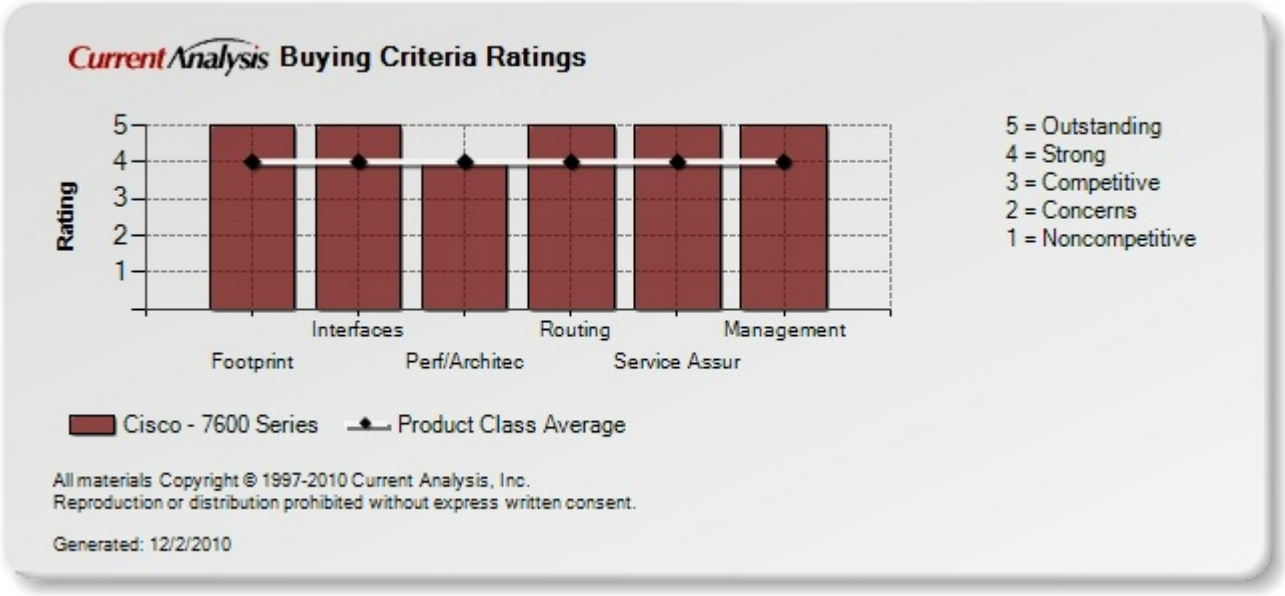
Current Analysis

Product Assessment:	**Cisco - 7600 Series**
Report Date:	November 30, 2010
Analyst:	Hunt, Glen
Service:	Service Provider Infrastructure
Market:	Transport and Routing
Class:	Edge Switch Routing
Current Perspective:	

Summary

Buying Criteria



Current Perspective

The 7600 Series is very threatening in the multiservice services edge (MSE) router and carrier Ethernet markets due to its market leading range of features, performance and market penetration. The 7600 addresses the MPLS provider edge, the service provider edge (IPv4/IPv6), carrier Ethernet aggregation, Ethernet broadband, video transport, support for large enterprises and mobile backhaul. The 7600 Series delivers strong IP routing and aggregation with robust Layer 2 and 3 IP services, and supports a broad range of interfaces, from 10/100 to 10 Gigabit Ethernet, and from T1/E1 to OC-192/STM-64 WAN connectivity. Complete Layer 2 and 3 multi-protocol label switching (MPLS) support couples with scalable and flexible QoS modeling to support network convergence and service enablement. The 7600 Series is available in five chassis configurations and it provides up to 720 Gbps of switching capacity and support for up to 1 million IPv4 routes, 500,000 IPv6 routes or 800,000 MPLS routes.

The 7600 leverages Cisco's Interface Flexibility (I-Flex) architecture, which combines compatible shared port adapters (SPAs) and SPA interface processors (SIPs) to offer consistent feature support and service delivery across Cisco's midrange and high-end routing platforms. This includes the ASR 1000, Catalyst 6500, Cisco 7304, 7600, 10000, XR 12000 and 12000 series routers as well as the flagship CRS Series core router. The I-Flex architecture allows customers to mix and match interface types: with speeds from T1/E1 to OC-192/STM-64 and 10/100 to 10 Gigabit Ethernet; copper or optical; Ethernet and legacy TDM, ATM and Frame Relay interfaces in the same slot to support services such as "triple play," IP VPNs, fixed-mobile convergence and IP security

(IPSec).

Since the introduction of the latest 15S release, the 7600 Series (together with the ASR 1000) is available with Cisco's 'New Era' IOS operating system, which is now componentized to improve feature velocity and reliability. The 7600 has centralized and distributed feature processing and forwarding technology, which can carry feature-laden IP traffic.

