



# Fabric Connects Key Capabilities

How to leverage the full value of your current or upcoming investment

# INTRODUCTION

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Did you know that the average smart phone user utilizes only a small percentage of the total features accessible to them?

What about your network? **Are you leveraging your Fabric Connect network to its full potential?** With networking requirements changing rapidly, there might be features that are more relevant today, than when you first deployed your network.

This eBook talks about the major capabilities available within the Fabric Connect technology. The intent is to make you aware of functionality that you may not be leveraging today, so that you can get the most value out of your strategic investment!

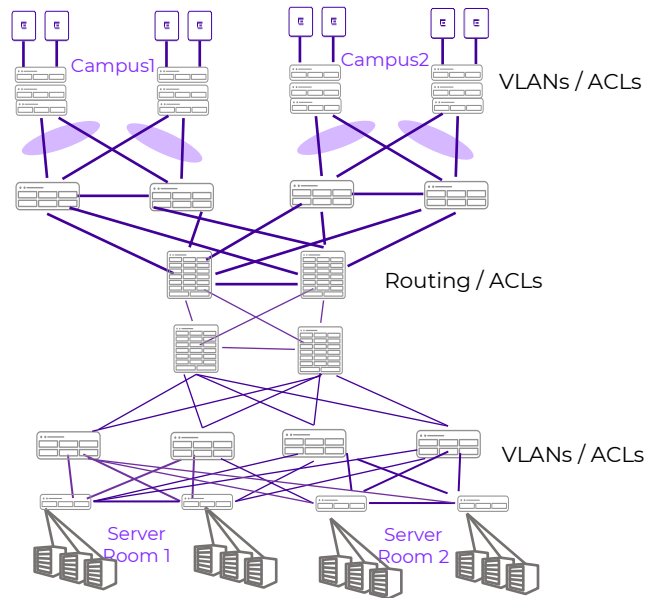
If you are just getting started with Fabric Connect, this eBook will help get you acquainted with the technology – but also to **really** get to know Fabric Connect - there is nothing better than getting hands-on experience through one of our Fabric Connect Virtual Workshops. Contact your Extreme sales representative to learn more.

# WHAT IS FABRIC CONNECT?

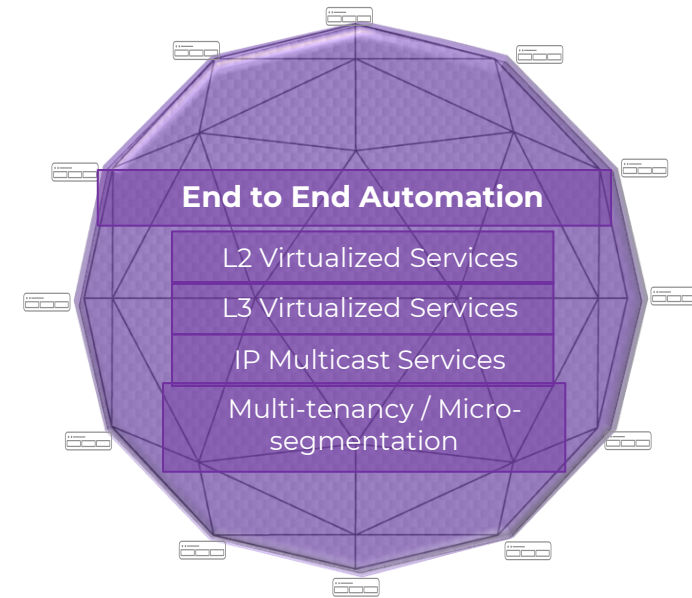


**A simpler way to design, deploy, manage and troubleshoot networks**

**Traditional Network:**  
Rigid and complex



**Fabric Connect:**  
Simple, agile, cloud-driven



**“A single, business wide fabric will become the de facto architecture to support modern digital imperatives.” - Forrester Research**

# HOW IT MEETS YOUR BUSINESS IMPERATIVES

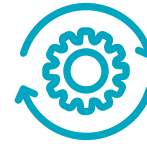


## DRIVE YOUR TOPLINE



11x Faster time  
to Service

## IMPROVE OPERATING EFFICIENCY



Implicit  
Automation



Advanced  
management



## REDUCE RISK

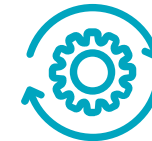


Segmented at Scale  
with a Stealth  
Topology

## ENHANCE CUSTOMER EXPERIENCE



Industry's Best  
Multicast



Network and  
application insights

# 10 THINGS TO KNOW



1. It is based on enhanced Shortest Path Bridging (IEEE 802.1Q-2018 clause 27/ IETF 6329)
2. **One** control plane for any type of network service
3. All services are only ever configured at the Fabric edge and can optionally be dynamically provisioned as users, devices and VMs connect to the network through NAC.
4. Services extend and retract as users and devices connect and disconnect from the network.
5. Fabric infrastructure is completely self-forming and self-provisioning
6. Offers scalable, secure multi-tenancy and network segmentation with ease
7. Stealth topology prevents the use of IP scanning and ensures true isolation between services.
8. Offers the simplest, most scalable and most resilient multicast without PIM/DVMRP
9. Extends network-wide from Data Center to remote branch
10. Is field-proven with thousands of global deployments in the most mission critical environments (nuclear power plants, air traffic control, hospitals) with fabrics networks that literally span the globe.

# HOW WE ARE ADVANCING THE TECHNOLOGY



1. ENHANCED  
AUTOMATION



2. FABRIC TO  
THE EDGE



3. CLOUD  
MANAGEMENT

# FABRIC CONNECT KEY CAPABILITIES

# KEY CAPABILITIES

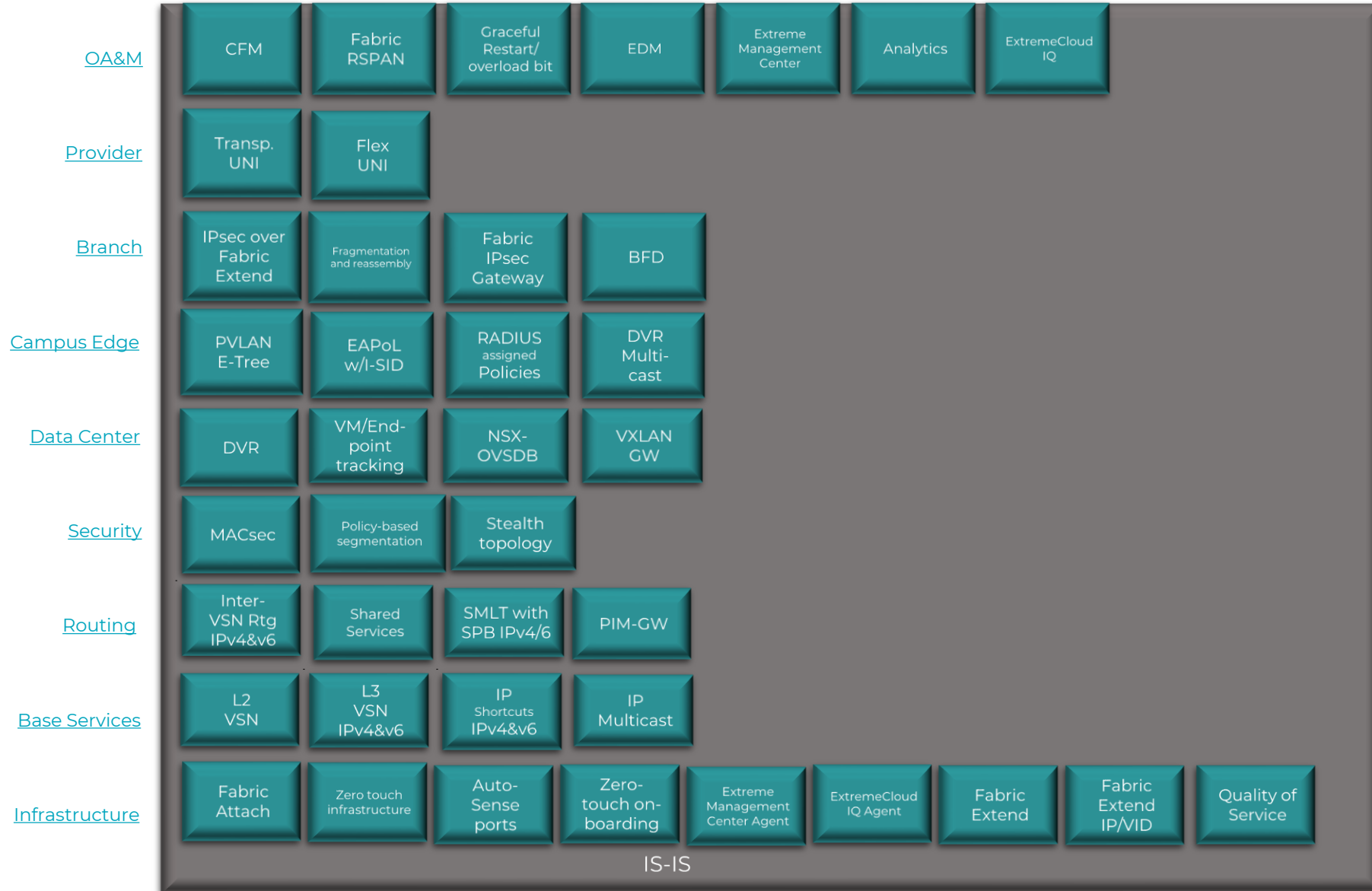


This eBook breaks down the major generally available Fabric Connect features by use case.

Although many of these features can fit into more than one use case, we have chosen just one to prevent duplication.

For each use case there will be an intro to each section and then each feature will be described with its associated value.

Each section as well as feature is hyper-linked for ease of navigation through the book.





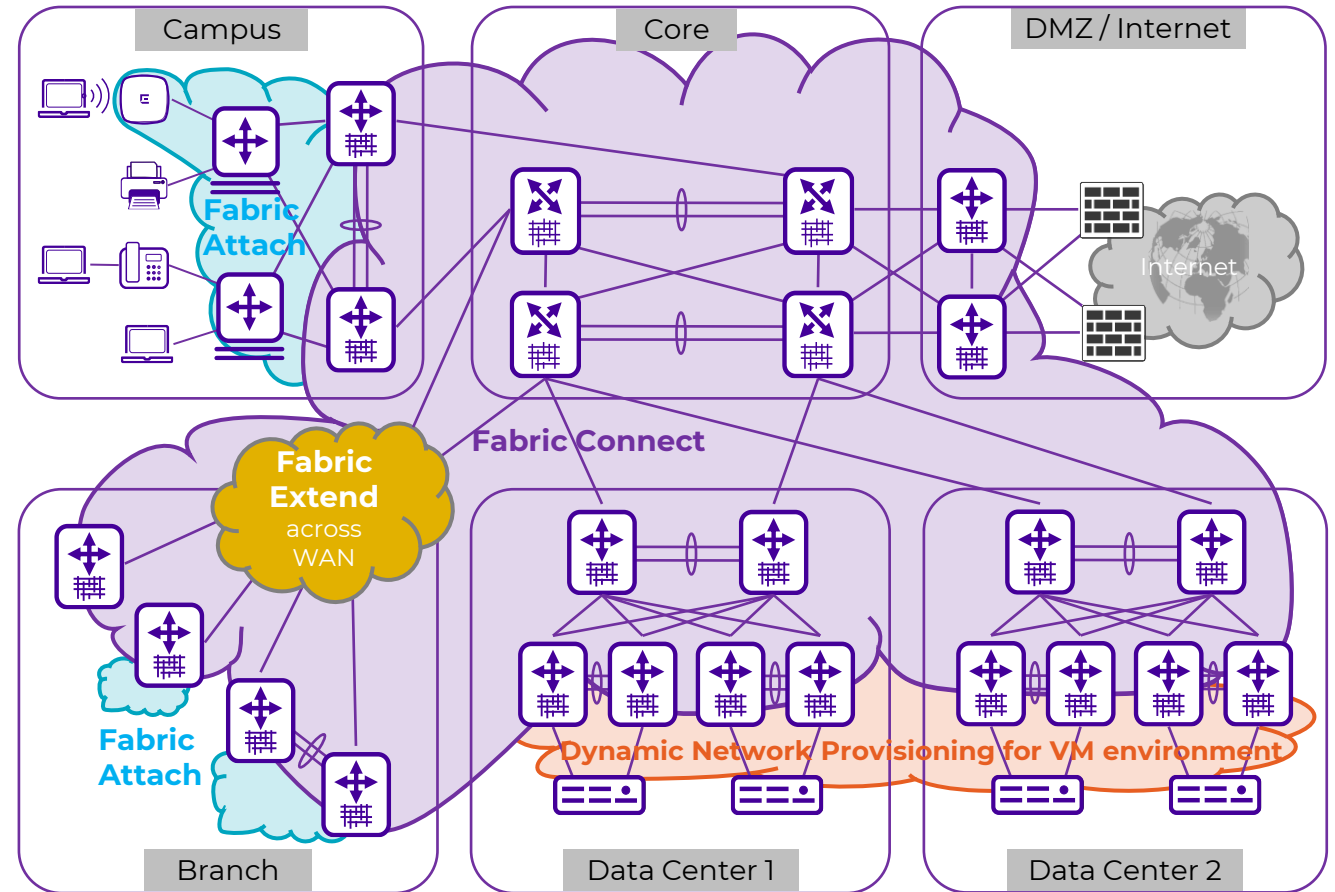
# FABRIC CONNECT INFRASTRUCTURE CAPABILITIES

# FABRIC CONNECT INFRASTRUCTURE BASICS



## Building network-wide fabrics consists of:

- FC: Fabric Connect
  - IEEE 802.1aq Shortest Path Bridging (SPB) – RFC 6329
  - IEEE 802.1ah Provider Backbone Bridges (Mac-in-Mac)
- FA: Fabric Attach
  - IEEE 802.1Qcj Automatic Attachment to Provider Backbone Bridging
- FE: Fabric Extend
  - Over the WAN or IP transport using VXLAN – RFC 7348



# FABRIC CONNECT INFRASTRUCTURE BASICS



## Understanding the technology foundations:

Control Plane: Based on IS-IS

Service Abstraction Layer: Service Instance ID (I-SID) which is used to uniquely define a Fabric Connect Virtual Service Network (VSN).

Data Plane: IEEE Provider Backbone Bridges (Mac-in-Mac) (IEEE 802.1ah)

## Fabric Connect Frame

(User/ device MAC addresses are completely hidden from the core)



### Backbone:

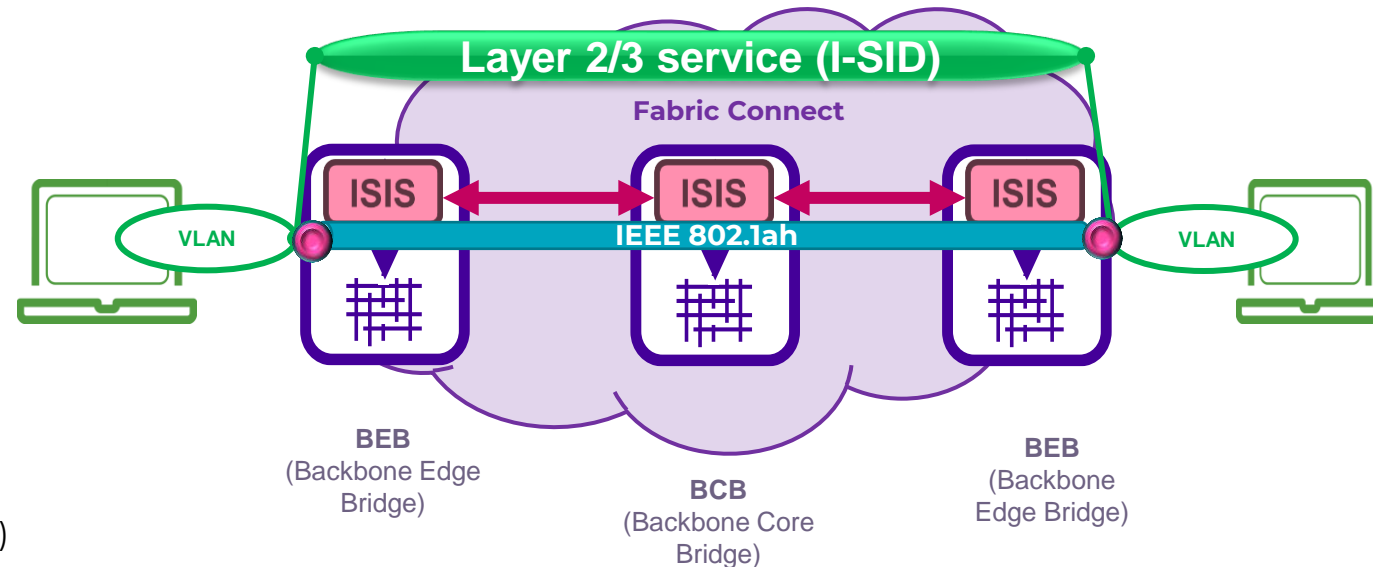
B-DA: Destination MAC Address  
B-SA: Source MAC Address  
B-VID: VLAN ID

### Customer:

C-DA: Destination MAC Address  
C-SA: Source MAC Address  
C-VID: VLAN ID

### I-SID

Service virtualization/ abstraction  
Unique identifier for Fabric Connect Virtual Service Networks



Backbone Edge Bridges: Fabric Connect services originate and terminate

Backbone Core Bridges: No services originate or terminate.

# FABRIC ATTACH OVERVIEW



## Extending Fabric Connect to the edge with Fabric Attach

### WHAT IS IT?

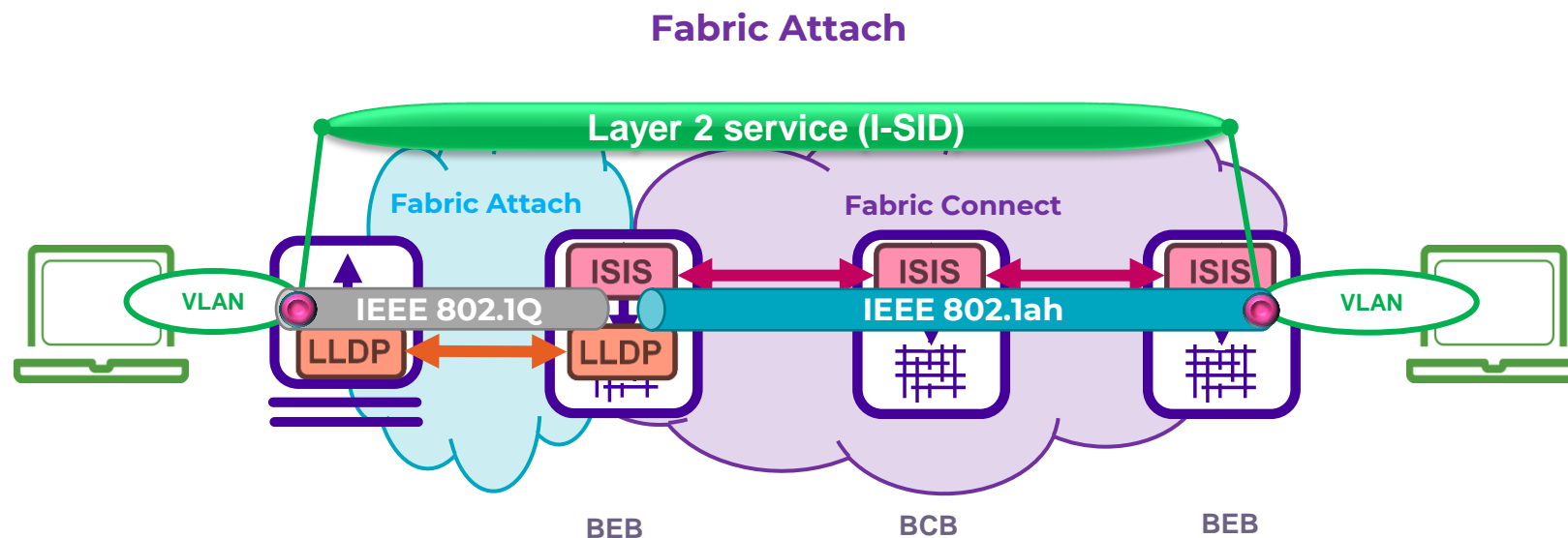
- Fabric Attach provides for automatic attachment of users, devices, and VMs to connect to I-SIDs.
- It uses extensions to the IEEE 802.1AB Link Layer Discovery Protocol (LLDP) to automatically attach network devices to I-SIDs or VSNs in a Fabric Connect network.

