

## Cisco Unified WAN Services: Services, Security, Resiliency, and Intelligence

Cisco® Unified WAN Services is an important extension to the Cisco architectural approach to systems deployment. It defines the fundamental requirements for a converged WAN edge solution that enterprise customers need to deploy to address their evolving business objectives. As implemented on the Cisco product line of routers and switches, Cisco Unified WAN Services provides a blueprint centered on realizing business success through high-performance services, integrated security, nonstop communications, and application intelligence.

### Transformation of the Enterprise

A change is occurring in the enterprise business model. The global scope of the enterprise is increasing, with many large enterprises now supporting worldwide, 24-hour operations. New types of content-rich applications are being deployed, as well as real-time collaborative services that incorporate voice and video. And with an increasingly mobile workforce, as well as the need to provide secure access to business partners and contractors, the traditional domain boundaries of the network are also beginning to shift.

Nowhere in the network are these changes felt more acutely than on the WAN edge. As a result, the typical requirements placed on a WAN edge aggregation router have expanded. Formerly, the WAN edge router was seen as a place in the network where speed and scalability were the main criteria for success. Progressively, the role of the enterprise WAN edge router has evolved into a consolidated focal point for rich services such as voice, multimedia, and real-time collaboration and commerce.

Increasingly, network designers, system administrators, and IT staff are being challenged to provide more sophisticated services at the WAN edge with greater levels of resiliency, security, and application intelligence.

### Solving the WAN Edge Puzzle

One approach that some network architects have considered is a design that incorporates multiple single-function, high-performance network appliances. Although this approach can resolve many of the challenges cited previously, ultimately it becomes a question of economics and manageability, because this model leads to:

- Increased training, testing, deployment, and integration overhead
- Additional real estate and power requirements
- Duplicate hardware and software maintenance and support costs
- Further expenditures for hardware redundancy and sparing
- Supplier management complexities with multiple WAN devices
- Operational inconsistency and service interoperability problems

To address these complex network challenges, Cisco has taken a different approach—one based on an in-depth understanding of customers' business and technology requirements. The Cisco WAN edge solution is a component of a comprehensive approach to the enterprise network, which is captured in a series of network blueprints. These blueprints for customer success are based on the concept that different portions of the network play decidedly different roles in an overall end-to-end architecture. Collectively, the series of blueprints comprise a model known as the Cisco "Places in the Network" (PIN) architecture.

### Places in the Network: An Architectural Approach to Systems Deployment

When discussing an enterprise network, it is important to consider that most networks are built from a set of discreet, but interconnected, architectural elements—each of which has its own requirements. A branch office, for example, may not have the same scalability prerequisites as a data center, but has a greater need for reduced form-factor devices with high-value integrated services.

The Cisco PIN architecture addresses the differing requirements for systems design and deployment in the three principal network areas: the campus, the data center, and the branch-office WAN (Figure 1).

**Figure 1.** Places in the Network, and Their Associated Solution Blueprints



Cisco has developed a series of solution blueprints based on this architectural design approach, including:

- **Cisco Data Center Transformation:** This solution addresses the evolving consolidation and virtualization of data center resources, and the resulting requirements for a highly scalable, resilient, and secure data center network foundation. The network is the fabric that provides secure user access to data center services and an infrastructure for the deployment, interconnection, and aggregation of shared components, including applications, servers, appliances, and storage.

- **The Cisco Campus Communications Fabric (CCF):** The Cisco CCF framework facilitates the interactive campus and supports businesses as they evolve their networks to include high-bandwidth multimedia and collaboration applications such as IP video, IPTV, and TelePresence. The Cisco CCF provides the architecture for customers to minimize business latency, achieve optimal operational manageability, and roll out services quickly.
- **The Cisco Empowered Branch:** This solution gives branch offices transparent, reliable, high-performance access to the corporate network. It is increasingly critical to business success. Today, roughly 35 percent of corporate employees (and more than 50 percent in larger businesses) work in branch-office or remote locations. As these branch offices expand and become more sophisticated, the need to deliver services in an intelligent, resilient, scalable fashion becomes critical. The Cisco Empowered Branch provides a model for doing so.

### Introducing Cisco Unified WAN Services

The newest blueprint in the Places in the Network series is Cisco Unified WAN Services, a network systems solution that can help your enterprise achieve business success by providing secure, scalable, and reliable services over your WAN. Cisco Unified WAN Services can help your enterprise accelerate growth potential by helping you transform your WAN from a reliable connectivity and data-transport hub to a converged conduit for information, communications, collaboration, and commerce.

