

The IP NGN Journey

Cisco innovation and technology advancements are helping service providers on the journey toward IP-based next-generation networks.

Gone are the days when providing connectivity was the name of the game. Today, service providers of all stripes must look toward offering new, value-added services for revenue growth, greater competitive differentiation, and increased customer loyalty. Carriers have adopted a strict laser focus on achieving efficiencies in operating expenses (OpEx) and capital expenditures (CapEx) to boost profitability. And in this intensely competitive environment, it's increasingly important for providers to gain control of their networks and the services that run on them and, in the process, to regain greater control over their business from the ever-changing market.

Service providers also need flexible solutions that help them cost effectively address the unique requirements and tap the opportunities of their various customer segments—consumers, small and midsize businesses, large enterprises, and wholesale customers. For example, in the consumer space, gaming, network-based personal video recorders, video on demand (VoD), Wi-Fi networks, and mobility are growth areas. Small and midsize businesses are likely to increase their interest in and use of a range of managed services such as hosting and security. Meanwhile, enterprises will experience increased demand for Layer 2 and Layer 3 virtual private networks (VPNs), remote access, storage, security, and Ethernet. For their part, carriers will seek revenue from wholesaling access, local and long-distance voice and services including collocation, peering, transport, and content delivery.

To address these diverse markets, service providers need a single infrastructure capable of evolving to provide a wide range of new services that will increase revenues and customer loyalty, as well as yield efficiencies in OpEx and CapEx. The industry generally calls this forward-looking infrastructure a *next-generation network (NGN)* and has near-unanimous consensus that IP will be the foundation technology to make it a reality.

“Many in the industry have narrowly defined the term NGN to address only a small piece of the very significant transition required by service providers,” says Jeff Spagnola, Cisco's vice president of service provider marketing. “Cisco takes a more comprehensive view

of an IP-based NGN that addresses a wide range of issues that service providers must resolve. We believe that IP NGNs bring about a broad network transformation that encompasses not just the service provider's network but its *entire business*.”

Nor does this network transformation end at a single point. Like providers' business and service plans, the IP NGN is a continuum. It will constantly evolve to adapt to customer demand and new technology opportunities. “IP NGNs refer to the idea of one network that can not only cost effectively deliver and manage all the voice, video, and data communications options available today, but one that can also adapt and grow to handle any new communications options that will inevitably evolve,” says Mike Volpi, senior vice president of Cisco's Routing Technology Group.

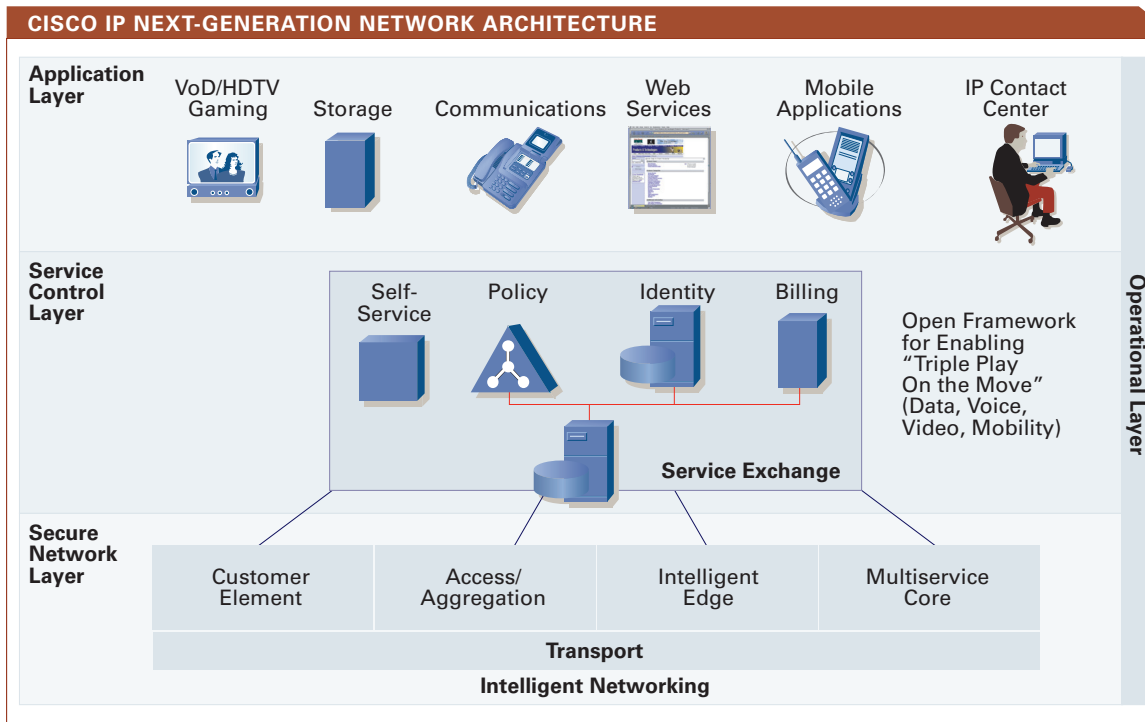
Many service providers are already moving toward IP NGNs. Though they might use different terms for NGN, broadly speaking, they share many of the same basic concepts in their visions for tomorrow's carrier infrastructure. AT&T, for example, is pursuing an NGN through its “Concept of One, Concept of Zero” initiative, and British Telecom characterizes NGN as the “21st Century Network.” Individual service providers will migrate to an IP NGN at their own pace based on their business and regulatory requirements.