### WHAT IS THE VALUE?

- Edge automation with dynamic auto-attach
- Enables non-Fabric Connect enabled access layer switches and APs to communicate seamlessly with the fabric.

### REQUIREMENTS:

- VOSS v5.0 for FA server capabilities; select switches, APs and endpoints for proxy/client



**Did you know?** Fabric Attach is currently being standardized as IEEE 802.1Qcj

## Understanding the technology foundations:

Fabric Attach Control Plane: LLDP (with extensions)

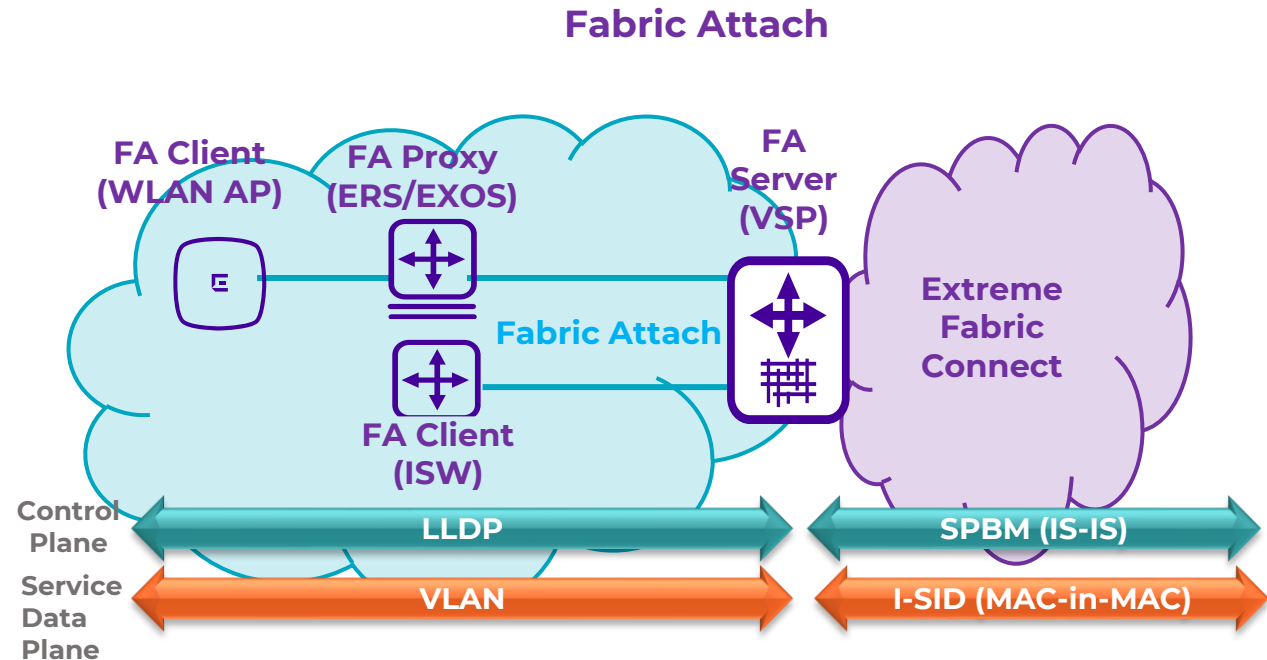
Fabric Attach Data Plane: VLAN

## Fabric Attach Elements:

**Fabric Attach Server:** VSP switches that receive requests to create and map VLANs to I-SIDs (VSNs).

**Fabric Attach Proxy:** Wiring closet switches (ERS or EXOS) that connect to an upstream FA Server device.

**Fabric Attach Client:** Can be WLAN access points, OpenvSwitch compatible hypervisors or end points, Industrial Ethernet switches (ISW or other) or IP cameras that are running the FA agent.



# ZERO-TOUCH INFRASTRUCTURE



## WHAT IS IT?

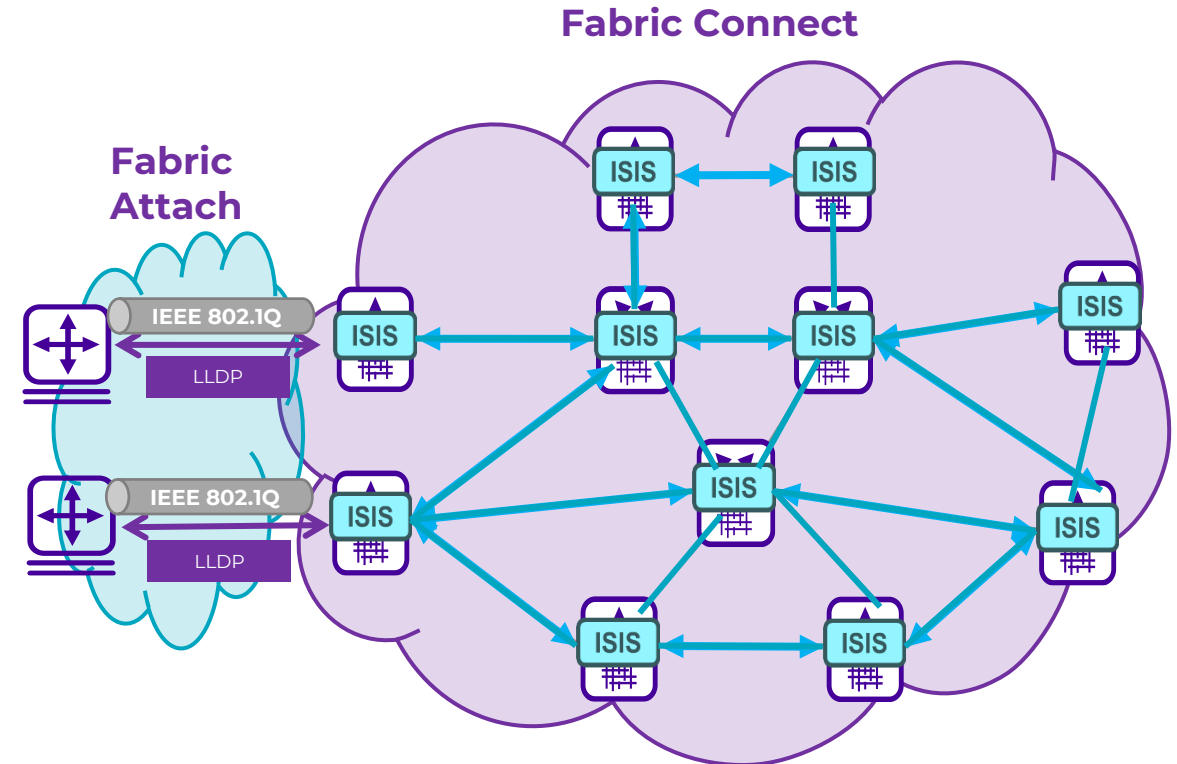
- Enables Fabric Connect/ Fabric Attach networks to self-form and self-provision without manual intervention.
- Enabled through port auto-sensing capabilities (see page 13)

## WHAT IS THE VALUE?

- True plug and play infrastructure deployment
- Eliminates the need for technical on-site resources when deploying new switches remotely.

## REQUIREMENTS:

- VOSS v8.3



## How does it work?

- Fabric-enabled devices automatically exchange IS-IS area and B-VIDs
- Fabric Connect NNIs and Fabric Attach peering links are dynamically provisioned

# AUTO-SENSE PORTS



## WHAT IS IT?

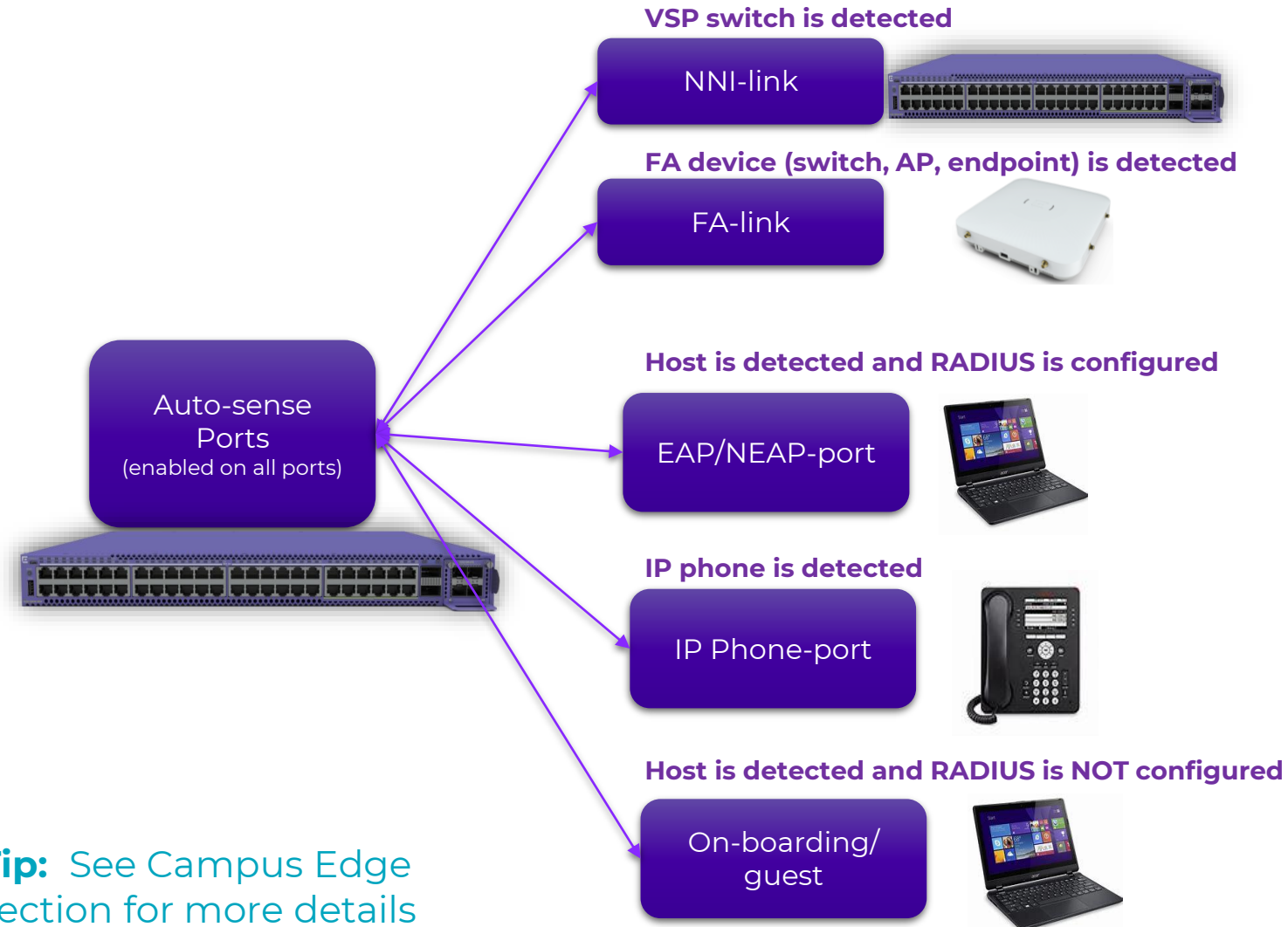
- It enables switch ports to auto-detect what is connected to it and provision it dynamically without any manual intervention.

## WHAT IS THE VALUE?

- Simple automation
- True plug and play deployments

## REQUIREMENTS:

- VOSS v8.3



**Tip:** See Campus Edge section for more details

# ZERO TOUCH ON-BOARDING OVERVIEW



## WHAT IS IT?

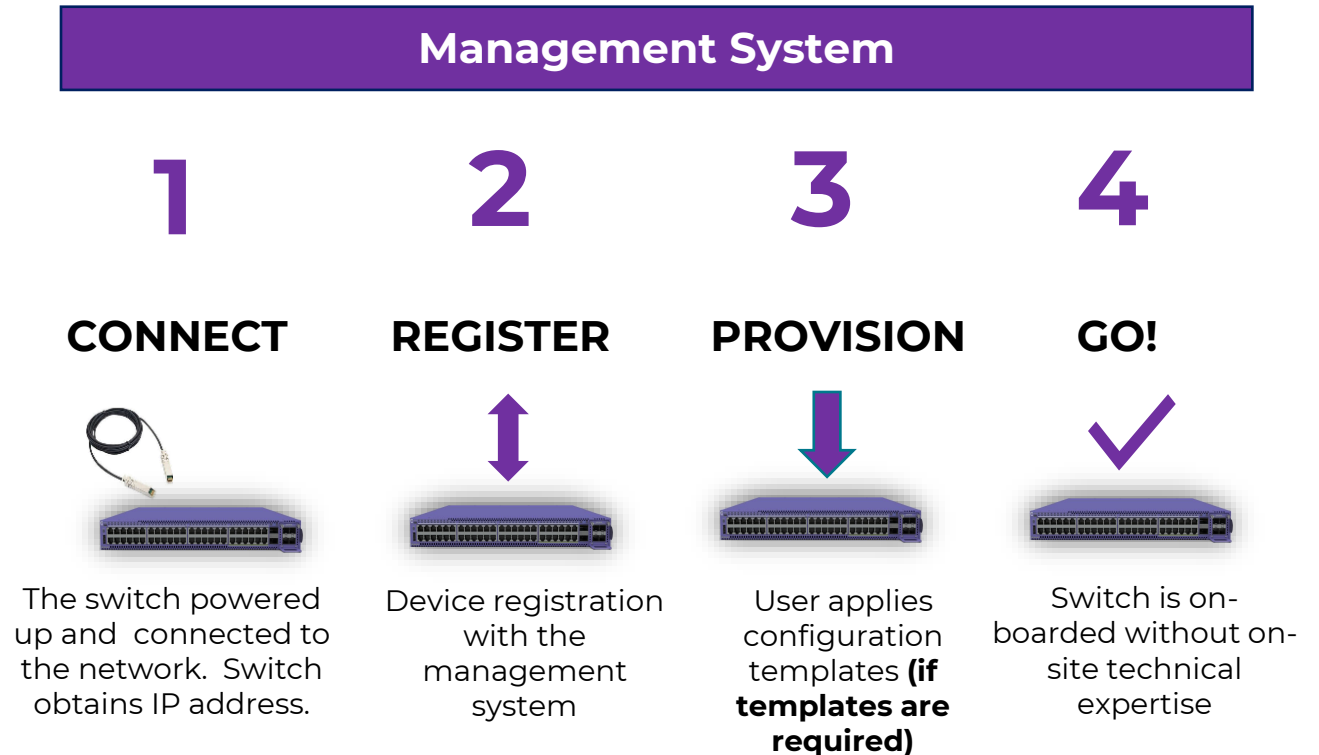
- Enables Fabric Connect devices to on-board to either the Extreme Management Center or ExtremeCloud IQ management systems through a secure on-boarding service that is dynamically established.
- Enabled by ExtremeCloud IQ and Extreme Management Center agent capabilities (see page 16 and 17)

## WHAT IS THE VALUE?

- Simplified deployment
- Eliminates the need for technical staff to be physically on-site for new hardware deployment.

## REQUIREMENTS:

- VOSS v8.3





# EXTREMECLLOUD IQ AGENT



## WHAT IS IT?

- ExtremeCloud IQ Agent enables NOS persona selection (on Universal Switches), device onboarding, NOS upgrades and simple edge device configurations to be applied to Fabric Connect / Fabric Attach devices

## WHAT IS THE VALUE?

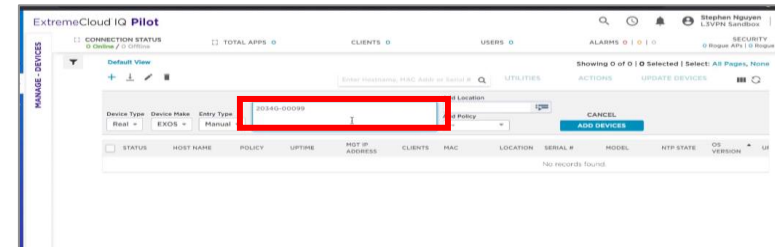
- Cloud-based device monitoring
- Simplified license management
- Ease of management and deployment
- Single pane of glass with cloud-wireless products

## REQUIREMENTS:

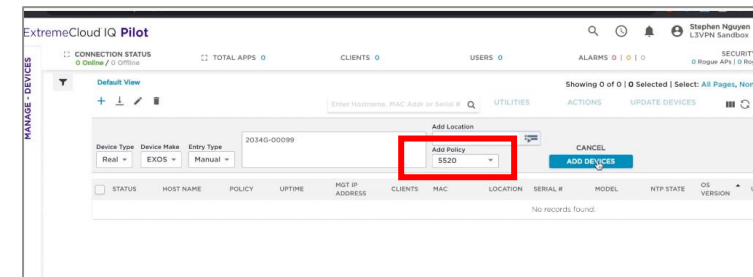
- VOSS v8.2

## ExtremeCloud IQ Onboarding Example

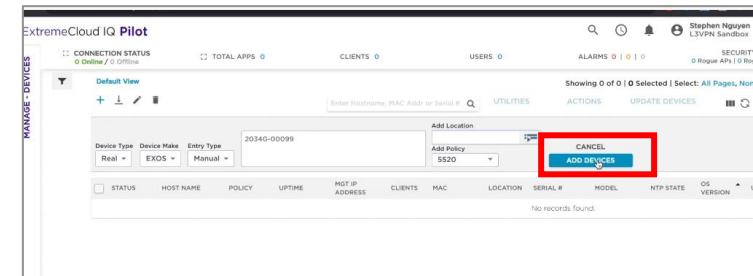
### Enter the device serial number



### Apply policy/ configuration template



### Add device to the network



# Extreme Management Center AGENT



## WHAT IS IT?

- Automates the secure on-boarding of devices to the Extreme Management Center centralized management system.

## WHAT IS THE VALUE?

- Enables NOS upgrades, device authentication and base configurations to be applied.
- Simplified deployment/ configuration
- Eliminates the need for technical staff to be physically on-site for new hardware deployment.