The foundation of the Cisco Unified WAN Services model is the ability of a WAN aggregation edge device to provide a set of core services to your network, and—by extension—to the users of your network. These services include:

- High-performance services, for increased WAN edge infrastructure performance
- Nonstop communications, delivering a highly available WAN infrastructure
- Integrated security, to provide full WAN security, data protection, and compliance
- Application intelligence, to enable consistent service delivery
- Operational excellence, to limit operational expenses and improve total cost of ownership

Cisco Unified WAN Services are delivered across a portfolio of platforms, in a variety of form factors and price-to-performance ratios, allowing your enterprise to “right-size” your WAN aggregation edge for your current and future scaling and performance requirements, while providing a smooth upgrade path as your business growth accelerates.

Also, Cisco Unified WAN Services encompass a systemic approach to allow you to deploy solutions on time and on budget through a proven, consistent design and support methodology that emphasizes validated network designs and coordination of Cisco, partner, and customer capabilities (Figure 2).

**Figure 2.** Capabilities Provided in Cisco Unified WAN Services Solution Blueprint



### High-Performance Services: Scalable, High-Performance Converged Networks

The emergence of new business applications and a new communication paradigm has caused an unprecedented increase in bandwidth and scalability requirements for the WAN. Your enterprise needs to deliver higher-performance, higher-bandwidth services over your converged WANs, along with the network intelligence and capacity headroom to operate efficiently.

In contrast to deploying multiple devices to address the increasing service needs of the WAN, Cisco Unified WAN Services recommends a single, unified platform. Your business can achieve significant economies of scale, performance advantages, and operational gains by consolidating services onto a high-performance, feature-rich edge platform.

Service integration onto a single platform provides a cleaner and more efficient model wherein services can interact with each other optimally. Converged services also provide a single point of reference for monitoring and management. Power and rack-space requirements are reduced, as are the costs associated with training, certification, deployment, and systems integration.

One of the most important advantages of unified network services is that they deliver a scalable solution for the deployment of advanced services. As network traffic continues to increase, or as new technologies are introduced—such as the emerging Ethernet WAN services—a converged solution provides a smooth, single-touch upgrade path. You can often realize new performance capabilities by adding a service module, line card, or routing or forwarding processor. For example, the Cisco 7200 Series Router network processing engines have been revised many times, helping you protect your investment while obtaining new processing power and feature richness with only an incremental expenditure.

If you need an order-of-magnitude increase in performance, services scalability, resiliency, or port density, Cisco also has a broad product portfolio for the WAN aggregation edge, allowing you to meet your ever-increasing need for high-bandwidth, high-performance services. Because all products in the aggregated WAN edge portfolio run Cisco IOS® Software, you can be assured that your investment in training and operations is preserved.

The individual platforms in the Cisco WAN aggregation portfolio are discussed in greater detail later in this document.

### **Nonstop Communications: Delivering Business-Critical Resiliency**

Your enterprise needs to provide 24-hour, uninterrupted access to applications and services over the WAN. This provision requires a more highly available, resilient, and adaptive infrastructure than you probably have today. You need your WAN edge infrastructure to support:

- Rapid failover without service disruption
- Streamlined change management and service turn-up without WAN disruption, and with fewer errors
- Increased system redundancy at the platform level

You can mitigate unplanned downtime resulting from a hardware or software service outage by using the field-proven Cisco Nonstop Forwarding with Stateful Switchover (NSF/SSO) technology. NSF/SSO can respond to software- and hardware-related outages by providing instantaneous system recovery, in most cases with zero packet loss.

As more businesses move toward 24-hour operations, finding a maintenance window to perform software upgrades becomes increasingly challenging. In addition to unplanned downtime, your enterprise can also reduce or eliminate planned downtime through the industry-leading Cisco In-Service Software Upgrade (ISSU) capability. ISSU permits the complete upgrade of the operating system while the router is actively passing traffic. Because ISSU works with NSF/SSO, you can perform the upgrade operation in a hitless manner—with zero packet loss throughout the procedure. Thus, you can enable new features and functions while business operations remain uninterrupted.

The Cisco IOS Embedded Event Manager (EEM) can also be an important addition to an enterprise availability design. EEM allows you to automate tasks, create custom solutions, and improve availability while lowering operational costs through the use of programmable policies that run on the devices and are programmed by customers. You can customize EEM policies to address the specific resiliency requirements of an individual network.

As enterprises expand into a global market, network downtime—whether planned or unplanned—has become a business- and revenue-affecting event. Cisco provides embedded software and hardware resiliency to help ensure that mission-critical business functions are always available.

