

SP 3.0 New Features

Application Note

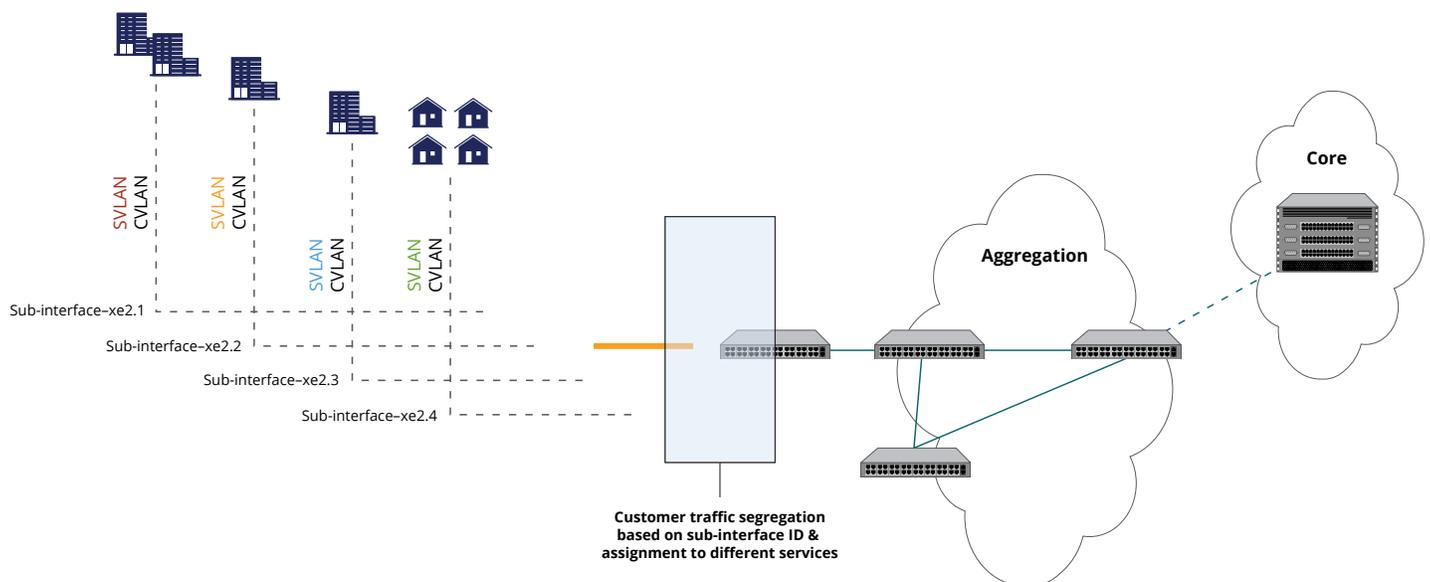
L2/L3 Sub-interfaces

Generic Technology Description

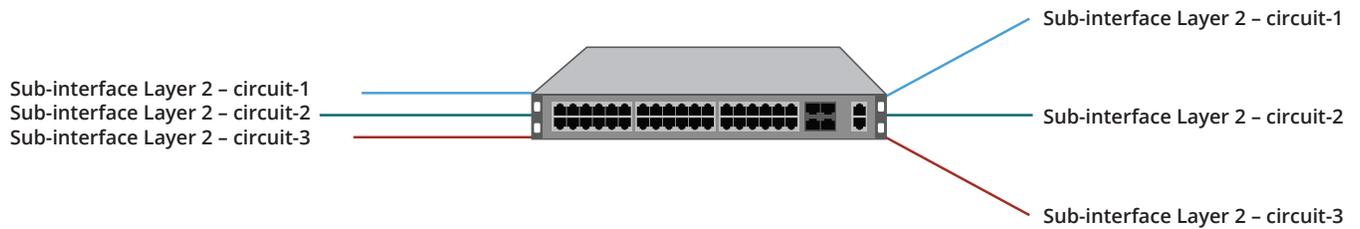
Sub-interfaces allow to break the physical interfaces into multiple logical interfaces, and this allows to provide more services from a single physical port.

