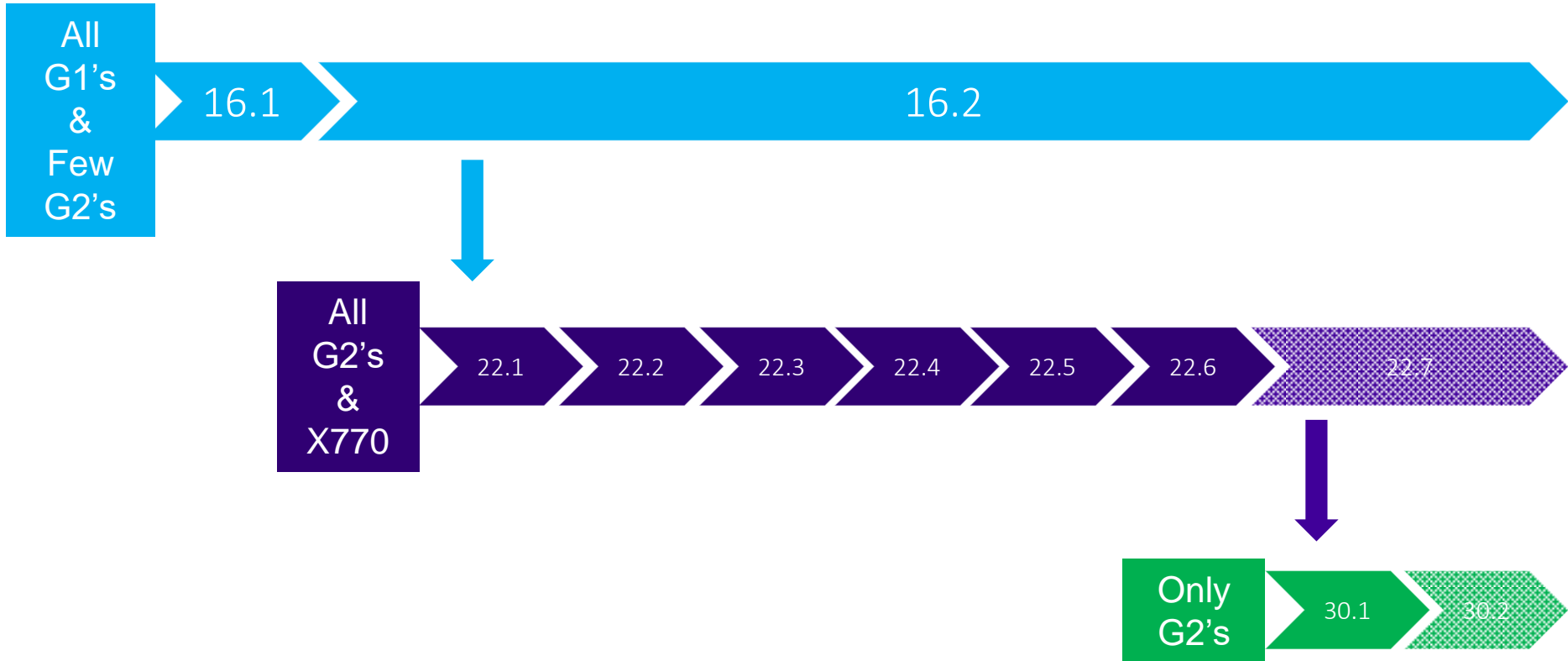




# Extreme EXOS

## Uniwersalny brzeg sieci

# ExtremeXOS Release Trains Overview



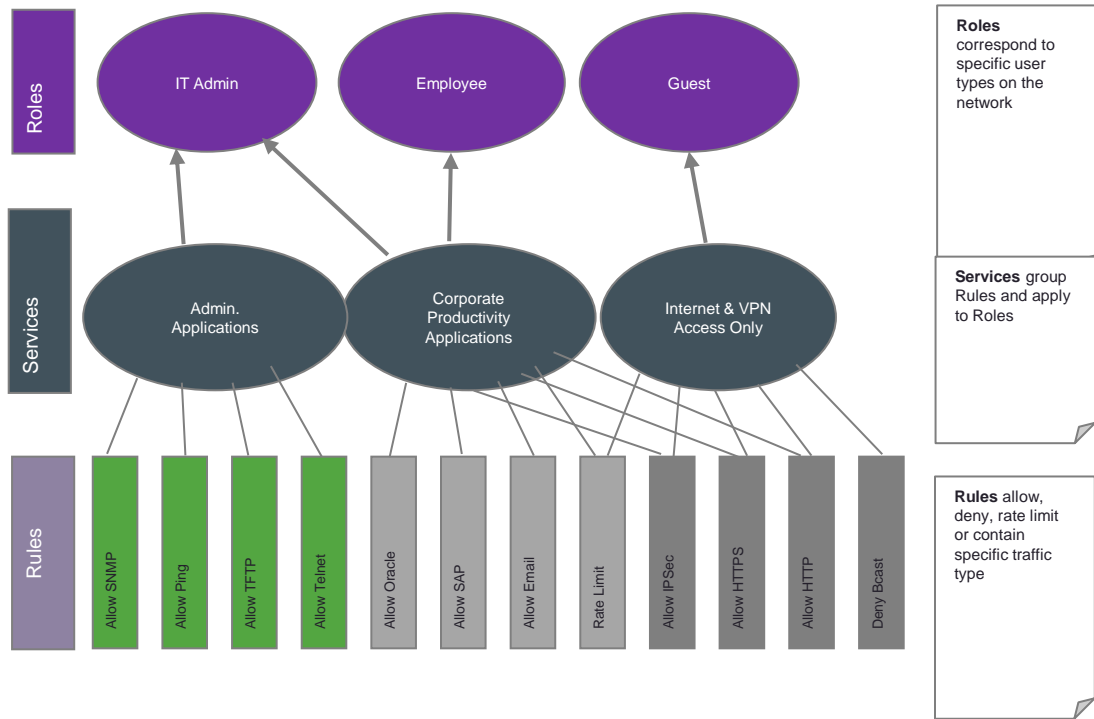
# EXOS Highlights

- Linux based
- IEEE 802.1Q 4096 VLANs
- Q-in-Q
- ACL – L2, L3, L4
- QoS – 8 queues, Strict Priority, Weighted Round Robin
- Security
- Scripting – TCL, CLI, Python
- Cross platform stacking
- Extreme Analytics
- IEEE 802.1x, MAC Authentication, Web
- Policy



# Policy-based Networking

- Enforce desired network behavior across switches, routers and APs
- “One click” enforcement of policies for QoS, bandwidth and other parameters