### **Integrated Security: The Self-Defending Network**

Your business must satisfy industry regulations regarding data privacy and adhere to regulations such as the Sarbanes-Oxley Act (SOX), Payment Card Industry (PCI), Health Insurance Portability and Accountability Act (HIPAA), etc. You need your WAN edge infrastructure to:

- Deliver network resiliency with a self-defending architecture
- Secure all critical business and client information without creating a performance bottleneck
- Integrate and embed security services within your network to reduce the need for standalone devices
- Inspect traffic flows at high speeds for attack prevention, policy enforcement, and application security

Cisco offers a portfolio of platforms featuring built-in, multilevel threat detection and containment with scalable, highly available, embedded firewall services. You can supplement firewall services by intrusion detection services. Depending on the capacity, architectural, and budgetary requirements of an individual business, these security services can be hardware-accelerated within a range of 5 to 20 Gbps.

The ability to classify application traffic is the foundation of a well-designed security solution. As waves of new Web 2.0 applications enter the network, the widely deployed Cisco Network-Based Application Recognition (NBAR) technology is an effective tool for traffic classification. NBAR can classify dozens of the most common applications found in enterprise networks, and—as you introduce new applications—you can dynamically enhance the NBAR engine to recognize them with Protocol Description Language Modules (PDLMs).

For enterprises looking for even more fine-grained control over application data than NBAR provides, Cisco Flexible Packet Matching (FPM) technology allows your network administrator to identify and classify packets—even for emerging or in-house applications. Using either the Cisco Common Classification Policy Language command-line interface (CLI) or XML, your network administrator can define policies to match any arbitrary bits at any arbitrary offset in any packet. You can use this powerful capability in a variety of scenarios. For example, being able to match the binary signature of a new virus immediately after it is unleashed can provide your enterprise with zero-day protection from such attacks.

For remote access, the Cisco platform portfolio contains integrated cryptography engines to support IP Security (IPsec) and Secure Sockets Layer (SSL) VPN encryption. As with the firewall engine, platforms within the portfolio provide a range of hardware-acceleration cryptography options, based on user requirements.

In addition to standard remote-access solutions such as Multiprotocol Label Switching (MPLS) VPN and IPsec VPN, Cisco also supports innovations such as Cisco Group Encrypted Transport VPN. Cisco Group Encrypted Transport VPN is a next-generation WAN solution that defines a new category of VPN, one that does not use traditional point-to-point tunnels. This new security model introduces the concept of “trusted” group member routers, which use a common security methodology that is independent of any point-to-point relationship. By eliminating point-to-point tunnels, Cisco Group Encrypted Transport VPNs can scale much higher while accommodating multicast applications and instantaneous branch office-to-branch office transactions.

The Cisco WAN platforms also form a key part of the Cisco Virtual Office (CVO) solution. The CVO solution provides secure, rich network services to workers at locations outside of the traditional corporate office, including teleworkers, full- and part-time home-office workers, mobile contractors, and executives. The Cisco WAN routers provides VPN convergence, terminating different VPN endpoints, devices, and technologies on a single device. In addition, the headend architecture includes Cisco Security Manager, Cisco Secure Access Control Server (ACS), and the Cisco Configuration Engine. Together, these features incorporate the ability to define networkwide policy, use identity for authorization, and actively update configurations at remote sites through a zero-touch deployment model.

As your business expands its traditional boundaries to accommodate an increasingly mobile workforce, as well as providing secure access for contractors, business partners, and customers, security is a critical concern. Collectively, the Cisco Self-Defending Network provides standards-

based and certified security services, delivered at a scalable range of speeds, and facilitates a simplified, single-point solution for the management and monitoring of network security.

### **Application Intelligence: Enabling Content-Rich Service Delivery**

Your enterprise needs to meet demanding internal service-level agreements (SLAs), with improved service delivery and application performance over the WAN. To accomplish this level of service, you need your WAN edge infrastructure to:

- Fulfill internal SLAs while containing WAN and telecom expense
- Speed service and feature deployment to quickly adapt to changing network requirements
- Provide advanced services that interoperate with critical network functions to ensure application performance and security

Some of the embedded services in the Cisco WAN aggregation edge portfolio that allow greater application awareness have already been discussed. The following sections highlight a few more.

All of the platforms in the portfolio support NetFlow, a Cisco innovation that has been adopted as the industry standard for application monitoring, network planning, security analysis, IP accounting, and traffic engineering. NetFlow boasts a large partner ecosystem, with most well-known systems management vendors providing the capability to capture and analyze NetFlow data.