The sub-interface can run at both Layer2 and Layer3 mode, which would allow multiple service types to run on a single physical interface. Sub-interfaces unlike switched VLAN interfaces, allow for VLAN to be re-used across ports.

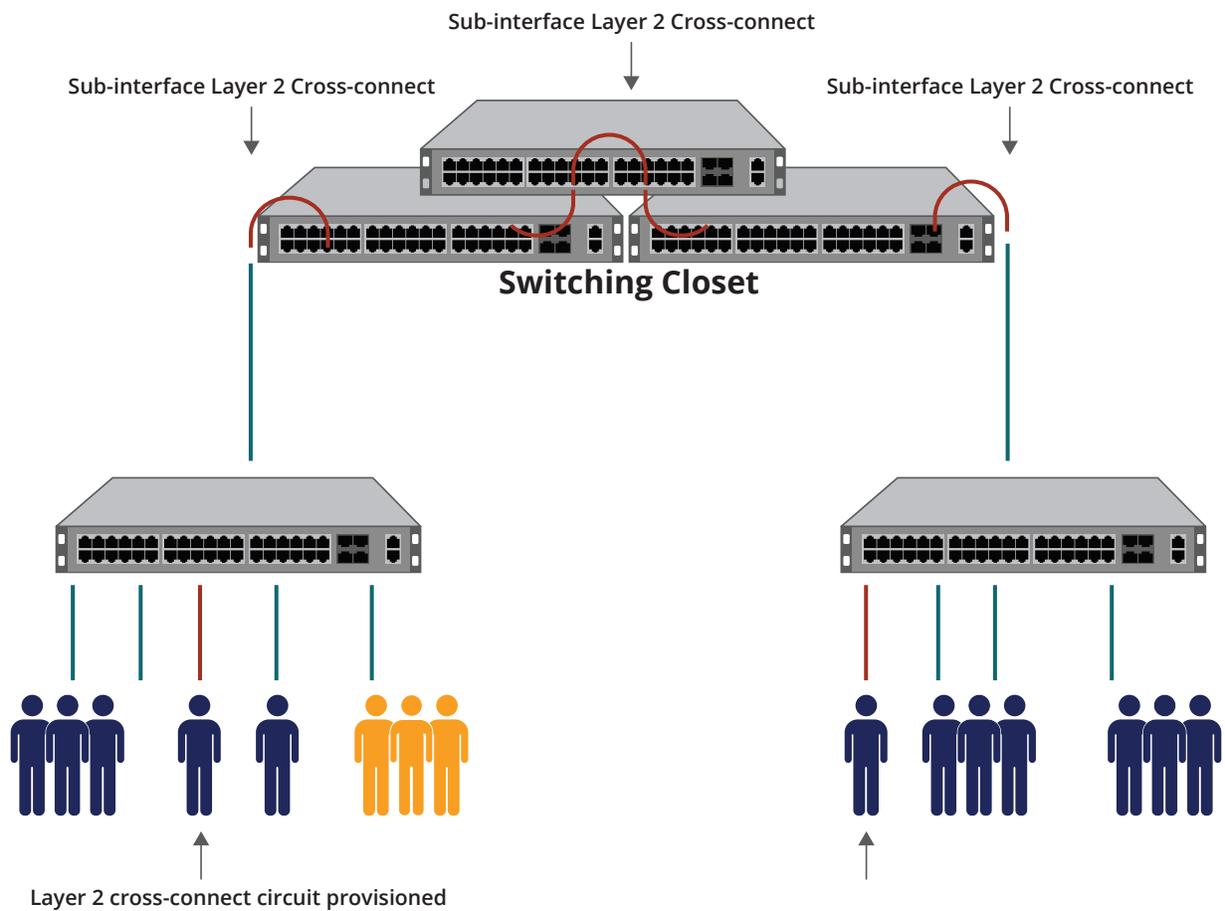
Every sub-interface is mapped to the incoming single, double tag or the encapsulation type of the packet. Depending upon the category and functional configuration of the sub-interface the packet is treated with the right functions in the pipeline.



A sub-interface configured as Layer 2 allows for a point to point circuit provisioning for pure Layer 2 transport. This allows the OcNOS enabled switches to be used as a Layer 2.



