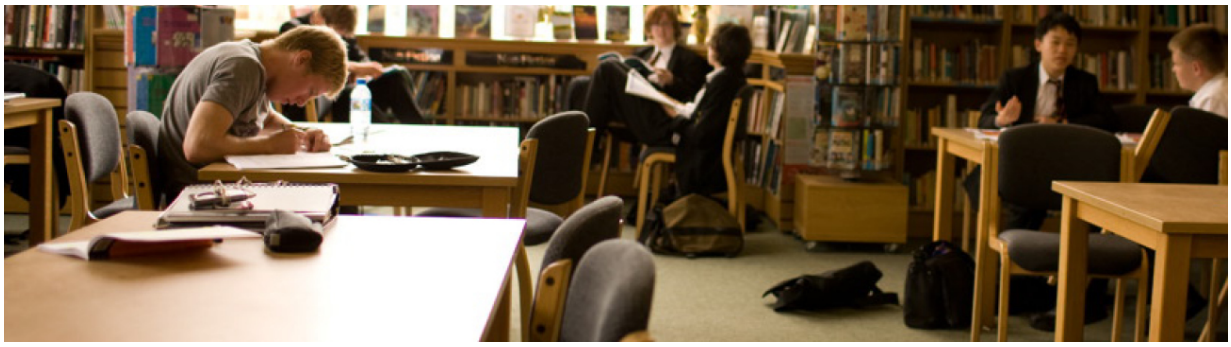
White Paper

Cisco ASR920 Full Internet Routing Capability



The objective of this document is to demonstrate how the Cisco ASR 920 platform was used as a cost effective platform by a large Service Provider to implement its Enterprise strategy.

Customer Summary

The Service Provider launched the continents first broadband submarine cable system along the Eastern and Southern coastlines, bringing with it a vast supply of high quality and affordable Internet bandwidth.

Ranging from dedicated International Private Line transmission services, flexible Ethernet services, to resilient IP Transit service capabilities and accessible Internet connectivity, the Service Provider can now provide tailor-made communication solutions.

With its continent-wide IP/MPLS network, it provides flexible, scalable and high-quality communications services that enable the growth of the continent's economy.

Under its connectivity business it provides services such as Private Line, Global IP Transit, Intra-continental IP Transit, Carrier Ethernet and Remote Peering.

Customer Testimonial

"The Cisco ASR920 router has permitted us to maintain the same level, standard and quality of service that all our customers - large and small - have come to expect of us, as we deliver our capabilities in the Enterprise market, a segment that is tightly reliant on low-cost infrastructure.

Prior to deploying the Cisco ASR920, we implemented our Enterprise strategy on the Cisco ME3600X platform. While it was up to the task, it was a very costly option for us. The ASR920 halved our deployment costs right away, and it has been a worthy replacement to the ME3600X." – Head of Engineering

Business Challenge

The Service Provider wanted to offer L2, L3 services and Internet services with full routing table support to enterprise customers with their own Metro-E network. The biggest problem with most ISP's is the Access network. How to reach the customers with a network that is actually a high quality network with five 9s' availability? How to build a network that is not only scalable but is also easy to maintain and operate using a low cost infrastructure?

The Service Provider decided to build an IP/MPLS-based network; in particular, in a ring topology where they could utilize both sides of the backbone at the same time. They would need to have traffic failover and not need to worry about the complications that arise due to Layer 2-based rings.

All the features that they provide within a data center, they wanted to provide also in the Metro so that they could provide the same services across all POP's, large or small.

Business Result

The Cisco ASR920 allowed them to be able to provide the service that they could usually provide from a small, a medium-sized or large Data Center PoP, or a small Metro-E PoP using a Cisco ASR9000 or Cisco ASR1000 to the same or different customer. So, for the Service Provider this was service uniformity, which means being able to deliver the same service anywhere in the network regardless of the platform or size of the PoP. This was imperative for their business goal, hence, making the Cisco ASR920 the right platform to choose.