The Cisco IP SLA Agent, implemented within Cisco IOS Software, is an application-aware agent that monitors network performance by measuring response time, network resource availability, application performance, jitter (interpacket delay variance), connect time, throughput, and packet loss. You can measure performance between any Cisco device that supports this feature and any remote IP host (server), Cisco routing device, or mainframe host. You can use performance-measurement statistics provided by this feature for troubleshooting, for problem analysis, and for designing network topologies.

As voice, video, and rich multimedia become progressively more important to enterprises, centralized management of multimedia streams is essential. The Cisco IOS Software Session Border Controller (SBC) is an IP-to-IP gateway designed to meet enterprise and service provider SBC needs and to facilitate simple and cost-effective connectivity between independent voice-over-IP (VoIP) and video networks. Direct IP interconnections between VoIP networks lower costs, lower latency, improve voice quality, and offer greater flexibility to support emerging services when compared with the public switched telephone network (PSTN) or time-division multiplexing (TDM).

End-to-end application performance is also vital; such performance is the focus of Cisco Performance Routing. Using built-in tools such as NetFlow, NBAR, and Cisco IP SLAs, Cisco Performance Routing can monitor not only the availability of wide-area links, but also their performance. If an application is not receiving its desired performance attributes, Cisco Performance Routing can reroute the application through an alternate path where the proper performance can be achieved. Using this technology, network designers can dynamically route around performance bottlenecks or service provider "brown-outs". Cisco Performance Routing can increase overall network availability and improve response time for critical applications, as well as bettering the user experience.

These tools are but a few of the many application-aware tools available in Cisco Unified WAN Services. More important than any individual capability, however, is the general direction they represent. Emerging applications are being deployed globally as enterprises seek to take advantage of the benefits of Web 2.0. Voice, video, interactivity, online collaboration, and real-time

responsiveness are changing the way businesses operate. Cisco has recognized this trend, and has aligned its strategy toward making ever-increasing levels of advanced application intelligence available directly in the network infrastructure.

### **Operational Excellence: Balancing Price and Performance**

To increase business efficiency, enterprises are challenged to meet progressively more stringent internal SLAs while maintaining a cap on operational expenses. As business requirements evolve, finding a balance between performance and cost becomes increasingly difficult. The Cisco Unified WAN Services framework can change the parameters of this equation by:

- Reducing and optimizing total WAN operating costs through effective bandwidth usage, and overlaying network and device consolidation, power efficiencies, and service integration
- Improving bandwidth usage with embedded and accelerated Cisco Performance Routing and traffic Management and instrumentation (scalable full NetFlow Version 9)
- Providing a hardware and software architecture that can readily adapt to new business requirements
- Enabling a single point of reference for monitoring and management
- Addressing oversubscription and providing scalable and flexible quality of service (QoS) for predictable application performance

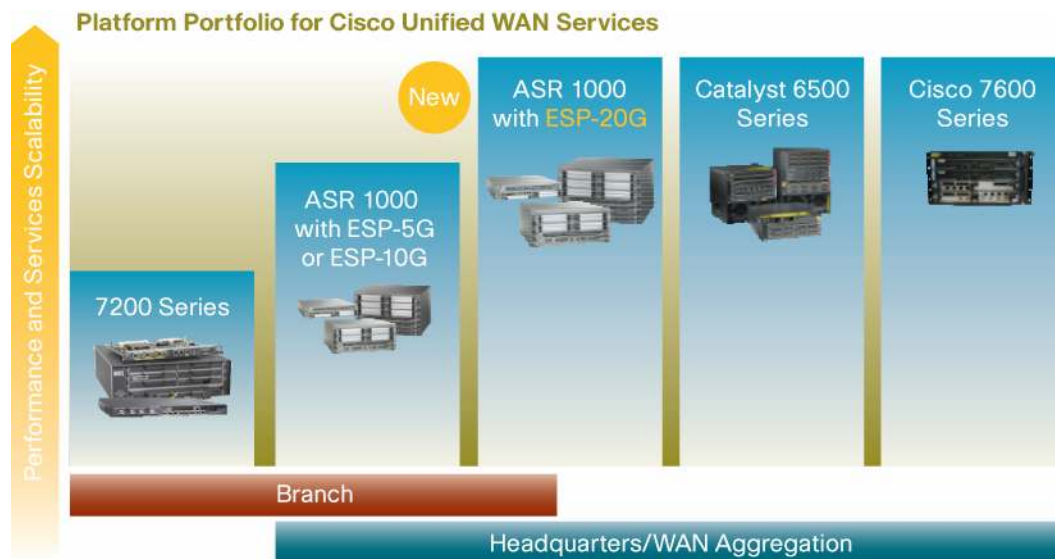
### **The Cisco Product Portfolio: Scalable Options for the WAN Edge**

Although the Cisco Unified WAN Services blueprint defines the common requirements for a WAN aggregation router, it is clear that not all enterprise networks are exactly the same. No “one-size-fits-all” router will accommodate the varying performance, scalability, capacity, and budgetary requirements of every business.