This allows for a Customer or Service Point-to-Point connect across Layer 2 switches.



When configured as a Layer 3 termination point, each of the Layer 3 sub-interfaces allow for various services to start and terminate. Multiple services can be configured over Layer 3 sub-interfaces such as;

- MPLS Layer 3 VPN
- MPLS Layer 2 VPWS
- Layer IPv4 and IPv6 routing
- ACL
- QOS-Remarking support only

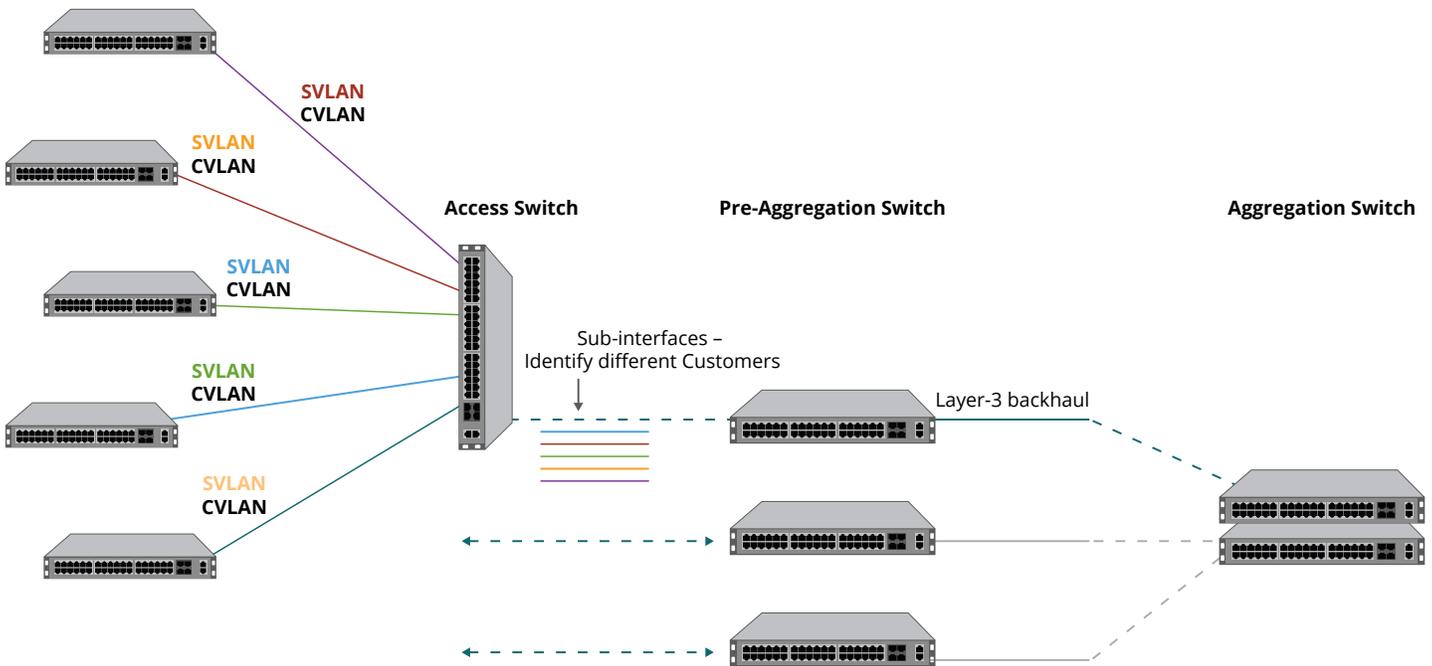
Use Case Description/General Description of the feature being used

OcNOS has multiple Service Provider useful features and can be used for many access services. In almost all cases when being used as an access device, each of the physical interfaces are expected to serve multiple customers or services.

Logical interfaces over a single physical interface helps to provide this segregation. The earlier way in OcNOS to provide logical interfaces was by means of providing VLAN based segregation; called as Switched Vlan Interfaces (SVI). This feature however had an inbuilt limitation in the number of SVI's which could be created across the platform and the VLAN's could not be reused more than once across interfaces. With Sub-interface support, this limitation goes away, the same VLAN and combination of outer/inner VLAN identifier can be used across different physical interfaces. This helps to use OcNOS to expand the services and user segregation based on the service or user VLAN identifiers and not bound by the software limitation on the switch side.