The 7600 Series is a key product for Cisco and is an integral part of many Cisco IP Next Generation Network (IP NGN) solutions, including: Intelligent Broadband; Medianet; Carrier Ethernet; Carrier Grade IPv6; IP/MPLS Core & Edge Networks; Cable & Wireline IPTV Infrastructure, Content Distribution and Contribution Networking, Unified RAN Backhaul; Wireless Mesh and Mobility Service Convergence; Enterprise WAN Edge, Core Routing and Data Center; and Managed Services.

Recent 7600 series portfolio enhancements include further additions to the range of enhanced ES+ 40G line cards; introducing the ES+T range of 'Transport' linecards with a lower number of queues, and the ES+XC range of 'Combo' linecards with a mix of Gigabit Ethernet and 10 Gigabit Ethernet ports to optimize space and power. ES+ linecards support the flexible Ethernet Virtual Circuit (EVC) architecture that supports Layer 2 Ethernet and Layer 3 IP service instances on the same logical interface. "Any-play" services are supported from any access media, with granular H-QoS to guarantee customer service level agreements. License support for further features supported by the ES+ linecards gives customers a 'pay as you grow' model and include Cisco's Intelligent Services Gateway & Programmable Ethernet, IPoDWDM and VidMon. VidMon is an integrated media quality-monitoring capability that can be used to improve the delivery of high-quality media services. The ES+ VidMon implementation support up to 40Gbps per slot of inline monitoring of unicast or multicast traffic at both IP transport and MPEG application layers.

In addition, the 7600 series supports a comprehensive set of standards-based Ethernet OA&M capabilities to enable service assurance for Ethernet-based services, and complies with the MEF-9, MEF-14, MEF-16 and MEF-22 set of recommendations, achieving the Industry's first MEF Network-Level Certification.

Other capabilities include Sync-E and 1588-2008 packet timing, integrated session border control for IP multimedia and non-IMS services, an intelligent services gateway for data service convergence, PDSN and GGSN integration, Service and Application Module for IP (SAMI) and an integrated mesh Wireless Service Module (WiSM) for metropolitan WiFi mesh network aggregation to expand service provider Ethernet services more efficiently. In addition to the existing services portfolio, the 7600 supports features such as IP SEC VPN, firewall, intrusion detection, DDoS anomaly and guard, CSG, NAM and SBC.

To complement the 7600 Series, Cisco has introduced its next-generation access and aggregation router solutions, which consist of the ASR 1000 Series, the ASR 9000 Series, and with the acquisition of Starent Networks, the ASR 5000.

Following on from the successful EANTC 'Experience Provider Megatest' in 2009, which highlighted the 7600 series industry leading performance with respect to high availability routing, network resilience, multicast scalability and video monitoring; Cisco recently submitted its mobile IP-NGN portfolio for testing, based on EANTC's requirements specification (black-box RFP) that was created as a blueprint for current and future mobile networks. The testing included the following equipment: the 7600 and ASR9000 aggregation layer routers; ASR5000 mobile gateway; the CRS-3 IP core router; the Nexus 7000; pre-aggregation systems such as the ASR1000, ME3600, and the ME3800 families; and cell site gateways like the MWR2941. The testing demonstrated the 7600's continuing role in Cisco's service provider portfolio providing high availability routing, network resiliency and packet timing accuracy.

Strengths and Weaknesses

Strengths

- The Cisco 7600 has been the primary edge router platform that comprises Cisco's IP NGN suite to fulfill the routing and switching role at the service provider edge, and has achieved

Weaknesses

- Configuration rules for the 7600 can become complex, given the multiple generations of interfaces and processor modules that continue to be supported. Much of the complexity is a

over 100,000 deployments, including many Tier 1 operators. The system runs Cisco's 'New Era' OS, which componentized to improve feature velocity and reliability plus support for complete IP/MPLS capabilities. The 7600 was one of the first 39 products to receive MEF certification for its carrier Ethernet services, and supports subscriber and service aware Ethernet (ISG), IP aggregation and low-speed line aggregation.

• The Cisco 7600 provides flexible interface support that includes copper, channelized, POS, ATM and Ethernet options, enabling a service provider to deploy the platform in nearly any geography. The 7600 can support interface modules with other members of the IP NGN portfolio, giving service providers a substantial level of I/O hardware investment protection and reuse.

• The Cisco 7600 supports "any play" services with asymmetric next-generation video networking, asymmetric EtherChannel, and unidirectional link routing, along with GigE and 10GigE optical interfaces. Cisco's NGN platforms, which also include the SIP-based Cisco Call Session Border Controller, provide an end-to-end solution for delivering video over an Ethernet and IP infrastructure. The 7600 supports video monitoring (Vidmon) functionality in-line at a 40 Gbps line rate performance. Vidmon runs on ES+ line cards and monitors video metrics such as media loss rate, delay and rate variations (MLR, MDI, DF and others) to help operators deliver high quality video services to end users.