An integral portion of the Cisco Unified WAN Services strategy is to provide customers with a choice of routing platforms, offered in a variety of form factors and price-to-performance ratios. Figure 3 shows the constituent platforms in the portfolio, as well as some initial capacity guidelines for comparison. Each platform series is discussed in greater detail in the following sections.

**Figure 3.** Portfolio of Cisco WAN Aggregation Routers





### Cisco 7200 Series Routers

With a global installed base of more than 350,000, the Cisco 7200 Series Routers are among the most widely deployed and versatile aggregation routers in the world. Providing an extremely cost-effective option for the enterprise WAN, they deliver exceptional performance (up to 2 mpps), and feature richness in a compact form factor.

Cisco 7200 Series Routers feature an extraordinary selection of WAN interfaces, including Ethernet, DS-0 to OC-3/STM-1, Packet over SONET/SDH (PoS), and ATM. In addition, they support a comprehensive variety of VPN technologies, including Layer 2 and Layer 3 VPNs, accelerated IPsec VPNs, MPLS, and Cisco Group Encrypted Transport VPNs.

The newest edition to the Cisco 7200 Series is the Cisco 7201 Router. The Cisco 7201 provides performance comparable to that of the Cisco 7200VXR NPE-G2 Network Processing Engine but in a smaller form factor and with low power consumption. Including four onboard Gigabit Ethernet ports and providing performance of up to 2 mpps in Cisco Express Forwarding, the new-generation Cisco 7201 Router doubles the forwarding capacity of the existing Cisco 7301 Router.

For more information about the Cisco 7200 Series Routers, please visit:

<http://www.cisco.com/go/7200>.

### Cisco ASR 1000 Series Aggregation Services Routers

A recent addition to the Cisco product portfolio, the Cisco ASR 1000 Series Aggregation Services Routers are designed to address the emerging needs of the unified WAN services edge. Combining the best attributes of existing Cisco routers, the Cisco ASR 1000 Series Routers deliver a resilient and secure next-generation WAN infrastructure, offering powerful performance and scalability for embedded services.

At the heart of the innovation found in the Cisco ASR 1000 Series Routers is the new Cisco QuantumFlow Processor. This processor combines the best attributes of both purpose-built application-specific integrated circuits (ASICs) and general-purpose network processors—providing hardware-accelerated speed without sacrificing flexibility. The Cisco QuantumFlow Processor combines massive parallel processing, customized QoS, advanced memory management, and integrated services programmability to facilitate fast services deployment and

increased feature velocity, resulting in reduced qualification and deployment time and operating expenses (OpEx) savings.

### **High Performance at the WAN Edge to Support New and Faster WAN Services**

As an upgrade path for customers who have greater capacity requirements than the Cisco 7200 Series Routers can deliver, the Cisco ASR 1000 Series Routers can provide a twentyfold order-of-magnitude increase in WAN bandwidth performance and capacity. The additional processing power and intelligent service capabilities in the Cisco ASR 1000 Series Routers can facilitate new WAN initiatives such as:

- Rich application use by local, remote, and mobile users, through converged data, voice, and video applications
- Segmentation of enterprise networks for workgroups, providing logical separation of services
- Data-center consolidation to enable high-performance application delivery to remote and mobile users

### **Powerful WAN Resilience to Support Consistent and Reliable Service Delivery**

As the Cisco ASR 1000 Series Router becomes the central conduit for high-value, business-critical traffic, it is vital that it embody a best-of-class high-availability solution. The Cisco ASR 1000 Series Router architecture implements a highly available carrier-class design with redundant hardware and software, providing consistent, reliable, and “always-on” services. Critical elements of the Cisco ASR 1000 Series Router design include:

- Resilient hardware platform architecture with control- and data-plane separation for powerful system availability
- Complete hardware redundancy for forwarding and route processors with millisecond failover and zero packet loss
- Industry’s first dual OS (Cisco IOS XE Software) redundancy, which facilitates streamlined change management with less disruption and fewer errors
- Modular Cisco IOS XE Software that provides restartability, fault containment, and ISSU

### **High-Performance Embedded WAN Edge Security for Attack Prevention and Compliance**

Enterprises are striving to accommodate a more mobile workforce by providing anytime, everywhere network access. In addition, more nonemployees, in the form of business partners, contractors, and customers, are gaining expanded access to the enterprise network. Although such developments encourage productivity and business growth, there is a natural concern about the effects of such openness on network security.