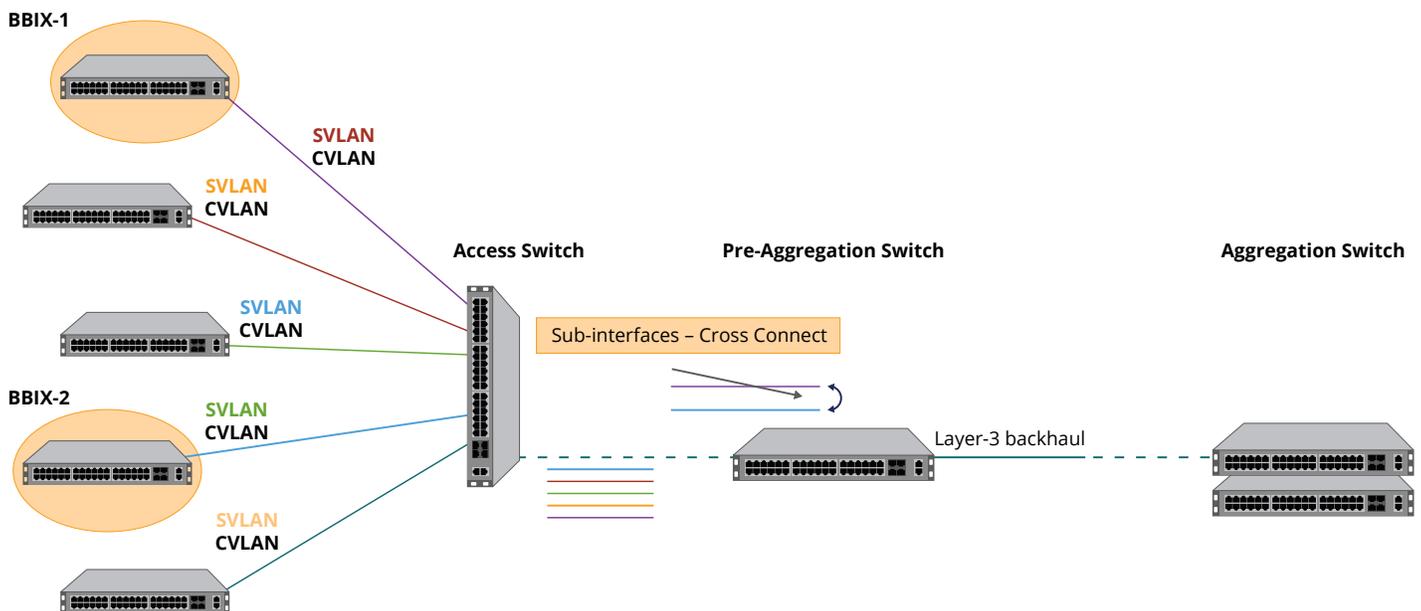
A typical use case is that of using OcNOS as an access switch connected to multiple customers being identified by S and C VLAN combination. These C and S VLAN sub-interfaces can be mapped to different services provided by the OcNOS enabled switch. As the sub-interface supports basic access control feature like ACL and QOS feature (in roadmap), the customer end points or services can be controlled to the degree agreed.

As in the below picture the Access Switches connects to various customers and identifies them with a C-VLAN and S-VLAN combination, which are then backhauled over to a Pre-aggregation switch. In the pre-aggregation switch all the different customers are mapped to different sub-interfaces (or circuits). The pre-aggregation can be configured with the sub-interfaces in Layer 3 mode and then the service transported back to the Aggregation switch for further qualified services. This back-haul may be done as a IP transport or optionally tunneled using a MPLS circuit upto the Aggregation switch.



The sub-interface feature also supports a sub-feature called as VLAN cross-connects, this feature allows a one-to-one stitching between 2 sub-interfaces and packets to be tunneled amongst them. This is again a very useful feature in cases where customer end points or service end points need to be interconnected either because they are distance located or for redundancy reasons.

