Deliver HP Virtual Application Networks
Software-defined networks for cloud providers and enterprises
Executive summary

The role of IT is changing from a service provider to service broker to deliver superior and differentiated services to IT customers. Technology advances have fueled new service delivery models like cloud computing and trends, such as bring your own device (BYOD) and video, which are increasingly demanded by users. Cloud computing has become a game-changer for organizations, allowing them to deliver new services quickly and cost-effectively. Deployed correctly, cloud computing can help transform business processes. It enables employees and partners to collaborate anywhere at anytime, using any device. It allows customers to interact with the business 24x7. Supporting mobility has become a business imperative—from delivering applications including rich media on mobile platforms to enabling employees, partners, and customers to use their own mobile devices to do business.

Successfully supporting these IT initiatives requires a highly intelligent and adaptable network, a software-defined network that’s built on open standards and can deliver agility and scalability. However, legacy networks are rigid and inflexible. They cannot adequately handle the types of applications demanded by users today, such as rich media, social media, and real-time interactions.

Legacy networks are at a breaking point. They are prohibiting organizations from benefiting fully from the cloud.

This white paper describes the characteristics and HP’s vision of software-defined networks. It describes how cloud computing and enterprise IT environments can benefit from software-defined networks. It explains how businesses can virtualize the network while validating the privacy and security of the applications.

Finally, this white paper describes the HP Virtual Application Networks solution, a software-defined network based on HP FlexNetwork architecture, a component of HP’s proven Converged Infrastructure, which integrates servers, storage, and networking onto a common platform.
People work on the go. Transactions are rapid-fire. Businesses run around the clock. Enterprises today are mobile, connected, interactive, immediate, and experiencing an explosion in the diversity of data and users. Cloud computing, mobility, and real-time applications place unprecedented pressure on networks.

“The convergence of cloud, social, mobile, and information into a unified set of forces is shaping almost every IT-related decision,” reports Gartner.¹

Cloud computing makes it possible to put applications and information in the right hands at the right time on nearly any device—and does so with greater scale and efficiency than ever before. Employees, contractors, and partners can access essential applications, and those applications reside anywhere—from the traditional data center to the private cloud, public cloud, or hybrid—and may span continents.

Virtualization is the stepping stone to the cloud, but as businesses have seen, virtualization fundamentally changes network traffic patterns. And that shift is having major implications for the data center network. Gartner says, “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.”²

Mobility is here to stay, as people work anywhere, anytime, and stay constantly connected with colleagues, family, and friends. Bring your own device (BYOD) is trending fast. IDC reports that roughly twice as many smart mobile devices as laptops were shipped in 2011.³ IDC contends that the explosive growth of smartphones and tablets is forcing IT to reevaluate how to support these devices in the workplace. IDC foresees, “2012 will see an increasing number of IT and network managers rethinking their wireless and wired networks to support the increased traffic needs from these mobile devices.”

While traditional enterprise applications are the lifeblood of corporate operations, voice, video, and unified communications are at the heart of collaboration. Real-time voice and video are demanding applications on the network.

According to Gartner: “Through to 2015, average bandwidth requirements among enterprises will grow at a rate of at least 30 to 50 percent per year depending on region, line-of-business, and so on.”⁴

Enterprises need an easy way to accelerate and simplify the transition to the cloud. That smooth transition is based on the prediction of having a scalable, agile, and secure network that simultaneously streamlines IT operations.

Watch the Gartner–HP webcast: Virtualization, Cloud Computing and Convergence Trends in the Data Center and Beyond.

Cracks in the network foundation

Enterprises have invested significantly in their networks. "The enterprise network continues to be a relatively high expense for most enterprises, with, on average, 17 percent of overall IT spending," according to Gartner. Despite the investment, there is ongoing dissatisfaction with the network's ability to adapt to changing business needs.

The core problem is that networks have been designed the same way for decades, but the types of applications demanded by users—rich media, social media, and mobility—have fundamentally changed. The legacy network architecture was created to support client/server applications in a bygone era when people tapped away on PCs at their desks and applications lived in the company's data center. Now, employees, customers, and partners could be accessing your applications from almost anywhere—headquarters, the campus, branch offices, or any remote location—and the applications may be in a traditional or cloud data center.

Traditionally, the network was largely set-and-forget. Network devices were configured individually and changes were few. Planning for growth in users and applications was met by over-provisioning the network. The network perimeter was clearly defined and well-protected.

The explosion of applications and new ways of delivering services creates new opportunities and a new set of challenges. Networks must be faster and more flexible to support the needs of diverse mobile users, highly dynamic application deployment environments with hundreds of virtual machines created and dissolved every day, a fragmented security perimeter, and a constantly changing set of applications and devices.

