AVAYA

The Power of We™

Avaya Virtual Services Platform 9000

An agile, streamlined, next-generation Ethernet Switching solution that delivers high-performance, high-capacity, and high-availability for mission-critical data centers and very large campus core networks.

The VSP 9000 3.3 operating system software introduces support for the field-proven Avaya Virtual Enterprise Network Architecture (VENA) Enterprise Fabric capability, featuring a number of highly versatile connectivity models:

- **Layer 2 Virtual Service Networks**
- **Layer 3 Virtual Service Networks**
- **Inter-VSN Routing**
- **IP Shortcut Routing**

These service types are delivered with a variety of Avaya and standards-based L2 and L3 high-availability options, ensuring robust end-to-end access.

The progressive evolution of the data center has created a new networking environment, no longer simply an extension of the enterprise campus; the data center has developed into an autonomous network with specific requirements and challenges. The Virtual Service Platform 9000 is the future-ready and future-proof solution to deliver the sought-after combination of performance, reliability, and scalability.

With mission-critical application demands increasing networks are required to ensure uninterrupted business operations and a quality user experience. Most networks are now called upon to provide 24x365 access, helping to drive business agility, accelerate time-to-service, respond to the needs of new applications and increase efficiency – all while IT budgets are being pressurized to deliver more and more efficiency.

Individual business imperatives will continue to evolve and so too must the network; cost-effectively adapting – forklift upgrades cause excessive disruption. The need is for a platform that is flexible and versatile, easily accommodates both growth and change – a platform that delivers support for new applications ahead of the pack. Equally important, that platform must be space and energy efficient. The right communications solution is critical to your success; the Avaya Virtual Services Platform 9000 is that solution.

The Virtual Services Platform 9000 (VSP 9000) is a next-generation solution for mission-critical data centers and campus core networks, designed for the needs of large enterprises, and other such as multi-tenant operators. The VSP 9000 rises to meet customer requirements for a future-proof, ultra-reliable network that easily and cost-effectively facilitates services integration; it provides a less complex, more agile virtual network infrastructure. It simplifies the network and helps reduce the cost of deploying new services; the VSP 9000 enables the building of a dynamic data center, helping to deliver 24x365 uninterrupted access to enterprise applications and services.

The VSP 9000 delivers industry-leading performance and scalability, with immediate support for very high-density 1 and 10 Gigabit Ethernet, in addition to being future-ready for the emerging 40 and 100 Gigabit Ethernet standards. The fully scalable architecture helps ensure that network capacity seamlessly scales in line with performance requirements, without complex or expensive re-engineering.

The VSP 9000 transforms the network and, as a result, the business, providing an ultra-reliable foundation for services such as communications-enabled Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) business processes, and unified communications. It not only simplifies the core network architecture but also offers enhanced flexibility and scalability to enable faster time-to-service in both data center and very large campus core deployment scenarios. By enabling the virtualized compute infrastructure to be more mobile, predictable, and available, the VSP 9000 fully delivers on the promise of centralizing services, all without compromising the high availability, performance, and security that's required in an enterprise environment.

Who has the VSP 9000 been developed for?

The Avaya VSP 9000 has been specifically developed for organizations that are planning new highly-virtualized data center deployments, and those that wish to deploy future-ready campus core solutions that support seamless IPv4, IPv6, and end-to-end network virtualization and service integration. The Avaya VSP 9000 is ideally suited for those organizations that:

- Require scalable, high-density 10GbE today, and with continued growth will need to position for future 40/100GbE
- Are suffering from performance limitations that result in poor application responsiveness
- Demand best-in-class resiliency
- Need to simplify network infrastructure operations in a highly virtualized environment
- Are required to deliver virtual services for multiple customers or user groups in a cloud computing environment
- Seek to maximize their investment in server virtualization
- Desire a lossless-ready solution should storage convergence become their preferred option

The VSP 9000 is for organizations that need to stabilize IT costs and maximize the cost-effective use of their infrastructures. It is for companies that are virtualizing to increase the efficient and flexible use of servers and appliances, and want to reduce maintenance costs. It is for those who are running out of space in the data center and are experiencing exponential increases in power and cooling costs. It is for organizations that want to simplify, save, and equip their networks for the future.

The key benefits of the VSP 9000

- An ultra-reliable platform, helping to ensure uninterrupted business operations
- Delivers very high-density 1 and 10 Gigabit Ethernet today, meeting immediate performance and reliability needs
- A highly flexible platform, offering an upgradable switching engine and an adaptable architecture that scales up to 27 terabits per second
- Is future-ready for a seamless evolution to 40 and 100 Gigabit Ethernet
- Supports a sophisticated suite for device and network virtualization capabilities; delivering versatile, end-to-end, L2 and L3 services
- Helps to lower operating costs, by reducing management complexity and simplifying the architecture

The VSP 9000 is one of the most robust products on the market for the demanding role of high-end Core Switch, and because it is so robust, it can deliver more uptime and can empower more dependable application access.