## REQUIREMENTS:

- VOSS v8.2.5

## New devices are automatically discovered

IP Address	Connected IP Address	Family	Type	Serial Number	Base MAC
10.3.222.42	10.3.222.42	VSP Series	VSP-8284XSQ	14JP202C100Y	b0.ad.aa.43.43
10.3.222.210	10.3.222.23	VSP Series	VSP-4450GSX...	16JP1160E521	
1828N-80006		Extreme Ac...	XA1480	1828N-80006	dc:b8:08:be:d4:00
1828N-80007		VSP Series	VSP-4900-48P	1828N-80007	00:04:96:b0:08:00
1828N-80005		Extreme Ac...	XA1440	1908C-W0005	dc:b8:08:b5:30:00
1828N-80008		ERS Series	ERS5928GTS	XLIR724T210008	B0:AD:AA:FC:90:01
10.101.3.115	10.101.3.125	ERS Series	ERS5928GTS	XLIR724T210008	B0:AD:AA:FC:90:01

## They are put in a “Pending Edit” Status until configured with the appropriate templates

Type	Serial Number	Base MAC	Profile	Status
VSP-4450GSX...	16JP1160E521		public_v1_Profile	ZTP+ Complete
Extreme Ac... XA1480	1828N-80006	dc:b8:08:be:d4:00	public_v2_Profile	ZTP+ Pending Edit
VSP-4900-48P	1828N-80007	00:04:96:b0:88:00	public_v2_Profile	ZTP+ Pending Edit
Extreme Ac... XA1440	1908C-W0005	dc:b8:08:b5:30:00	public_v2_Profile	ZTP+ Image upgrade
ERS Series	XLIR724T210008	B0:AD:AA:FC:90:01	BOSS_v1_Profile	ZTP+ Complete

# FABRIC EXTEND OVERVIEW



## WHAT IS IT?

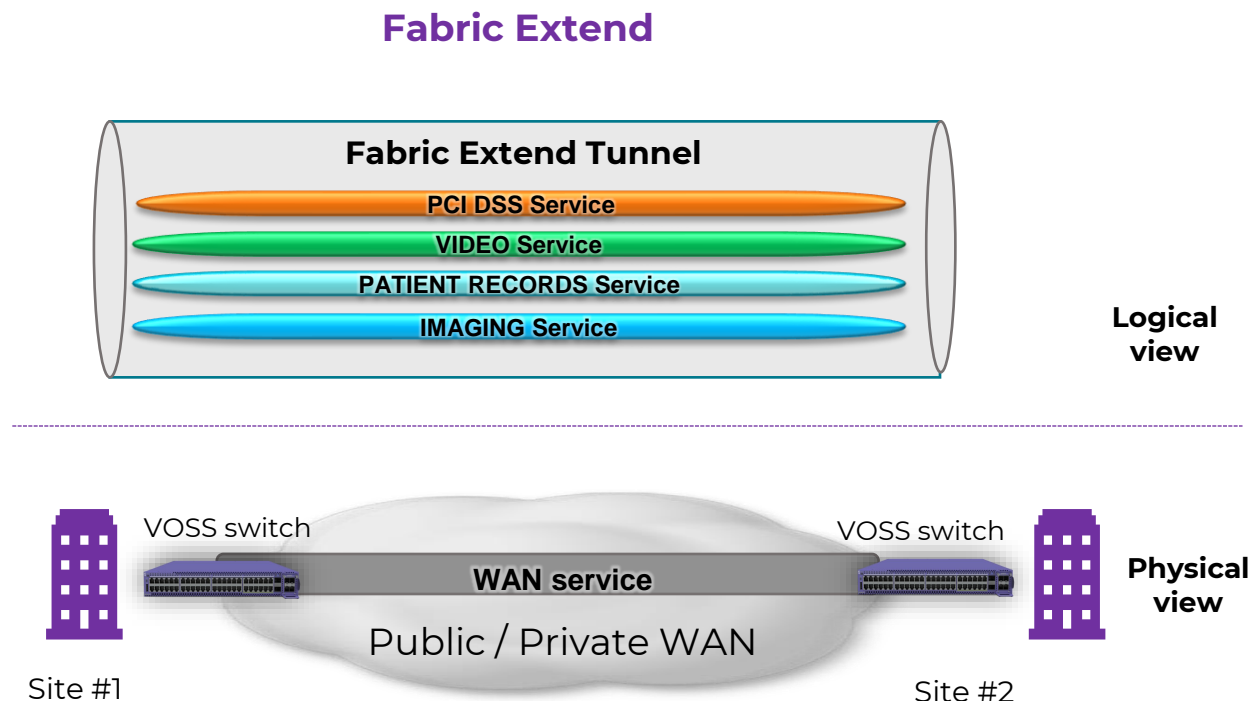
- Fabric Extend allows you to connect islands of fabrics into a single fabric over a Public/Private WAN/MAN infrastructure.

## WHAT IS THE VALUE?

- Ability to save money in WAN costs by tunneling multiple services/ networks within a single service
- Seamless extension of Fabric Connect services across geographically dispersed sites.

## REQUIREMENTS:

- VOSS 5.0



# FABRIC EXTEND: IP AND VID



## WHAT IS IT?

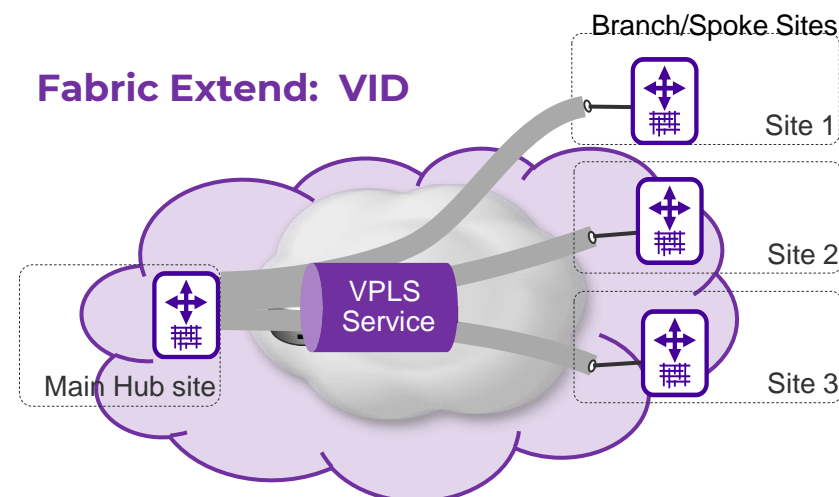
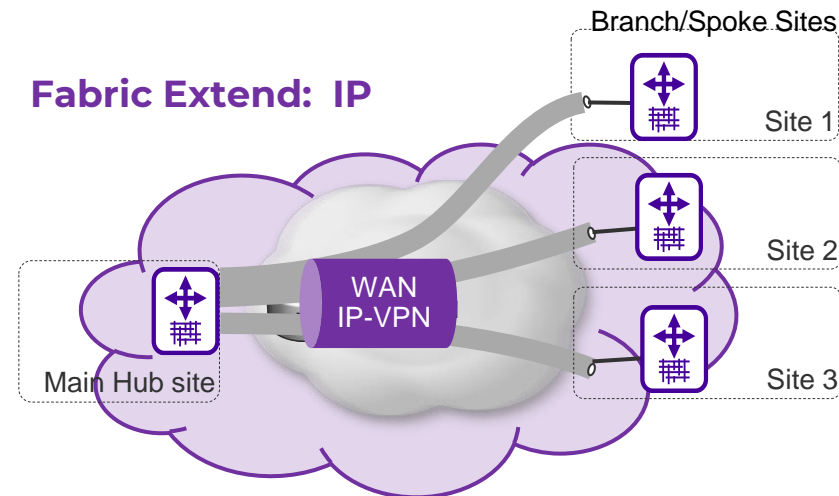
- There are two different types of Fabric Extend tunnels depending on whether transport is over a service provider IP-VPN service (FE IP) or over a L2 VPLS service (FE VID).

## WHAT IS THE VALUE?

- Enables flexible WAN service deployment (L2 or L3)
- No requirement for the service provider network to participate in the customer IP route advertising.
- Transparent extension of IP multicast to the branch.

## REQUIREMENTS:

- VOSS 5.0



## WHAT IS IT?

- Fabric Connect enabled switches are both DiffServ and 802.1Q-Tag / 802.1p-bit aware and leverage an 8-class queuing model.
- If the traffic is being forwarded within an L2 VSN, the Ethernet p-bits will be used to define the priority. If the traffic is being forwarded within an L3 VSN, the DSCP markings will define the priority.
- Across the Fabric Connect backbone, the MAC-in-MAC header always carries the p-bits in the Backbone VLAN Q-tag and a Drop Eligible Bit to determine the per hop behavior across each transport node.

## WHAT IS THE VALUE?

- Priority of mission critical L2/3 traffic across the Fabric Connect Network.

## REQUIREMENTS:

- VOSS v3.0 with enhancements up to v7.1.0

Class of Service and ERS/VSP naming	Description
COS 7 Network/ Critical	Network Control – Strict Queue, 5-10% shaped
COS 6 Premium	Real Time Voice – Strict Queue, 50% shaped
COS 5 Platinum	Real Time Video – WRR Queue
COS 4 Gold	Non-Real Time Streaming – WRR Queue
COS 3 Silver	Non-Real Time – WRR Queue
COS 2 Bronze	Best Effort – WRR Queue
COS 0 Custom	Scavenger – Low Priority Queue

# FABRIC CONNECT BASE SERVICES

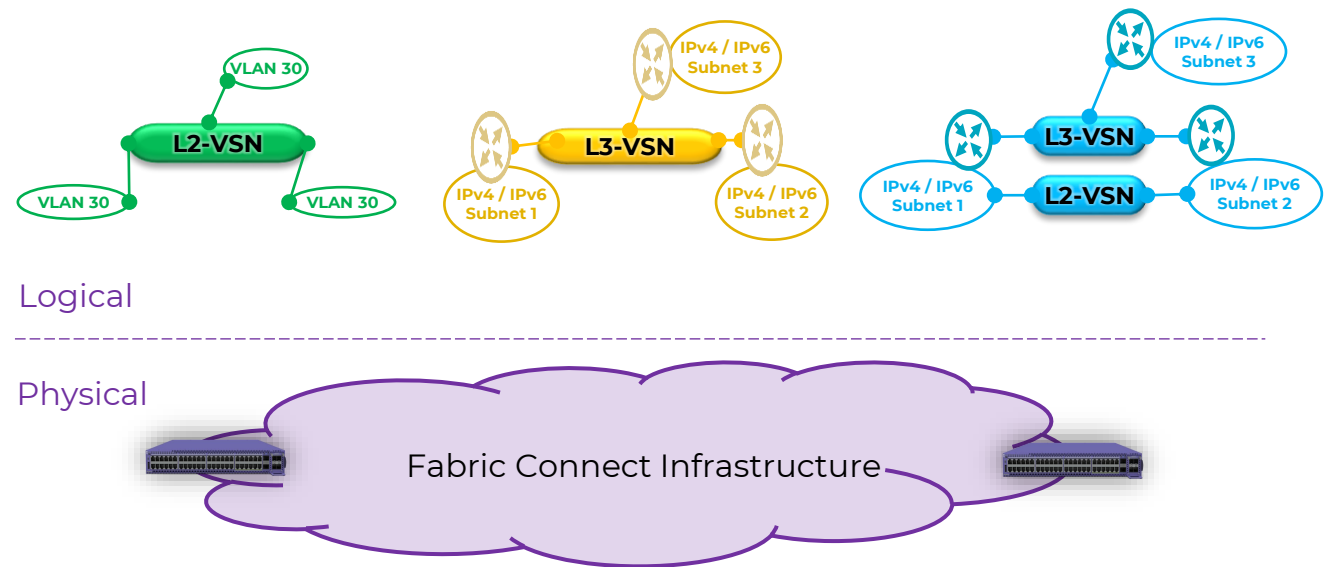
# FABRIC CONNECT SERVICES BASICS



## Key Benefits:

- Fabric Connect provides the entire suite of today's Layer 2 and Layer 3 (IPv4/6) connectivity services but implements them in a far simpler way than traditional networks.
- All Fabric Connect services are based on a single control plane (IS-IS)
- Users, IoT and applications reside in Virtualized Service Networks
- The underlying Fabric infrastructure is decoupled from the Virtualized Service Networks allowing for increased flexibility in deploying / changing services.
- Virtual Service Networks are completely isolated from one another and run as ships in the night over the Fabric infrastructure.

## Fabric Connect Virtualized Services



# LAYER 2 VIRTUAL SERVICE NETWORKS



## WHAT IS IT?

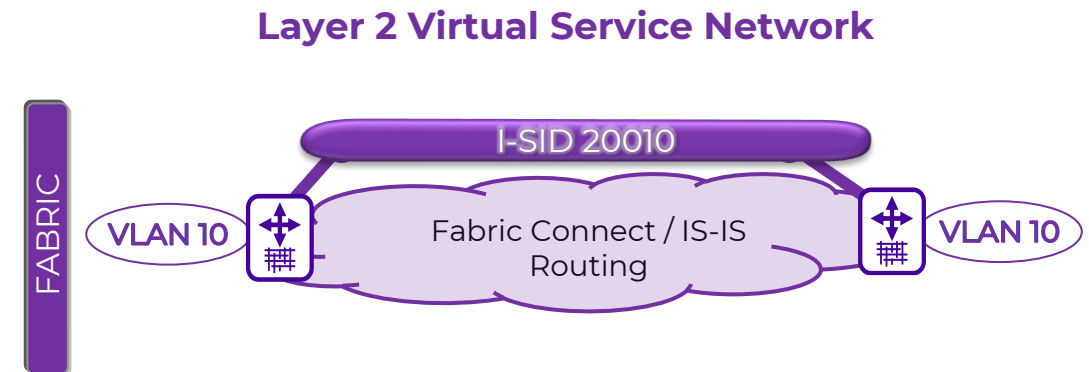
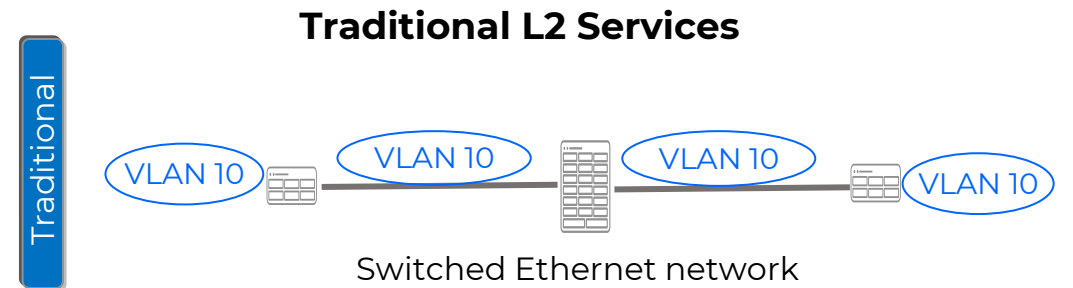
- The ability to stretch a VLAN to any point in the network
- Support for E-Line (point-to-point), E-LAN (any-to-any) and E-Tree (hub and spoke) services

## WHAT IS THE VALUE?

- Edge provisioning only
- Scalability of Layer 2 services

## REQUIREMENTS:

- VOSS v3.0





# LAYER 3 VIRTUAL SERVICE NETWORKS



## WHAT IS IT?

- The ability to use VRFs to support multi-tenancy and / or network segmentation with fully segmented routing tables

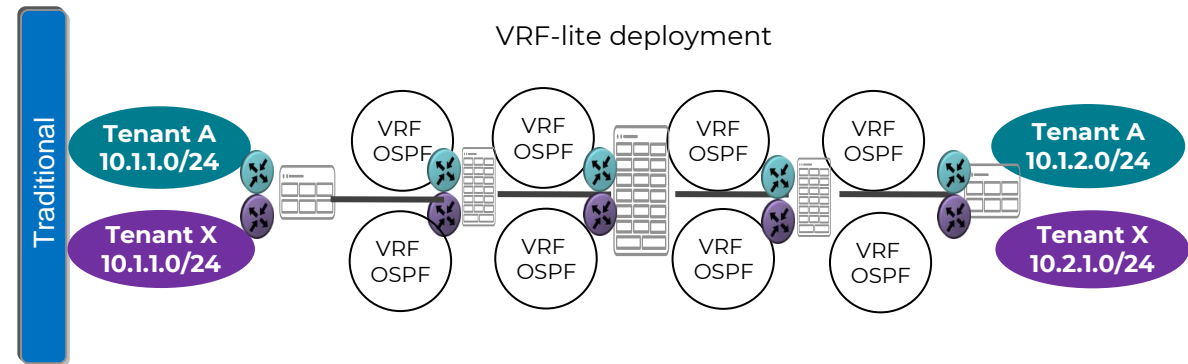
## WHAT IS THE VALUE?

- Edge provisioning only
- Scalability of Layer 3 VPN services
- Functionality of a MPLS IP-VPN without the complexity

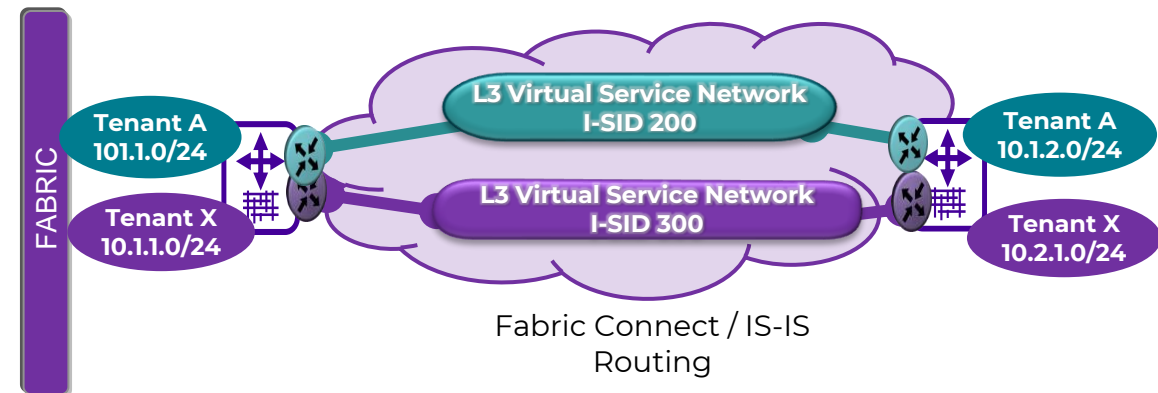
## REQUIREMENTS:

- VOSS v3.0 / higher scaling in v6.0; requires a premier license to activate.

### Traditional IP-VPN Services



### Layer 3 Virtual Service Network

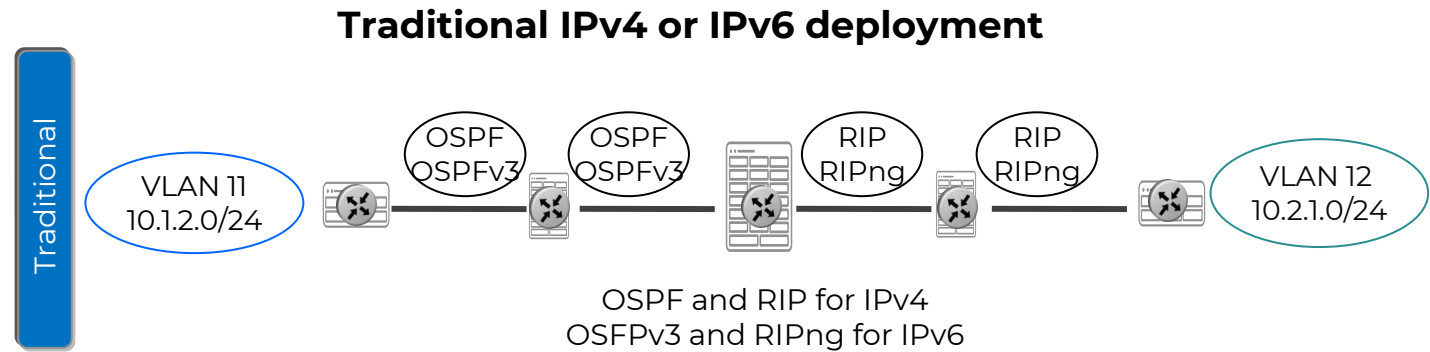


# IPv4/6 SHORTCUTS



## WHAT IS IT?

- The ability to efficiently route traffic through the fabric using the Global Routing Table. Rather than a route look-up at every hop; traffic is efficiently switched across the fabric.



## WHAT IS THE VALUE?

- Edge provisioning only
- A single routing instance for IPv4 and IPv6 for efficient IPv4 to IPv6 migration / co-existence.



## REQUIREMENTS:

- VOSS v3.0

## WHAT IS IT?

- The ability to support multicast traffic across the fabric without needing to deploy complex legacy multicast protocols. Multicast traffic can be constrained within either IP Shortcuts, L2 VSNs or L3 VSNs.