  - No tedious device-by-device ACL modifications for every move/add/change
- Network planning
  - Passive policies for what-if scenarios prior to enforcing
  - Utilize Wireshark captures for before & after comparisons to test new policies before deployment
- Reporting
  - Policy audit reports in OneView
  - Policy hit reports showing resulting traffic control
- Role-based access
  - Roles, Services, Rules



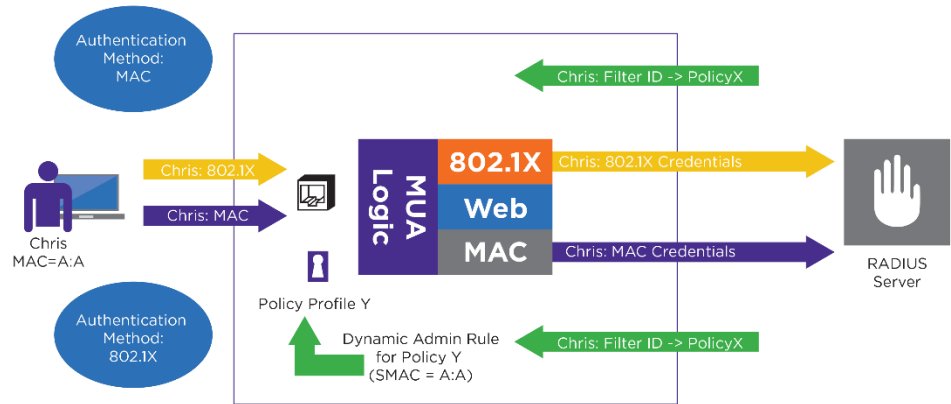
# Multi-Method Authentication

Allows for the coexistence of multiple authentication agents on the same port.

- 802.1X
- Web Authentication
- MAC Authentication

Allows for the coexistence of multiple authentication agents on the same port.