Meeting the need

The VSP 9000 is specifically designed to support new and emerging requirements. Virtual application LANs enable applications hosted on virtual machines to move – on demand – from one location to another in a completely seamless fashion, and application-specific deep-packet filters help to ensure that only relevant traffic enters the virtual application LAN, delivering application security.

The networking industry is a perpetual work-in-progress, an 'unfinished masterpiece', and the number of standards and recommendations now runs into the thousands. Equipment that is based on a traditional ASIC architecture is limited in that these are set at a certain point in this history and cannot easily adapt to future change. Typically this means that newer features and functionality are supported only in hardware and require additional software processing. The switching architecture of the VSP 9000 is uniquely based on Network Processing Units (NPU) rather than the ASIC technology typically found in rival products. NPUs are scalable computational arrays specifically designed for network-related functions such as efficient examination and manipulation of packet headers, and include the ability for deep packet inspection and manipulation. The Avaya specialized high-performance NPU is known as the Route Switch Processor (RSP) and being an in-house development, Avaya has direct control over functional development. It delivers fast-path protection through its ability to support in-life firmware upgrades and provides 10Gbps line rate switching and routing capabilities regardless of Standards evolution.

The VSP 9000 leverages the RSP to deliver faster implementations of new, performance-optimized functionalities, thus meeting the needs of evolving applications — often directly driven by the evolution of Standards — without ASIC re-spins and major hardware changes.

How the VSP 9000 delivers

The VSP 9000 is designed to meet three critical network requirements, and the VSP 9000 has the power to meet these requirements today, and to also scale as the business evolves and grows – an agility that delivers best-in-class longevity and investment protection.

It's the foundation for the future

The VSP 9000 supports an initial 240 port of 10G Ethernet in a compact 14RU chassis – allowing three chassis per rack – and is based on a switching architecture that is designed to scale up to 27Tbps. Initial IPv4 forwarding rate is 1,050Mpps per system. This architecture, combined with a lossless crossbar fabric, allows for seamless evolution to the emerging 40G and 100G Ethernet standards for future services integration, and the delivery of Converged Enhanced Ethernet functionality in support of the IEEE's data center bridging initiative. Leveraging the fully programmable RSP provides the VSP 9000 with the flexibility to incorporate future standards and protocol developments without a forklift upgrade, thus helping to provide optimal performance and investment protection.

It's carrier-class reliable

The Avaya VSP 9000 builds upon our solid foundation of always-on technology to deliver maximum availability and continuity of business operations with zero service interruption. The VSP 9000 Operating System is based on a carrier-class real-time Linux operating system – bringing to the enterprise high-availability technologies that have been field-proven by a huge, global installed-base of Service Providers. Avaya Networking Solutions

have a deep heritage of carrier-grade resiliency with our pioneering Switch Clustering technology utilizing split multi-link trunking and routed split multi-link trunking. The VSP 9000 takes this to the next level with a set of explicit, hardware-assist features which enhance robustness, scalability, predictability for control plane and fast-path protection. Reactions to failures occur in milliseconds, optimizing network operations, and instantaneous all-port re-routing means dramatically reduced packet loss. Innovative "in-service control plane integrity check" and "rapid failure detection and recovery of data path" provide system-level health check and self-healing capabilities. Hitless patching enables one software module to be patched without the requirement to reload the complete system image, thereby minimizing maintenance down time. And redundant control processor and switch fabric modules help ensure the VSP 9000 handles business critical information with utmost reliability.

It's your gateway to simplified and agile virtual networking services

This platform enables future services integration that can help consolidate and simplify network deployments. Avaya has pioneered a faster, simpler way to provide agile virtual network services. The VSP 9000 advances this innovation, offering layer 2 and 3 VPN services and "Virtual Service Networks"; leveraging an enhanced implementation of the IEEE's open and interoperable Shortest Path Bridging and the Avaya Virtualization Provisioning Service to deliver solutions that far surpass rival offerings.

The introduction of virtualization has fundamentally changed how compute, network and storage resources are used and managed. From fixed sets of resources within physical constraints, we've now moved to virtual machines that can be created, moved, and removed on demand, and whose resource parameters can be changed dynamically. There is often a requirement for virtual machines to be moved from one physical server to another over disparate geographies.

As multi-core processing architectures and virtualization trends take hold, new possibilities have emerged in how applications can be written. Newer, more powerful distributed applications are being developed and older applications are being retrofitted into the new service-oriented architectures. An optimized network must support the unprecedented agility of this virtualized compute environment.

Virtualization Capabilities

The VSP 9000's lossless architecture, along with its 27Tbps switching capability and ultra-reliability, leverages device and network virtualization to empower services integration, simplifying how enterprise data centers and core networks are architected.

Device Virtualization

The Avaya VRF-Lite capability allows the use of the single hardware platform to support multiple Layer 3 routing domains, each supporting unique customers or user groups.