The phased development of the IP NGN, emphasizes Volpi, involves creating an *intelligent* infrastructure from which application-aware services are delivered by service-aware networks. This type of intelligent IP NGN will open new opportunities for service providers to offer end customers advanced, value-added, and personalized all-media services securely and seamlessly over wireline and wireless connections.

Convergence Is at the Heart of IP NGN

Central to an IP NGN are three fundamental areas of convergence already being enabled by service providers today:

- *Application convergence*—integrating new, innovative IP data, voice, and video services over a single broadband infrastructure.
- *Service convergence*—Providers are migrating toward delivering “triple play on the move,” which combines voice, video, data, and mobility services. Service convergence includes network access and control that is technology-agnostic and seamlessly



FOUNDATION FOR SUCCESS The goal of the Cisco IP NGN architecture is to provide rich, personalized, value-add multimedia services. To do this, carriers need a service control framework that supports the key business transition from a basic "highway" to value-added "tollway" service structure.

compatible with any networking medium: mobile, wireless, cable, DSL, or Ethernet.

- **Network convergence**—Providers are migrating from deploying, managing, and maintaining multiple service-specific networks to delivering all services on a single network, most often an IP Multiprotocol Label Switching (IP MPLS)-based network.

Of course, service providers prioritize these areas of convergence in different ways, depending on their business. Many mobile operators, for example, might focus most of their efforts on service convergence, whereas cable operators target their efforts at application convergence.

The Cisco IP NGN vision and architecture address these three primary areas of convergence (see figure).

"Providers worldwide are building networks to create revenues, not just to move bits," says Tom Nolle, president of CIMI Corporation, an industry analysis and consulting firm. "Cisco's IP NGN architecture and vision offer them a compelling model for generating revenue from new services that focus on delivering a network experience based not just on transport and connection but on linking applications and networks in a seamless way to achieve carrier goals."

Recent advancements by Cisco, largely in the areas of service control and the secure network layer, underscore its commitment to building, acquiring,

and partnering to develop technology and solutions that help service providers transform their networks to profitable IP NGNs.

Cisco IP NGN: Service Control Layer

To achieve true service convergence, companies must be able to operate, bill, and manage services over a range of access media. To this end, Cisco and its technology partners have developed and are continuing to advance an open Service Exchange Framework, which allows providers to facilitate and control customer access and use wireline and mobile IP services with no limits on the types of applications that can be deployed.

While this framework contains a range of different products and solutions from Cisco and its partners, one of the most recent additions comes from Cisco's acquisition of P-Cube, a developer of IP service control platforms. The *Cisco Service Control* solution overlays intelligence and application-level control on existing IP transport networks, allowing service providers to analyze, control, and meter and charge for multiple application- and content-based services—all on a common network infrastructure. The hardware components of the solution, the Cisco SCE 1000 and 2000 Series Service Control Engines, are programmable network elements that reside behind an aggregation device such as a Cisco 10000 Series Router, broadband remote access server (B-RAS), or cable modem termination system (CMTS). The Cisco SCE interoperates with subscriber authentication and management components, as well as billing, data

collection, and policy provisioning systems, to deliver transparent, application-differentiated broadband services to subscribers.