- 802.1X
- EXOS Web Authentication
- MAC Authentication



# Applications Everywhere – Public and Private Cloud

## Here is the dilemma

How users see applications:

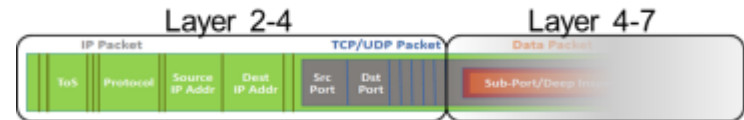


How **traditional switches** see applications:



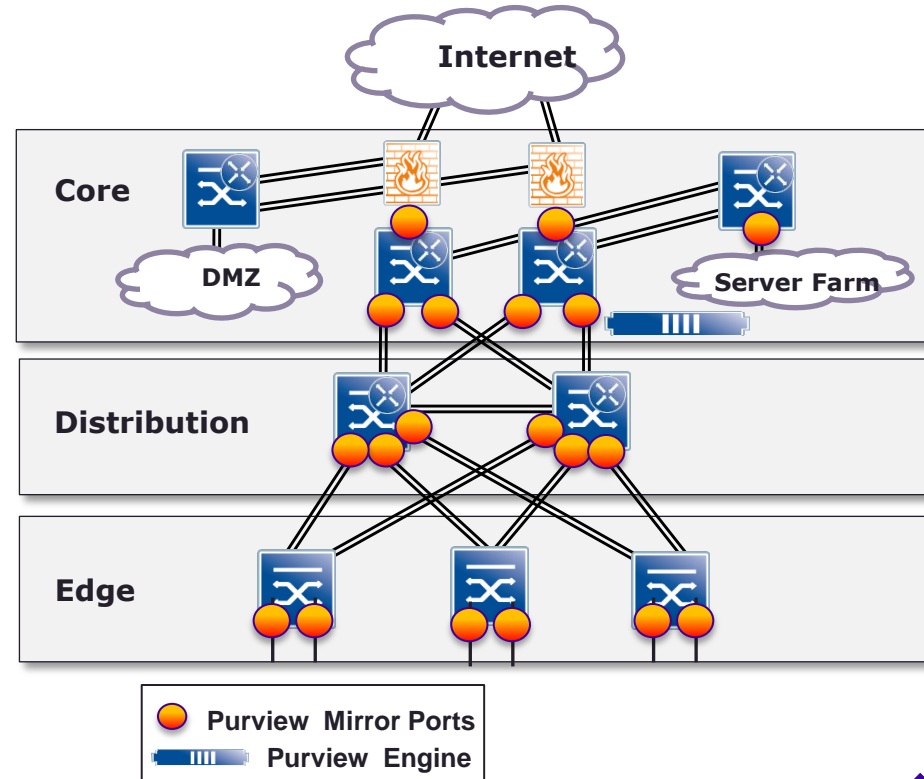
Port 80

Port 443



# Deployment Models

- Access
  - Application visibility on access communications (typically covers most user traffic)
- Distribution
  - Achieve application visibility for all communications except those that are resident only in the core
- Core
  - Application visibility for all communications that involve the core
  - Include high-bandwidth applications such as storage backup runs
- Data Center
  - Multi-sensor + Multi-NetSight deployment to scale with massive data communications
- Pervasive
  - Multiple traffic domains with Purview coverage for all domains
  - Multi-sensor + Multi-NetSight deployment
  - Avoids duplication of flows across traffic domain selections



# ExtremeAnalytics Architecture – Telemetry

**Commercial  
Silicon (BroadCom)**



**sFlow**

**ACL Mirror  
over GRE**

**Management Center**



**Aggregated  
Flow Data**



**Analytics  
Engine**



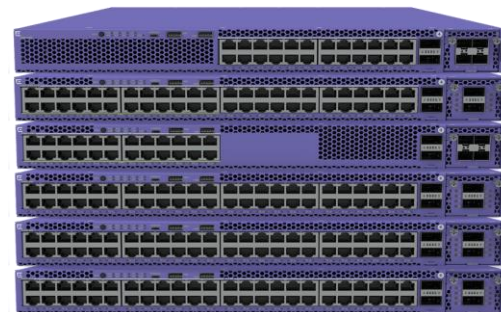
# Smart OmniEdge “Premium” X465 Policy Edge Switch