In configuring the switch to have multiple routing instances, more sophisticated connections are made possible and overlapping IP address spaces are supported. The system can be configured to provide inter-VRF forwarding capabilities to allow access to common resources without incurring additional capital or operational expenses.

Combining VRF-Lite with other technologies provides a seamless connectivity environment for virtual users, connecting from anywhere in the enterprise network or branch offices without complex set-up or configuration.

Network Virtualization

The Avaya VENA Enterprise Fabric capability is designed as an enhanced and extended implementation of the Shortest Path Bridging (SPB) standard. It offers the ability to create a simplified network layer that dynamically virtualizes individual elements to fully and efficiently utilize network and computing resources, thus reducing the strain on networking resources and personnel. The Enterprise Fabric provides a number of `Virtual Service Network' types:

- L2 VSNs operate at Layer 2, extending VLANs across the Fabric
- L3 VSNs operate at Layer 3, interconnecting and extending VRFs
- Inter-VSN Routing provides the ability to natively routing between VSNs, and
- IP Shortcut Routing enables direct L3 connectivity between individual end-points

High availability is another unique value that Avaya brings to the fabric networking challenge; leveraging our tried and tested capabilities we are able to provide comprehensive high availability (HA) solutions at both Layer 2 and Layer 3. The Avaya VENA Switch Cluster capability empowers dual/multi-path fabric access options, with further optimization available with the Distributed vRouting feature, and this helps ensure that L3 gateway placement is fully flexible and delivers maximum efficiency.

Virtualization Provisioning Service

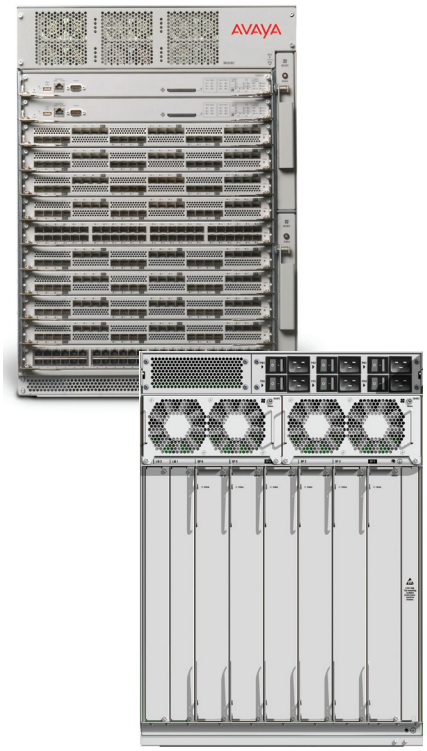
Avaya's Virtualization Provisioning Service (VPS) improves efficiency and flexibility when managing highly dynamic virtual machine environments across the extended data center. Enhanced orchestration and management optimize the efficiency of VMware vCenter live migrations, facilitating more efficient real-time maintenance, dramatically improving time-to-service, reducing errors, delivering effective disaster recovery, and lowering total cost of ownership.

Capability meets simplicity

The combination of virtualized networking services, application awareness, and orchestration capabilities drive network simplification and can lower OPEX. For example VMware vMotion virtual applications are dynamically and seamlessly moved or extended within and between data centers; without the provisioning complexity associated with rival solutions. The Enterprise Fabric offers a robust, resilient alternative to today's existing increasingly complex offerings and it delivers Ethernet-based services and solutions, all while maintaining Ethernet's key value propositions of simplicity and cost-effectiveness.

The VSP 9000 can offer you:

- Very high density 10 Gigabit, and 1 Gigabit, Ethernet aggregation



Virtual Services Platform 9000 (front & rear views)

Real-world scenarios: Avaya VENA Enterprise Fabric

Avaya VENA Enterprise Fabric allows an historic **banking and finance** organization to more quickly plan and implement upgrades and changes to their advanced Cloud-based network that supports its many locations.

The adoption of technology-enhanced learning initiatives have been facilitated at a progressive **university**, and the Enterprise Fabric has contributed to a 200-fold improvement in network fail-over and restoration time, so that students and the faculty are not impacted during planned or unplanned application transitions across its three data centers.

A large regional **health care** provider leverages the Enterprise Fabric to create a shared, virtualized network that supports different user groups, projects, and applications for multiple merged facilities; maintaining a continuously high level of availability for critical care services.

- Future-ready platform for 40/100 Gigabit Ethernet
- Highly robust hardware with no single point-of-failure
- Hardened carrier-class operating system
- Highly-available equipment-level device, combining with native support for Avaya's Switch Clustering architecture to deliver an always-on network-level solution
- Built in diagnostics such as ingress/egress mirroring, L3 remote mirroring, packet capturing, filter logging
- Hitless software patching without reload of the complete system image
- Instantaneous re-route across all ports to minimize packet loss
- Efficient layer 2 and 3 network virtualization services providing supports for multiple customers and user groups on the same platform
- A robust, resilient alternative to today's existing, often complex and/or compromised, offerings
- Highly efficient support for both IPv4 and IPv6 traffic
- Future-ready support for storage convergence with an architecture optimized for Lossless Ethernet

What's on the chassis?

