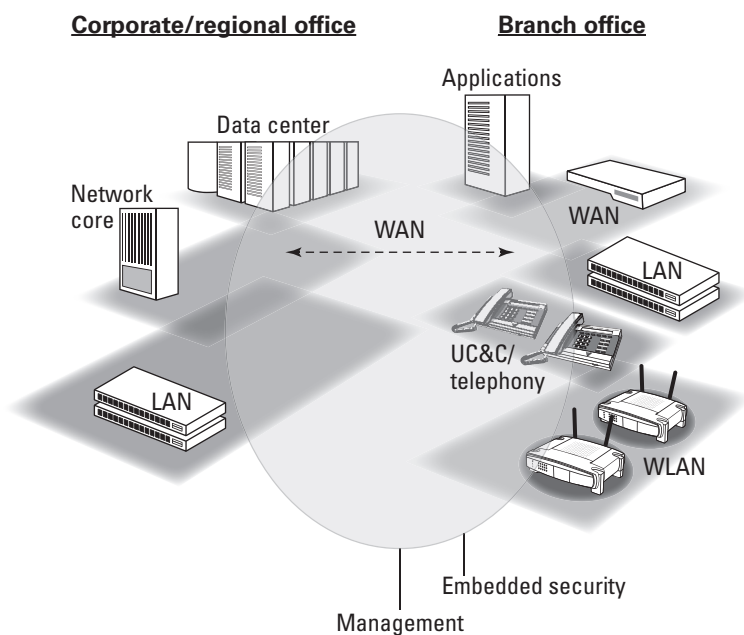

Figure 3-1: HP FlexBranch solution components.

Chapter 4

HP Networking Innovations

In This Chapter

▶ Simplifying operations, management, and orchestration

▶ Focusing on security in the physical and virtual environment

▶ Protecting the mobile network and the environment

*1*n this chapter, I explore the technical features that set HP networking solutions apart from others.

Simplifying Network Operations

It's an all too familiar refrain within most organizations: "Do more with less." Even when business is good, cost efficiency and bottom line focus are a constant. As a result, IT departments must always be on the lookout for opportunities to consolidate, simplify, and streamline their operations.

In today's networks, complexity translates quickly into direct cost as well as operational risk. The relentless, sustained growth in the number of network-connected endpoints and application/service traffic loads has stressed networks and raised the attention paid to monitoring and planning. Fault-tolerant architectures are in place to assure continuous network services, but to date, this has required substantial overprovisioning, and the administrative load for configuration and maintenance has been high. The move toward simpler, flatter networks offers hope for a better, lower cost, lower risk future.

TIP

HP's Intelligent Resilient Framework (IRF) answers the need to reduce complexity and cost in switched Ethernet networks, while also improving network resiliency.

HP's Intelligent Resilient Framework (IRF) reduces complexity and cost, while also improving network reliability. IRF virtualizes Ethernet switches to provide a unified, intelligent network that offers some important benefits over common approaches based on STP (Spanning Tree Protocol). IRF flattens networks and provides a common, virtualized fabric spanning data center core, distribution, and access layers. With IRF, up to nine discrete switches are managed as a single IP address/ IRF domain, where one switch operates as the primary system switch. That primary switch maintains the control plane for the domain and updates forwarding tables for all associated switches. The associated switches provide Layer 2 and Layer 3 networking functionality for directly connected users and devices and operate as secondary backups in the event of primary switch failure, with rapid failover to ensure high resiliency. The result is simplified design, improved performance, better capacity utilization, and accelerated failover/recovery for improved resiliency.

The HP IRF approach offers a number of important advantages in terms of network architecture and functionality versus traditional Ethernet IP alternatives. Those advantages not only result in greater performance and resiliency within the network itself — they also translate directly into advantages in terms of network management practices and associated operations and administrative costs (see Table 4-1).

