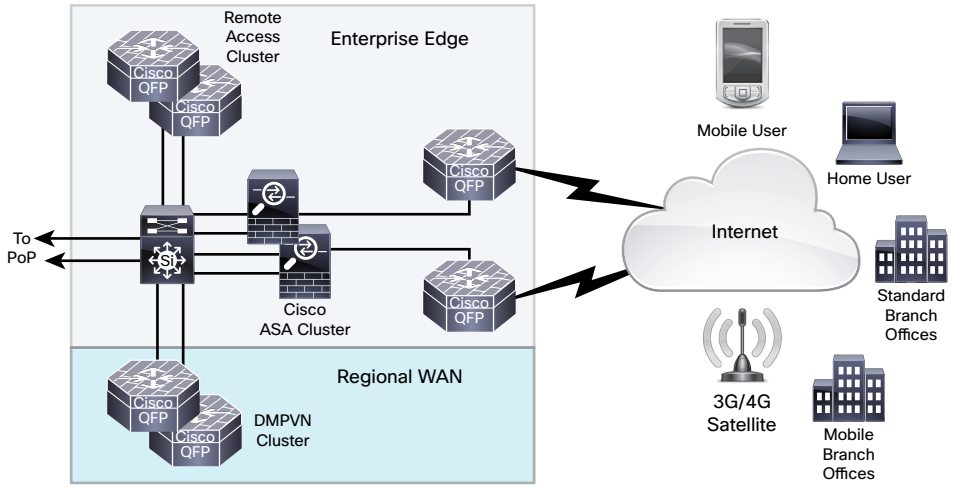
Cisco Next-Generation Enterprise WAN IPv6 Deployment at the Internet Edge

Internet Edge Solution Overview

The Cisco® Regional WAN architecture, a part of the Cisco Next-Generation Enterprise WAN (NGEW) solution, provides a set of pretested deployment recommendations for enterprises. This document focuses on the edge functions required to provide primary access using the Internet over IPv6. A pair of Cisco ASR 1000 Series Integrated Services Routers act as the edge routers facing the Internet, as is shown in Figure 1.

Figure 1. Topological View of the Internet Edge for Regional WAN Support



The deployment of IPv6 at the Internet edge allows enterprises to connect critical content and services to the Internet over IPv6.

IPv6-to-IPv4 address translation with Network Address Translation IPv6 to IPv4 (NAT64) helps ensure that an enterprise's revenue-generating services can be accessed regardless of whether a customer or partner is using an IPv4- or IPv6-enabled connection. Both stateless and stateful NAT64 are available. Stateless NAT64 provides one-to-one mapping of IPv6 addresses to IPv4 addresses, and stateful NAT64 aggregates many IPv6 devices into a single IPv4 address, thus preserving IPv4 address space.

Additionally, stateful NAT64 allows non-dual stack IPv6 users within the enterprise to access the IPv4 Internet. The Cisco ASR 1000 Series router supports up to 2 million NAT64 sessions.

DNS64 is always available for use in deployments and enables client-server communication between IPv6-only clients and IPv4-only servers.

What Problems Do IPv6 and NAT64 at the Internet Edge Solve?

The Cisco Internet edge solution gives enterprises a tested hierarchical architectural solution for providing branch-office IPv6 and NAT64 functions. The challenges that this solution solves for the enterprise are:

- The exhaustion of IPv4 address space
- The inability of IPv6 clients at the Internet edge to communicate with IPv4 servers on the Internet