• The 7600's Route Processor provides control and forwarding performance for the platform, delivering 40 Gbps of switching capacity per slot. The system provides native support for IPv4, IPv6 and MPLS protocols. With hardware-enabled forwarding for IPv4, IPv6 and MPLS, the system performance is capable of 400 Mpps for IPv4 and 200 Mpps for IPv6 traffic with features enabled.

• The 7600 provides high Ethernet interface density across a breadth of interface options to give service providers the best of both worlds by enabling both traditional IP/MPLS network edge aggregation and deployment of advanced Ethernet services using GigE and 10GigE optical interfaces. The 7600 supports up to 820/1,640 line rate/oversubscribed GigE interfaces in a single telco rack. 10G IPoDWDM capabilities have been added to support tighter integration with the optical transport network.

result of investment protection (critical, given it has deployed over 100,000 7600 systems), which Cisco takes seriously, noting that customers want to carry legacy line cards forward so that they don't have to fork lift upgrades or replace existing line cards every few years. Users should fully understand the capabilities and limitations of the older-generation interfaces.

• The 7600 is one of multiple edge platforms that Cisco offers. Customers often desire to have multiple functions supported on a single box because the choice of multiple edge platforms can lead to a level of confusion in the market as to which Cisco edge platform to use. However, the 7600 is targeted toward subscriber-aware Ethernet applications with Cisco's integrated services gateway (ISG) functionality, while the Cisco ASR-1000 Series is the lead BNG platform deployed, and the XR 12000 is now positioned as the lead multiservice provider edge platform. The ASR 9000 Series becomes Cisco's next generation high scale Ethernet service router offer, and the ASR 5000 is Cisco's solution for the mobile core.

• The 7600 provides a vehicle for network convergence via its strong market offering in the metro, cable, mobile and traditional wireline arenas, coupled with its flexible and dense feature options. The 7600 comprises part of Cisco's industry-leading proven and tested solutions. Recent and independent testing of Cisco's Carrier Ethernet (MEF), IPTV/CATV 'Experience Provider' (EANTC) and Mobile (EANTC) solutions, all including the 7600, have validated them to be class leading.

Point and Counterpoint

Point

• Competitors will tend to spread "FUD" related to the demise of the 7600, now that the long awaited ASR 9000 Series has arrived.

Counterpoint

• Cisco will point out that the 7600 is laden with the features service providers need to deploy advanced service networks. The 7600 offers a 40G/slot (80 Gbps/slot half-duplex) performance that is on par with its competitors and actually complements the ASR 9000 for applications that need sub-100G/slot performance. Cisco has deployed over 100,000 7600 Series Routers along with over 7 Million Ethernet Ports in close to 1000 Service Provider networks. The 7600 continues to gain traction with multiple wins in the last quarter, continued growth in IPTV deployments, as well as key deployments of the Mobile Transport over Packet (MToP) solution for IP RAN backhaul.

Buying/Selecting Criteria

Footprint and Density

• The 7600 series is available in multiple chassis sizes to address the needs of service provider PoPs. The 7613 is 18 RUs, the 7609/7609S are 21 RUs, and the 7606/7606S are seven RUs. The 7604 is a five-RU modular chassis designed to enable service providers to deploy L2/L3 VPN and triple play services in small PoPs and Internet gateways requiring edge aggregation. The smallest member of the family is the 7603, which is four-RU.

• The power options for the 7600 series include: 6,000W AC/DC, 4,000W AC/DC, 3000W AC, and 2500W DC for the 7613/7609/7609-S, 1,900W AC/DC, 2700W AC/DC for the 7606/7606-S, 2700W AC/DC for the 7604 and 1500W DC for the 7603-S. Cisco has achieved NEBS Level 3 certification and is designed for "five-nines" reliability. It is suitable for deployment in a service provider PoP location.

• The 7609/7609-S supports the following port densities: 34 10 GigE ports/chassis, 386/386 GigE ports/chassis line-rate/oversubscribed, 386 to 770 10/100 ports/chassis, and 386 to 770 100Base-FX ports/chassis.

• The 7613 supports 192 T3/E3 ports with 12 slots and can be configured with a single SIP-200 plus four four-port T3/E3 SPAs, 192 OC-3c/STM-1 POS ports/chassis, 48 OC-12c/STM-4 POS ports/chassis, 48 OC-48c/STM-16 POS ports/chassis and 24 ATM OC-12c/STM-4 ports/chassis. Up to 12 OC-192/STM-64 POS ports, along with DWDM optics and up to eight wavelengths and 32 wavelengths per optical ring per system are supported. Cisco

recently added 10G IPoDWDM support to the 7600.

• Based on a fully loaded rack with 44 RU of mounting space, excluding power considerations, the 7609/7609-S0 delivers a total 10 GigE density of up to 68 non-blocking ports per rack, which is the average for the class; up to 132 oversubscribed 10 GigE ports are supported.

