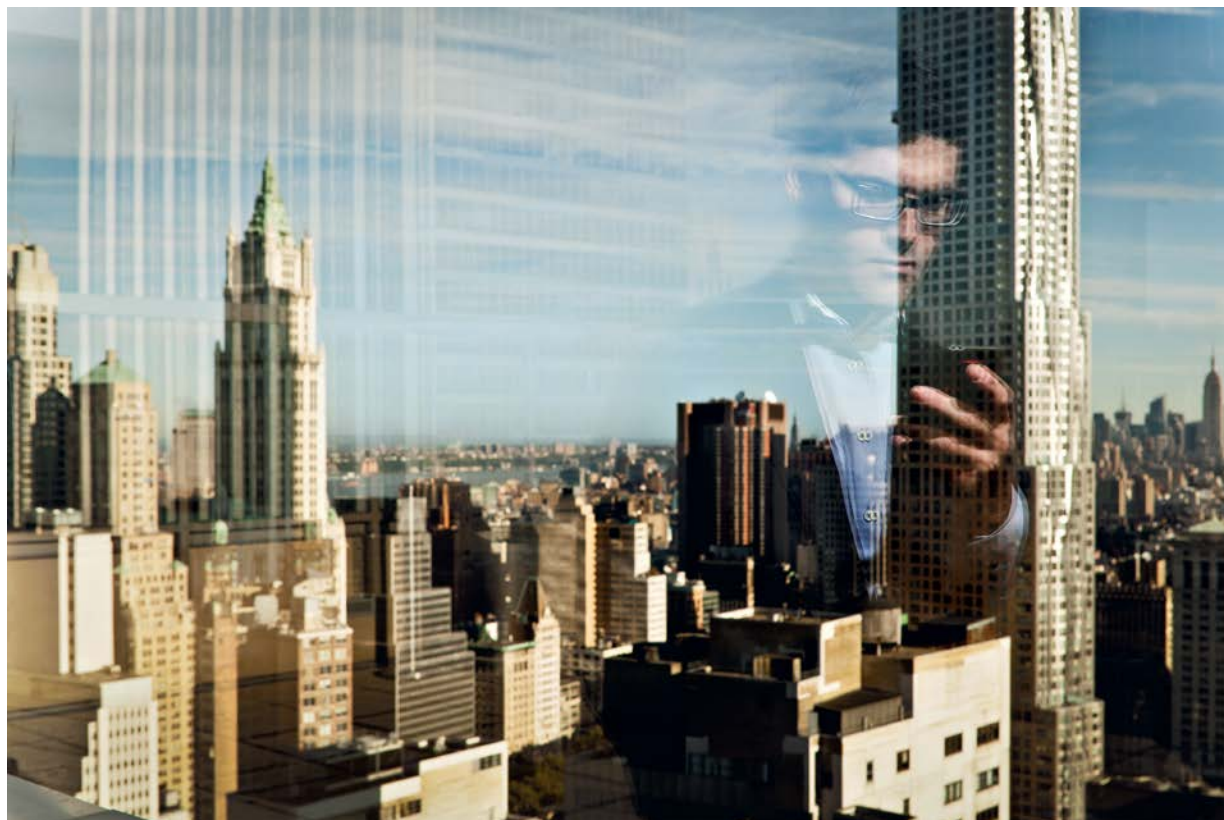


Enhanced Programmable Network (EPN) 4.0

Intelligent programmable networks fused with virtual cloud-based services



***Converged, programmable, and virtualized* describe Cisco's EPN architecture. With EPN 4.0, 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 4.0 Design and Implementation 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 Wi-Fi or mobility at the customer premises or offsite, the EPN System provides an umbrella of transparent transport services for site-to-site connectivity through either Layer 3 VPN for Enterprise connectivity and Mobile Transport services, or Metro Ethernet Forum (MEF) Ethernet Transport Services. Moreover, by integrating multiple access options, it easily accommodates the capabilities of existing network devices with the operator's history and preferences. Options for native Ethernet access, network virtualization (nV), 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.