Here again, the Cisco ASR 1000 Series Routers provide a comprehensive toolset to facilitate business flexibility without assuming additional risk. This toolset includes:

- The ability to turn on embedded high-performance security services without affecting WAN routing performance
- An integrated “all-in-one” router approach that simplifies operation and reduces costs and time to qualify, deploy, and maintain the WAN infrastructure
- Secure services aggregation for private WAN and remote sites

- Embedded secure Internet access, multiservice gateway, SBC, firewall, and VPN termination
- Built-in high-performance security services that provide high integration of security services with routing available, reducing the need for standalone devices
- Firewall services with up to 20-Gbps throughput, onboard IPsec acceleration, VPN, and Network Address Translation (NAT) services
- Multigigabit deep packet inspection through NBAR to identify, prioritize, limit, or block a wide variety of applications to meet compliance requirements and ensure mission-critical application performance
- Multigigabit Flexible Packet Matching to provide a rapid first line of defense against network threats, notable worms and viruses, and zero-day attacks

### Improved WAN Service Levels Through Application Intelligence

As applications such as unified communications, digital video, conferencing, and collaboration become more interactive and real-time, the need to reduce application latency is paramount. The user experience and acceptance of these new, business-enhancing applications will hinge upon their responsiveness. But, as applications become more complex, new means of optimizing and monitoring application performance are required. The Cisco ASR 1000 Series Routers integrate this important requirement through:

- Cisco WebEx SPA module which enhances the Cisco WebEx experience by optimizing WAN bandwidth, increasing scalability, and providing granular security for web conferencing.
- Embedded and unified SBC capabilities, supporting up to 32,000 simultaneous voice or multimedia sessions and enabling Session Initiation Protocol (SIP) trunking
- WAN optimization services such as Web Cache Communication Protocol Version 2 (WCCPv2) for improved network performance and dynamic optimization for business-critical applications such as enterprise resource planning (ERP), customer relationship management (CRM), Oracle, etc.
- Full NetFlow Version 9 capture and export for in-depth application monitoring and analysis
- Hardware-accelerated NBAR to optimize the network for well-known applications
- Cisco FPM, which enables deep packet inspection to identify and optimize emerging applications
- More than 100,000 hardware queues, empowering a sophisticated, tiered traffic management system, allowing for multiple levels of QoS

With such substantial processing power on a single Cisco ASR 1000 Series Embedded Services Processor (ESP), plus the capability to enable new hardware-accelerated services with a straightforward software upgrade, the Cisco ASR 1000 Series Router is an investment not just for the short term, but for years to come. For more information about the Cisco ASR 1000 Series Routers, please visit: <http://www.cisco.com/go/asr1000>.

### Cisco Catalyst 6500 Series Switches

Often thought of as the flagship of Cisco switches, the Cisco Catalyst 6500 Series Switch is a modular switch and router that offers high port density and WAN routing in a single chassis, resulting in a high-performance solution for WAN services aggregation. This option is particularly appropriate for enterprises that want to take the architectural approach of extending their campus

network. It offers the benefits of consistent features across both the campus network and WAN edge, as well as the very practical advantage of parts sparing.

Enterprise WAN features such as high availability, QoS, and security, together with Cisco IOS Software modularity, offer investment protection in the LAN that extends to the WAN. Cisco IOS Software modularity boosts operational efficiency and minimizes downtime through evolutionary software infrastructure advancements. By enabling modular Cisco IOS Software subsystems to run in independent processes, this innovation:

- Minimizes unplanned downtime through self-healing processes
- Simplifies software changes through subsystem ISSU
- Facilitates process-level, automated policy control by integrating EEM

Additionally, Cisco Catalyst 6500 leadership in integrated virtualized services such as firewalls, intrusion prevention solutions, IPsec VPNs, and deep packet inspection facilitates consistent end-to-end deployments in a virtualized network, further reducing operational costs. For more information about the Cisco Catalyst 6500 Series Routers, please visit:

<http://www.cisco.com/go/6500>.