• The 7600 supports up to 820 non-blocking ports per rack, which is near the class average of 860 ports per rack. Operators can obtain greater Ethernet port densities by using the 7606/7606-S chassis.

Interface Support

• The 7600 supports Cisco's Interface Flexibility (I-Flex) design for shared port adapters (SPAs) and SPA interface processors (SIPs), providing broad interface options (copper, channelized, PoS, ATM and Ethernet) for the Cisco carrier-routing portfolio, which includes the ASR 1000, Catalyst 6500, Cisco 7304, Cisco 7600, Cisco 12000 and Cisco XR 12000 Series routers, as well as the Cisco CRS-1. These new SPAs and SIPs reduce total cost of ownership by providing slot-economics and scalability for cross-platform sharing/sparing.

• The 7600 supports 10 GigE port requirements with multiple modules which include: the Ethernet Services 20G/40G (ES+), which supports one/two/four ports of 10G Ethernet interfaces, hierarchical QoS, locally significant VLANs and up to 16,000 VLAN IDs per line card for rich services at scale; a one-port 10 GigE module, and a four-port 10 GigE module. For over-subscribed applications, there is a four and eight port 10G module. The one-port 10 SPA, Version 2, is also available, which is IEEE 802.3ae standards-based for compatibility and interoperability.

• The 7600 supports GigE ports requirements with multiple modules which includes: the Ethernet Services Plus (ES+), 20G/40G (7600-ES+20, 7600-ES+40) which supports 20/40 ports of Gigabit (SFP and DFC3C/XL) at full line rate with services enabled; and a two-, five- and ten-port Gigabit Ethernet Shared Port Adapters, Version 2 is supported on SIP-400/600.

• POS support is provided by new SPA interfaces and includes the following interfaces: 16 OC-3 POS per slot (four x four-port SPAs), four OC-12 POS per slot (four x one-port SPAs), up to four OC-48 POS per slot (four x one-port SPA), and one OC-192 POS per slot.

• ATM is supported on the 7600 with the OC-12/STM-4 SPA and OC-48/STM-16, in addition to the OC-3c/STM-1, T3/D3, T1/E1 SPA for the SIP-200/400 and the port adapter for the Enhanced FlexWAN (two SPAs or PAs per carrier card). ATM is also supported for 3G mobile backhaul applications using the clear channel/channelized ATM/OCn Circuit Emulation over Packet (CEoP) SPA modules.

• For T1 - DS3 support, the 7600 provides Channelized T1/E1, T3, OC-3 and one-port CHOC-12/CHSTM-4 to DS0. The 7600 also offers a number of clear channel and channelized shared port adapters and SIPs. TDM support for 2G mobile backhaul applications is provided on the T1/E1 CEoP SPA modules.

Performance and Architecture

• The 7600 series is available in multiple chassis sizes to provide operators with the ability to scale performance and port density to match specific site and application requirements. Models 7609, 7609-S and 7613 offer a total Layer 2/3 switching capacity of 720 Gbps. The 7606 and 7606-S models offer up to 480 Gbps of performance. The 7604 and 7603/7603-S models deliver 320 Gbps and 240 Gbps respectively.

• The 7600-S enhanced chassis deliver improved services: the 7609-S delivers numerous design improvements including improved hardware failover mechanisms, up to 750W per slot, redundant multispeed fans and a front-to-back airflow design plus improved thermal flow measurement and management. The 7603-S enables mobile operators to pre-aggregate TDM and ATM circuits over a common pseudowire layer, to reduce OpEx. The 7606-S delivers on multiple networking solutions at the enterprise edge.

• The Cisco 7600 provides performance and reliability with options for redundant route processors and power supplies. The inclusion of two Gigabit Ethernet ports on the Supervisor Engine 720 with the Multilayer Switch Feature Card 3 (MSFC-3) or up to two Gigabit Ethernet and two 10 Gigabit Ethernet ports on the Route Switch Processor 720 (RSP 720) with the MSFC-4 eliminates the need for a line-card slot for uplink ports, resulting in efficient use of available line-card slots and increased deployment flexibility.

• The 7600 provides scalable routing performance with the 7613, 7609 and 7609-S models each providing up to 400 Mpps of packet forwarding, the 7606-S provides 270 Mbps, while the 7604 and 7603-S provide 170 Mbps and 120 Mbps respectively using the distributed forwarding characteristics of the DFC3/4 running is distributed mode.

• For class comparisons based on a fully loaded rack with 44 RU of mounting space, excluding power considerations, the 7606/7606-S (based on six chassis per rack) can provide a total switching capacity equivalent to 2.8 Tbps per rack. This is above the average for the class. In addition, it delivers routing performance equivalent to approximately 1,600 Mbps per rack.