The front of the VSP 9000 contains the I/O slots, dual Control Processor modules and cooling fans; supporting ten I/O slots. Being a compact 14RU means that one 7-foot rack can hold three VSP 9000 chassis. Three module types are being offered initially: 24-port 10GbE SFP+ (also capable of support 1GbE), 48-port 1GbE SFP and 48-port 10/100/1000.

There are two Control Processor modules offering 1+1 redundancy, with the control plane decoupled from the Switching Fabric, leveraging a mid-plane architecture. Two redundant cooling fans are provided for side-to-side cooling for the I/O and Control Processor modules. The speed of the cooling fans is automatically adjusted depending on system temperature and fan status, with sensors located on each slot to test the temperature and manage the fan speed accordingly.

The rear of the chassis contains the power supplies, cooling fans, switch fabric and auxiliary modules. There are six power supplies with N+1 and grid feed redundancy, and the power requirements are automatically load-shared across all installed units. Two additional redundant cooling fans provide front-to-back cooling for the switch fabric and auxiliary modules.

There are up to six switch fabric modules with N+1 redundancy. This is a distributed architecture in which the load is dynamically distributed and shared, and in the event of a switch fabric failure any performance constraint is gracefully managed. The auxiliary module slots are reserved for future use.

How can your network benefit?

The VSP 9000 is designed to maximize the efficiency and potential of your network:

A future-proof platform

- Very high density – 240 port of 10G Ethernet or 480 ports of 1G support from Day 1
- Highly scalable lossless fabric architecture supporting future 40Gbps and 100Gbps interface connectivity, services integration, Converged Enhanced Ethernet and future enabling the expansion of the infrastructure to align with the needs of your business
- Field-programmable RSP network processor delivers flexible data forwarding and investment protection for layer 2-4 10Gbps line-rate capabilities without requiring forklift upgrades for future standards
- IPv4/IPv6 forwarding rate of up to one billion packets per second, per system, allowing for more efficient data transfer

Reliable

- Unmatched resiliency powered by Avaya unique Switch Clustering capability (using split multi-link trunking and Routed Split Multi-Link Trunking technology); High Availability mode engages all links when forwarding traffic, resulting in industry-leading performance and maximization of investment
- Instantaneous all-port re-routing results in the elimination of packet loss
- Redundant and hot swappable control processor and switch fabric modules,

plus redundant cooling fans and power supplies, for unparalleled reliability

Simple, flexible and dynamic

- Helps ensure an uninterrupted virtual application transition within and between data centers (dynamic application allocation of a VMware application)
- Multi-Terabit Switch Clustering optimizes virtual routing and forwarding capacity for multiple customers, enabling always-on and concurrent forwarding of Layer 2-3 traffic across all links

Achieving maximum uptime

Ensuring uninterrupted business operations requires a reliable and resilient platform with no single point-of-failure, and the VSP 9000 can deliver this. From the very outset, the VSP 9000 was designed and developed on the basis of leading-edge hardware resiliency. It provides 1+1 control plane redundancy, with separate management path between the control plane and I/O, 5+1 switch fabric redundancy, 5+1 power supply or grid-feed redundancy, and system cooling fan redundancy. In-service control plane integrity check, rapid detection and recovery of data path and hardware assist are designed to protect the control plane against denial-of-service attacks and system overload, and are just some of the mechanisms in place to ensure system availability.

However, uptime maximization also requires software that allows for easy and efficient management of your network. The VSP 9000 utilizes a carrier-grade Linux operating system, and combines this with a complete set of reporting capabilities and operation-focused features to help ensure this is achieved with streamlined efficiency.

Reporting features include:

- A "flight recorder" style logging capability to help with continuous real-time monitoring of internal control message flows
- Key Health Indicators to provide system operators an view of system health on all levels: OS, system applications / protocols I/O modules, ports and the forwarding path
- Hardware-assisted protection for control plane integrity, constantly monitoring system health and protecting against loop-induced system crashes
- Dedicated "in-service control plane integrity check" and "rapid failure detection and recovery of data path" sub-systems provide real-time health checking and self-healing capabilities
- Checksum logic tests to determine if hardware, firmware or data corruption has occurred
- Memory error-code detection and correction
- Detailed packet statistics and counters for failure debugging
- The ability to remotely update flash images
- Dual flash images to assist when restoring
- Card-based Flash Memory for log capture and retrieval
- Common alarms and logging
- LED indication on cards to indicate activity and system health
- Process separation

This future-proof platform features unique, field-proven technologies, including Switch Clustering, an online packet capture functionality for all ports, and 'ERSPAN'; an enhanced traffic mirroring capability that supports the encapsulation of ACL-defined, Port- or Flow-based sessions so that they can be forwarded seamlessly across the IP network.