### Cisco 7600 Series Routers

Cisco 7600 Series Routers are the largest Cisco aggregation routers; they are particularly well-suited for service providers and very large enterprises that require high speeds and high density. The Cisco 7600 Series combines optical WAN and metropolitan-area network (MAN) networking and high-volume Ethernet aggregation with a focus on the delivery of high-touch services for the IP and MPLS edge.

Cisco 7600 Series Routers provide features crucial to WAN aggregation, such as high availability and QoS, coupled with carrier-class performance. Recent enhancements to the Cisco 7600 Series Routers include:

- **ISSU Phase I:** Based on NSF/SSO, ISSU for Cisco 7600 Series Routers Phase I implements Enhanced Fast Software Upgrade (eFSU) and allows you to upgrade or downgrade from one major or maintenance release to another with only a short system outage. ISSU Phase I facilitates rapid software upgrades for new line cards, new power supplies, new features, or bug fixes.
- **Dual-priority queues:** In Cisco IOS Software, the existing Low Latency Queuing (LLQ) capability has been enhanced with the introduction of Multilevel Priority Queuing (MPQ). This extension brings a second priority queue for latency-sensitive traffic. MPQ facilitates differentiation between two types of traffic with strict latency requirements. For example, a QoS policy using MPQ can provide isolation between real-time voice and real-time video traffic while still meeting latency targets.
- **Circuit Emulation over packet port adapters (CEoP):** The Cisco 7600 Series CEoP Shared Port Adapter (SPA) facilitates the imitation of a physical communication link across a packet network. This feature allows network administrators to use their existing IP/MPLS network to provide leased-line emulation services or to carry data streams or protocols that do not meet the format requirements of other multiservice platform interfaces.

For more information about the Cisco 7600 Series Routers, please visit:

<http://www.cisco.com/go/7600>.

Taken together, the Cisco WAN aggregation edge portfolio provides a versatile offering of scalable hardware designs and form factors, allowing your enterprise to meet increasing requirements for high-bandwidth, high-performance services atop a secure, highly available infrastructure, while still operating within your performance, capacity, and budgetary restrictions.

### **Cisco Validated Network Designs: Cisco Unified WAN Services Deployment**

Systems deployment can often be the most challenging aspect of introducing new platforms or capabilities onto a network. Will the network design that looked so good on paper translate into the real world?

In addition to a rich spectrum of required network services and a broad platform portfolio on which to implement those services, the third component of Cisco Unified WAN Services focuses on successful customer deployment.

The Cisco Validated Design Program consists of systems and solutions that are designed, tested, and documented to facilitate faster, more reliable, and more predictable customer deployments. These designs incorporate a wide range of technologies and products into a broad portfolio of solutions that meet the needs of enterprise customers. Cisco Validated Design Program designs can give you vital information about the capabilities, expected performance, and scale of a solution prior to its actual deployment. Having such a comprehensive, lab-certified template for deployment can appreciably reduce certification time and mitigate risk.

The most visible output of the Cisco Validated Design Program is detailed solution guides, or Solution Reference Network Designs (SRNDs), which provide detailed discussions of how to design, implement, integrate, and manage specific PINs. For more information about the Cisco Validated Design Program, please visit: <http://www.cisco.com/go/cvd>.

The Cisco Validated Design Program is part of an extensive ecosystem of deployment services available from Cisco, including:

- Five Cisco Technical Assistance Centers worldwide, employing 1,400 support engineers
- Two hundred thousand partner representatives globally
- More than 500,000 individuals trained and certified in Cisco technology

Cisco and its extensive global network of partners work collaboratively to develop and deliver solutions and support services that offer you a consistent support services approach and delivery across your entire network, regardless of its size or geographic reach.