Routing and Service Features

• The 7600 supports Layer 2 and Layer 3 MPLS VPNs including: RFC 2547 bis, VPLS, Ethernet over MPLS, frame relay over MPLS, PPP over MPLS, HDLC over MPLS, ATM AAL5 over MPLS, cell relay over MPLS, MPLS CoS, RSVP and LDP.

• The 7600 offers advanced service delivery options. Recent enhancements include the addition of integrated session border control (SBC) for IP multimedia services as well as an intelligent services gateway (ISG) for data service convergence, Service and Application Module for IP (SAMI) and PDSN and GGSN integration to reduce mobile backhaul constraints and reduce costs.

• Significant video service enhancements were added to the 7600 such as the video-aware ES+ Ethernet linecards, support for dynamic multicast/QoS, video admission control, VQE, and video quality monitoring to improve overall video delivery. The 7600 supports multicast features such as P2MP-TE, mVPN, IGMP (snooping), CGMP, GMRP, hardware IP multicast replication and forwarding, PIM-SM and PIM-DM; VLAN trunking enables multiple enterprise customers to share a single GigE access switch fiber but use separate VLANs to access the PoP.

• The 7600 supports VLAN trunking so that multiple customers can share a Gigabit Ethernet access switch fiber but use VLANs to access the service provider's PoP.

• Services are centralized in the supervisor engine; they run at 30 Mpps, including ACL, classification and marking based on differentiated services code point (DSCP), type of service (ToS) and interface (physical or logical), and policy-based routing (PBR).

• The 7600’s route scalability includes 1 million simultaneous IPv4 FIB entries or 512,000 simultaneous IPv6 FIB entries, and it supports IGRP, EIGRP, RIP, RIPII, BGP4, IS-IS, RTMP and DECnet Phase IV routing protocols.

Service Assurance

• The 7600 provides hardware-based QoS, classification on IP CoS, IP precedence, ToS, DSCP, MPLS EXP, policing, RSVP priority mapping and CiscoAssure L2, L3 and L4 policy management. Software enhancements include hierarchical quality of service (H-QoS), enhanced capabilities for prioritizing IP traffic and dynamic multipoint virtual private network (VPN) security capabilities.

• The 7600 features a redundant CPU, switch fabric modules, load sharing power supplies (AC & DC), fans, and 1:1 SONET APS per port, per line card or per chassis.

• The 7600 supports load balancing of traffic over 16 equal-cost paths (load balancing per packet) and

aggregation/load balancing across eight Fast Ethernet or Gigabit Ethernet ports from the same I/O module or diverse I/O modules, as well as support for load balancing across up to eight 10 GigE ports.

• The 7600 supports non-stop forwarding (NSF) and stateful switchover (SSO) to eliminate or reduce the impact on system failures.

• The 7600 uses the CNS Notification Engine software application to assist in management of the network. CNS converts Syslog messages to user-selected SNMP trap notifications or XML events, eliminates duplicates, and correlates events at the device layer before presenting to the network management layer. It also provides remote management capabilities such as service ping, mirroring and trace route to aid in diagnostics and troubleshooting activities.

System and Service Management

• The 7600 is supported by the Cisco Element Manager Framework GUI or through higher-level applications accessing the EMS using its northbound CORBA interface. Cisco domain managers provide provisioning, service-level monitoring and service-level accounting. The domain managers support service domains such as MPLS VPN, IPSec VPN, any transport over MPLS (AToM), Internet access, managed security, metro Ethernet, voice over IP, cable, access voice and wireless.

• The 7600 is supported by the Cisco Internet Solution Center (ISC) provisioning application and Cisco Active Network Abstraction (ANA), which provides complete EMS framework for device and domain management with standard APIs for NMS and business management integration.

• Fault management is addressed by Cisco EMS solutions, such as ANA and CIC, which correlate events, alarms and traps for intelligent device and domain fault management. Complete embedded fault, configuration, accounting, performance and security (FCAPS) management is provided.

• Configuration management supports the configuration of IP, VLANs, EtherChannel, BGP, EIGRP and OSPF, and it provides inventory details for chassis and modules. EMS and NMS application GUIs from Cisco enables configuration of IP, VLANs, EtherChannel, BGP, EIGRP and OSPF, and provides inventory details for chassis and modules. Flow-through provisioning is also supported.

• Accounting management is supported and includes records by total bytes/flow, total packets/flow, ToS of packets/flow, first and last packet time stamps/flow, and source and destination ports. BGP policy accounting services use the BGP policy accounting traffic index to perform services such as destination-sensitive billing/accounting based on the destination of a packet.