The new 'VSP Talk' feature provides critical system health and event monitoring for the VSP 9000, delivered in real-time directly to a smartphone or desktop Instant Messaging client. VSP Talk provides unsolicited, real-time updates and also facilitates on-demand 'show' functionality. Leveraging XMPP, VSP Talk is introduced with initial support for Google Talk, Avaya Aura, and other standards-based platforms. Ideal for monitoring systems in real-time and particularly post-maintenance, VSP Talk supports an abbreviated, IM-style command syntax to accelerate interactive administration. VSP Talk is completely secure, featuring process isolation, transport and password encryption, and full audit logging. When situational awareness is key, stay informed whether you're on the other side of the campus or the other side of the planet.

Real-world scenario: Avaya Network Processing Unit (NPU) advantage

Examples are numerous that detail how the performance of newer features cannot be guaranteed by manufacturers that utilize fixed ASIC technology, including one instance where a rival's top-selling product was only able to deliver IPv6 forwarding performance at 50% of the levels claimed for IPv4. Yet, our unique network processing unit (NPU) has been specifically designed to continue to deliver the same hardware-based performance levels without an upgrade – churn – to hardware. We've leveraged this advantage to deliver emerging functionality such as our next-generation device and network virtualization capabilities.

Why choose Avaya

Avaya has the ability to work within multi-vendor environments but can also serve as your sole provider for efficient networking across all layers of the data center and campus, core to edge. Avaya is delivering carrier-grade reliability to the enterprise network.

The VSP 9000 uses unique and innovation technologies to achieve both blazing performance and rock-solid resiliency, and delivers these in a fully interoperable solution to enable network- and system-level self-healing for uninterrupted business operations. The powerful network virtualization technologies used in the VSP 9000 are specifically designed to support the needs of an evolving virtualized compute environment.

With a highly-scalable switching architecture, the VSP 9000 provides an efficient platform for flexible scaling and growth to meet future network and

application requirements by quickly adapting to business needs, without the need for a forklift upgrade in the availability-sensitive network core. Avaya offers core-to-edge network solutions that ensure design efficiency and lower operational burden.

The bottom line

The VSP 9000 is purpose-built to support dynamic data center and high-density 10 Gigabit Ethernet network core deployments. It can alleviate infrastructure complexity and reduce power consumption with a truly scalable architecture; it is designed to be the high-performance platform for the coming decade.

Uptime is essential - mission-critical applications must be delivered 24x365, without interruption - and the ultra-resilient VSP 9000 delivers against this challenge. It empowers the services needed today and positions networks for the emerging needs of tomorrow, and it does so with a foundation that can be genuinely trusted.

Features such as its hardware-based control plane protection, hardware-assisted Switch Cluster failure and detection, and the carrier-grade operating system make the VSP 9000 one of the most robust high-end core switches on the market. The VSP 9000 has been architected to help meet emerging application requirements, reduce operating expenses and protect investments as both technology and businesses evolve. Virtualization is a key enabling capability, and Avaya is leading the way with our innovative VENA features; creating the perfect storm of capability and simplicity.

The Avaya VSP 9000 is the platform for today and is future-ready for tomorrow, delivering dependable networking infrastructure for successful business evolution.

Learn More

To learn more about the Avaya Virtual Service Platform 9000, contact your Avaya Account Manager, Avaya Authorized Partner or visit us at: **www.avaya.com**.

Specifications

General & Performance

- Switch architecture: 27Tbps gross capacity
- 9090SF Switch Fabric capacity: up to 8.4Tbps
- 9090SF per I/O Slot Packet Switching capacity: 480Gbps Aggregate Bi-Directional
- Initial Frame forwarding rate: up to 1,050Mpps
- Frame length: 64 to 1518 Bytes (802.1Q Untagged), 64 to 1522 bytes (802.1Q Tagged)
- Jumbo Frame support: up to 9.6 KBytes
- Multi-Link/Split Multi-Link Trunks/LAG: up to 512 Groups, with 16 Links per Group
- VRRP Backup Master
- VLANs: up to 4,084
- RSMLT Core & Edge: 4000 VLANs & 512 SMLT links
- Multiple Spanning Tree Instances: up to 64
- MAC Address: up to 128k
- IP Interfaces: 4,343
- Dynamic ARP Entries: up to 64k
- VRRP Interfaces: up to 512
- IP Forwarding Table: 500k
- IP static Routes: up to 10k
- Circuitless IP Instances: up to 256
- ECMP Routes: up to 64k
- RIP Instances: up to 64
- RIP Routes: up to 10k
- OSPF Instances: up to 64
- OSPF Areas: up to 80
- OSPF Adjacencies: up to 512
- OSPF Routes: up to 64k
- BGP Peers: up to 256
- BGP Routes: up to 1,500k
- BGP 4-Octet AS support
- VRF instances (IPv4): up to 512
- L2 VSNs, with HA options
- L3 VSNS, with HA options
- Inter-VSN Routing, with HA options
- IP Shortcut Routing, with HA options
- IPv6 Interfaces: 4k
- IPv6 Routes: up to 128k
- IPv6 Static Routes: up to 10k
- IPv6 Configured Tunnels: up to 2k
- PIM Active Interfaces: up to 512
- IP Multicast Streams: up to 6k (with SMLT)
- IGMP v1 / v2 / v3 interfaces: 4k
- Policy-based Routing
- Flow-based Policers: up to 16k
- Hardware-assisted Ingress & Egress Port & VLAN ACLs
- Enterprise Device Manager GUI, on-box & off-box
- Configuration & Orchestration Manager
- Virtualization Performance & Fault Manager
- Virtualization Provisioning Service
- System and Filter Logging
- On-box Packet Capture
- Mirroring: 1:1 / 1:M / M:1 / M:M
- Layer 2 & 3 Remote Mirroring (aka ERSPAN)
- IPFIX Flows: up to 960k
- Key Health Indicators
- Flight Recorder
- Hardware-assisted Control Plane Protection
- Hardware-assisted Rapid Failure Detection & Recovery (sub-20msec)
- High Availability mode
- Lossless Ethernet mode
- Microsoft NLB (Unicast- / Multicast- / IGMP-modes)