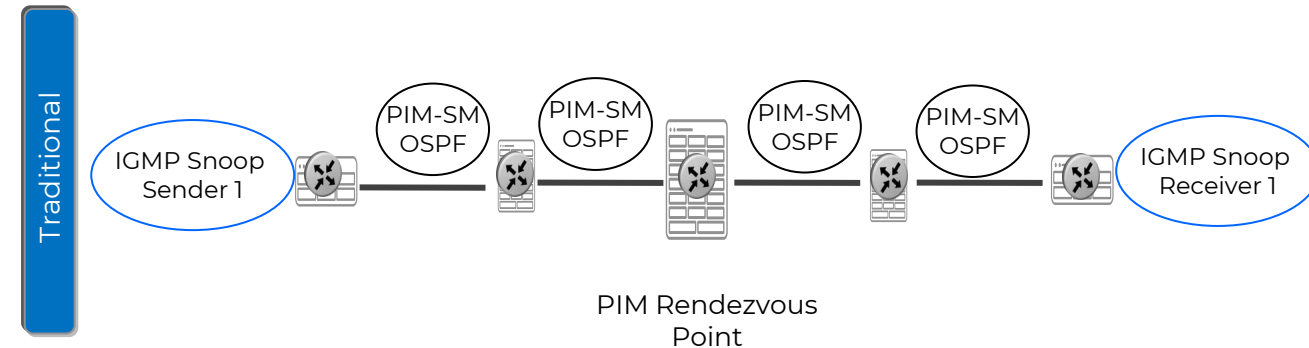
## WHAT IS THE VALUE?

- Edge provisioning only
- Eliminates the need for complex, slow and erratic protocols such as PIM and DVMRP
- Performance, scale, ease of deployment
- Unique in the industry!

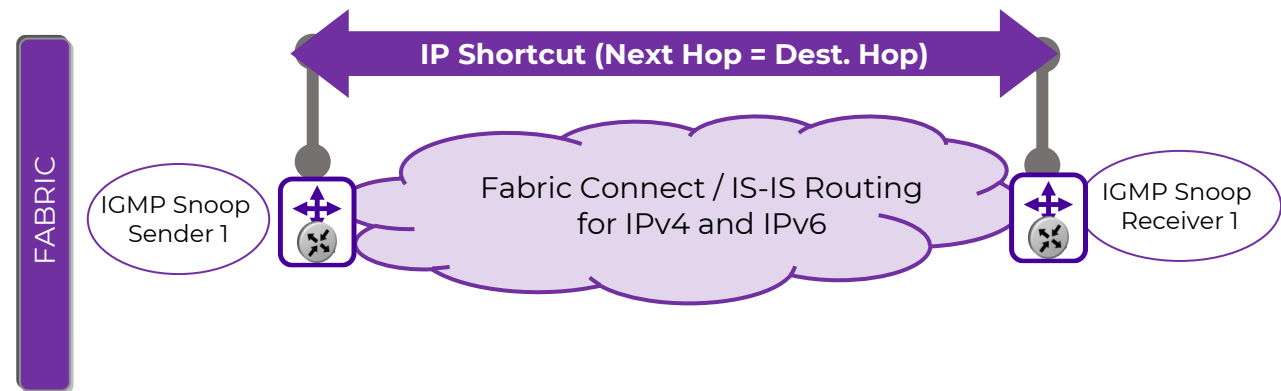
## REQUIREMENTS:

- VOSS v3.1, increased scale v6.0; premier license is required when multicast is constrained within a L3 VSN

## Traditional multicast deployment



## Multicast across a Fabric Connect Network



**\*Multicast can also be virtualized within a L2/L3 service**

# FABRIC CONNECT ROUTING CAPABILTIES

# INTER-VSN ROUTING FOR IPv4/v6



## WHAT IS IT?

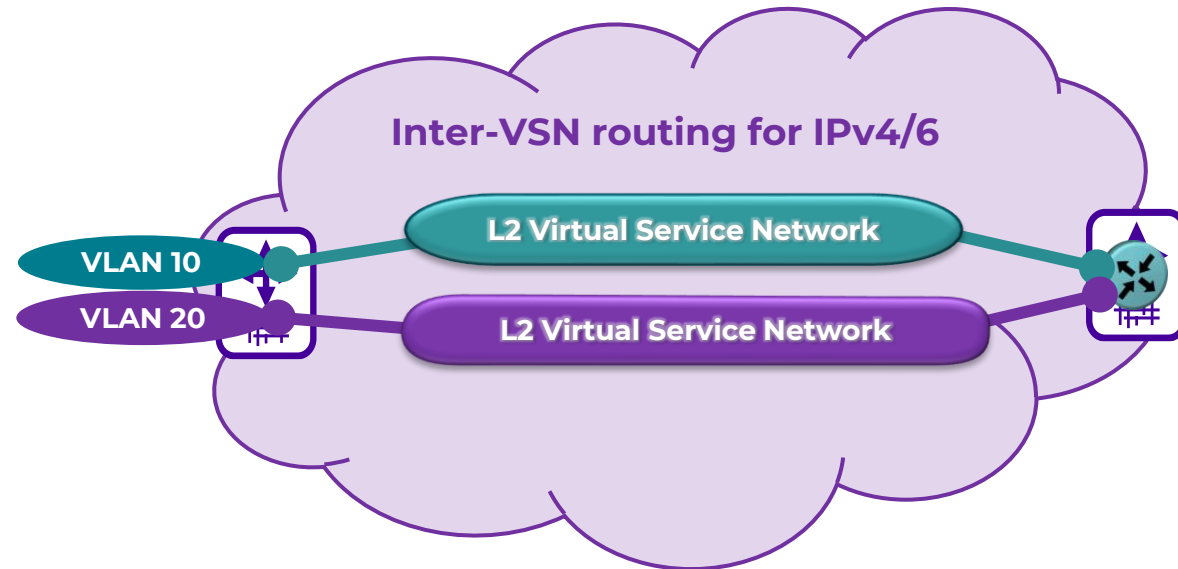
- The ability for any VSP node to be able to route between two or more Layer 2 Virtual Service Networks using a VRF or Global Routing Table IP Shortcuts

## WHAT IS THE VALUE?

- Ease of implementation
- Flexible network design options.

## REQUIREMENTS:

- VOSS v3.0



VRF/ IP Shortcut enabled in order to route between VLANs/ L2 VSNs

# SHARED SERVICES BETWEEN TENANTS



## WHAT IS IT?

- Shared services between tenants are enabled by a feature called IS-IS Accept Policies that creates L3 Hub and Spoke topologies.
- It allows users on different Layer 3 VSNs to remain completely isolated from each other while still accessing shared services.

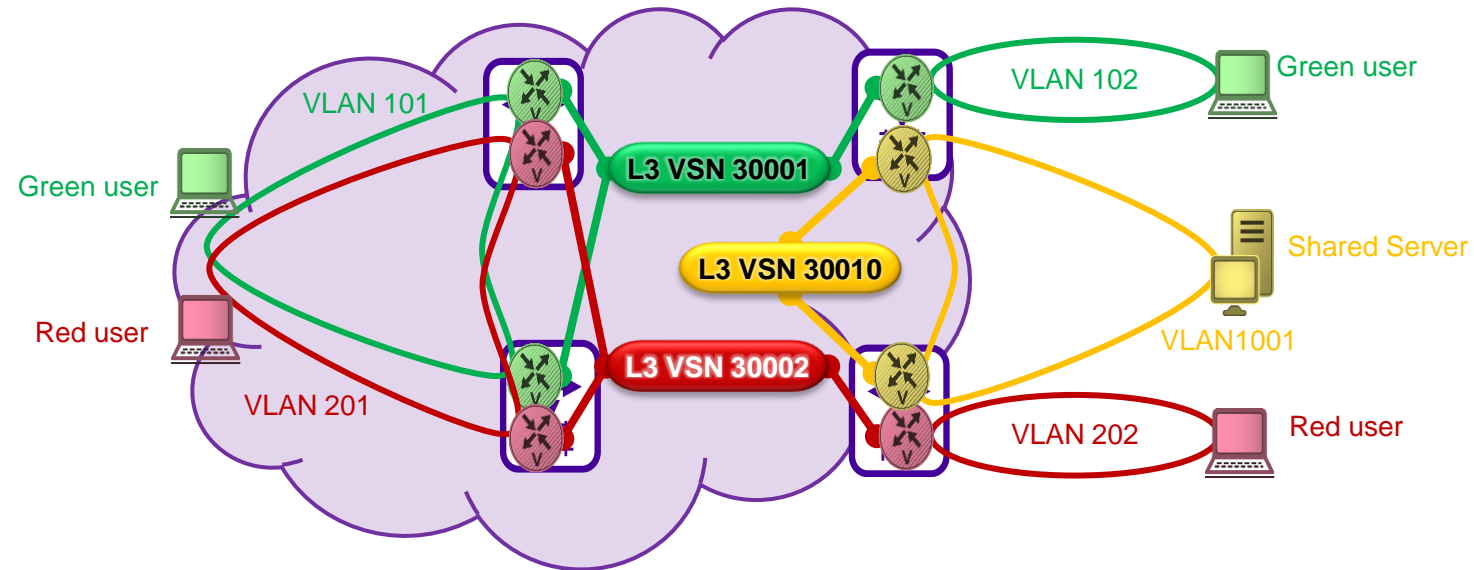
## WHAT IS THE VALUE?

- Efficient multi-tenancy since it allows different tenants to be completely isolated while safely accessing shared services.

## REQUIREMENTS:

- VOSS v4.1

Shared Services between Tenants  
in a Fabric Connect Network



# SMLT WITH FABRIC CONNECT IPv4/IPv6



## WHAT IS IT?

- Split Multilink Trunking provides active/active loop-free redundant paths for non-fabric devices attached to a Fabric Connect network.
- For active/active IP Gateway redundancy with SMLT (or across multiple SMLT domains), there are two options. VRRP with Back-up / Master extensions or Routed Split-Multilink Trunking.

## WHAT IS THE VALUE?

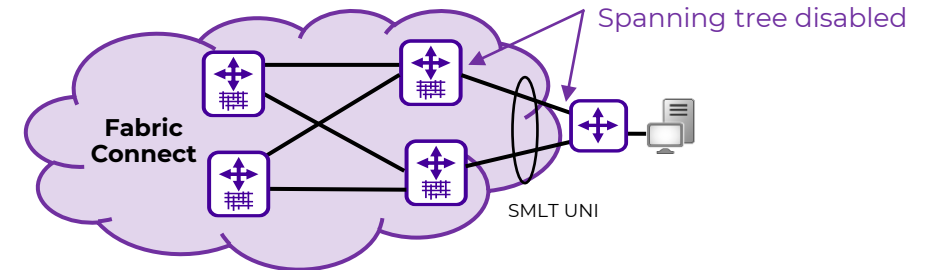
- Active/active connectivity for Layer 2 and Layer 3 traffic flows

## REQUIREMENTS:

- VOSS v4.2.1

## Fabric Connect with SMLT

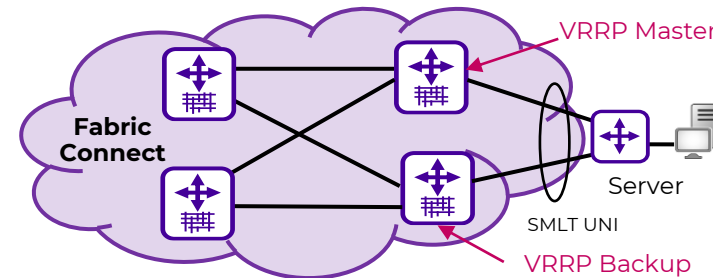
(active/active L2 connectivity)



## IP Gateway Redundancy Options

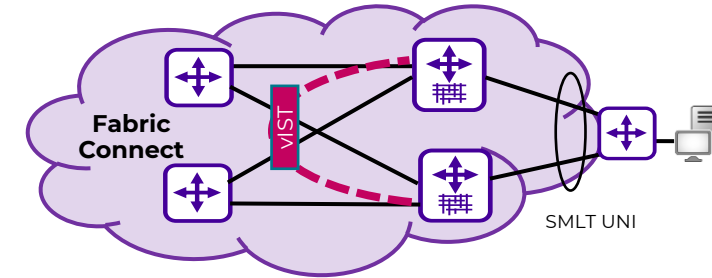
### SMLT with VRRP Back-up / Master

(active/active L2/3 connectivity)



### Fabric Connect with RSMLT IPv4/6

(active/active L2/3 connectivity)



**Did you know?** Distributed Virtual Routing can also be used as an alternative to VRRP and RSMLT for both Campus's and Data Centers. See pages 40 and 48 for details.

## WHAT IS IT?

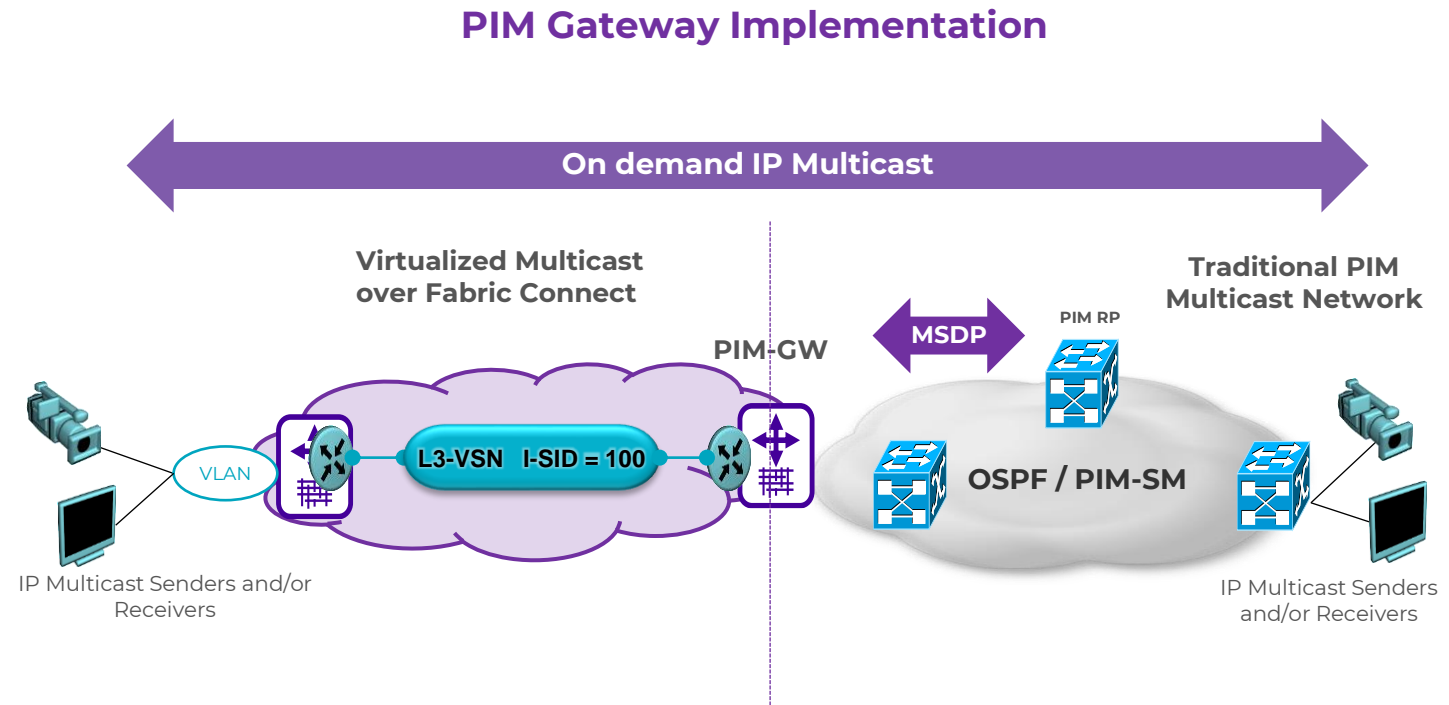
- The ability to connect any Fabric Connect L3 VSN or IP Shortcut to a PIM-SM or PIM-SSM domain.

## WHAT IS THE VALUE?

- IP Multicast Interworking between a traditional multicast network and a Fabric Connect network.
- Seamless migration / co-existence.

## REQUIREMENTS:

- VOSS v6.0





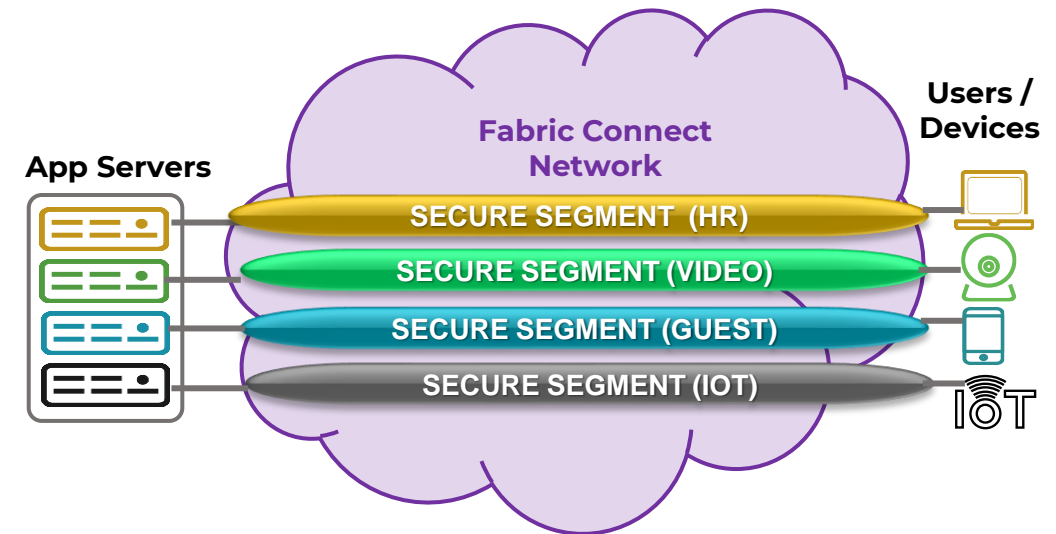
# SECURITY ATTRIBUTES

# FABRIC CONNECT SECURITY BASICS



## Key Benefits:

- Traffic separation is an essential component to network security. Fabric Connect offers the following capabilities:
  - Service separation/ segmentation: Fabric Connect Layer 2/3 VSNs are isolated by design. They run as ships in the night over the Fabric infrastructure. This isolation even allows for overlapping IP/MAC addresses between VSNs
  - Address separation: Is provided between the access and core. User/ device MAC addresses are completely hidden from the core of the network.
  - Routing separation: Layer 3 VSNs offer fully segmented routing tables at scale.
- Stealth networking refers to the use of Ethernet Switched Paths to forward traffic which provide strong inherent security and prevent the use of IP scanning to discover the network topology.



**Did you know?** A user or device in one VSN can't communicate with a user or device in another VSN unless configured to do so.