Table 4-1	Comparing IRF, STP, and Competitive Solutions		
	HP IRF-based designs	**STP-based designs**	**Competitive solutions**
Rapid failover	Yes (Sub 50 milliseconds)	No (Often measured in seconds)	Varies by protocol
Design simplification – common across data center/campus core/edge	Yes (Virtualizes up to 9 switches; common across layers/devices)	No (Switch by switch configuration)	No (Different protocols used at each layer and device type)

	HP IRF-based designs	*STP-based designs*	*Competitive solutions*
Support for Layer 2/3, MPLS, IPv6 protocols	Yes	L2 only	Varies by protocol
Performance	Very high	Low	High (Design/ device specific)
Geographic resiliency	Yes (Supported across 70 km)	Low	Unclear (Varies by protocol)
Overall administration effort and cost	Low (No extra cost)	High (No extra cost)	High (Often requires additional license and hardware)

A recent study conducted by Network Test found that using IRF in place of even the fastest versions of spanning tree accelerated virtual machine mobility in the data center by up to 40 percent, and doubled the performance of the network. Additionally, IRF was proven to reconverge over 500 times faster than the fastest version of spanning tree.

Converging Network Management and Orchestration

The HP FlexManagement solution combines single-pane-of-glass multivendor management with automated virtual machine orchestration and automatic synchronization of network connectivity information. The HP Intelligent Management Center (IMC) and HP PCM+ are two solutions in the HP FlexManagement solution suite.

HP IMC is a comprehensive, modular platform with the flexibility and scalability to meet the needs of large enterprise networks. IMC software delivers superior visibility and management by consolidating a host of traditionally separate management tools, including those for managing the net-

work's elements or resources, its services, and its users. Plus, IMC provides the vital orchestration needed for the HP FlexManagement solution.

HP IMC's integrated toolset extends from the data center to the edge across an entire heterogeneous enterprise network, even if it is geographically dispersed. And IMC supports the management of all HP networking equipment as well as over 2,600 third-party devices from a variety of vendors.

In the data center, IMC provides insight into what is a "black hole" for many network administrators: the virtualized network environment. IMC offers new capabilities that allow it to automate virtual machine orchestration and automatically synchronize network connectivity information, helping to bridge the management and operational divide between physical and virtual worlds.

At the network edge, in a campus or branch office, IMC offers seamless wired and wireless infrastructure management, user access policies based on individual roles and responsibilities, and traffic analysis. The result is a substantial reduction in manual involvement by the IT department, and in time wasted on problem recognition.

HP PCM+ Network Management provides a complete management solution for medium business to small enterprise networks built primarily using HP network devices. PCM+ enables automatic discovery, mapping, configuration, and monitoring of network devices, both wired and wireless. In addition, HP PCM+ provides network performance monitoring, reporting, and troubleshooting tools to make managing networks easier. PCM+ includes security and extensibility for small to large networks with remote sites. Network-wide management control allows users to securely add, customize, and restrict network management access.

With HP security and wireless modules, as well as basic support for discovering and monitoring third-party devices, HP PCM+ offers a single-pane management solution. With remote agent extensibility, the software can securely manage many remote sites with encrypted communications and firewall traversal.

Securing the Network

There are four key security trends impacting the data center today, the four Cs, if you will:

- ✔ **Consumerization:** The explosive growth in consumer-driven technologies such as web applications, recreational applications, and mobile devices are significantly impacting the network security profile, forcing businesses to rapidly evolve their security practices and policies.

- ✔ **Compliance:** Virtually all organizations today are dealing with the need to comply with various, multiple industry and government regulations.

- ✔ **Consolidation:** Specifically, the physical consolidation of data center infrastructure driven by virtualization tools, the growth of cloud computing models, and other products that improve the efficiency of the data center.

- ✔ **Convergence:** Challenges associated with the integration of multiple security products and functions and the corresponding policy management tools that control these products.

The HP TippingPoint security portfolio offers complete network security solutions for the data center, campus, and branch.

HP TippingPoint Intrusion Prevention Systems (IPS) combined with security intelligence services from DVLabs, and security management systems, help secure vulnerable applications, sensitive data, and valuable network assets from attack.

HP's Secure Virtualization Framework (SVF) provides network security managers the ability to take the same security functionality that exists in the physical environment and apply it in the virtual environment — same policies, same infrastructure, and same devices.

Overall, the HP TippingPoint network security solution portfolio provides:

- ✔ Inline, real-time threat protection by performing deep packet inspection.

- ✔ A broad and rich set of security filters that can serve as virtual patches for your vulnerable software.

✔ Protection from attacks against your vulnerable applications.

