Enhanced Programmable Network (EPN) 3.0

Intelligent programmable networks fused with virtual cloud-based services

Converged, *programmable*, and *virtualized* describe Cisco's EPN architecture. With EPN 3.0, Cisco delivers an architecture supported by products, designs, and configurations that leverage intelligent, self-healing networks. These networks are the foundation for an agile, programmable service delivery platform. *Leveraging the* EPN 3.0 design and configuration guide simplifies the deployment of virtualized cloud-based services over service provider-scale access, aggregation, and edge networks.

Challenge

Service providers obtain a lower return on investment in infrastructure if they fail to meet bandwidth demands while maintaining high levels of network utilization. Service provider customers continually demand perfection in service performance—they now expect immediate provisioning of move, add, and change services. Also, the need for network monetization is greater than ever because of huge investments to keep pace with demand.

Solution

The Cisco EPN System gives operators a proven architecture, platforms, and solutions for addressing the dramatic changes in subscriber behavior and consumption of communications services, over both fixed and mobile access, and provides operational simplification, all at optimized cost points. Expanding on the Unified MPLS concept originally developed in the UMMT System program, the EPN System encompasses the transport of consumer and enterprise services over any type of access, wireline or wireless,

In addition to WiFi or Mobile at the customer premises or off-site, the EPN System provides an umbrella of transparent transport services for site-to-site connectivity *through Layer 3 VPN for enterprise connectivity and Mobile Transport services, for* Metro Ethernet Forum Ethernet Transport Services. Moreover, by integrating multiple access options, it easily accommodates the capabilities of existing network devices with the operator¹s history and preferences. Options for native Ethernet access, network Virtualization, or MPLS access cater to the needs of operators with different installed bases.
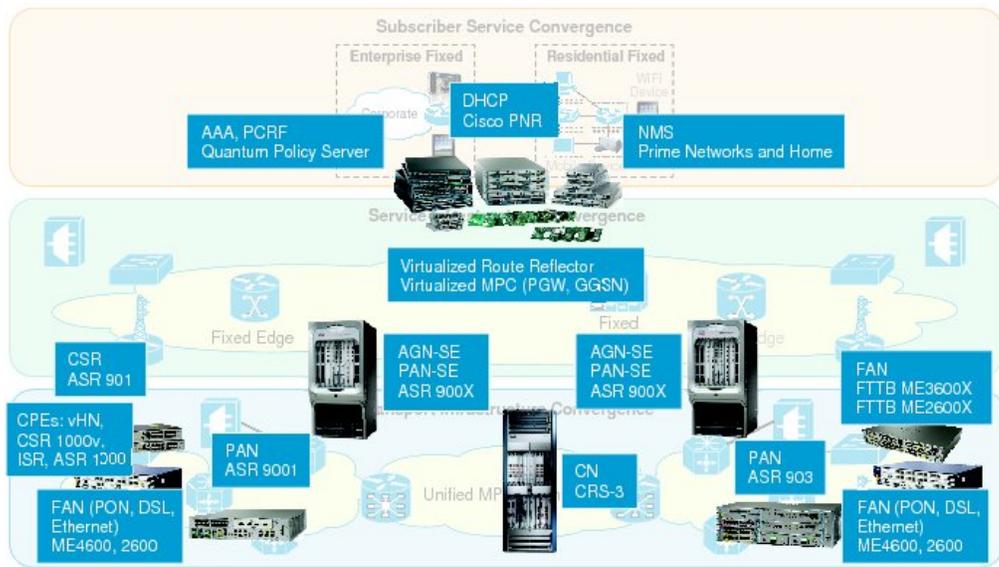
The EPN System also provides convergence of network functions in both the physical and virtual realms, supporting optimal service placement in the architecture at any location. Virtualization of network functions such as route reflectors, residential and business CPEs, provider edge functions, and managed services over standard server systems optimize the network infrastructure in both OpEx and CapEx costs.

The use of a consolidated Policy and Charging Rule Function and new collaborative models between operators and enterprises ensures a personalized and unified experience across fixed and wireless networks. This experience extends from consumers to business subscribers with mediated subscriber identities and common services transport and policies. Traditional Enterprise services are innovated through new offerings based on programmable and billable SLA capabilities that dynamically adapt to the enterprise's immediate needs and behaviors.