As in the topology below , the customer traffic switch at Location BBX-1 and BBX-2 located spread may need an transparent interconnect. This can be done by enabling Layer2 sub-interface cross-connect at the Pre-aggregation switch. In addition the cross-connect service allows to change the outer VLAN's at both ends of the circuits.



MPLS VPNv4, 6PE and 6VPE support with Inter AS Option A,B,C

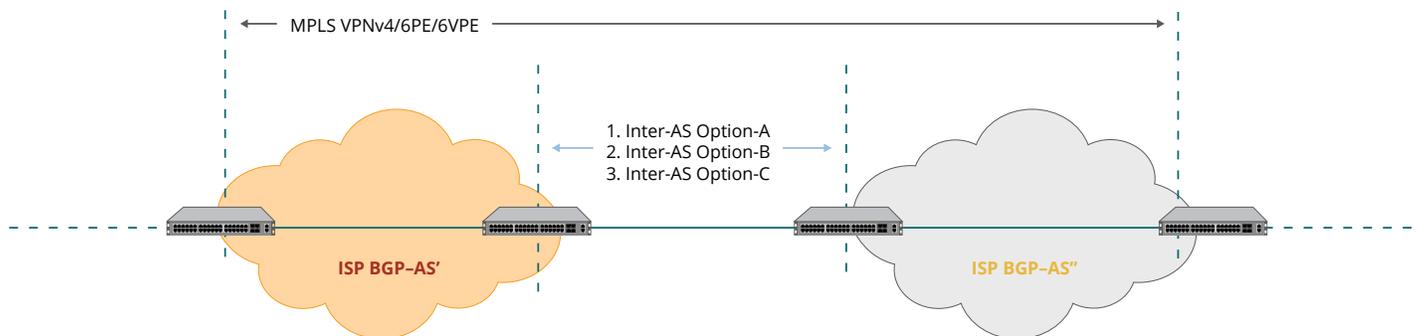
Generic Technology Description:

OcNOS Supports multiple Inter AS Option connectivity options, over which multiple MPLS services can be enabled like MPLS VPNv4, 6PE, 6VPE service.

Different Inter-AS Options allows for a degree of flexibility and ease to interconnect. With Inter-AS Option-C, OCNOS can be used for Seamless MPLS deployment end to end.

Besides connectivity to other Service Providers, Inter AS Option allows the flexibility to connect with existing infrastructure and extend it with new services offered by OcNOS. Inter-AS option with pure control plane forwarding allows for an extended scale without the use of BGP-LU. Using BGP-LU allows for much more scale and methods to stitch to existing incumbent vendors equipment if it supports BGP-LU.

6PE allows for IPv6 islands to be interconnected using a MPLS transport. With 6VPE OcNOS can support L3VPN functionality for IPv6 traffic but using IPv4 MPLS transport at the core. This expands the use of OCNOS to bridge new designed IPv6 networks over legacy IPv4 transport.



Inter AS MPLS VPNv4/6PE/6VPE

Use Case Description/General Description of the feature being used

6PE and 6VPE:

IPv6 over MPLS feature enables the service provider to bridge IPv6 enabled customers across a MPLS IPv4 VPN backbone. This can be done easily without any change to the internal infrastructure. It only requires the end PE's to support dual IPv4 and IPv6 stack enabled OCNOS feature set.