Running on the service control engines, the Cisco Service Control Application Suite is composed of three software applications: Service Control Application for subscriber service monitoring, Cisco Collection Manager for capturing and reporting service data, and Cisco Subscriber Manager for individualized traffic accounting and control.

The Service Exchange Framework is further enhanced by Cisco's recent acquisition of dynamicsoft, a maker of carrier voice-over-IP (VoIP) software based on Session Initiation Protocol (SIP). The integration of dynamicsoft's technology with Cisco's carrier VoIP products, such as the Cisco BTS 10200 Softswitch, will help service providers offer SIP-based integrated communications services (telephone, mobile phone, e-mail, and instant messaging) that enable users to be contacted via a single device.

These new Service Exchange Framework components complement the Cisco Mobile Exchange (CMX) portfolio, which addresses the interface between the evolving radio access network and an array of Internet services offered by IP networks. CMX gives mobile operators, application providers, and system integrators flexible solutions that enable them to offer value-added data services to mobile subscribers.

Cisco IP NGN: Secure Network Layer

At the foundation of an IP NGN is the secure network layer, composed of a customer element, access/aggregation, intelligent IP MPLS edge, and multiservice core components with transport and interconnect elements layered below and above. The secure network layer is undergoing fundamental change compared to just a few years ago. For example, IP MPLS is being integrated throughout each section of the network, and edge and core areas are converging, with each adopting capabilities of the other and providing greater efficiencies to service providers.

Cisco has played a major role in developing IP MPLS communications infrastructures, the foundation for large-scale, converged, next-generation IP networks. "For several years, IP MPLS has been recognized as a foundation enabler of network convergence," says Spagnola. "Cisco has more than 250 service provider customers worldwide who deploy IP MPLS. By virtue of the fact that these customers have chosen Cisco and its intelligent IP MPLS solutions, they are already joining us on our mutual IP NGN journey."

Cisco is leading the industry in delivering innovative technology to drive network convergence and help service providers lower infrastructure costs. This is

most evident with the Cisco CRS-1 Carrier Routing System and the recently launched CRS-1 8-Slot Single-Shelf System. The world's most advanced routing system, the CRS-1 has a system capacity of up to 92 Terabits per second (Tbit/s) and is designed to provide continuous system operation, service flexibility, and extended system longevity to telecommunications providers and research organizations. Designed to fit into half of a standard 19-inch rack and with 640 Gbit/s of total switching capacity, the Cisco CRS-1 8-Slot System extends the reach of CRS-1, providing a foundation for network and service convergence.

Global carriers and research organizations worldwide are adopting the Cisco CRS-1 for building out their IP network infrastructures and to deliver advanced multimedia services. A few examples are:

- Broadband content and services provider SOFTBANK BB Corp. in Japan (provider of Yahoo!BB) has chosen the Cisco CRS-1 for its IP NGN super backbone core router. SOFTBANK focuses on services such as broadband Internet access, video-on-demand, and online gaming.
- SuperSINET, the largest national academic research network in Japan, will deploy the Cisco CRS-1 as the core routing system to enable research of grid, supercomputing, and other scientific applications.
- The Pittsburgh Supercomputing Center, a leading scientific research organization, has been measuring IP NGN performance using the Cisco CRS-1, to gauge performance levels required for advancing next-generation scientific research.
- Telecom Italia is in trials with the CRS-1, which serves as the network foundation for delivering advanced multimedia applications to its customers. So far, the CRS-1 is meeting the carrier's top requirements for availability and service flexibility and is slated to be a key component of Telecom Italia's IP NGN.

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Cisco's strategy in the service provider arena is to innovate and to provide the technology, solutions, and expertise carriers need as they transform their networks and move along the IP NGN journey. Deploying solutions that deliver greater network intelligence, integration, and overall flexibility will not only provide carriers with short-term relief but, in the end, enable them to combat competitive pressures, address new market opportunities, and increase profitability. ■

FURTHER READING

- Routing Solutions for Service Providers
cisco.com/packet/171_8b2
- Cisco Service Control
cisco.com/packet/171_8b3
- Cisco CRS-1 Carrier Routing System
cisco.com/packet/171_8b4

Read the full white paper, *Cisco and the Service Provider IP Next-Generation Network Journey*, at cisco.com/packet/171_8b1.