Finally, the Unified MPLS concept at the heart of the Cisco EPN System resolves legacy challenges such as scaling MPLS to support tens of thousands of end nodes, and provides the required MPLS functionality on cost-effective platforms without the complexity of technologies like Traffic Engineering FRR (TE-FRR) to meet transport SLAs. By addressing the scale, operational simplification, and cost of the MPLS platform, the EPN System provides a comprehensive solution to the converged operator seeking an immediately deployable architecture suitable for deployment of residential, business, and mobile services on a converged platform.

Figure 1 shows the three layers used to categorize the functions and use cases validated in the EPN System design and the lead products in each role. Each layer builds upon the functionality of the lower layer, delivering a complete architecture for service deployment. The transport layer leverages a common data, control, and management plane for all services, while the service layer implements common functions across all services. The subscriber layer enables identification of subscribers who then have services delivered to them seamlessly as they move from fixed to mobile access either within a session or across multiple sessions.

Figure 1.   Cisco Evolved Programmable Network System

Key Innovations

For Programmability:

- A programmable VPN service that enables an enterprise to programmatically request ToD, bandwidth on-demand, and usage-based services in an economically feasible way. These requests are authorized under the control of the provider-based Quantum Policy Server that automatically delivers billing and accounting information to OSS systems. This monetizes network intelligence by eliminating time-to-revenue for service requests, while maintaining accounting and billing for requested services.

For Network Function Virtualization:

- Virtual residential CPEs on distributed UCS that leverages MAP-T for IPv6 introduction. Supporting the CPE function in software eliminates site visits as new functionality becomes available while dramatically improving new service time-to-market.
- Virtual business CPEs based on CSR1000v that rapidly deploys new business services.
- Virtualized route reflector that is implemented on UCS in the cloud.
- Quantum Policy that runs on UCS-based hardware in the cloud.

For Converged Transport:

- Pseudowire headend functionality for BNG services eliminates the native Ethernet handoff to the BNG previously required; simplifying operations dramatically, particularly for QoS, availability, and OAM functions when aggregating access nodes.
- ME4600 PON access, coupled with virtual residential gateways (see above), is introduced.
- Remote BYOD devices connecting to WiFi can be mapped directly to enterprise VPNs, enabling service providers to offer a new service.
- Access technologies are extended to cover g.8032 native Ethernet for all services and Network Virtualization (nV) for enterprise Layer 2 and Layer 3 services.

- IPv6-enabled eMBMS transport allows for efficient multicast handling in LTE networks.
- Zero Touch Deployment capability for unified MPLS nodes leverages auto-IP, autonomic networking, and Embedded Event Manager scripts to enable reachability to and management of zero configuration devices.
- Efficient hybrid clock distribution is utilized for mobile networks.

EPN 3.0 Benefits

- **Flexible deployment options for multiple platforms** to meet size and throughput requirements of differing networks optimally.
- **High-performance solution** that utilizes the highest-capacity Ethernet aggregation routers in the industry. The components of this system can be in service indefinitely.
- **Tested and validated reference architecture** that allows operators to leverage a pre-packaged framework for different traffic profiles and subscriber services.
- Promotes **significant capital savings** and **time-to-revenue** improvements from various unique features such as pre-tested solutions, benchmarked performance levels, and robust interoperability, all of which are validated and pre-packaged for immediate deployment.
- Leverages the latest developments in **Network Function Virtualization** and **Programmability** to deliver the most agile service delivery platform in the industry.
- **Cisco's IP expertise is available to operators deploying EPN through Cisco Services.** These solutions include physical tools, applications, and resources plus training and annual assessments designed to suggest improvements to the operator's network.

Why Cisco?

The Cisco EPN 3.0 System is more than just an architecture. Cisco Services is taking an active role in working with Cisco customers to help them implement the architecture and its various solutions, establish benchmarked SLAs, and provide ongoing support through Cisco's global NOCs. Cisco's comprehensive focus on the rapidly changing landscape and evolving opportunities of the Mobile Internet—together with a tested and validated end-to-end architecture, solutions, and Cisco Services expertise—is a unique total offering. It enables operators around the world to rapidly deploy EPN 3.0 and quickly benefit from the new capabilities and efficiencies it provides.

For More Information

For more information about the Cisco Enhanced Programmable Network 3.0, please visit
http://www.cisco.com/c/en/us/solutions/service-provider/network-infrastructure/index.html