System

- 9012 12-Slot Chassis with 10 Interface Module Slots
- 9080CP Control Processor Module
- 9090SF 1.4Tbps Switch Fabric Module, up to six per Chassis delivering up to 8.4Tbps
- 9006AC 2kW Power Supply

Interface Modules

- 9024XL 24-port 10G Ethernet SFP+ Interface Module
- 9048GB 48-port 1G Ethernet SFP Interface Module
- 9048GT 48-port 1000BASE-T Ethernet Interface Module

IEEE & IETF Standards Compatibility

IEEE

- IEEE 802.1D MAC bridges (Spanning Tree Protocol)
- IEEE 802.1Q VLAN Tagging
- IEEE 802.1X Ethernet Authentication Protocol
- IEEE 802.1AX Link Aggregation Control Protocol (LACP)
- IEEE 802.1p Priority Queues
- IEEE 802.1s Multiple Spanning Tree Protocol (MSTP)
- IEEE 802.1v VLAN Classification by Protocol and Port
- IEEE 802.1w Rapid Spanning Tree Protocol (RSTP)
- 802.1ag Connectivity Fault Management
- 802.1aq Shortest Path Bridging (MAC-in-MAC)
- IEEE 802.1Qbb Priority-based Flow Control
- IEEE 802.3 10BASE-T Ethernet
- IEEE 802.3 CSMA/CD Ethernet (ISO/IEC 8802-3)
- IEEE 802.3i 10BASE-T Auto-Negotiation
- IEEE 802.3u 100BASE-FX
- IEEE 802.3u 100BASE-TX Fast Ethernet (ISO/IEC 8802-3, Clause 25)
- IEEE 802.3u Auto-Negotiation on Twisted Pair (ISO/IEC 8802-3, Clause 28)
- IEEE 802.3x Flow Control on the Gigabit Uplink port
- IEEE 802.3z Gigabit Ethernet
- IEEE 802.3ab 1000BASE-BX Ethernet
- IEEE 802.3ab 1000BASE-CWDM Ethernet
- IEEE 802.3ab 1000BASE-LX Ethernet
- IEEE 802.3ab 1000BASE-SX Ethernet
- IEEE 802.3ab 1000BASE-T Ethernet
- IEEE 802.3ab 1000BASE-XD Ethernet
- IEEE 802.3ab 1000BASE-ZX Ethernet
- IEEE 802.3ae 10GBASE-X

And hardware-ready for emerging technology such as:

- IEEE 802.1AXby Link Aggregation: Distributed Resilient Network Interconnect
- IEEE 802.1Qbg Edge Virtual Bridging
- IEEE 802.1Qbp Equal Cost Multiple Paths for SPBM

Specifications

IEEE & IETF Standards Compatibility (cont.)