This new reality has created a breaking point for legacy networks because they are:

- **Application-indifferent**
  Legacy networks forward packets in a void without the context of the seemingly infinite and constantly changing set of applications and devices used.

- **Rigid and inflexible**
  Legacy networks are designed for one tenant, one user type, one location type, one application class, and one service-level agreement (SLA). They lack programmability to meet a variety of needs.

- **Managed manually**
  Legacy networks are managed device-by-device, with complex command-line interfaces (CLIs) and scripting, or by juggling multiple management applications. The network can no longer be set-and-forget, and a manual approach is costly and ineffective.

Modern networks must be different

To accelerate the move to the cloud, applications must be characterized prior to connecting them to the network and opening up access to users. Characterizing applications first enables definition of the necessary network resources, verification of resource availability, and aligns the resources with the application—allowing the network to deliver the expected service level.

Network abstraction gives IT a control plane for the network in the same way the hypervisor gave IT a control plane for the server. Multiple applications and services can share the same infrastructure, while ensuring each gets the network resources it needs based on pre-defined policies.

Network abstraction allows IT to separate the logical provisioning and physical management of network resources. This enables the shift to automating orchestration of the network, rather than having IT staff toil in the engine room. Orchestrating the network speeds application delivery and verifies that all aspects of the policy are aligned to the application so it meets the users’ expected service level.

With virtual networking, the network can gracefully adapt to the needs of different tenants, users, applications, and devices. IT no longer has to build and manage inflexible overlay networks to accommodate the need for wired, wireless, and secure remote connectivity. Employees, contractors, and partners have easy access to the information they need, while security risks are more effectively mitigated.

While there are some approaches in the market that have attempted to address these issues, they have only managed to create more complexity by adding an overlay network and have not addressed how to:

- Deliver an end-to-end SLA for each application and, at the same time, offering secure multi-tenancy
- Accelerate provisioning of applications and minimize downtime caused by configuration errors
- Manage the consumption of an application once it is provisioned

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**HP Software-defined networks vision**

**HP’s vision for software-defined networks**

HP is changing the rules of networking with HP FlexNetwork architecture, a component of HP’s proven Converged Infrastructure. HP FlexNetwork is the only converged architecture that connects the data center, which delivers the applications, to the campus and branch, where users consume them. The FlexNetwork architecture allows networks to be open, scalable, secure, agile, and consistent.

Software-defined networks (SDNs) are a new way of looking at networking by abstracting underlying network complexities and providing access through software and applications to change network behavior. This provides the ability to apply business logic to network behavior dynamically and facilitates the control of the data flow.

**SDN for cloud providers**

SDN is necessary in an environment where changes are rapid and require dynamic network reconfiguration and scale. It allows IT organizations to reduce complexity by abstracting the underlying infrastructure as they deploy new applications. The software and infrastructure cloud service providers are early adopters of this technology as their business model is built around highly scalable and agile infrastructure to accommodate dynamic application deployment. Without this ability to modify, change, and control the flow of traffic through the network as thousands of virtual machines and sizeable applications are deployed, the operating model falls apart.

**SDN for enterprises**

Enterprises are adopting SDN to deal with the rapid adoption of private cloud, BYOD, security, and rich media applications that require network features, such as QoS, that are complex and difficult to manage. Enterprises are considering SDN to gain operational efficiency—ensuring high availability of services while reducing the complexity of managing networks.

HP’s vision of SDN is to separate the control plane and the data plane traditionally in the network fabric, giving network applications control to manipulate network behavior. By providing programmable interfaces to the control plane (or controller), HP delivers a modular SDN architecture that leads to the development of network applications, which rapidly adapt the network to the requirements of business applications. HP is delivering this SDN vision with Virtual Application Networks.

**Virtual Application Networks**

HP Virtual Application Networks are complete, end-to-end solutions that enable businesses to create scalable, agile, and secure networks that streamline operations.
HP Virtual Application Networks simplify the deployment of cloud networks and accelerate the move of applications to the cloud. Different Virtual Application Networks can be used to meet particular application requirements such as for voice, financial transactions, or video over a secure shared infrastructure. Virtual Application Networks also support a multi-tenant model, in which each is dedicated to business units or companies.

With Virtual Application Networks, businesses can focus on connecting users to business applications and on the quality of experience—rather than on the details of configuring the network, device by device.

To enable network flexibility and multivendor networks, HP integrates new open standards for SDN technologies—including OpenFlow—into HP FlexNetwork and Virtual Application Networks. With OpenFlow, organizations can adapt their multivendor network environments with FlexNetwork architecture and Virtual Application Networks to meet the dynamic business needs of the cloud without the risk of being locked in.