✔ Granular application control and the ability to rate limit noncritical applications.

✔ Protection against access to known bad Internet hosts.

✔ Protection for your web applications.

✔ Security for proprietary applications.

TIP

Attacks against your applications, sensitive data, and critical networking assets continue to rise as hackers find new and creative ways to compromise your network. A defense-in-depth approach featuring external and internal security solutions improves your threat profile and decreases your overall attack window.

HP Networking provides a host of network security solutions for the campus and branch LAN (the HP FlexCampus solution and the HP FlexBranch solution) including firewalls, virtual private networks (VPNs), Intrusion Prevention Systems, security intelligence services, management systems, and access control solutions. Network and security management under a single pane of glass simplifies the management of your network and reduces your overall administrative costs.

Going Mobile

Wireless LANs are playing an increasingly important role in enterprise networking. But many organizations still rely on legacy WLAN solutions that were originally implemented to facilitate wireless roaming across a building or campus environment and can't accommodate growing performance, availability, and scalability demands. Legacy solutions are typically built around inflexible system architectures with non-intelligent APs and intelligent WLAN controllers. Traffic is backhauled across the wired enterprise infrastructure to a central WLAN controller that is responsible for all traffic forwarding decisions. The AP's sole function is to provide wireless access.

Although centralized WLAN architectures are appropriate for organizations that consolidate servers and IT resources into common data centers, they aren't well suited for distributed IT environments or for time-sensitive applications, where traffic forwarding decisions are best made locally to optimize traffic to flow via the most direct path. Going forward, enterprises must seek more flexible WLAN solutions that support both centralized and distributed deployment models to accommodate diverse use cases, organizational requirements, and business needs.

HP mobility solutions are specifically designed to meet ever-increasing WLAN scalability, performance, and reliability requirements. HP's non-blocking optimized WLAN architecture supports flexible traffic distribution models and combines centralized management and control with intelligent access points at the edge of the network for unparalleled scalability, performance, and ease-of-deployment. HP's industry-leading and award-winning Multi Service Mobility 802.11a/b/g/n access points deliver a 50 percent increase in both user density and performance through dual radios and three-spatial-stream MIMO (Multiple Input, Multiple Output). The extensible architecture enables optimal application delivery, with low impact on the wired core, no single point of failure or performance bottlenecks, cost-effective scalability, and strong investment protection.

HP Mobility Traffic Manager helps customers optimize network performance and service quality by tightly controlling the way WLAN traffic is managed and distributed across the enterprise network.

Staying Green

HP is working in partnership with many non-governmental organizations (NGOs) such as the Climate Group, World Wildlife Fund, Green Grid, and National Resources Defense Council to address environmental issues with HP technologies, education programs, and public policy efforts.

HP has cut its solutions' energy use and associated emissions to 40 percent below 2005 levels, has more than 1,000 products that meet Energy Star, EPEAT, and other eco-label guidelines, and uses 100 million pounds of recycled plastic in its HP printing products.

HP walks its talk

In 2010, HP converted its corporate network infrastructure from Cisco to an all-HP network, which increased network capacity and performance, and accelerated service deployment. HP significantly optimized costs and reduced IP power consumption by 70 percent as a result of this migration.

Business technology improvements

- ✔ Increased support for 10 Gbps attached servers to allow for higher levels of network traffic

- ✔ Reduced time to deploy new applications by 50 percent on average

- ✔ Eliminated proprietary protocols in favor of open standards, avoiding vendor lock-in

- ✔ Gained scalability of network capacity and security, a key enabler for growth

- ✔ Increased resilience within the core network with extension of high-speed Layer 3 switching

- ✔ Implemented common operating system across all core routing and switching platforms via HP Networking technologies

- ✔ Increased capability to support high availability architectures and business continuity between data centers through upgrade of inter data center beltway to 10G optical IP technology

Business benefits

- ✔ Improves security and boosts PCI compliance by adding intrusion prevention

- ✔ Cuts power utilization by 70 percent, using green technology

- ✔ Supports more than 120 Gbps of Internet traffic, which offers faster internal communications and a better user experience for shopping at HP.com

- ✔ Significantly reduces infrastructure investment, maintenance, support, and overall total cost of ownership

HP Networking is the first vendor to introduce switches that meet the IEEE 802.3az Energy Efficient Ethernet, a set of physical layer protocol enhancements to significantly reduce power consumption during periods of low traffic by allowing networks to go into a standby or sleep mode, while retaining full compatibility with existing equipment.