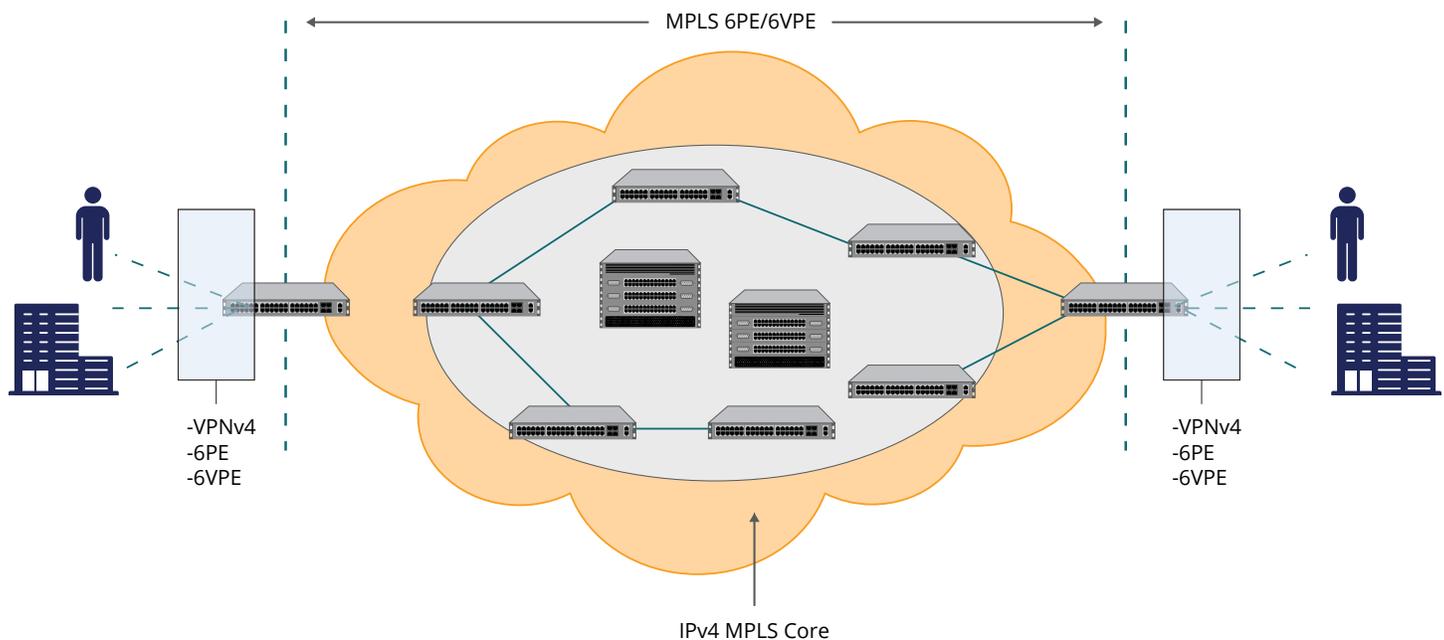
Advantages of 6PE and 6VPE:

- The ISP is able to provide IPv6 services without the need to upgrade the core infrastructure from IPv4 to IPv6.
- IPv6 enablement allows for more customer penetration and added services for the ISP.

Advantages of 6VPE over 6PE: 6VPE allows for MPLS VPNv6 services yet still retaining the old infrastructure of IPv4 core routers. This brings more service capability to the ISP, in addition to offering existing MPLS VPNv4 services the ISP can also offer IPv6 VPN services.

Both 6PE and 6VPE rely on using Multiprotocol BGP extension to exchange the reachability information for IPv6 prefixes and also uses BGP to exchange the labels being used to identify the prefix ranges across the end PE's.

The transport path continues to rely on the MPLS IPv4 tunnel being setup by LDP, RSVP or BGP-LU based paths.



Inter AS Option A, B and C

Inter AS connectivity options are varied, with basic IP-VRF or VLAN based interconnect as in Option A to more advanced connectivity options based on using MPLS or BGP-LU as an interconnect method, called as Option-B and Option-C respectively.

Option B and Option C rely on the need for support of additional feature enhancements over BGP. These features are;

1. Support for BGP next hop unmodified over EBGP session when working as a Route reflector – required for Option-C.
2. Support to accept VRF routes without RT/RD import filters -required for Option -B, as the ASBR routers do not terminate VPN sessions over a VRF.
3. Stitching of LDP/RSVP tunnels to BGP-LU tunnels – required for both Option-B and Option-C.

OcNOS can support Inter-AS connectivity for MPLS VPNv4 , 6PE and 6VPE services. The PE can additionally provide these services over a sub-interface for increased service density. Interface level features such as ACL & QOS(for sub-interfaces in roadmap), can be enabled to provide controlled services as per agreement to the end customers.

ABOUT IP INFUSION

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