# MACsec ENCRYPTION



## WHAT IS IT?

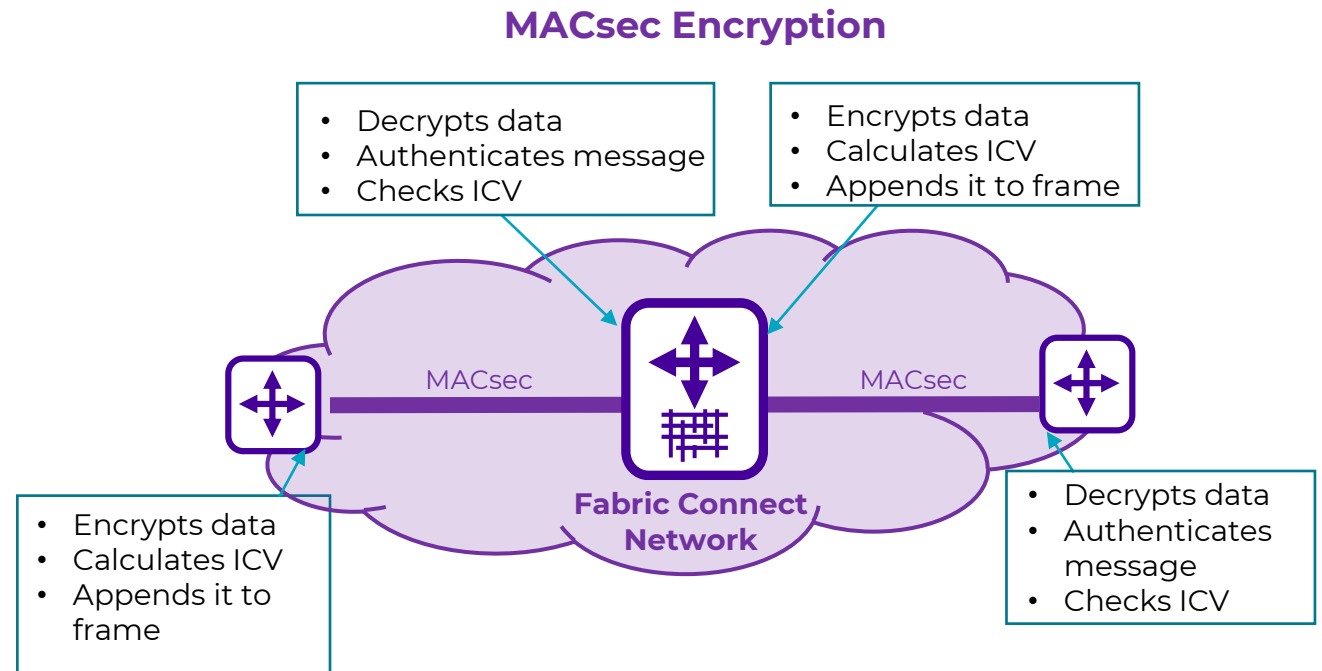
- MACsec is a hop-by-hop security capability which encrypts/ decrypts packets between connected switches or devices.

## WHAT IS THE VALUE?

- Provides increased security/ data protection at the Ethernet link layer.

## REQUIREMENTS:

- Requires a MACsec feature license to activate
- Supported on select platforms



# POLICY-BASED SEGMENTATION



## WHAT IS IT?

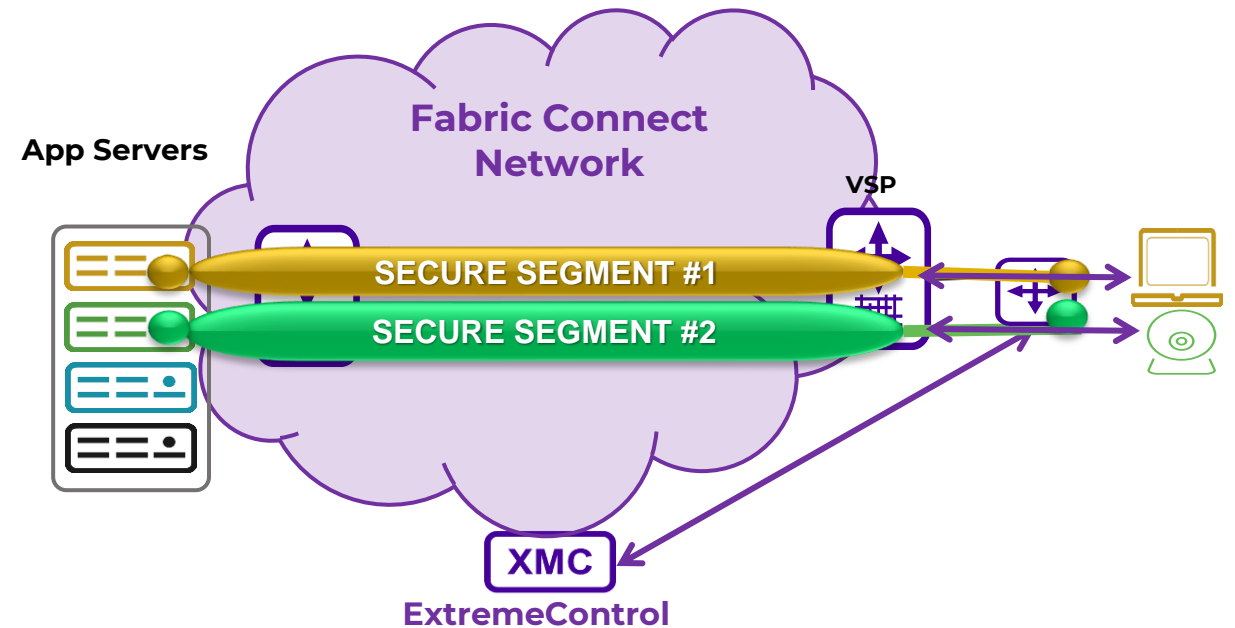
- When an Extreme NAC solution is deployed in the network, access to secure Fabric Connect VSNs/ segments can be controlled.
- When a user or device connects to the network, it is authenticated, dynamically assigned a VLAN/I-SID as well as a role-based policy.
- These assignments follow the user / device as they change locations

## WHAT IS THE VALUE?

- Controlled access to only required resources
- Ability to lock down communication of IoT devices to only authorized hosts, preventing machine to machine attacks within a segment.
- Configuration dynamically applied and deleted from edge ports as users connect and disconnect from the network.

## REQUIREMENTS:

- VOSS v8.3 (for VOSS-enabled edge switches); Fabric Attach capable switches, Extreme Management Center v8.2



# STEALTH ATTRIBUTES



## WHAT IS IT?

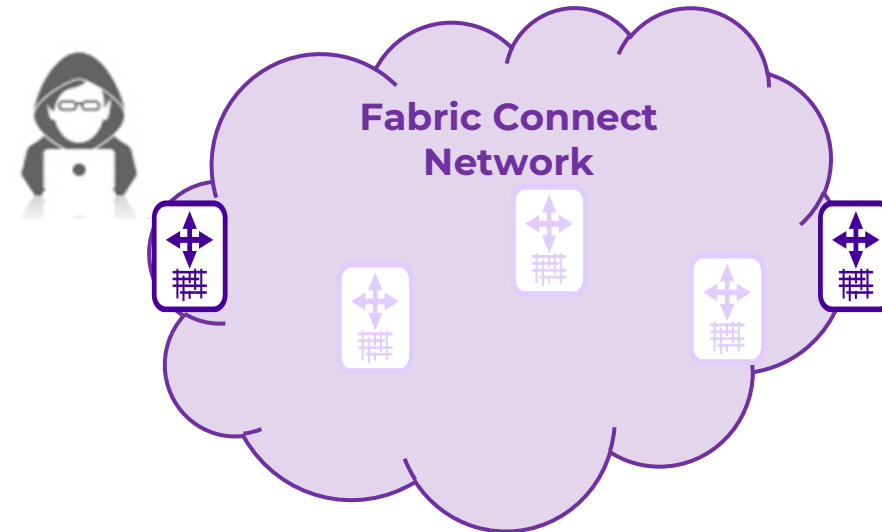
- All traffic in a Fabric Connect network is forwarded using Ethernet Switched Paths. Also, because IS-IS runs directly over Ethernet, there are not any IP addresses anywhere in the core.

## WHAT IS THE VALUE?

- Prevention of lateral movement through concealment of the core network topology.
- Without IP in the aggregation/ core, IP scanning techniques commonly used by hackers won't work.

## REQUIREMENTS:

- VOSS v3.0



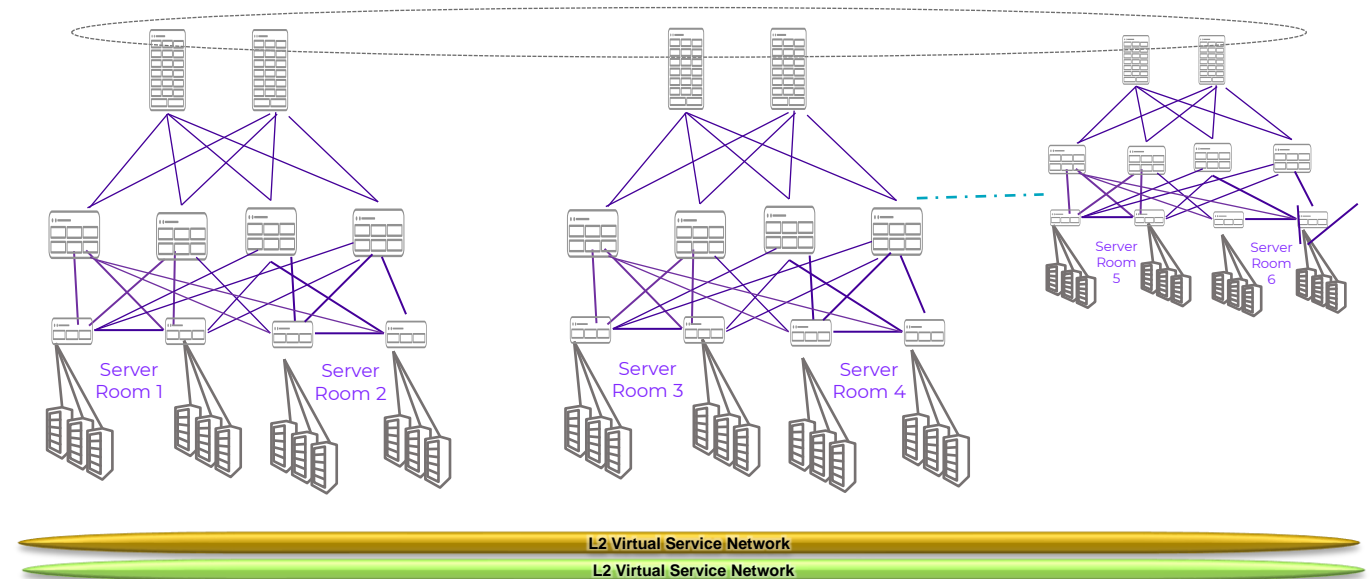
**Did you know?** A Fabric Connect network topology is **dark** when scanned by a malicious actor. This helps prevent lateral movement.

# DATA CENTER CAPABILITIES

## Key Benefits:

- Simplifies Virtual Machine Mobility by stretching Layer 2 VLANs within and between Data Centers
- Simplifies Data Center Interconnect by enabling active/active, full mesh connectivity
- Simplifies multi-tenant and micro-segmented networks
- Can be deployed over any physical topology
- Dynamic auto-attach features for ESX, Hyper-V and KVM-based hypervisor environments.
- East/west and north/south traffic optimization to reduce latency and provide an enhanced quality of experience for critical applications.

## Fabric Connect Multi-site Data Center



# DISTRIBUTED VIRTUAL ROUTING (DVR)



## WHAT IS IT?

- DVR brings IP host-based routing to Fabric Connect.
- It distributes the routing function to every node in a stretched VLAN (to eliminate tromboning) without having to provision any routing functionality on the ToR or leaf nodes.
- Injects “selected” host routes into WAN routers so that users accessing the DC follow the most direct route to the correct Data Center (when multiple DCs are deployed)

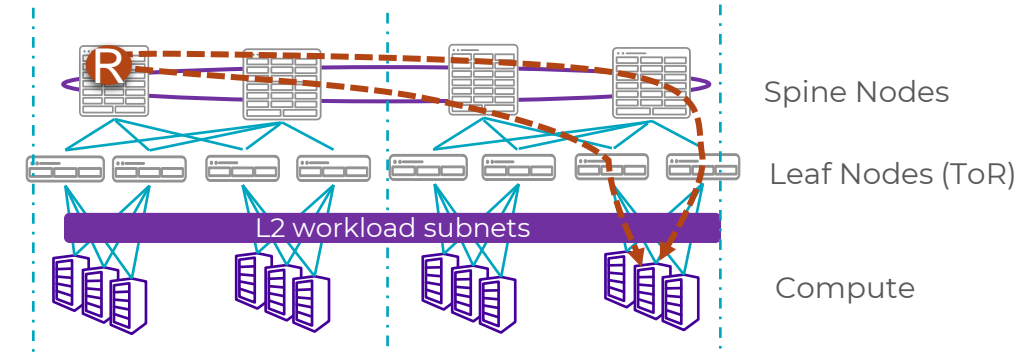
## WHAT IS THE VALUE?

- East/west traffic optimization: eliminates tromboning for server-to-server communications
- North/south traffic optimization: reduces latency for user to server communications over the WAN in multi-site networks.

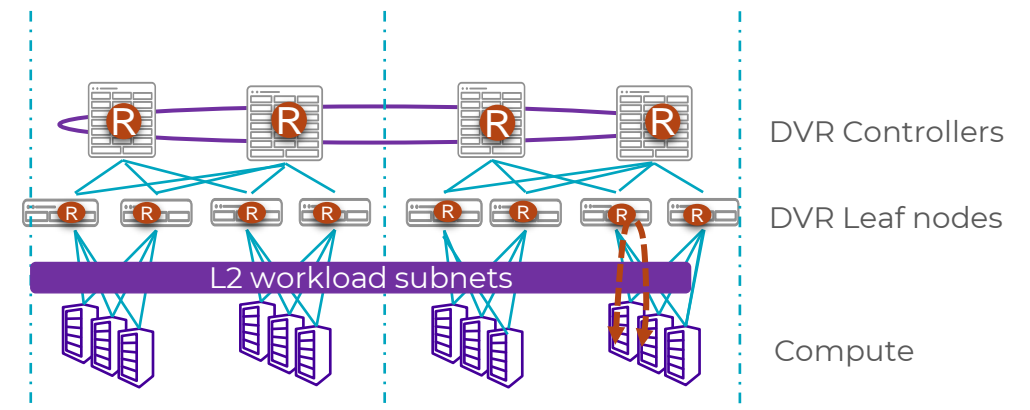
## REQUIREMENTS:

- VOSS v6.0

The Challenge with Centralized Routing:  
Traffic Tromboning



Distributed Virtual Routing:  
Eliminates Tromboning





# VIRTUAL MACHINE / ENDPOINT TRACKING



## WHAT IS IT?

- Extreme Management Center / ExtremeControl capability that can dynamically assign moving Virtual Machines (VMs) to the correct IP Subnet (VLAN/I-SID) at their destination location.
- Works for both VMware and Microsoft HyperV virtual server environments

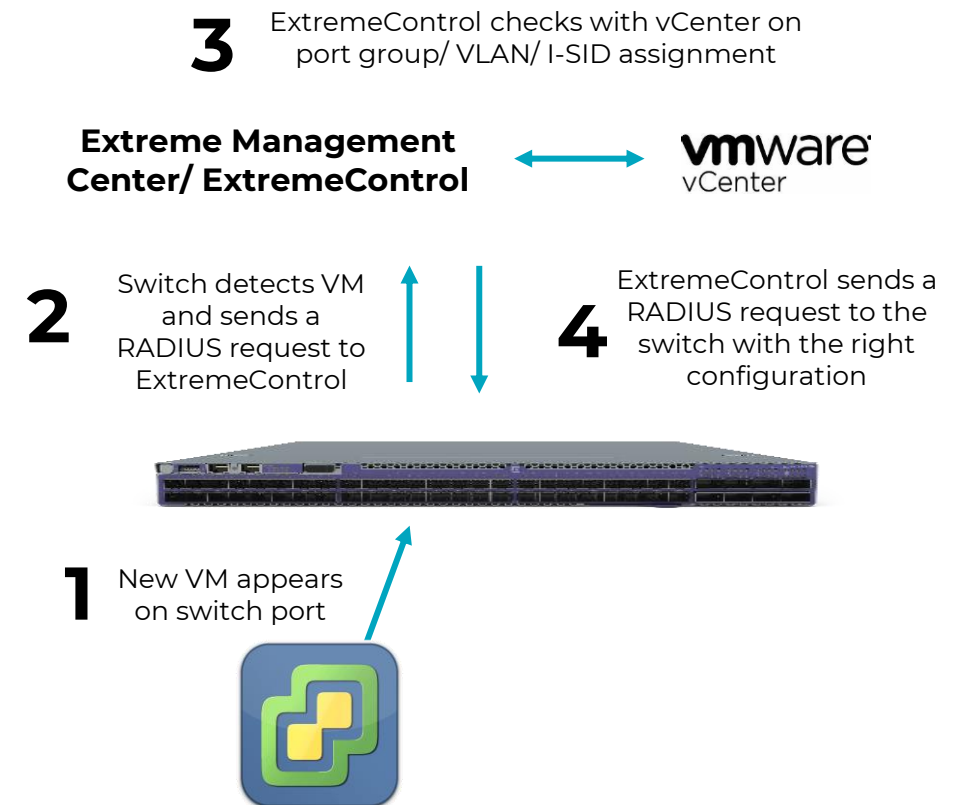
## WHAT IS THE VALUE?

- Dynamic provisioning of switch ports as VMs move within and between Data Centers.
- Visibility of VM environment through API integration between Extreme Management Center and VMware ESXi and Microsoft HyperV.

