Big Virtual Switch
Network Virtualization with the Open SDN Architecture

Network Virtualization with Big Virtual Switch delivers unmatched network agility, choice in hardware and optimized network operations.

Big Virtual Switch™ is a data center network virtualization application built upon an OpenFlow switching fabric that dynamically segments your networks to make the network infrastructure as agile as the other elements of your cloud infrastructure. Big Virtual Switch enables you to automate network provisioning and realize dramatic increases in business agility, while optimizing network operations.

Data Center Networking Challenges

Over the last decade, enterprise data center operators have gained tremendous business advantages and cost savings from the introduction of compute virtualization technologies. Virtualization technology delivers reductions in server provisioning time and increased server utilization, creating dramatically higher service levels and reducing server capital expenditures and operating expenses. Some of these benefits have been hindered, because the traditional network architecture poses insurmountable barriers, preventing network operators from realizing the ultimate potential of virtualization and cloud computing.

Conventional data center networks are built using traditional networking platforms that are static, inflexible, and incapable of meeting the dynamic needs of a virtualized cloud data center. While virtual machines can be provisioned in a matter of minutes with user self-provisioning capabilities, network resources are still manually configured with static policies and definitions. So, when users want to create new classes of cloud workloads, the network is the bottleneck, delaying new workload provisioning for days or weeks while manual network provisioning is completed. Traditional network platforms are just not agile enough to meet user expectations in modern data center computing environments.

Figure 1 - Network Virtualization: Big Virtual Switch creates a programmable OpenFlow fabric, which dynamically segments multi-tenant cloud data center networks providing business agility and optimized network operations.
Automated Provisioning Optimizes Network Operations

Big Virtual Switch automates network provisioning for large-scale data centers, and eliminates days or weeks of manual tasks associated with traditional move/add/change requests. Instead of being constrained by device-by-device, static configuration steps required with traditional networking platforms, Big Virtual Switch creates a unified network topology and automatically distributes a forwarding table for each OpenFlow-enabled physical and virtual switch. The low-level instructions are based on policy definitions within Big Virtual Switch that are combined into Virtual Network Segments. The Open SDN™ application dynamically updates these Virtual Network Segments based upon real-time changes in application workload definitions learned from the network and through integration with third-party applications, including cloud management platforms such as OpenStack. For example, using the certified OpenStack plug-in module, Big Virtual Switch will dynamically learn about new workloads or modifications to existing workloads, and automatically provision Virtual Network Segments according to specified administrative policies. Each Virtual Network Segment can support rich network security settings, quality of service, and other policies.

Big Virtual Switch also supports zero-touch networking of both physical and virtual network switches through the Switch Light™ thin-switching platform. Switch Light for Broadcom is an open source OpenFlow-based thin switching platform that operates on bare metal switches available from a variety of vendors, and automates network deployment and provisioning tasks. The Switch Light thin-switching platform dramatically accelerates both physical and virtual switch deployment and provisioning time by eliminating manual and time consuming tasks associated with legacy network architectures.

With the combination of dynamic policy provisioning and zero-touch networking, Big Virtual Switch drives dramatic reductions in service-provisioning time while also optimizing network operations.

Dynamic Network Segmentation Ensures Policy Enforcement

Big Virtual Switch implements strict network policy enforcement for data center workloads using Virtual Network Segments and Distributed Virtual Routing Services according to centrally programmed policies that enable dynamic workload provisioning and multi-tenant networks. Virtual Network Segments dynamically update with the appropriate segmentation and routing policies as workloads migrate in real-time and instantiate on disparate systems, without requiring network managers to make any manual network configuration changes or implement manual process reviews to accommodate moves and changes. Big Virtual Switch provides a hierarchy of network policy enforcement services across a fabric of connected hosts and networks, including: Virtual Network Segments that create a policy-based virtual broadcast domain; Virtual Routing Services to provide policy-based connectivity between segments and networks; and, Access Control Lists to constrain connectivity between workloads and segments. Big Virtual Switch distributes these policy enforcement services across all OpenFlow network
elements, which enables the system to support increased resiliency, performance and throughput, because no single instance within a physical or virtual switch must process all traffic and enforce all policies. The logical definition of these policy enforcement services is centralized, which greatly reduces administrative overhead and tasks. This architecture allows for extremely efficient and scalable performance and policy enforcement, and preserves the simplicity of a centralized policy definition for segments, tenants, and external networks.

Support for OpenFlow Switch Fabrics Running on Bare Metal Switches

Big Virtual Switch leverages the Switch Light open source thin-switching platform to provide customers choice and industry-standard hardware in their data center network fabric. Switch Light for Broadcom runs atop bare metal switches from a variety of vendors, providing you flexibility and choice in data center network fabric hardware and eliminating vendor lock-in to a particular hardware and protocol regime.