Metrics

System Performance and Architecture

Total Switching Capacity, Gbps	7613 - 720Gbps; |7609-S - 720Gbps; |7606-S - 480Gbps; |7604 - 320Gbps; |7603-S - 240Gbps
Full Duplex Switching Cap.	7613 - 360Gbps; |7609-S - 360Gbps; |7606-S - 240Gbps; |7604 - 160Gbps; |7603-S - 120Gbps
Routing/Switching	7613 - 400Mpps; |7609-S - 400Mpps; |7606-S - 270Mpps; |7604 - 170Mpps; |7603-S - 120Mpps, | (with distributed line cards)
Service Performance per Slot	Up to 48Gbps per slot
Rack Density	7613 - 2 per rack; |7609-S - 2 per rack; |7606-S -

	6 per rack; |7604 - 9 per rack; |7603-S - 11 per rack

Architecture

Switch Fabric	Switch fabric: 720 Gbps crossbar fabric ; option to install second fully-redundant switch fabric. Fully compatible with line cards with dual or single fabric as well as non-fabric enabled line cards such as EFlexWAN and SIPs.
Dist. of Intelligence	Redundant engines with switch fabric/control plane functions. Services may be applied centrally or distributed (with DFCs).
Queuing, Buffering	64,000 queues (32,000 ingress and 32,000 egress) per SIP-400 with 256MB buffer

Service Assurance

Hardware Redundancy	Redundant CPU, switch fabric modules, load sharing power supplies (AC & DC), fans; 1:1 SONET APS & MSP & ATM APS are supported
Redundant Power, Fans, Feeds	Yes, fully redundany power AC or DC power supplies and redundant fans
Interface Redundancy 1:1	Yes
Interface Redundancy, 1:N	Yes
Redundant Hot Swappable Components	Yes
SONET APS	SONET APS and SDH MSP supported
RPR, Standard/Proprietary	Resilient Ethernet
Resilience/Availability	Link redundancy is support with SONET APS, 802.3ad LACP as well as control/data plane features like NSF/SSO, Fast IP/MPLS convergence
Control, Data, and Management Plane Separation	Yes, Separate data and control plane
Graceful Restart	Yes
50 ms Link Failover	Yes
MPLS Fast Reroute	Yes
Non-Stop Switching/Hitless Layer 2	Yes

failover	
Non-Stop Routing/Hitless Layer 3 failover	Yes
Non-Stop Services/Hitless Layer 4	Yes
Hitless Software Upgrade	No

Interface Density

100 Gbps Ports/Chassis (non-blocking)	Not Supported
100 Gbps Ports/Chassis (oversubscribed)	Not Supported
40 Gbps Ports/Chassis (non-blocking)	Not Supported
10 Gbps Ports/Chassis (non-blocking)	7613 - 29; |7609-S - 34; |7606-S - 22;|7604 - 14; |7603-S - 10
10 Gbps Ports/Chassis (oversubscribed)	7613 - 49; |7609-S - 66; |7606-S - 42; |7604 - 26; |7603-S - 18
1 Gbps Ports/Chassis (non-blocking)	7613 - 410; |7609-S - 386; |7606-S - 242; |7604 - 146; |7603-S - 98
1 Gbps Ports/Chassis (oversubscribed)	|7613 - 410; |7609-S - 386; |7606-S - 242; | 7604 - 146; |7603-S - 98
1 Gbps Ports/Rack	7613 - 820; |7609-S - 772; |7606-S - 1148; |7604 - 1314; |7603-S - 1078
10/100 Mbps Ports/Chassis	7613 - 650;|7609-S - 770; |7606-S - 482; |7604 - 290; |7603-S - 194
10/100 Mbps Ports/Rack	7613 - 1300; |7609-S - 1540; |7606-S - 2892; |7604 - 2610; |7603-S - 2134
100 Mbps Ports/Chassis	7613 - 650; |7609-S - 770; |7606-S - 482; |7604 - 290; |7603-S - 194
T3/E3 Ports/Chassis	7613 - 192; |7609-S - 128; |7606-S - 80; |7604 - 48; |7603-S - 32
ATM Ports/Chassis (OC-3)	7613 - 96; |7609-S - 64; |7606-S - 40; |7604 - 24; |7603-S - 16

ATM Ports/Chassis (OC-12)	7613 - 24; |7609-S - 16; |7606-S - 10; |7604 - 6; |7603-S - 4
ATM Ports/Chassis (OC-48)	7613 - 24; |7609-S - 16; |7606-S - 10; |7604 - 6; |7603-S - 4
ATM Ports/Chassis (OC-192)	Not Supported
POS Ports/Chassis (OC-3)	Cisco 7613 - 192; Cisco 7609-S - 128; Cisco7606-S - 80; Cisco 7604 - 48; 7603-S - 32
POS Ports/Chassis (OC-12)	7613 - 48; |7609-S - 32; |7606-S - 20; |7604 - 12; |7603-S - 8
POS Ports/Chassis (OC-48)	7613 - 48; |7609-S - 32; |7606-S - 20; |7604 - 12; |7603-S - 8
POS Ports/Chassis (OC-192)	7613 - 12;|7609-S - 8; |7606-S - 5; |7604 - 3; |7603-S - 2
WDM Lambdas/Chassis	32 DWDM lambdas and 8 CWDM lambdas are supported using SFPs, GBIC, XENPAKs and XFPs