AllianceONE Partner Program

Businesses need to deploy new technologies and applications to gain competitive advantage, and yet are fearful of adding complexity to their IT infrastructure. They could acquire applications from their existing networking vendor; however, these are rarely best-in-class. HP's open, standards-based HP FlexNetwork architecture strategy incorporates applications from a variety of vendors, allowing you to choose the apps that meet your needs. Applications available from AllianceONE partners can be implemented as standalone appliances, or applications running on a HP Networking services module directly embedded within the switch.

Benefits of AllianceONE

✔ **Choice:** A choice of secure best-in-class solutions.

✔ **Environmental responsibility:** When compared to standalone appliances, integration into HP helps to ensure optimal use of space, power, and cooling.

✔ **Support management:** Alliance ONE provides customers with a single initial point of contact for network support escalations, while maintaining the advantages of a multivendor model.

✔ **Business applications** enable your network to improve business outcomes, whether distributed through the network or consolidated in a central location. Data-intensive applications such as enterprise search or video distribution can be optimized with distributed processing or caching located throughout your network. Collaboration applications such as Unified Communications and VoIP enable distributed teams to communicate across the IP network, utilizing integration to determine phone location and embedded Microsoft Lync solutions to ensure survivability of telephony services in a branch office.

✔ **Network applications and services** can make your network easier to manage and control while offering additional services. They're integral to the fabric, foundation, or workings of the network and may use information

embedded within the network — such as location and usage data. Load balancing applications provide an automated engine to adjust or optimize the behavior of your network. Many aspects of security applications benefit from network integration, protecting the network and users from threats and defending against attacks. Location-based systems allow you to track the location of wirelessly connected end points, enabling business applications such as asset management.

Chapter 5

Ten Benefits of HP Networking

1 sum up the benefits of HP Networking in this chapter by succinctly breaking it down to ten distinct advantages!

✔ **Ease of management:** With HP FlexNetwork architecture, IT can put an end to swivel-chair management. Instead, a single pane-of-glass management application can be used across all modular network building blocks: data center, campus, and branch. HP offers *two* single-pane-of-glass management platforms, depending on level of complexity of the network: IMC for more complex networks and PCM+ for less complex networks.

✔ **Application enabled networks:** VoIP creates network challenges such as scalability, interoperability, security, and manageability. HP FlexNetwork architecture's UC solutions increase productivity with streamlined communications and collaboration, reduce operating costs, and improve ROI.

✔ **Flexibility:** The HP FlexNetwork architecture's unique approach to network design enables you to build a modular, heterogeneous network with interoperable multivendor components.

✔ **Security:** The HP FlexNetwork architecture gives customers a consistent approach to securing all segments of the network: data center, campus, and branch.

✔ **Interoperability:** HP's AllianceONE Partner Program is a comprehensive partner program focused on HP's Converged Infrastructure strategy of providing a shared services model to deliver secure, best-in-class applications.

✔ **Mobility:** HP has a robust mobility solution with single-pane-of-glass management that extends to wireless and wired networks (allowing you to manage them together), wire speed access points, and integrated security.

✔ **Open and standards-based:** Using open, industry-standard protocol implementations mitigates the risk and cost of change when the network needs to adapt and enables enterprises to choose best-in-class solutions that will meet their business needs.

✔ **Going green:** HP Networking is the first networking vendor to introduce switches that meet the IEEE 802.3az Energy Efficient Ethernet standard.

✔ **Simplicity:** Simplify data center and campus networks from legacy three-tiered to optimized one- and two-tiered architectures to increase performance and reduce latency, increase scale and functionality, and lower operational and capital costs. The HP FlexFabric solution and Intelligent Resilient Framework (IRF) answers the need to reduce complexity and cost.

✔ **A well-kept secret:** HP Networking is one of the best-kept secrets in IT! HP Networking is one of only two vendors with a double-digit share of the switching market — and growing rapidly. HP is the number one vendor in Ethernet switching ports in China.