Together, HP FlexNetwork architecture and Virtual Application Networks create a unified platform for the dynamic and rapid deployment of cloud applications and services. The result is a highly agile and flexible network that provides application access to control the network characteristics.

Three steps to cloud networks

The Virtual Application Networks solution allows businesses to characterize, virtualize, and orchestrate the network.

- **Characterize**
  HP Virtual Application Networks are tuned to the business application characterization requirements. Parameters such as bandwidth, priority, and security policies are defined as policies bound to the Virtual Application Network to provide a consistent, reliable, and repeatable experience for users.

- **Abstract the network**
  By virtualizing the network, businesses can create a multi-tenant network with the necessary levels of isolation, security, and privacy, so that multiple applications can be delivered from public and private cloud data centers over a single network. IT can unify network access for all types of users, whether employees, contractors, or partners, and ensure that security is applied consistently and appropriately regardless of the method of network access—wired, wireless, or VPN.

- **Orchestrate**
  Virtual Application Networks enable IT to shift from device-by-device management to network orchestration. IT can rapidly and dynamically connect users to applications and services. With open and extensible APIs, other network components such as servers, storage, security, and application delivery controllers can be instrumented to simplify orchestration with Virtual Application Networks.
Virtual Application Networks Solutions

HP IMC Virtual Application Networks (VAN) Manager

Built to eliminate manual provisioning on a device-by-device basis, Intelligent Management Center (IMC) VAN Manager is designed to accelerate the delivery of applications by providing a consistent policy-based approach that leverages profiles. The connection policies based on bandwidth, QoS, and security requirements are bound to the Virtual Application Network and follow it wherever it is in a global network. With IMC VAN Manager, your IT team can provision network services faster, more consistently, and more securely with the added benefit of reduced downtime and manual errors. For more information on IMC VAN Manager, refer to the white paper, “Orchestrate—virtual application networks accelerate the move to the cloud,” and hp.com/networking/imc.

HP Virtual Application Networks SDN Controller

The new HP Virtual Application Networks SDN Controller provides a centralized abstract view of all devices in the infrastructure to automate network configuration. By eliminating thousands of manual CLI entries, the controller enables network administrators to easily and flexibly program and scale their network environment for single-touch automated applications. It also provides application program interfaces (APIs) to third-party developers to integrate custom enterprise applications. The controller can dynamically manage multiple devices to deliver services and applications dynamically by applying centrally defined policies.

HP Sentinel Security

HP Sentinel Security is an instance of a network application using the virtual application controller to deliver a security solution. This controller-based security application inspects specific traffic flows to detect the presence of botnet, malware, or spyware threat traffic. The controller does so by leveraging HP TippingPoint DVLab’s cloud-based security intelligence feed, consisting of reputation information that is continuously updated with malicious websites, which today numbers over 700,000 worldwide. The controller leverages OpenFlow to steer interesting traffic to itself where it is compared against the locally cached DVLab’s reputation database. Any matches immediately signal a threat condition and the controller takes a policy-based action of alerting, blocking, or alerting and blocking threat traffic. Alerts are generated in the HP ArcSight Common Event Format (CEF) to facilitate integration with HP ArcSight, the enterprise management platform for enterprisewide security correlation analysis.

HP Virtual Cloud Networks Application

The HP Virtual Cloud Networks (VCN) application leverages the HP Virtual Application Networks SDN Controller and OpenFlow-compliant virtual switches to automatically create overlay virtual networks. HP VCN allows providers to deliver secure multi-tenant public clouds at the scale necessary to compete in their markets. Enterprises can leverage VCN to gain the advantages of automation within their private clouds while enabling secure integration of public cloud environments into their private estate. HP VCN provides the network abstraction necessary for service providers and enterprises to take maximum advantage of the public and the private cloud.

Figure 3. FlexNetwork Architecture
The HP advantage for delivering the Virtual Application Networks

HP Technology Services offers consulting services that help IT organizations transition to the cloud. Network Consulting Services for Cloud-Ready Networks provides customers with expertise, reference architectures, and proven methodology focused on people, process, and technology. HP Technology Services consultants leverage expertise from thousands of different IT transformation projects across the world, and its own recent data center transformation.

HP Financial Services offers a range of products and services tailored to your needs. From simple equipment acquisitions to global data center transformations, we can tailor a financing and asset management solution that's right for your business. With companies everywhere facing reduced budgets, let us help you free up capital without limiting your investment in IT innovation.

With HP Virtual Application Networks, cloud service providers or enterprises can leverage the tools and architectural constructs that provide greater network agility to rapidly adapt to the demands of the changing business environment.

Learn more about Virtual Application Networks for the data center hp.com/networking/van

Learn more about virtualized networks enabled by OpenFlow hp.com/networking/openflow

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