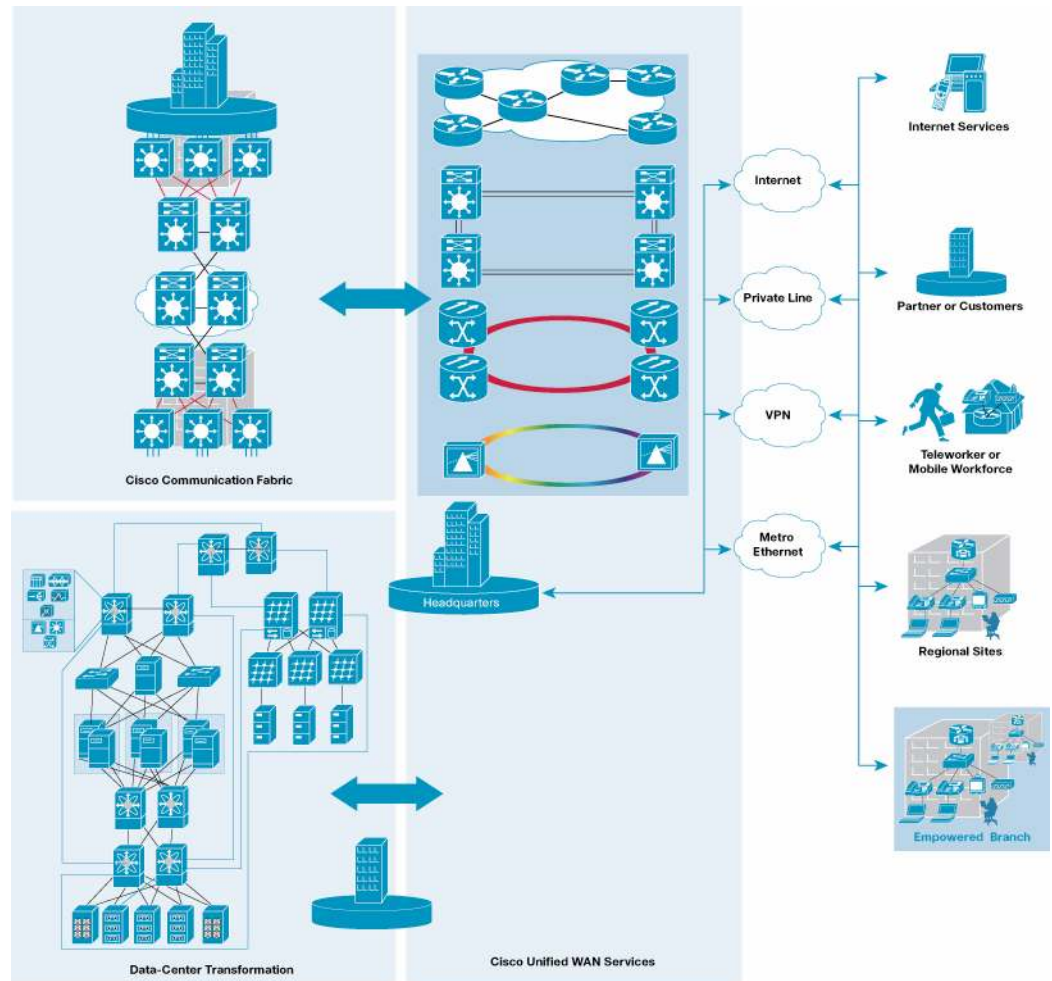
### **Cisco Unified WAN Services: The Cisco Strategy for the Next-Generation WAN**

Cisco Unified WAN Services provides an architectural approach to systems deployment, which can empower your enterprise with a suite of integrated services, hardware options, and deployment recommendations to address your evolving business requirements. Its main elements include:

- High-bandwidth, high-performance, application-aware services, delivered on a secure and highly available, resilient infrastructure
- A scalable portfolio of hardware platforms that implement these attributes
- Deployment guidance to enable faster, more reliable, and more predictable deployment

Even more importantly, Cisco Unified WAN Services is the newest component of an overall end-to-end architecture, as illustrated in Figure 4.

**Figure 4.** Interaction Between the Cisco Places in the Network Solution Architectures



By providing a clean, modular approach to determining the scalability, performance, and services requirements for each element in the end-to-end topology, as well as defining the interactions between the elements, your enterprise can achieve the appropriate level of performance, capacity, scale, and interoperability. As you deploy new technologies such as Cisco Group Encrypted Transport VPN or Cisco Performance Routing, you can optimize for individual PINs, as well as provide consistency and compatibility across your network as a whole.

Cisco Unified WAN Services, the newest component of this end-to-end strategy, delivers the vital capabilities of high-performance services, integrated security, nonstop communications, and application intelligence to unite the campus, data center, and branch-office network elements, as well as providing a compelling blueprint for customer success.

## Cisco Services for the Enterprise WAN Edge

Cisco and our partners help make your enterprise WAN edge deployment a success with a broad portfolio of services based on proven methodologies. We can help you establish a secure, resilient WAN architecture and successfully integrate Cisco® Unified Communications, Cisco TelePresence™, security, and mobility technologies with bandwidth to support video, collaboration, branch solutions, and growth in alignment with your business goals. Planning and design services align technology with business goals and can increase the accuracy, speed, and efficiency of deployment. Technical services help maintain operational health, strengthen software application functionality, solve performance issues, and lower expenses. Optimization services are designed to continually improve performance and help your team succeed with new technologies. For more information, visit <http://www.cisco.com/go/services>.



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