Features

CoS/QoS	Classification on IP COS, IP Precedence, TOS, DSCP, MPLS EXP; policing, RSVP priority mapping, CiscoAssure L2, L3, L4 policy management
Hardware-based QoS	Yes
Number of Forwarding Classes Supported per Port	SIP and ES20 line cards support up to 8 per logical or physical port
Service-based QoS	Yes
Interface-based QoS	Yes
Subscriber-based QoS	Yes
Rate Shaping/Limiting/Marking	Yes
Line rate forwarding with all features enabled	Yes
Layer 2, IEE 802.1p Traffic Prioritization	Yes

Policy-based Traffic Management	Yes
Hierarchial QoS	3 levels
Load Balancing	Supports CEF load-balancing over 16 paths (per flow)
Link Aggregation	Aggregation and load balancing across 8 Fast Ethernet, or Gigabit Ethernet, or 10 Gigabit Ethernet ports from same I/O module or diverse I/O modules
MPLS	Supports Layer 2 and Layer 3 MPLS VPNs, Ethernet over MPLS, frame relay over MPLS, ATM AAL5 and cell relay over MPLS, MPLS CoS, RSVP, LDP, and Inter-AS and CsC L3VPNs, VPLS, H-VPLS
Routed Protocols	IP, IPX, AppleTalk, DECnet, VINES
Routing Protocols	IGRP, EIGRP, RIP, RIPII, BGP4, IS-IS, RTMP, OSPF
Route Scalability	1 million simultaneous IPv4 FIB entries or 512,000 simultaneous IPv6 FIB entries
VLANs/Multicast	IGMP (snooping), SSM, BirDir PIM, M-BGP, MSDP, CGMP, GMRP, hardware IP multicast replication and forwarding, PIM-SM, PIM-DM; VLAN trunking enables multiple enterprise customers to share a single GigE access switch fiber but use separate VLANs to access the POP

Advanced Service Features

Application Awareness/Assurance	Content Services Gateway (CSG2)
Deep Packet Inspection	Content Services Gateway (CSG2)
Intrusion Detection	IPSec VPN Shared Port Adapter (SPA) - max two per system
IPSec	IPSec VPN Shared Port Adapter (SPA) - max two per system; Up to 5 10 IPSec VPN SPAs
Other Service Features	Not applicable
Session Border Control	ACE 7600 Application Control Engine Module, supports Session Initiated Protocol (SIP) and non-SIP applications
Subscriber Management	Intelligent Services Gateway, (ISG) providing scalable subscriber and application awareness with multidimensional identity capabilities and policy controls
Video Service Support	Integrated Video Admission Control as part of Cisco's Service Exchange Framework; with visual quality of experience (VQE) for both broadcast and video on demand (VoD)

Network Management

EMS	EMS software applies to both the Catalyst 6500 and Cisco 7600 series. EMS can be used via the Cisco Element Manager Framework GUI or through higher-level applications accessing the EMS using its Northbound CORBA interface.
Fault Management	CNS Notification Engine software application converts Syslog messages to user-selected SNMP trap notifications or XML events; de-duplicates and correlates events at the device layer before presenting to the network management layer.
Configuration Management	Enables configuration of IP, VLANs, EtherChannel, BGP, EIGRP, and OSPF, and provides inventory details for chassis and modules.
Accounting	Records by total bytes/flow, total packets/flow, TOS of packets/flow, first and last packet time stamps/flow, source and destination ports. BGP policy accounting services uses the Border Gateway Protocol (BGP) policy accounting traffic index as the classification criterion to perform services such as destination-sensitive billing/accounting based on the ultimate destination of a packet.
Performance Management	Service Assurance Agent (SAA) embedded in Cisco IOS enables service level monitoring without external probes. Collects response time, one-way latency, jitter, packet loss. Per-class traffic monitoring.
Security	ASIC-based Control Plane Rate Limiting for IP Unicast & Multicast (DoS Protection), ASIC-based ACLs, IPSec VPN, Firewall, IDS
Provisioning	Not available

Physical Specifications

Slots/Chassis	7613 - 13 7613 - 13 slots, |7609-S - 9 slots, |7606-S - 6 slots, |7604 - 4 slots, |7603-S 7613 - 13 slots, |7609-S - 9 slots, |7606-S - 6 slots, |7604 - 4 slots, |7603-S - 3 slots, | 7609 - 9 slots, 7606 - 6 slots, 7604 - 4 slots, 7603 - 3 slots
I/O slots	7613 - 12 slots, |7609-S - 8 slots, |7606 - 5 slots, |7604 - 3 slots, |7603 - 2 slots; | 1 fixed line card per slot. Up to 4 I/O slots per SIP-200 and SIP-400
Dimensions	7613 - (H x W x D): 33.3 in. x 17.2 in x 18.1 in (82.3 x 42.5 x 44.7 cm); |7609/7609-S - (H x W x D): 36.75 x 17.2 x 20.7 in. (93.3 x 43.1 x 53.3 cm); |7606/7606-S - (H x W x D): 12.25 x 17.37 x 21.75 in. (31.11 x 44.12 x 55.25 cm);|7604 - (H x W x D): 8.75 x 17.5 x 21.75 in. (22.225 x 44.45 x 55.245 cm); |7603-S (H x W x D): 7 in. x 17.37 in. x 20.3 in.
MTBF	MTBF figures depend on specific system configurations. Information can be provided upon request.