IETF

- RFC 768 UDP Protocol
- RFC 783 TFTP Protocol
- RFC 791 IP Protocol
- RFC 792 ICMP Protocol
- RFC 793 TCP Protocol
- RFC 826 ARP Protocol
- RFC 854 Telnet Protocol
- RFC 894 A standard for the Transmission of IP Datagrams over Ethernet Networks
- RFC 896 Congestion control in IP/TCP internetworks
- RFC 903 Reverse ARP Protocol
- RFC 906 Bootstrap loading using TFTP
- RFC 950 Internet Standard Sub-Netting Procedure
- RFC 951 / RFC 2131 BootP / DHCP
- RFC 1027 Using ARP to implement transparent subnet gateways/ Nortel Subnet based VLAN
- RFC 1058 RIPv1 Protocol
- RFC 1112 IGMPv1
- RFC 1122 Requirements for Internet Hosts
- RFC 1256 ICMP Router Discovery
- RFC 1305 Network Time Protocol v3 Specification, Implementation and Analysis
- RFC 1340 Assigned Numbers
- RFC 1340 Assigned Numbers
- RFC 1519 Classless Inter-Domain Routing (CIDR): an Address Assignment and Aggregation Strategy
- RFC 1541 Dynamic Host Configuration Protocol1
- RFC 1542 Clarifications and Extensions for the Bootstrap Protocol
- RFC 1583 OSPFv2 RFC 1587 The OSPF NSSA Option
- RFC 1591 DNS Client
- RFC 1723 RIP v2 – Carrying Additional Information
- RFC 1745 BGP / OSPF Interaction
- RFC 1771 / RFC 1772 BGP-4
- RFC 1812 Router Requirements
- RFC 1866 HTMLv2 Protocol
- RFC 1965 BGP-4 Confederations
- RFC 1966 BGP-4 Route Reflectors
- RFC 1981 Path MTU Discovery for IPv6
- RFC 1997 BGP-4 Community Attributes
- RFC 1998 An Application of the BGP Community Attribute in Multi-home Routing
- RFC 2068 Hypertext Transfer Protocol
- RFC 2131 Dynamic Host Control Protocol (DHCP)
- RFC 2138 RADIUS Authentication
- RFC 2139 RADIUS Accounting
- RFC 2178 OSPF MD5 cryptographic authentication / OSPFv2
- RFC 2236 IGMPv2 for snooping
- RFC 2270 BGP-4 Dedicated AS for sites/ single provide
- RFC 2328 OSPFv2
- RFC 2362 PIM-SM
- RFC 2385 BGP-4 MD5 authentication
- RFC 2439 BGP-4 Route Flap Dampening
- RFC 2453 RIPv2 Protocol
- RFC 2740 OSPF for IPv6
- RFC 2796 BGP Route Reflection – An Alternative to Full Mesh IBGP
- RFC 2819 Remote Monitoring (RMON)
- RFC 2874 DNS Extensions for IPv6
- RFC 2918 Route Refresh Capability for BGP-4
- RFC 2992 Analysis of an Equal-Cost Multi-Path Algorithm
- RFC 3046 DHCP Relay Agent Information Option 82
- RFC 3065 Autonomous System Confederations for BGP
- RFC 3162 RADIUS and IPv6
- RFC 3315 DHCP for IPv6
- RFC 3376 IGMPv3
- RFC 3569 An overview of Source-Specific Multicast (SSM)
- RFC 3513 Internet Protocol Version 6 (IPv6) Addressing Architecture
- RFC 3587 IPv6 Global Unicast Address Format
- RFC 3768 Virtual Router Redundancy Protocol
- RFC 4213 Basic Transition Mechanisms for IPv6
- RFC 4893 BGP Support for 4-Octet AS Number Space
- RFC 6329 IS-IS Extensions supporting Shortest Path Bridging

QoS

- RFC 2474 / RFC 2475 DiffServ Support
- RFC 2475 An Architecture for Differentiated Service
- RFC 2597 Assured Forwarding PHB Group
- RFC 2598 Expedited Forwarding PHB

Network Management

- RFC 959 File Transfer Protocol
- RFC 1155 SMI
- RFC 1157 SNMP
- RFC 1215 Convention for defining traps for use with the SNMP
- RFC 1269 Definitions of Managed Objects for the Border Gateway Protocol: v3
- RFC 1271 Remote Network Monitoring Management Information Base
- RFC 1258 BSD Rlogin
- RFC 1305 (NTP client / unicast mode only)
- RFC 1350 The TFTP Protocol (Revision 2)
- RFC 1354 IP Forwarding Table MIB
- RFC 1389 RIP v2 MIB Extensions
- RFC 1757 / RFC 2819 RMON
- RFC 1907 SNMPv2
- RFC 1908 Coexistence between v1 & v2 of the Internet-standard Network Management Framework
- RFC 1930 Guidelines for creation, selection, and registration of an Autonomous System (AS)
- RFC 2428 FTP Extensions for IPv6
- RFC 2541 Secure Shell Protocol Architecture
- RFC 2571 An Architecture for Describing SNMP Management Frameworks
- RFC 2572 Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)
- RFC 2573 SNMP Applications
- RFC 2574 User-based Security Model (USM) for v3 of the Simple Network Management Protocol (SNMPv3)
- RFC 2575 View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)
- RFC 2576 Coexistence between v1, v2, & v3 of the Internet standard Network Management Framework
- RFC 2616 Hypertext Transfer Protocol 1.1
- RFC 4250 Secure Shell (SSH) Protocol Assigned Numbers
- RFC 4251 Secure Shell (SSH) Protocol Architecture
- RFC 4252 Secure Shell (SSH) Authentication Protocol
- RFC 4253 Secure Shell (SSH) Transport Layer Protocol
- RFC 4254 Secure Shell (SSH) Connection Protocol
- RFC 4255 DNS to Securely Publish SSH Key Fingerprints
- RFC 4256 Generic Message Exchange Authentication for SSH