## REQUIREMENTS:

- Extreme Management Center/ Extreme Control v
- VOSS v8.1.1

## Virtual Machine Tracking (VMware example)



# VMWARE NSXv INTERWORKING



## WHAT IS IT?

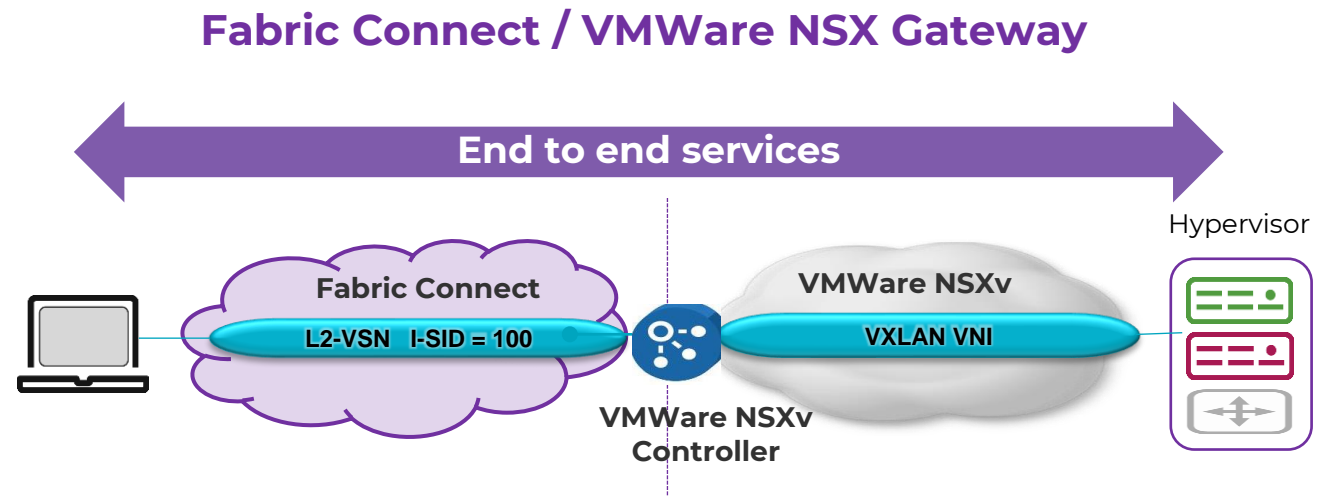
- Fabric Connect Virtual Network Services can be seamlessly and redundantly extended from the NSXv domain to the Fabric Connect domain by mapping the Virtual Network ID (VNIs) to the Fabric Connect services (or I-SID's) directly within the NSXv controller

## WHAT IS THE VALUE?

- Seamless interworking with VMware's NSXv

## REQUIREMENTS:

- VOSS v7.1



# VXLAN GATEWAY



## WHAT IS IT?

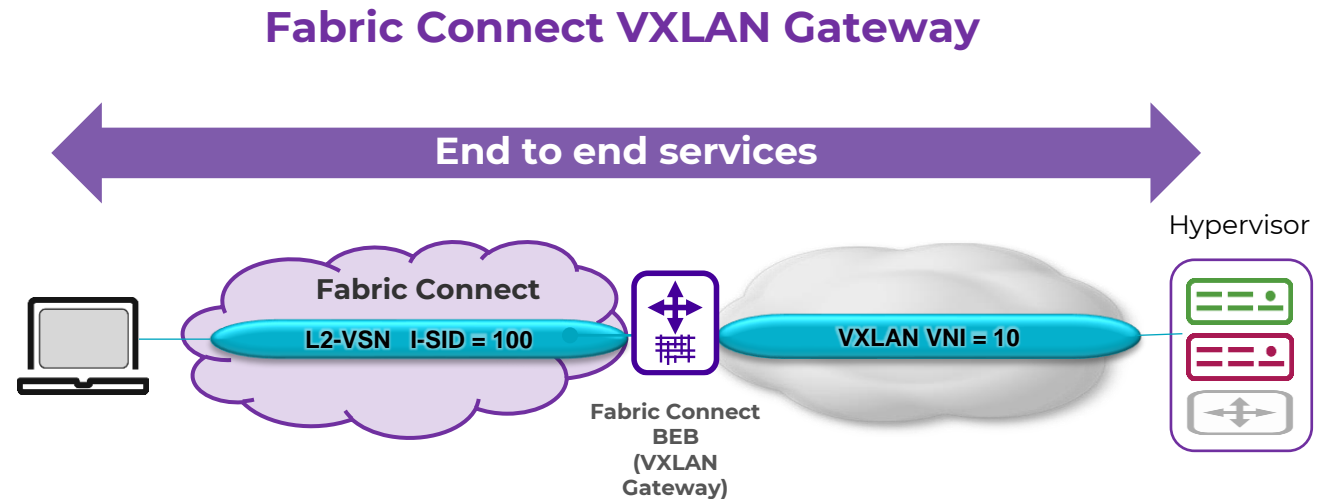
- VXLAN Gateway translates Fabric Connect Layer 2/3 VSNs into a VXLAN Service.
- Provides the mapping of I-SIDs into VXLAN Network Identifiers (VNI's)

## WHAT IS THE VALUE?

- Third party interoperability with VXLAN compatible devices.
- Seamless extension of end-to-end services between the Fabric Connect and VXLAN infrastructures

## REQUIREMENTS:

- VOSS v6.0



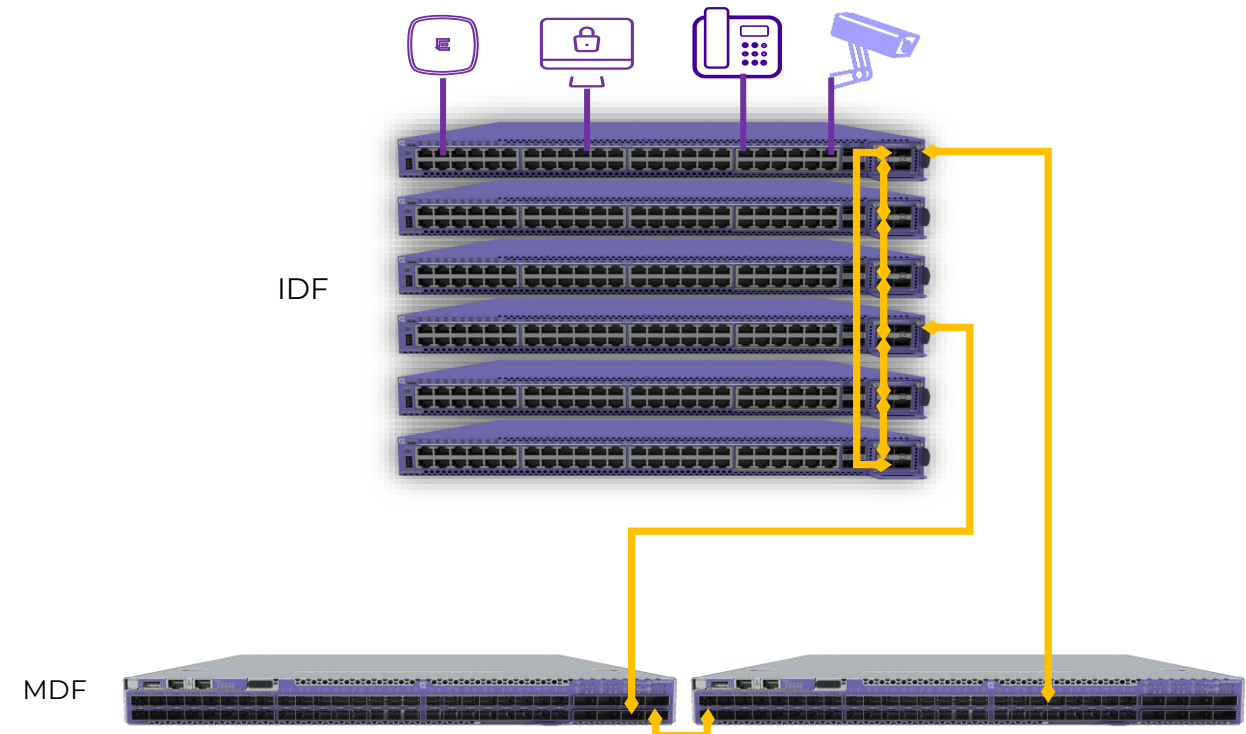
# CAMPUS EDGE CAPABILITIES

# FABRIC CONNECT CAMPUS EDGE BASICS



## Key Benefits of the Fabric Edge:

- Significant reduction in manual provisioning that is currently required at the network edge (MLAG, VLANs, IP multicast, Fabric Attach, etc)
- Fabric infrastructure automation (automation of all Fabric Connect and Fabric Attach links)
- Dynamic authentication, service provisioning and policy assignment of users and devices when RADIUS is deployed
- Centralized management through on-premise or cloud-based management tools
- Edge network design simplification



# EAPoL / MAC w/I-SID



## WHAT IS IT?

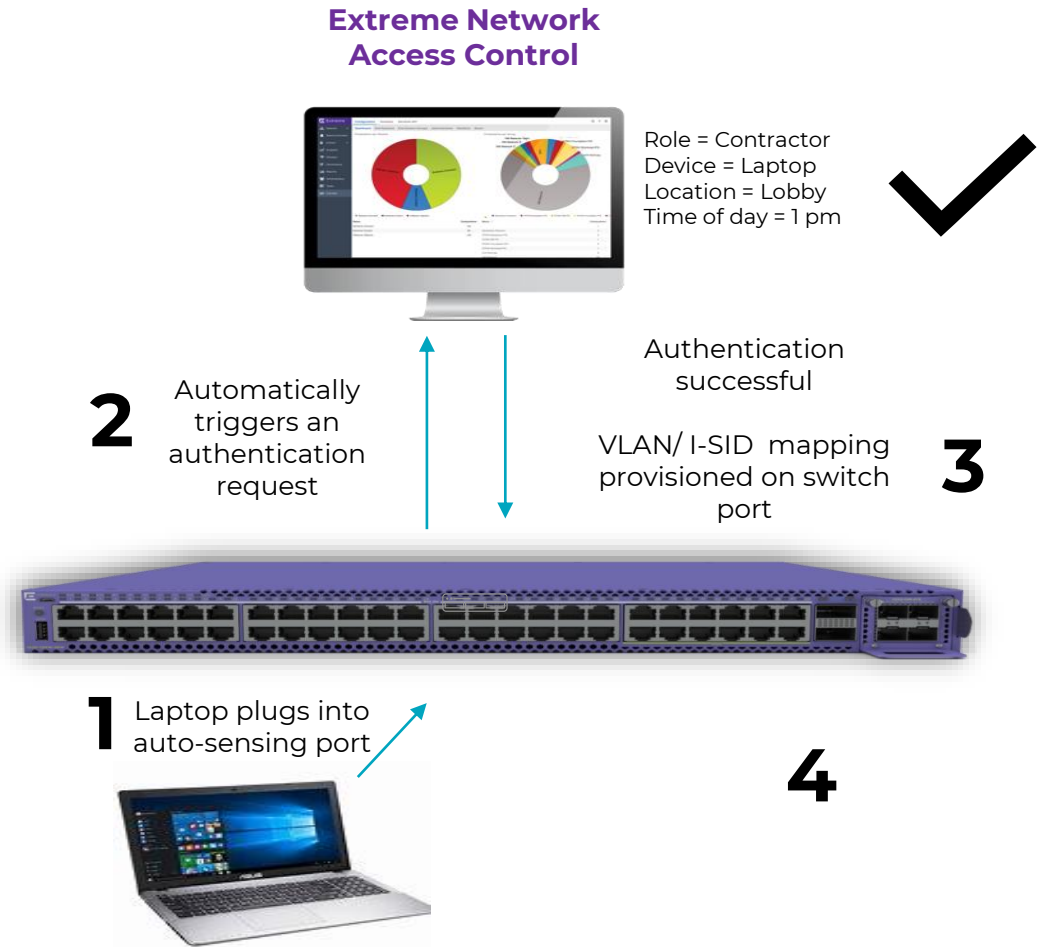
- When a client or IoT device is plugged into a VOSS edge switch, it will detect the client, authenticate it (through an Extreme NAC solution) and then based on its credentials, it will be assigned the right I-SID or Fabric Connect VSN.

## WHAT IS THE VALUE?

- Dynamic moves, adds and changes
- Elimination of manual provisioning by eliminating the need to pre-configure any VLANs on edge switch ports.
- Enhanced security since unauthorized devices will not be allowed to connect to the network.

## REQUIREMENTS:

- VOSS v8.3



# RADIUS-ASSIGNED POLICIES



## WHAT IS IT?

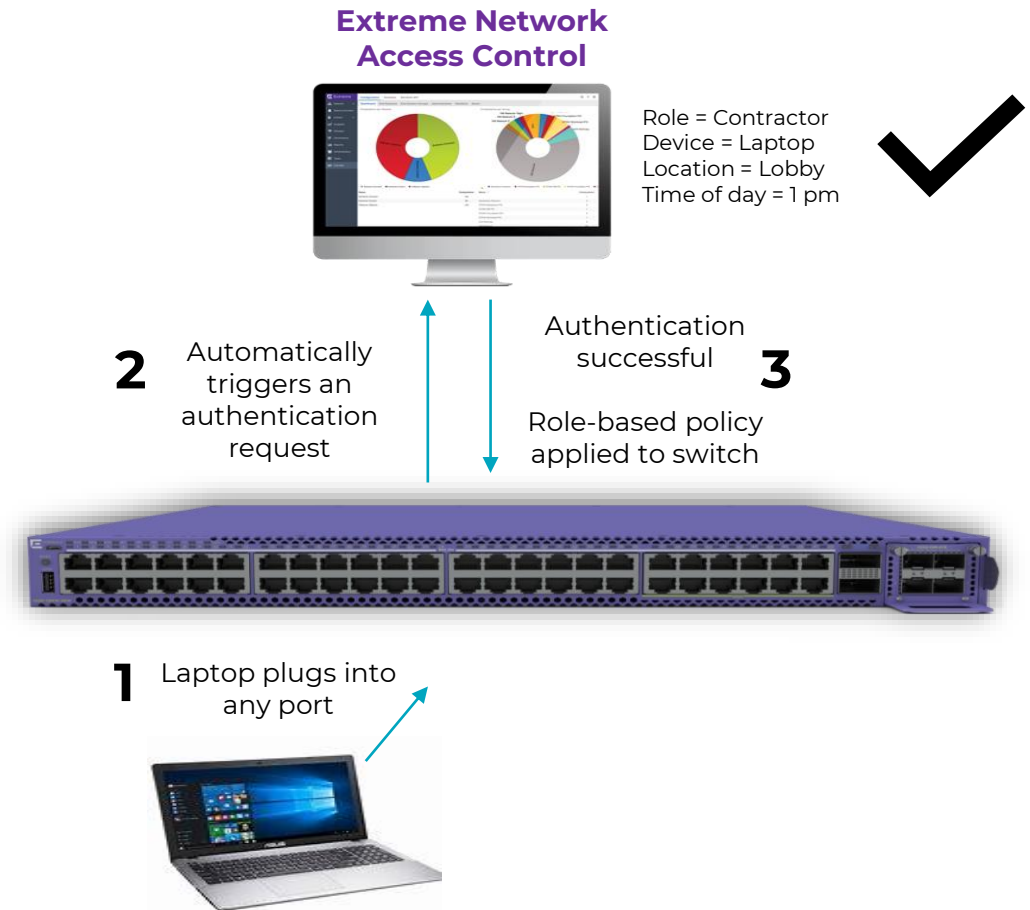
- When a client or IoT device is plugged into a VOSS edge switch, it will detect the client, authenticate it, assign the right service and assign a user-based policy (ACL) that follows the user as they connect and disconnect from the network.

## WHAT IS THE VALUE?

- Dynamic moves, adds and changes
- Enhanced edge security by controlling access to network services and applications.

## REQUIREMENTS:

- VOSS v8.3



# DVR MULTICAST



## WHAT IS IT?

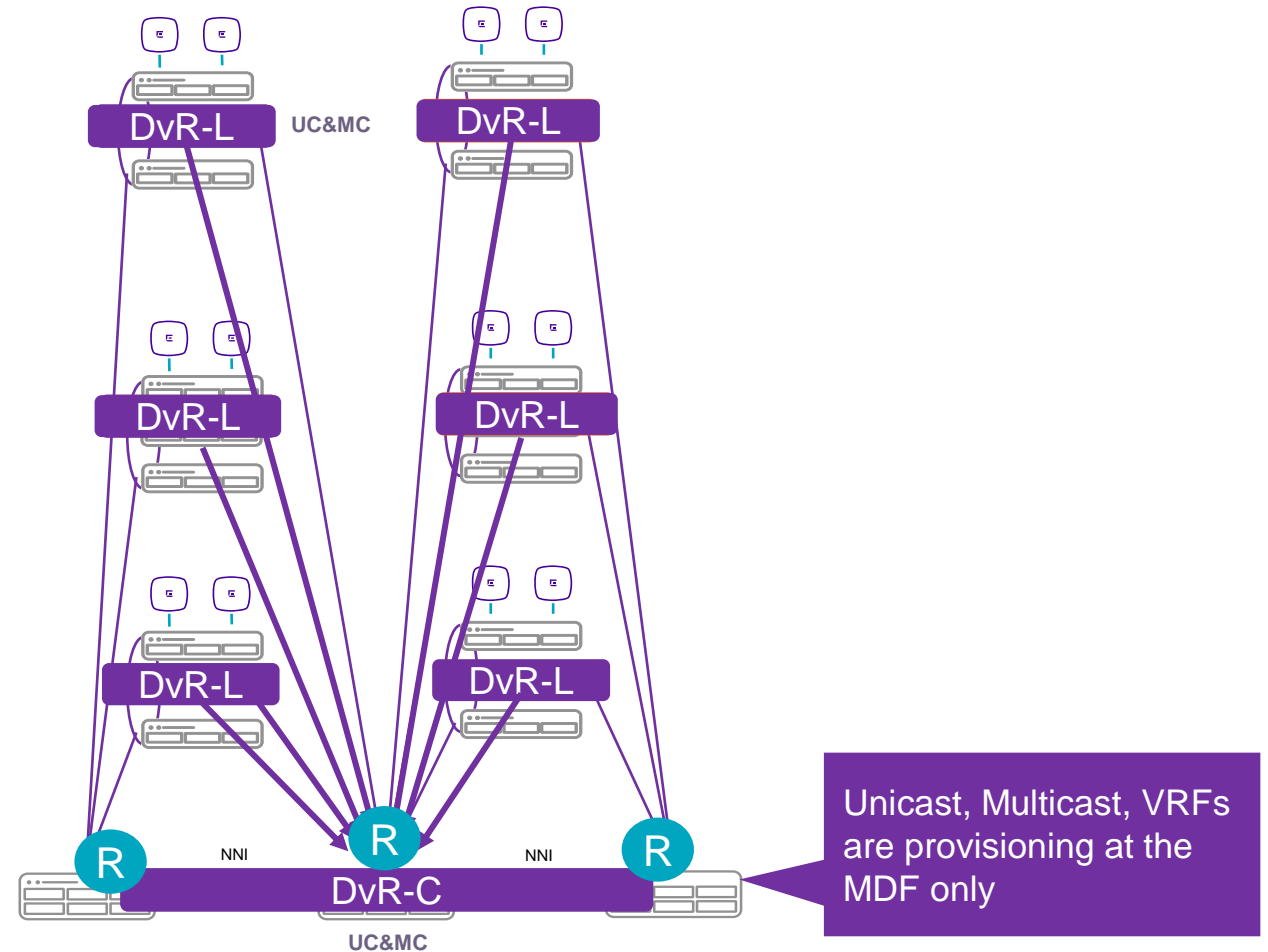
- Fabric edge architecture that enables default gateway configuration per I-SID as well as the ability to centrally provision VRFs and multicast.

## WHAT IS THE VALUE?

- Enables customers with distributed networks to replace VRRP
- Keeps the edge nodes simple and lightweight by centralizing VRF/multicast provisioning on aggregation (MDF) nodes only

## REQUIREMENTS:

- VOSS v8.3





# E-TREE SERVICE WITH A PRIVATE-VLAN



## WHAT IS IT?

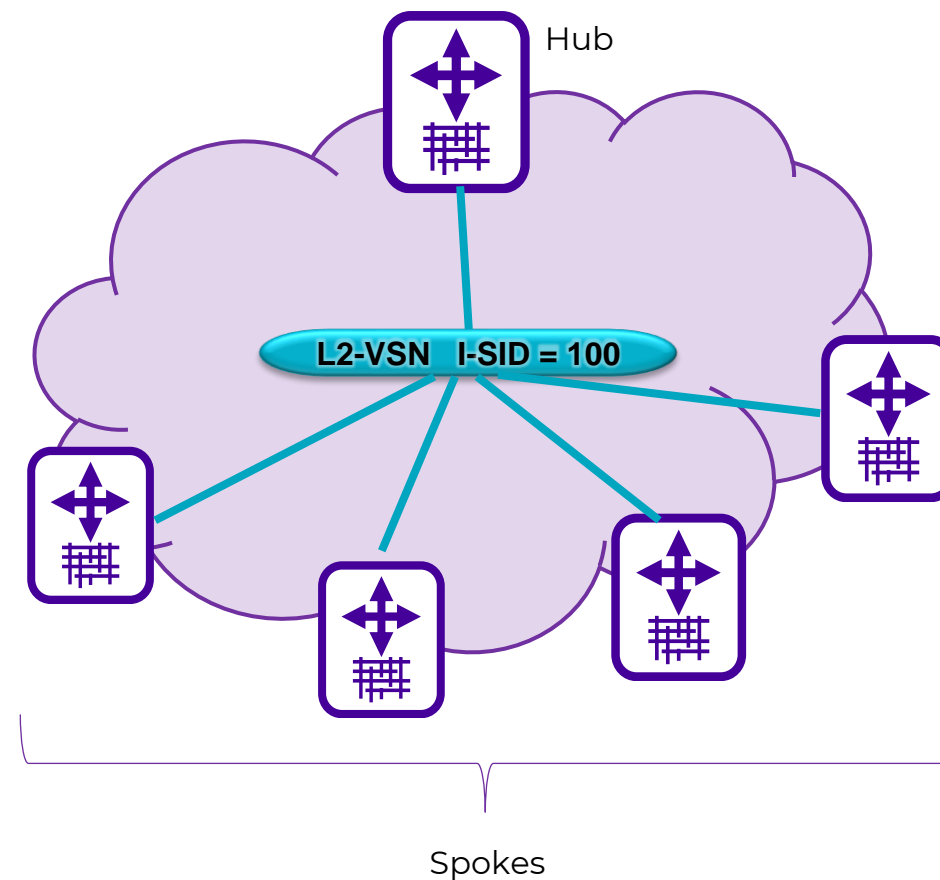
- Layer 2 hub and spoke topology where spokes can only communicate via the hub
- Prevents direct spoke-to-spoke (peer-to-peer) communication.