NEBS Compliance	NEBS 3 Certified on all chassis
Power Requirements	2500W AC/DC, and 4000W AC/DC and 6000W AC/DC supply for 7609-S, 7609, 7613; | 2700W AC/DC and 1900W AC/DC 7606-S, 7606; |1500W DC for 7603-S. |DC power supplies may operate lower depending on number of feeds are utilized giving customers more flexiblity and investment protection.
Power Draw & Thermal Load	For Specifics, contact vendor
Chassis Options	13-slot, 9-slot, 6-slot, 4-slots, 3-slots
System Applications	MPLS PE, SP Edge (IPv4/IPv6), Metro Ethernet, Ethernet BRAS, Video, Cell Backhaul (Mobile), High-end Enterprise, Lease Line
RU	7613 - 18RU; |7609-S - 21RU; |7606-S - 7RU; | 7604 - 5RU; |7603-S - 4RU
Chassis/Rack	7613 - 2 per rack; |7609-S - 2 per rack; |7606-S - 6 per rack; |7604 - 9 per rack; |7603-S - 11 per rack
Availability	Available

Interfaces

10/100 Mbps Ethernet	10/100Base-TX (48-port module, RJ-45, RJ21 interfaces), 10Base-FL (24-port module, MT-RJ connectors for MMF); 96-port 10/100
100 Mbps Ethernet	100Base-FX (24-port, MultiMode MT-RJ, MMF, SMF)
100/1000 Mbps Ethernet	16, 48 10/100/1000
1 Gbps Ethernet	Ethernet Services+ 40G LC (40 ports); Ethernet Services+ 20G LC (20 ports); |67xx LC (24 or 48 ports), |SPA (2-, 5-, and 10-Port)
10 Gbps Ethernet	Ethernet Services+ 40G LC (4 ports); Ethernet Services+ 20G LC (2 ports); |67xx LC (4 or 8 ports), SPA (1-Port)
40 Gbps Ethernet	Not Supported
100 Gbps Ethernet	Not Supported
DS-1/DS-3/HSSI	1-port CHOC-12/CHSTM-4 to DS0, |1-port CHOC-3/STM-1 to DS0, |24-port CH T1/E1/J1 to DS0. |No CHOC-48 available
ATM	96 port T1/E1, |8 port T3, 8 port OC3, |1 port OC-12, |1 port OC48 ATM per slot
POS	16 port OC-3, 4 port OC-12, 4 port OC-48, 1 port OC-192 POS interface per slot
Advanced Services	Packet Services Card - Session Border Control, SPA-IPSEC-2.5G

Cards	

Additional Information

Customers	Over 3,000 customers including tier-1 providers as well as challengers across all geographic theaters. To name a few AT&T, Comcast, Cox, Sprint, Colt Telecom, U's Communications, Time Warner, Saudi Telecom,and Qwest
Partners	Netflow partners include Concord Communications (performance and availability management), Narus (Internet Business Infrastructure Solutions), XACCT (IP billing record creation and account provisioning), Portal Software
Special Notes (1)	1. Supports the full Catalyst 6500 Series Ethernet, Fast Ethernet, GigE, and 10 GigE Ethernet LAN modules. 2. Supports FlexWAN modules, enabling aggregation of low-speed DS-0 to OC-3 services.
Special Notes (2)	3. The SIP-600 supports VLAN trunking so that multiple customers can share a Gigabit Ethernet access switch fiber but use VLANs to access the service provider's POP. 4. Several services are centralized in the supervisor; they run at 30 Mpps, including ACL, classification, and marking based on differentiated services code point (DSCP), type of service (ToS) and interface (physical or logical), and policy-based routing (PBR).
Special Notes (3)	5. Intrusion detection system (IDS) and content switching modules (CWMs) make the Cisco 7600 a complete single-box solution for space-constrained data centers.
Special Notes (4)	6.Network Processor-based traffic shaping can be used to offer sub-rate Gigabit Ethernet connections when customers do not have enough current traffic to justify a full Gigabit Ethernet. 7. 2 Gigabit Ethernet ports on the Cisco Supervisor 2 Multilayer Switch Feature Card 2 (MSFC2) route processor, which eliminates the need to use a line-card slot for uplink ports. The result of this design is more efficient use of available line-card slots and increased deployment flexibility.

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