MIBs

- RFC 1156 MIB for network management of TCP/IP
- RFC 1212 Concise MIB definitions
- RFC 1213 TCP/IP Management Information Base
- RFC 1213 MIB II
- RFC 1354 IP Forwarding Table MIB
- RFC 1389 RIP v2 MIB Extension
- RFC 1389 / RFC 1724 RIPv2 MIB extensions
- RFC 1398 Ethernet MIB
- RFC 1442 Structure of Management Information for version 2 of the Simple Network Management Protocol (SNMPv2)
- RFC 1450 Management Information Base for v2 of the Simple Network Management Protocol (SNMPv2)
- RFC 1573 Interface MIB
- RFC 1650 Definitions of Managed Objects for the Ethernet-like Interface Types
- RFC 1657 BGP-4 MIB using SMIv2
- RFC 1850 OSPF MIB
- RFC 2021 RMON MIB using SMIv2
- RFC 2096 IP Forwarding Table MIB
- RFC 2452 IPv6 MIB: TCP MIB
- RFC 2454 IPv6 MIB: UDP MIB
- RFC 2466 IPv6 MIB: ICMPv6 Group
- RFC 2578 Structure of Management Information v2 (SMIv2)
- RFC 2674 Bridges with Traffic MIB
- RFC 2787 Definitions of Managed Objects for the Virtual Router Redundancy Protocol
- RFC 2863 Interface Group MIB
- RFC 2925 Remote Ping, Traceroute & Lookup Operations MIB
- RFC 2932 IPv4 Multicast Routing MIB
- RFC 2933 IGMP MIB
- RFC 2934 PIM MIB
- RFC 3416 v2 of the Protocol Operations for the Simple Network Management Protocol (SNMP)
- RFC 4022 Management Information Base for the Transmission Control Protocol (TCP)
- RFC 4113 Management Information Base for the User Datagram Protocol (UDP)

Specifications

IEEE & IETF Standards Compatibility (cont.)

Weights & Dimensions

- Height: 61.91cm (24.375in.) or 14RU
- Width: 44.45cm (17.5in.)
- Depth: 82.55cm (32.5in.)
- Weight (empty): 73kg (160lb)
- Weight (fully loaded): 131kg (288lb)

Cooling system

- Two side-to-side fan trays
- Two front-to-back fan trays

Safety agency approvals

- UL/CSA-60950-1
- EN60950-1
- IEC60950-1 CB scheme with all country differences

Environmental specifications

- Operating temperature: 0°C to 40°C (32°F to 104°F)
- Storage temperature: -25°C to 70°C (-13°F to 158°F)
- Operating humidity: 10% to 90% relative humidity, non-condensing
- Storage humidity: 0% to 90% relative humidity, non-condensing
- Shock/bump: IEC 68-2-27-29
- Operating altitude: 3024m (10,000ft) maximum
- Storage altitude: 3024 m (10,000 ft) maximum
- Free fall/drop: ISO 4180-s, NSTA 1A
- Vibration: IEC 68-2-6/34

Electromagnetic emissions summary

- FCC Part 15 (CFR 47) (USA) Class A
- ICES-003 (Canada) Class A
- EN55022 (Europe) Class A
- CISPR22 (International) Class A
- AS/NZS CISPR22 (Australia and New Zealand) Class A
- VCCI (Japan) Class A
- CISPR24
- EN55024
- EN61000-3-2
- EN61000-3-3
- EN300 38

Country of Origin

Malaysia

Ordering Information

Component	Part Code	Description
Chassis	EC1402001-E6	9012 12-Slot Chassis – complete with Front and Rear Fan Trays, Rack Mount Kit, and Cable Guide Kit
System Modules	EC1404007-E6	9080CP Control Processor Module
	EC1404006-E6	9090SF Switch Fabric Module
Power Supplies	EC1405A01-E6	9006AC 100-240 VAC Power Supply – country-specific Power Cords sold separately
Interface Modules	EC1404001-E6	9024XL 24-port 10G Ethernet SFP+ Interface Module – SFP+ Transceivers sold separately
	EC1404002-E6	9048GB 48-port 1G Ethernet SFP Interface Module – SFP Transceivers sold separately
	EC1404003-E6	9048GT 48-port 10/100/1000 RJ-45 Ethernet Interface Module
Software	EC1410003-3.3	Virtual Services Platform 9000 Base Software Kit for 1 Chassis – mandatory for every Chassis
	EC1410010	Virtual Services Platform 9000 Advanced License Kit for 1 Chassis – enabled features: BGP4 Limited (16 Peers, 64k Routes), IPv6 Routing, Layer 3 Remote Mirroring, Packet Capture (PCAP)
	EC1410015	Virtual Services Platform 9000 Premier License Kit for 1 Chassis – enabled features: Advanced License Features, BGP4 Unlimited (256 Peers, 500k Routes), CEE, VRF-Lite, Enterprise Fabric (Enhanced SPB)

(Principle components only, and does not include ancillary components such as Transceivers, etc)

About Avaya

Avaya is a global provider of business collaboration and communications solutions, providing unified communications, contact centers, networking and related services to companies of all sizes around the world. For more information please visit **www.avaya.com**.

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