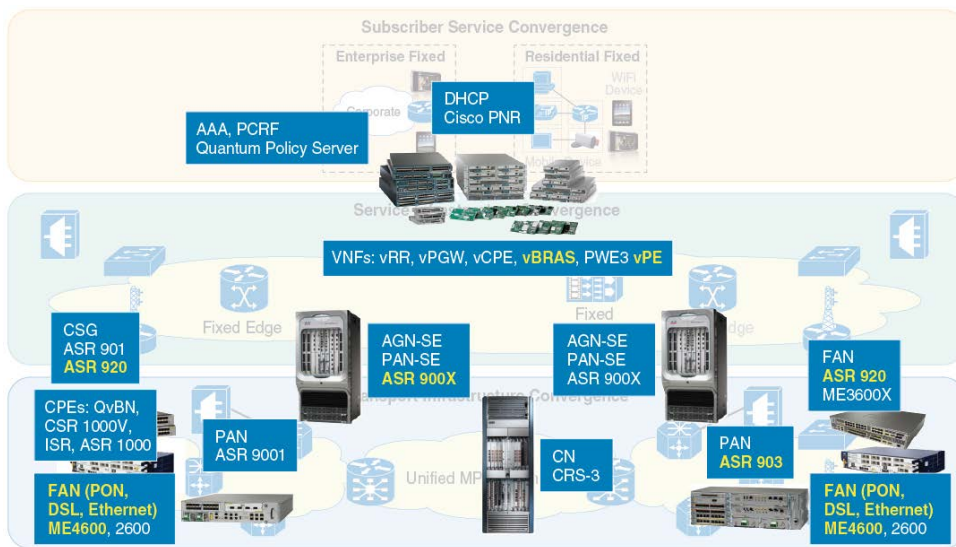
The use of a consolidated Policy and Charging Rule Function (PCRF) and new collaborative models between operators and enterprises ensures a personalized and unified experience across fixed and wireless networks. This experience extends from consumers to business subscribers with mediated subscriber identities 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 such as 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.
- 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

Key innovations for programmability include the following:

- The new ME1200 Network Interface Device (NID) with programmatic control from upstream 3600, eliminating the need for device-specific configuration. Services validated using this new and innovative capability are MEF and Mobile transport services.
- Microwave Adaptive Code Modulation (ACM) that has been extended to cover topology management via G.8032, meaning adaptation to changing weather conditions can drive path selection in native Ethernet access networks.
- Enhanced autonomic networking features combined with auto-IP address allocation simplify device deployment operations.

The key innovation for Network Function Virtualization (NFV) is the following:

- BNG PPPoE termination has been offloaded from physical devices to a cloud-based model.

Key innovations for Converged Transport include the following:

- Mobile cell site traffic monitoring for Long Term Evolution (LTE) service has been validated to assist operations planning for placement of new cell sites.
- New ASR920 has been regressed into the Unified MPLS Transport. This brings simplified operations and superior transport reliability via improved redundancy and scale.
- BGP accumulated IGP (AIGP) improves the way BGP selects paths and reduces potential for sub-optimal routing, thus increasing the efficiency and improving the user experience of the network.
- Subscriber Redundancy Groups (SRG) improve the user experience by adding stateful box-to-box redundancy models for subscribers in residential and mobile services.

- New micro multi-service access nodes have been integrated providing simple and efficient access for multiple services in buildings.
- Multicast VPN optimizations for nV access have been introduced.

EPN 4.0 Benefits

- **MEF 2.0 Service Delivery Certification** — The MEF has certified the EPN design to deliver MEF Ethernet services.
- **Deployment Options for Multiple Platforms** — Deployment options are flexible to meet size and throughput requirements of differing networks optimally.
- **High-Performance System** — This system 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** — Operators can leverage a pre-packaged framework for different traffic profiles and subscriber services.
- **Significant Capital Savings and Time-To-Revenue** — Improvements come 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.
- **Network Function Virtualization and Programmability** — The latest developments in NFV are leveraged 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 4.0 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 4.0 and quickly benefit from the new capabilities and efficiencies it provides.

For More Information

For more information about the 4.0 release of Cisco Enhanced Programmable Network, please visit <http://www.cisco.com/c/en/us/solutions/enterprise/design-zone-service-provider/programmable-network.html>



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