## WHAT IS THE VALUE?

- Enhanced security for services utilized by IoT devices since it prevents machine to machine attacks

## REQUIREMENTS:

- VOSS v3.0.1



# BRANCH CAPABILITIES

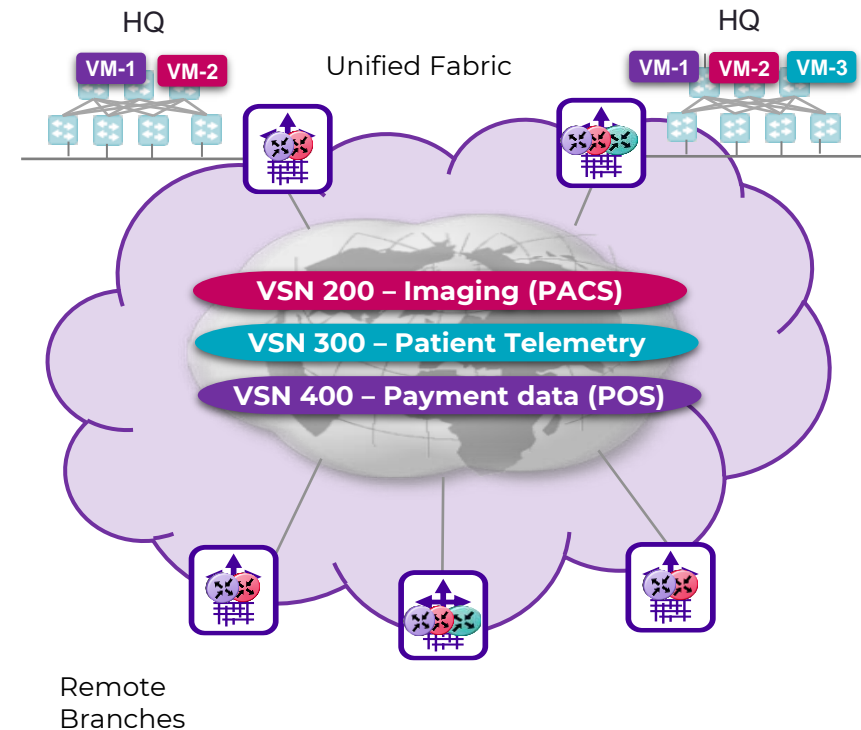
# FABRIC CONNECT BRANCH BASICS



## Key Benefits:

- Secure branch office connectivity over public and private WANs
- Edge only provisioning for new services/network changes across the distributed network
- Reduced WAN charges by the ability to transport many Fabric Connect services within a single Service Provider circuit/connectivity service.
- Reduces the number of distributed firewalls by using the Fabric Connect network to extend secure zones/micro-segments to the branch office.
- Simple extension of multicast capabilities across the WAN into the branch office
- Consistent architecture. Consistent operations.

## Fabric Connect Extension to the Remote Branch Office



# IPsec OVER FABRIC EXTEND



## WHAT IS IT?

- IPsec over Fabric Extend encrypts Fabric Extend tunnels so that connectivity to remote sites can be extended over broadband connections.

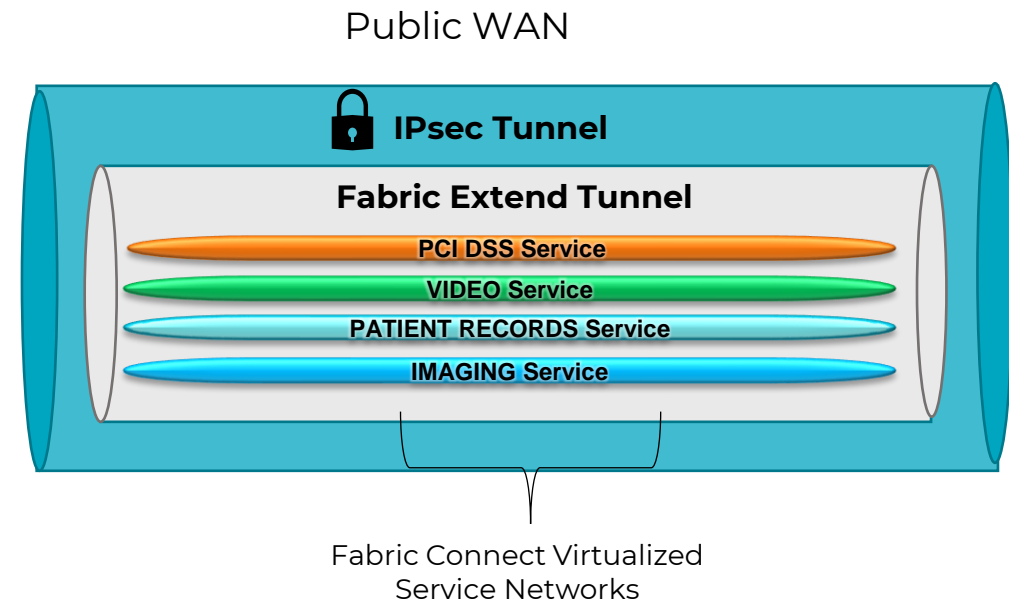
## WHAT IS THE VALUE?

- Allows customers to reduce their WAN costs by leveraging the public Internet as either primary or back-up connectivity.

## REQUIREMENTS:

- VOSS v8.0.50 (XA1400)

## IPsec over Fabric Extend



# FRAGMENTATION AND REASSEMBLY



## WHAT IS IT?

- Fragmentation and reassembly is supported for Fabric Extend tunnels (both encrypted and not encrypted) and is required when the WAN MTU is <1594 bytes

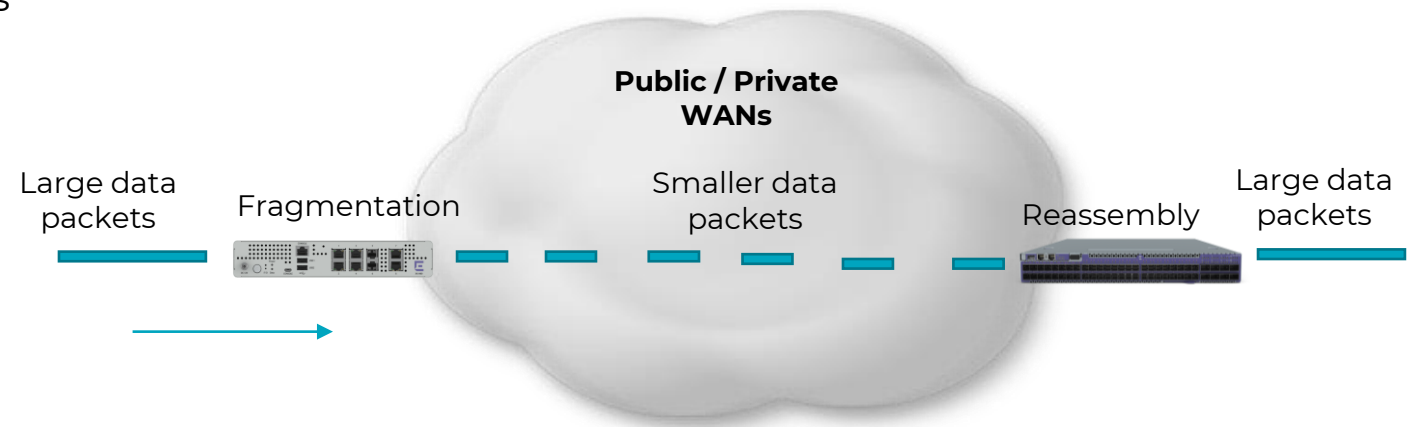
## WHAT IS THE VALUE?

- Avoids packet loss when frame sizes being transmitted over the WAN are larger than the WAN MTU

## REQUIREMENTS:

- VOSS v8.0.50 (XA1400)

## Fragmentation and reassembly over the WAN



# FABRIC IPsec GATEWAY



## WHAT IS IT?

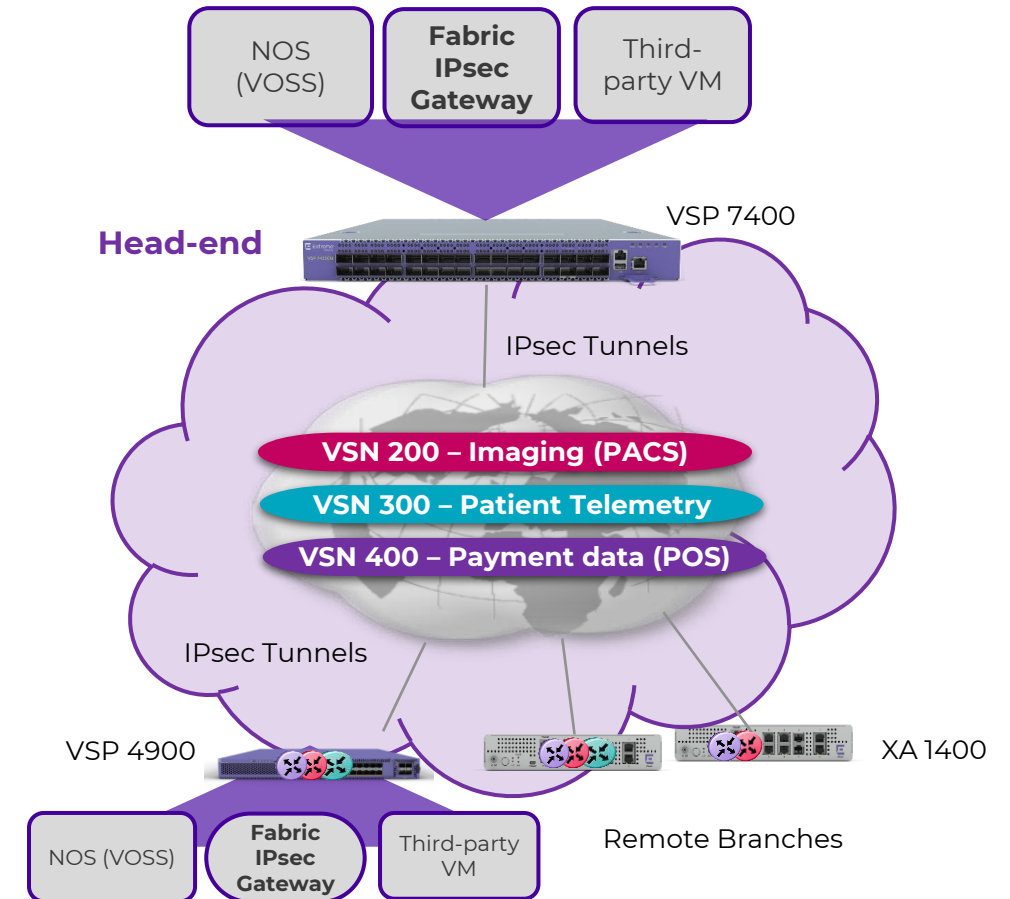
- A VM-based solution that is deployed on-board a Fabric Connect enabled device that provides Fabric Extend IPsec tunnel aggregation. It also includes fragmentation and reassembly.

## WHAT IS THE VALUE?

- Offers the ability to deploy a VSP 7400 at the head-end to aggregate tunnels from multiple IPsec connected branch offices.

## REQUIREMENTS:

- VOSS v8.2 (select platforms)
- Premier license is required to activate Integrated Application Hosting



# BIDIRECTIONAL FORWARDING DETECTION



## WHAT IS IT?

- BFD delivers fast fault detection for a path failure with the IP underlay when Fabric Extend (with and without IPsec encryption) is being used.

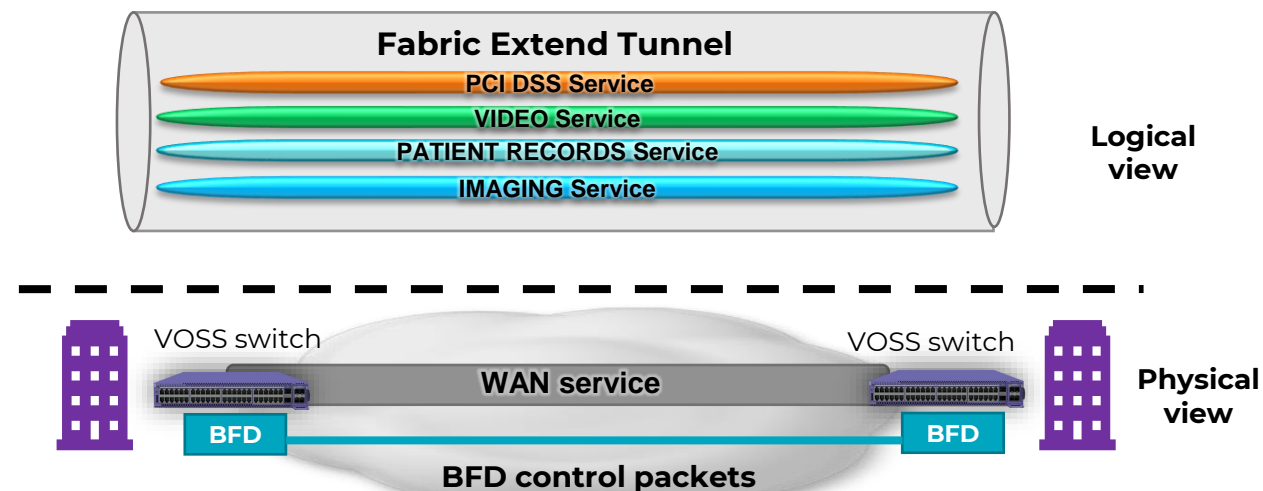
## WHAT IS THE VALUE?

- Faster failure detection of IP underlay (Service Provider WAN) issues.

## REQUIREMENTS:

- VOSS v8.2

## Bidirectional Forwarding Detection



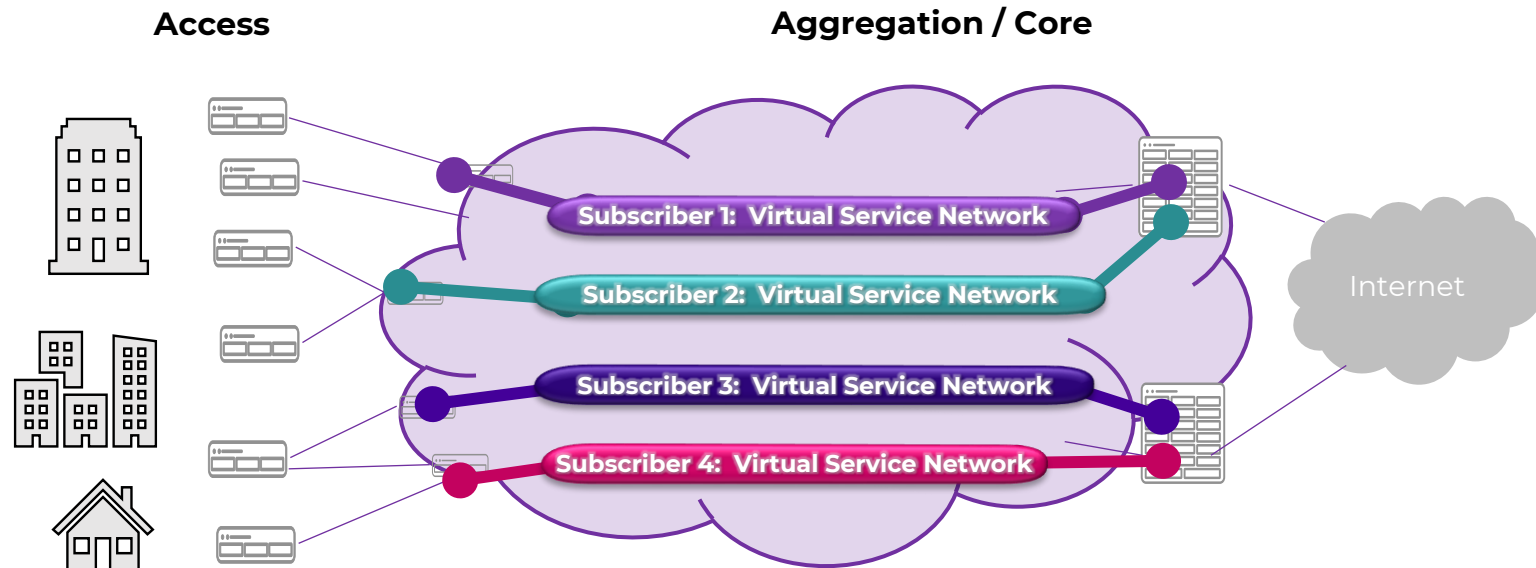
# SERVICE PROVIDER CAPABILITIES



# FABRIC CONNECT SERVICE PROVIDER BASICS

## Key Benefits:

- Fast time to service in enabling new customer services
- Reduced operations costs by having a simpler, more plug and play network environment
- Ability to meet/exceed customer SLAs through a resilient network architecture.
- Simplified multi-tenancy and micro-segmentation with simple end point provisioning
- Powerful analytics to show network, application and client data/ health
- Centralized management with on-premise and cloud-based operations.