Big Virtual Switch utilizes the OpenFlow protocol to centrally provision an entire fabric of Switch Light networking devices. Both virtual and physical network switches are supported via Switch Light for Broadcom and Switch Light for Linux products.

Security and L4-7 Service Insertion at Network Edge

Big Virtual Switch automates the configuration of L4-7 network services that must be associated with dynamic workloads in a modern data center. While modern data center server provisioning offers “click-to-compute” capabilities, the underlying network services are traditionally provisioned manually with legacy architectures. Big Virtual Switch automates these load balancing and security service configuration tasks, and dynamically responds according to real-time changes to the compute environment.

By deploying automated service delivery, users can reduce the complexity of data center configuration, avoid repetitive and manual configuration changes and become more productive by automating the tasks required to roll out new applications or to scale out existing deployments. Automated service coordination has been validated with the F5 BIG-IP platforms and with Palo Alto Networks Next-Generation Firewalls, enabling advanced network security solutions and application delivery to be dynamically programmed to provide a more cost effective and flexible data center network.

Conclusion

Modern data centers have outgrown traditional networking architectures, which were not built to support the dynamic nature of virtualized workloads, and thwart efforts to integrate automation and programmability. Traditional networks are complex and fragile, with arduous deployment procedures and an increasing number of manual tasks to complete. Big Virtual Switch brings datacenter networks into the modern era, enabling network automation and dynamic policy provisioning while dramatically reducing operating costs.

Features and Benefits

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<th>Feature</th>
<th>Benefit</th>
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<tr>
<td><strong>Automated Provisioning Optimizes Network Operations</strong></td>
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<tr>
<td><strong>Central Policy Provisioning via OpenFlow Protocol</strong></td>
<td>• Industry standard protocol abstraction between network control plane and data plane • Centrally builds network topology and provisions forwarding rules to device flow tables • Enables dramatically reduced operating costs through centralized, automated provisioning</td>
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<td><strong>Dynamic Provisioning Supports Host Mobility and Traffic Isolation</strong></td>
<td>• Virtual Network Segments ensure workload isolation by dynamically updating forwarding tables to reflect segmentation policies • Distributed Virtual Routing Services to enable controlled L3 connectivity between Virtual Networks Segments, Tenants and External Networks. • Supports host migration and virtual machine mobility • Virtual Network Segment properties move transparently</td>
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<td><strong>Out-of-the-Box Cloud Orchestration</strong></td>
<td>• Pre-built integration with OpenStack • Dynamically program the infrastructure in response to workload provisioning requests • Certified networking orchestration plug-ins available (OpenStack Neutron and Open vSwitch)</td>
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<td>Feature</td>
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<td><strong>Dynamic Network Segmentation Ensures Policy Enforcement</strong></td>
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| Virtual Network Segments | • Membership rules: based on L1-L4 portions of the header as well as meta-information available to the application  
• Access control lists: define ACLs in the virtual network that follow the VM wherever it moves  
• Broadcast handling: ARP, DHCP, and other broadcast traffic is optimized and can be broadcast, selectively unicast, or dropped  
• Isolation: Virtual Network Segments have dedicated L2 and L3 address spaces  
• Duplicate MAC/IP addresses and virtual networks can use the same address space |
| Distributed Virtual Routing Services | • Supports routing services between Virtual Network Segments, Tenants and External Networks.  
• Distributed routing services are implemented across the OpenFlow switch infrastructure, which increases performance and throughput and preserves centralized policy definition |
| L4-7 Service Insertion | • Built atop Big Network Controller and Switch Light  
• Leverages centralized console  
• Delivers reliability and scalability of the Open SDN |
| **Support for OpenFlow Switch Fabrics Running on Bare Metal Switches** | |
| Commercial Support for Switch Light | • Supports OpenFlow thin-switching for virtual and physical switches based on Switch Light platform  
• Enables zero-touch networking in virtualized datacenters  
• Switch Light for Broadcom supports bare metal switches from multiple vendors, including Quanta, Extreme*, Accton* and Celestica*  
• Switch Light for Linux supports the Kernel-based Virtual Machine (KVM) hypervisor on Linux distributions from Canonical and Redhat. |
| Open Network Application Platform | • Built atop Big Network Controller and Switch Light  
• Leverages centralized console  
• Delivers reliability and scalability of the Open SDN |

* Available in a future release

**About Big Switch Networks**

Big Switch Networks is the leading platform-independent Software-Defined Networking (SDN) vendor. The company’s highly scalable Open SDN architecture leverages industry standards and open APIs that enable customers to deploy dynamic and flexible networking applications, including data center network virtualization. Big Switch Networks is backed by the largest SDN ecosystem of OpenFlow applications and physical and hypervisor switches. The company’s commercial controller, network virtualization, and applications, which accelerate delivery of cloud services, are in customer trials today. For more information, visit bigswitch.com