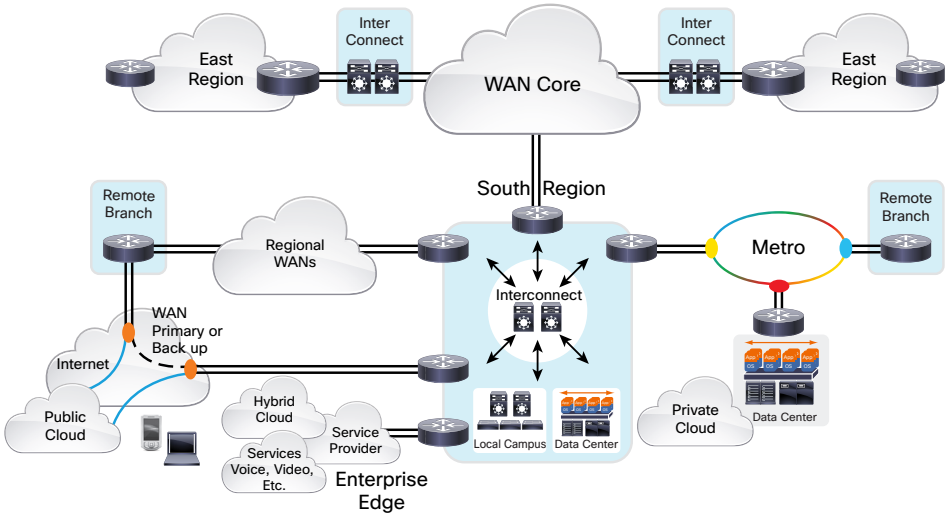
Relationship to Cisco NGEW

Cisco NGEW is an end-to-end architecture that provides foundation building blocks for next-generation enterprise networks. The hierarchical design provides the scalability required by large enterprises and can be extended and replicated throughout multiple regions and topologies. This consistency leads to ease of deployment, maintenance, and troubleshooting.

The architecture consists of four core modules, as shown in Figure 2:

- Regional WAN: Used to connect branch offices and aggregate remote locations
- Metro: Used to connect remote offices and Data Centers across metro transports
- WAN Core: Used to interconnect regional WANs within a theater and globally
- Enterprise Edge: Used to connect the enterprise network to other networks
- Enterprise Interconnect: Used as an interconnect and aggregation point for all modules

Figure 2. Next Generation Enterprise WAN High Level Topology



Benefits of IPv6 and NAT64 on the Internet Edge

The latest Cisco NGEW release provides enterprises with a rigorously tested and validated solution that can be deployed quickly and easily. The number of new devices (smartphones, tablets, etc.) on enterprise networks has increased dramatically in recent years. IPv6 addressing and compatibility is critical to the next-generation strategy. This solution allows enterprises to meet the growing demand for devices and applications that use IPv6 and help solve the problem of decreasing availability of IPv4 address space. Here are some examples of business benefits:

- Allows business continuity of revenue-generating services regardless of the protocol that a customer or partner uses to reach those services
- Conserves IPv4 address space
- Increases the number of addressable entities and helps enable future scalability
- Allows IPv6-only clients to reach IPv4 content and servers on the Internet
- Eliminates the requirement for IPv4-translatable IPv6 address assignments through the use of stateful (rather than stateless) NAT64

A significant amount of work went into the verification and testing of the new IPv6 and NAT64 features. Table 1 summarizes the primary features introduced and tested as part of Cisco's Internet edge solution.

Table 1. Primary Cisco NGEW Internet Edge Features Tested

IPv6 Features	General NAT64 Features	Stateful NAT64 Features
Works in conjunction with Cisco NetFlow	Provides stateful and stateless NAT64 feature interaction	Works in conjunction with V6-to-V4 and V4-to-V6 static configuration
Works in conjunction with Network-Based Application Recognition 2 (NBAR2)	Provides high-speed logging (HSL) with Cisco NetFlow Collector (NFC) and Flexible NetFlow (FNF) logging	Works in conjunction with V6-to-V4 and V4-to-V6 dynamic configuration
Works in conjunction with NBAR2 and multicast quality of service (MQoS)	Works in conjunction with virtual fragmentation reassembly (VFR)	Works in conjunction with V6-to-V4 PAT configuration
Works in conjunction with IPv6 service-level agreement (SLA) operations	Works in conjunction with FNF	Can clear NAT translations and statistics
	Scaling numbers with NAT64 work in conjunction with NAT IPv4 to IPv4 (NAT44), FNF, NBAR, and firewall on the same device	Works under the following conditions: high availability, stress, and in-service software upgrade (ISSU) and downgrade
	Verified NAT64 scaling numbers work with dynamic configurations and bindings (Stateless NAT64 only)	Verified NAT64 scaling numbers work with static and Port Address Translation (PAT) configurations and bindings

Why Cisco?

Cisco is the world's leading supplier of computer networking products, systems, and services and has a demonstrated background in technical innovation. By choosing the Cisco NGEW solution, you receive a complete end-to-end modular design that can be tailored to fit your specific needs. Each piece and configuration of this architecture has been tested and certified to work so that you can be assured that the solution can be deployed in your network easily and that the solution will perform as expected. IPv6 and stateful NAT64 at the Internet edge are important features of Cisco NGEW that help you both meet your future addressing and scalability needs and allow IPv6 users on your network to access IPv4 servers on the Internet.

For More Information

The entire Cisco Next-Generation Enterprise WAN solution, including documentation and deployment guides, can be found at the Cisco Design Zone. The Cisco Design Zone provides tested and validated recommendations from Cisco experts in a variety of network environments. For more information, please visit:

- Next-Generation Enterprise WAN IPv6 Migration Deployment Guide
- Design Zone for Branch/WAN - White Papers
- Design Zone for Branch/WAN - Solution Overviews

C45-711061-00 09/12