Technical Challenge

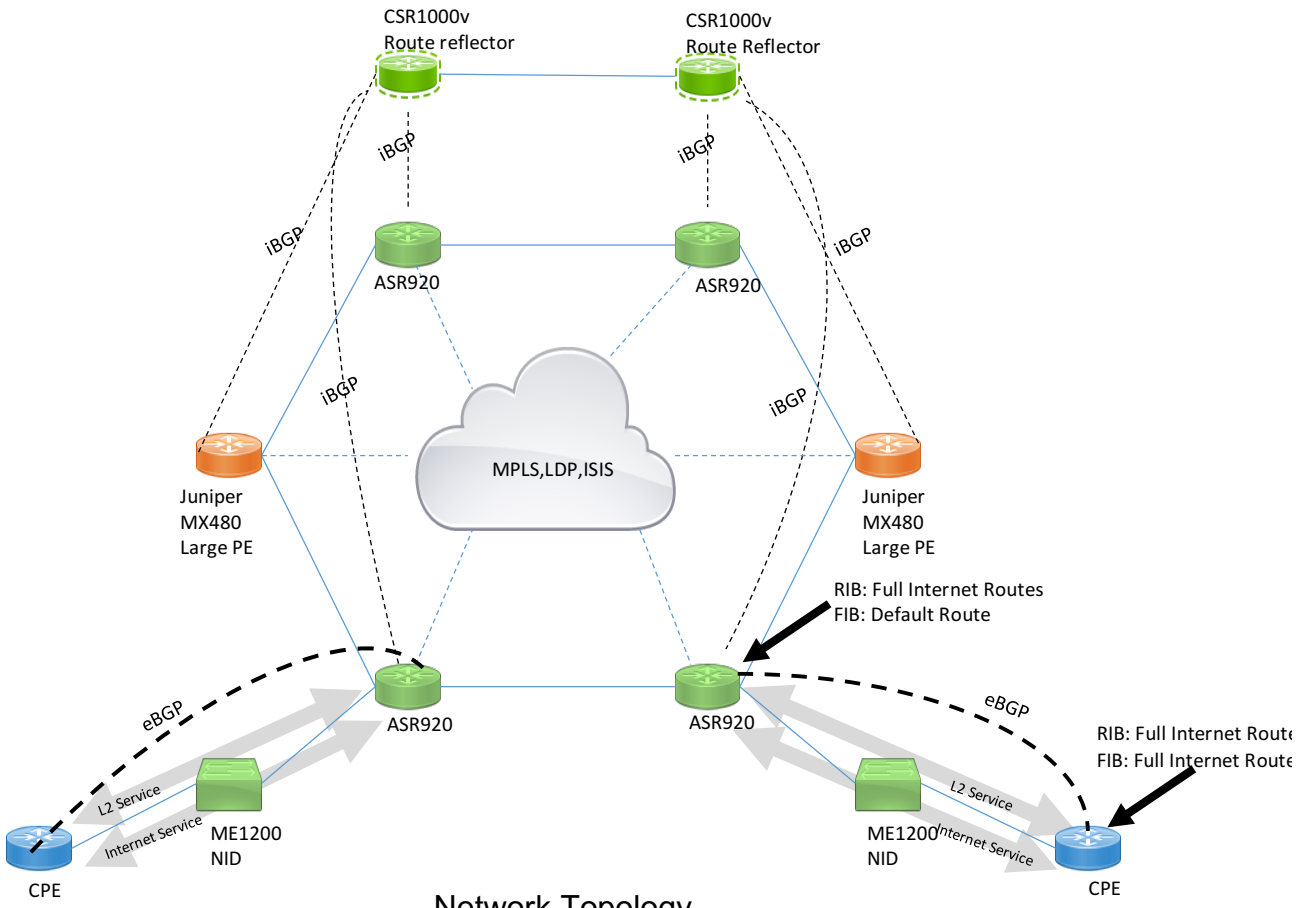
One major requirement to achieve the above business goal was to have the ability to announce the full internet routing table (+/- 700,000 IPv4 and +/- 41,000 IPv6 routes today) to its enterprise customers using small PE routers. Small PE routers have a limited forwarding capacity (+/- 20,000 entries) and therefore would not be feasible to deliver this service. Another option was to use eBGP Multi-Hop, or use the Access router as L2-only. However, there were multiple disadvantages with this approach. Running eBGP Multi-Hop to the edge router would make it a single point of failure. Taking MPLS forwarding all the way to the access was not possible, as the access router cannot be used as a small PE router.

Solution Description

The solution uses the feature called BGP Selective Download on the ASR920. This feature enables the ASR920 to function as a small PE router and at the same time is being able to exchange the full internet routing table with the customer premises router (CPE). BGP Selective Download forces the BGP routes to be installed in software, but kept away from the precious hardware FIB.

The network topology below shows the network design of one of the Service Provider's Metro-E rings. The Metro-E networks are connected to Juniper Edge routers, the MX480 platform. In the MPLS Metro network, the traffic from the customers on the ASR920 rings is forwarded over the MPLS data plane until it gets to the MX480. The MX480 act as an edge router that holds the full BGP routing table and also runs MPLS for other edge customers in the data center. Since the ASR920 being a small router, with limited FIB scale, cannot hold the full internet routing table, a pair of route reflectors is used to announce a default route to each ASR920 in the Metro-E network.

The Cisco CRS1000v platform, placed in the data center, is used as the route reflector. Since the default route is actually coming from the route reflector, using an MPLS forwarding paradigm, the ASR920 would forward the traffic towards the route reflector in the core. But these route reflectors do not handle the traffic as they are purely out-of-path. When the traffic reaches the MX480 in the data center the route reflectors are not running MPLS so there is no MPLS path from MX480 to the route reflectors. So the MPLS packet is popped and the MX480 will do a traditional look-up on the IP packet, and that IP packet will have a destination via a specific egress router somewhere in the network. It could be a peering router, another edge router or it could be an upstream router. For the return traffic the MX480 will re-encapsulate the IP packet into MPLS and forward it so the packet never reaches the route reflector.



Network Topology

Below is the snippet of customer configuration applied on ASR920 which enables the BGP Selective Download feature on the ASR920. The configuration only allows the default route to be installed in the memory constrained FIB table, keeping rest of the routes in the RIB table of ASR920.

****

```
ip prefix-list default-route-in description Accept The Default Route
ip prefix-list default-route-in seq 10 permit 0.0.0.0/0
ip prefix-list default-route-in seq 65535 deny 0.0.0.0/0 le 32
!
ipv6 prefix-list default-route-in6 description Accept The Default Route (IPv6)
ipv6 prefix-list default-route-in6 seq 10 permit ::/0
ipv6 prefix-list default-route-in6 seq 65535 deny ::/0 le 128
!
router bgp 1234
 address-family ipv4
  table-map BGP-TO-RIB-SELECTIVE-DOWNLOAD filter
!
 address-family ipv6
  table-map BGP-TO-RIB-SELECTIVE-DOWNLOAD6 filter
!
route-map BGP-TO-RIB-SELECTIVE-DOWNLOAD permit 10
 match ip address prefix-list default-route-in
!
route-map BGP-TO-RIB-SELECTIVE-DOWNLOAD deny 65535
!
!
route-map BGP-TO-RIB-SELECTIVE-DOWNLOAD6 permit 10
 match ipv6 address prefix-list default-route-in6
!
route-map BGP-TO-RIB-SELECTIVE-DOWNLOAD6 deny 65535
```