# TRANSPARENT UNI



## WHAT IS IT?

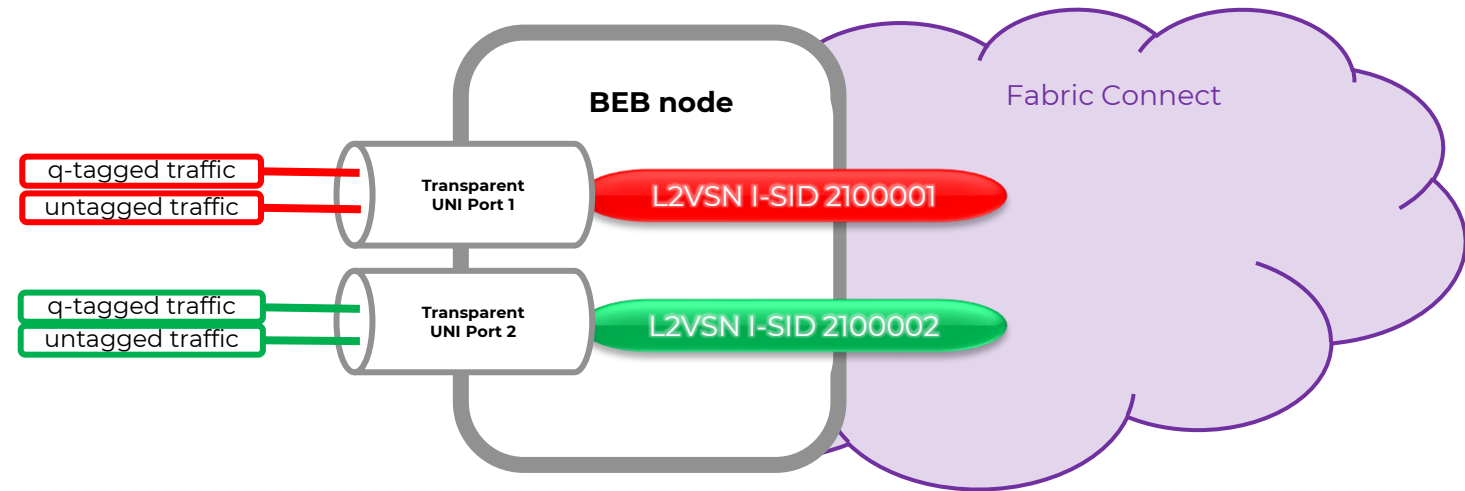
- Transparent UNI's are used to deliver point to point (E-LINE) services across a Fabric Connect Network and is when the UNI is an entire Ethernet port or MLT bundle.
- Transparent UNI's are not VLAN tag aware. All packets with and without a VLAN q-tag are transported into the VSN

## WHAT IS THE VALUE?

- Simple and quick deployment of point-to-point services

## REQUIREMENTS:

- VOSS v3.1



## WHAT IS IT?

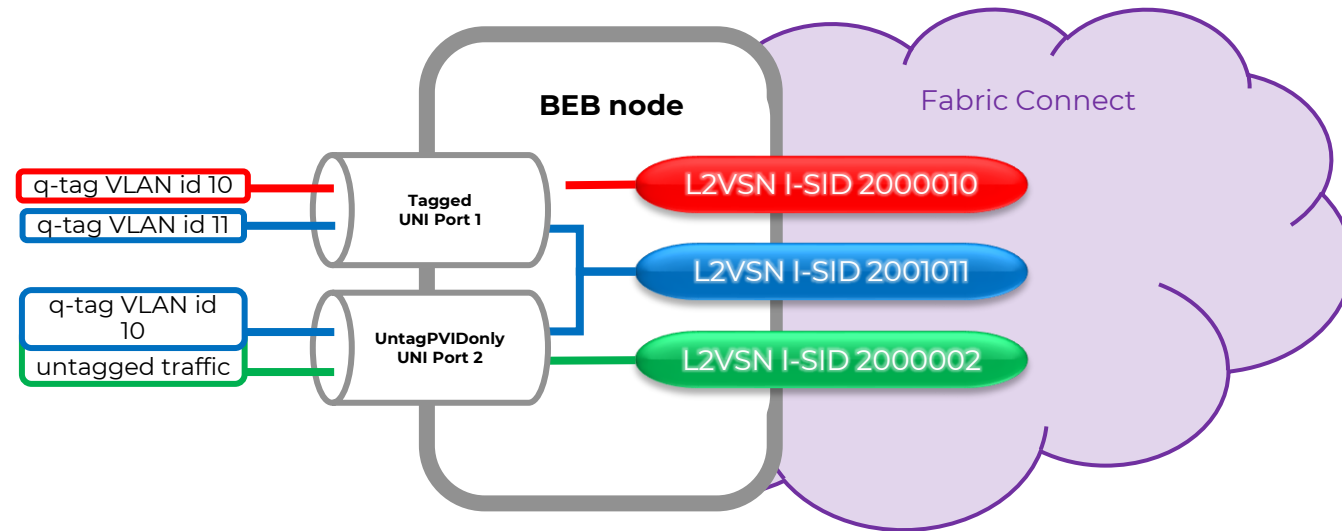
- Flex UNI's are used to enable Layer 2 Virtual Service Networks where a specific VLAN-ID on a Port or MLT is mapped to a UNI
- VLAN-ID only has local significance on the Ethernet port / MLT

## WHAT IS THE VALUE?

- Different VLAN-ids on different (or same – Stackable only) ports can be assigned to same I-SID
- Allows for overlapping VLAN-ID / IP addresses

## REQUIREMENTS:

- VOSS v5.0; ERS5900 v7.0, ERS4900 v7.1



# OPERATIONS, ADMINISTRATION AND MAINTENANCE

# FABRIC CONNECT OAM BASICS



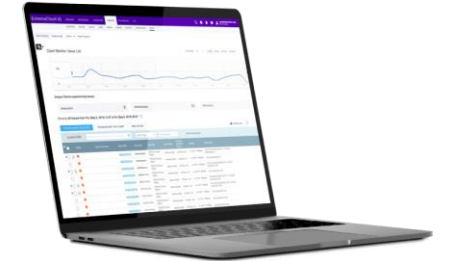
## Key Benefits:

- Powerful on-box OAM capabilities through standards-based Ethernet OAM capabilities (IEEE and ITU) as well as a user friendly on-box web interface.
- Centralized management available through Extreme Management Center and increasingly through ExtremeCloud IQ
- Powerful analytics are available with ExtremeAnalytics and ultimately through ExtremeCloud IQ
- Simplified RSPAN capabilities to mirror select traffic to traffic analyzers for performance monitoring, IoT and security solutions and troubleshooting / debugging tools.

## Extreme Management Center, ExtremeCloud IQ or hybrid management



**On-premise (Extreme Management Center)**



**Cloud-based (ExtremeCloud IQ)**

# CONNECTIVITY FAULT MANAGEMENT



## WHAT IS IT?

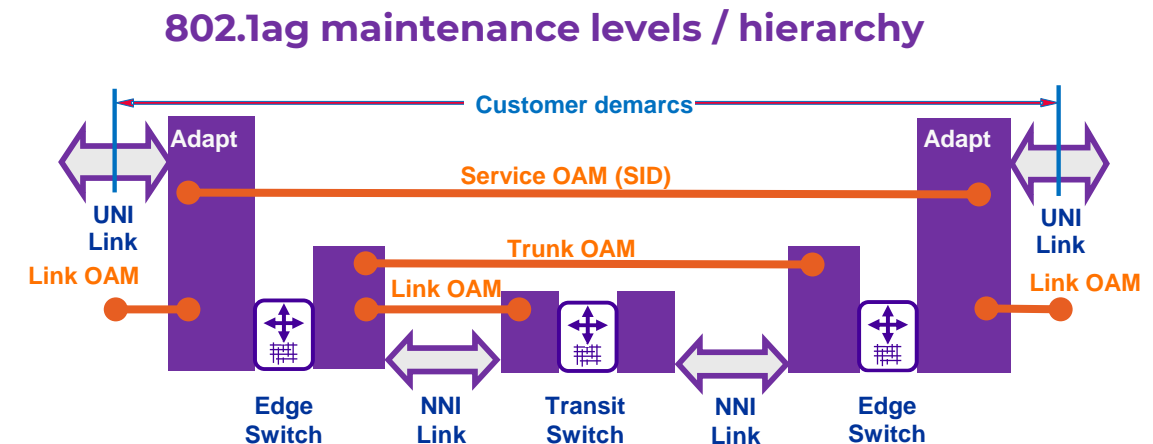
- IEEE802.1ag CFM provides Layer 2 OAM capabilities for Ethernet links, trunks and I-SIDs. It provides ping, Traceroute, Tracetree and Tracemroute (for multicast) for the different hierarchies.

## WHAT IS THE VALUE?

- Standards-based tools for managing and troubleshooting the Fabric Connect network.
- Tracemroute for multicast is unique in the industry. No other multicast technology can provide this level of visibility.

## REQUIREMENTS:

- VOSS v3.0



## WHAT IS IT?

- Fabric RSPAN mirrors port, VLAN or flow-based traffic to a Fabric Connect I-SID. This mirrored traffic can be sent to one or more switches within the Fabric Connect network for analysis by central or distributed collectors/analyzers.

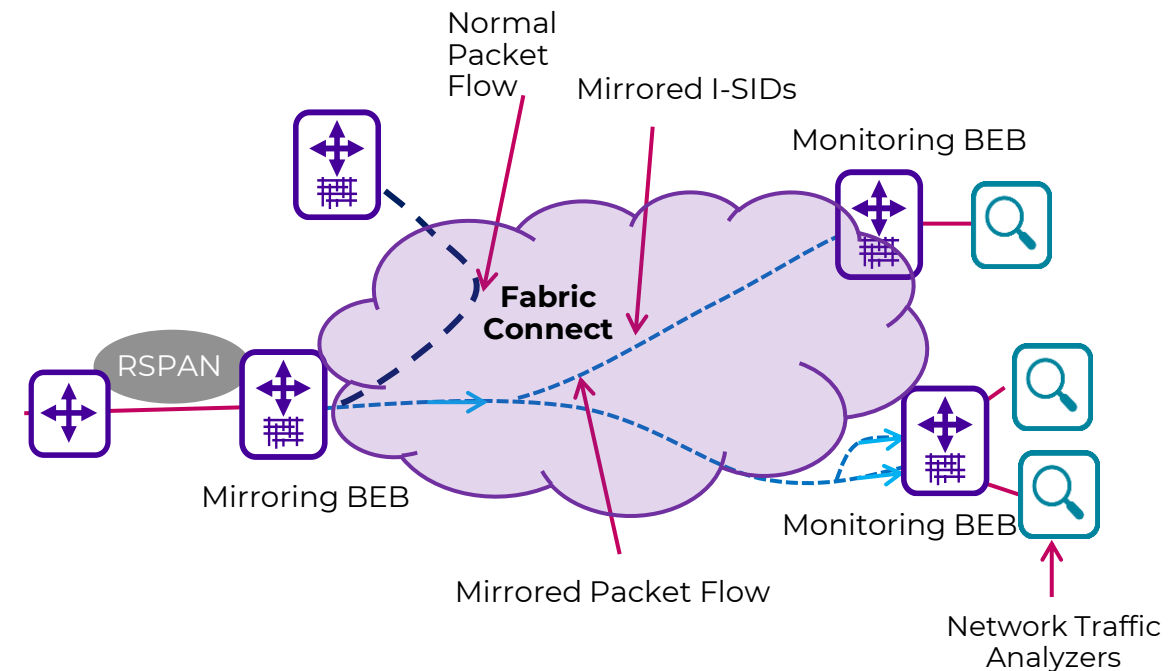
## WHAT IS THE VALUE?

- Simplified configuration compared to traditional SPAN/RSPAN
- Efficient replication of mirrored traffic using L2 multicast.
- Ability to save money by not having to deploy traffic sniffers or in-line sensors for 3<sup>rd</sup> party monitoring or security solutions.

## REQUIREMENTS:

- VOSS v6.0

### Fabric RSPAN implementation



# GRACEFUL RESTART W/OVERLOAD BIT



## WHAT IS IT?

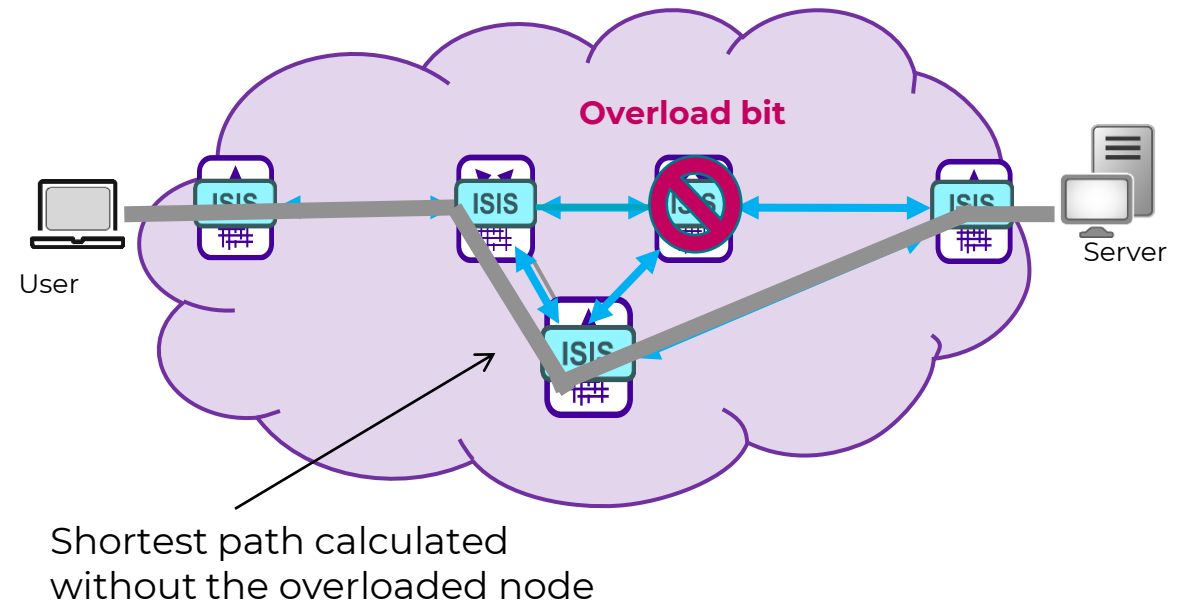
- An overload bit is sent by a Fabric Connect device to inform other devices, not to use that node for transit traffic. When a node receives an overload bit, it will know not to include the node that generated the overload bit in shortest path calculations.

## WHAT IS THE VALUE?

- Ensures that overloaded switches/ or switches that are being upgraded or need to be taken out of service for maintenance are not part of the shortest path from any source to any destination.
- Minimizes traffic loss during planned maintenance

## REQUIREMENTS:

- VOSS v5.1.1.5 (maintenance release)





# ENTERPRISE DEVICE MANAGER (EDM)



## WHAT IS IT?

- Web GUI-based device manager that enables on-box monitoring and configuration.

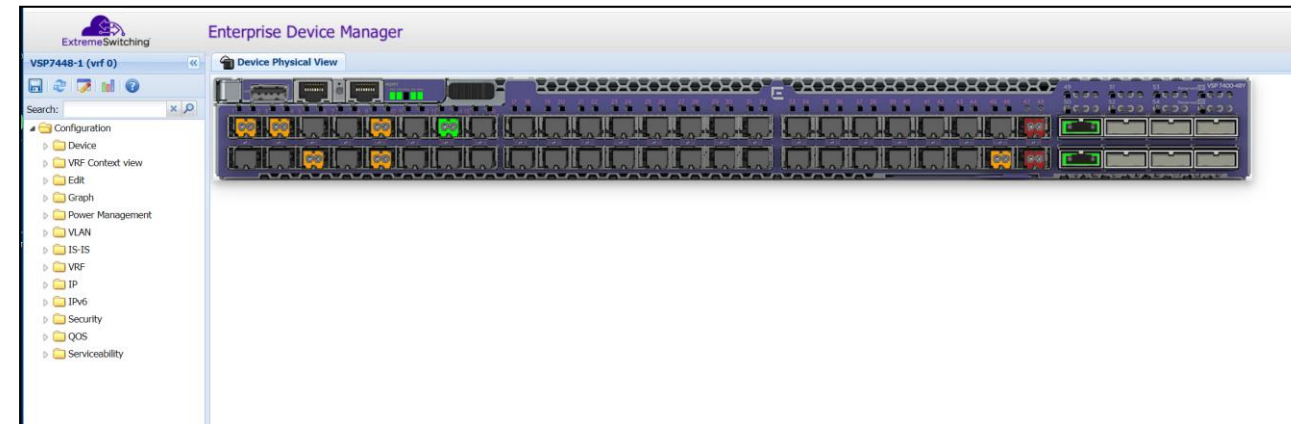
## WHAT IS THE VALUE?

- Intuitive and simple web-based device manager that is easy to use.
- Available with VSP, ERS and Universal Switching Platforms (running VOSS) at no added cost.

## REQUIREMENTS:

- VOSS v3.0

## Enterprise Device Manager



## WHAT IS IT?

- Delivers centralized on-premises management, policy, analytics and compliance capabilities to Fabric Connect networks.

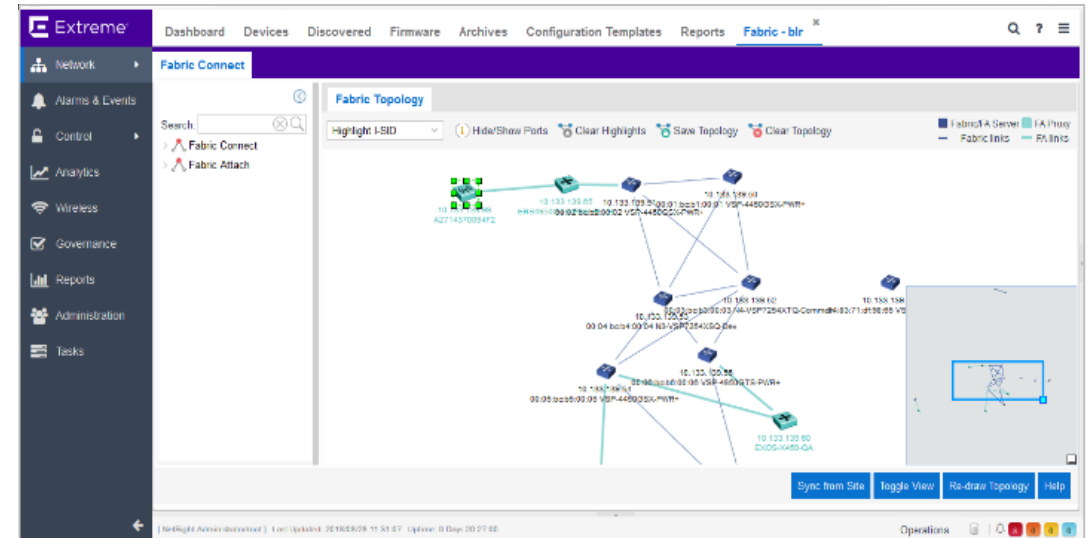
## WHAT IS THE VALUE?

- Provides a 360-degree view of users, applications, devices and the network.
- Consistent policy and analytics across devices.
- Delivers zero-touch provisioning, fabric visualization and management, automated service assignment to on-boarded users and devices and application visibility.
- Optional integration into the ExtremeCloud IQ Navigator tier through migration to ExtremeCloud IQ site engine (coming)

## REQUIREMENTS:

- VOSS 6.1.1; Extreme Management Center v8.1 / v8.2.3 for Fabric Manager

## Fabric Manager



# APPLICATION TELEMETRY / ANALYTICS



## WHAT IS IT?

- Represents the data (sFlow, and other) that is collected from the network infrastructure, that is then transmitted to an analytics engine (ExtremeAnalytics) where it is mapped, processed, and analyzed to provide valuable insights into both the network and the applications.

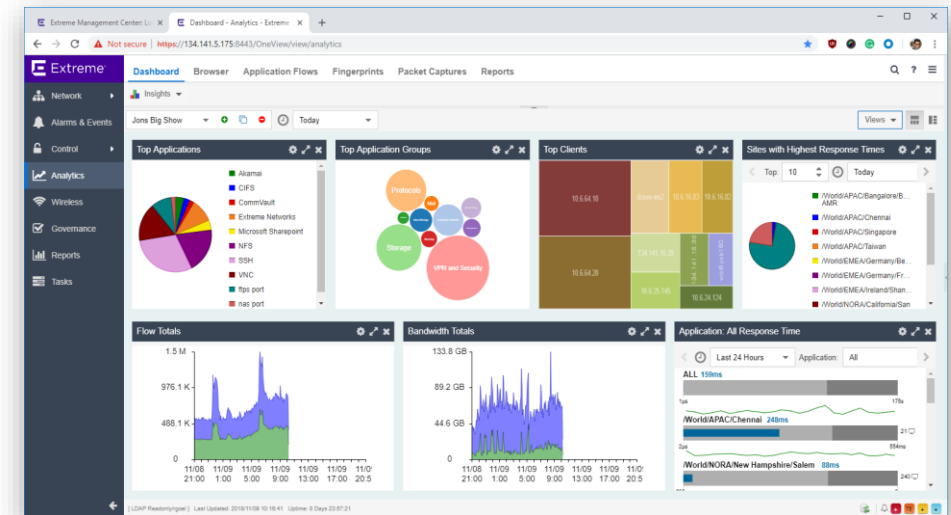
## WHAT IS THE VALUE?

- Faster troubleshooting; enhanced QoE and strengthened security
- No external probes required for an Extreme-based infrastructure.
- Traffic is sampled not mirrored so it doesn't impact the performance of the network

## REQUIREMENTS:

- VOSS 7.1, VSP 8600 6.2, XOS 22.4, ERS 7.7
- Extreme Management Center 8.2

## ExtremeAnalytics



## WHAT IS IT?

- Delivers centralized cloud-based management, capabilities for cloud-enabled VOSS / EXOS switches and APs

## WHAT IS THE VALUE?

- Powerful AI/ML driven insights
- Ease of deployment
- Scalability
- Continuous innovation and development

## REQUIREMENTS:

- Select VSP / EXOS switches and Extreme Mobility APs