# Smart OmniEdge X465 Series – Usecase

- Security Policy Edge
  - Highly scalable OnePolicy support / MACSec link encryption
- IoT Edge
  - Multi-Gig access / 30/60/90W PoE
  - Extended Edge Switching Controlling Bridge
- Any Campus Edge
  - Fabric Attach -> Fabric Connect
  - Universal Attach -> Any Campus\*
- Visibility Edge
  - Application Telemetry/sFlow
  - Insight Architecture\*
- Timing Edge
  - Audio Video Bridging (AVB)\*
- Provider Edge
  - G.8032/ERP
  - MPLS/VXLAN/EVPN

## X465 Series



Multi-Purpose OmniEdge  
Switch Series To Future  
Proof



# Smart OmniEdge X465 Series – Models



## 1Gb Models

Model	Description
X465-24W	24 x 10/100/1000 ports with 802.3bt type 4 (90W) PoE
X465-48T	48 x 10/100/1000 ports
X465-48P	48 x 10/100/1000 ports with 802.3at (30W) PoE
X465-48W	48 x 10/100/1000 ports with 802.3bt type 4 (90W) PoE

### CPU / Memory

- Dual Core X86
- 2 GB DRAM
- 8 GB eMMC



## Multi-Rate Models

Model	Description
X465-24MU	24 x 100M/1G/2/5G/5G ports with 802.3bt type 3 (60W) PoE
X465-24MU-24W	24 x 100M/1G/2.5G/5G ports with 802.3bt type 3 (60W) PoE + 24 x 10/100/1000 ports with 802.3bt type 4 (90W) PoE

### CPU/Memory

- Quad Core X86
- 8 GB DRAM
- 8 GB eMMC



# ExtremeSwitching X465 Hardware Overview

- Dual Core x86 CPU (1Gbps models)
- Quad Core x86 CPU (2.5/5G models)
- Dual Hot Swappable Power supplies
  - Utilizes X450-G2/X460-G2 PSU
  - New 2000W PSU option
- Single Modular “VIM” uplink slot
- Dual Dedicated QSFP Stacking Ports
- Front to Back Airflow
- N+1 Redundant Modular Fans
- 128 bit/256 bit MACsec capable uplinks (10G/25G) and 10/100/1000 access ports
- Dual USB Type A
- USB Type B micro-B console
- 802.3bt type 3 (60W) and type 4 (90W) PoE
- **Perpetual PoE** enables PoE power to be maintained during a switch re-start, preventing attached IoT devices from being disrupted or rebooted during the switch reset
- **Fast PoE** enables power to be supplied to connected edge or IoT devices before switch boot-up completion, speeding the time for powered end-points to start up
- 10/100/1000bps Out of Band Management port
- Bluetooth Dongle support for console access
- Blue “location” LED
- IEEE 802.3az Energy Efficient Ethernet
- SSD Slot



# ExtremeSwitching X460-G2 Family



- 48-port or 28-port GbE models
- 4 ports of SFP+ 10GbE or 4 ports of SFP 1GbE on front faceplate
- 16 port multi-rate (100Mb/1/2.5Gb)
- PoE+ switch with 32 10/100/1000 PoE+ ports
- All configurations Non-blocking
- Copper, Fiber, and PoE-Plus models
- Optional two-port 10 GbE fiber and copper options to provide additional 10Gbps streams of uplink bandwidth
- Optional two-port 40 GbE to provide 80 Gbps uplinks or SummitStack-V160 stacking



# ExtremeSwitching X460-G2 Multi-Rate Switch Model



- Four 10Gb SFP uplinks on the front panel
- Sixteen 100Mb/1.0Gb/2.5Gb multi-rate ports
- Multi-rate ports do NOT support SynchE
- Thirty-two 10/100/1000 ports
- All 48 ports are PoE+ enabled



# ExtremeSwitching X460-G2 Half-Duplex Switch Models

- PoE or non-PoE version
- Four 10Gb SFP uplinks on the front panel
- 24 10/100/1000 ports that are full-duplex only
- 24 10/100/1000 ports that are half-duplex and full-duplex capable



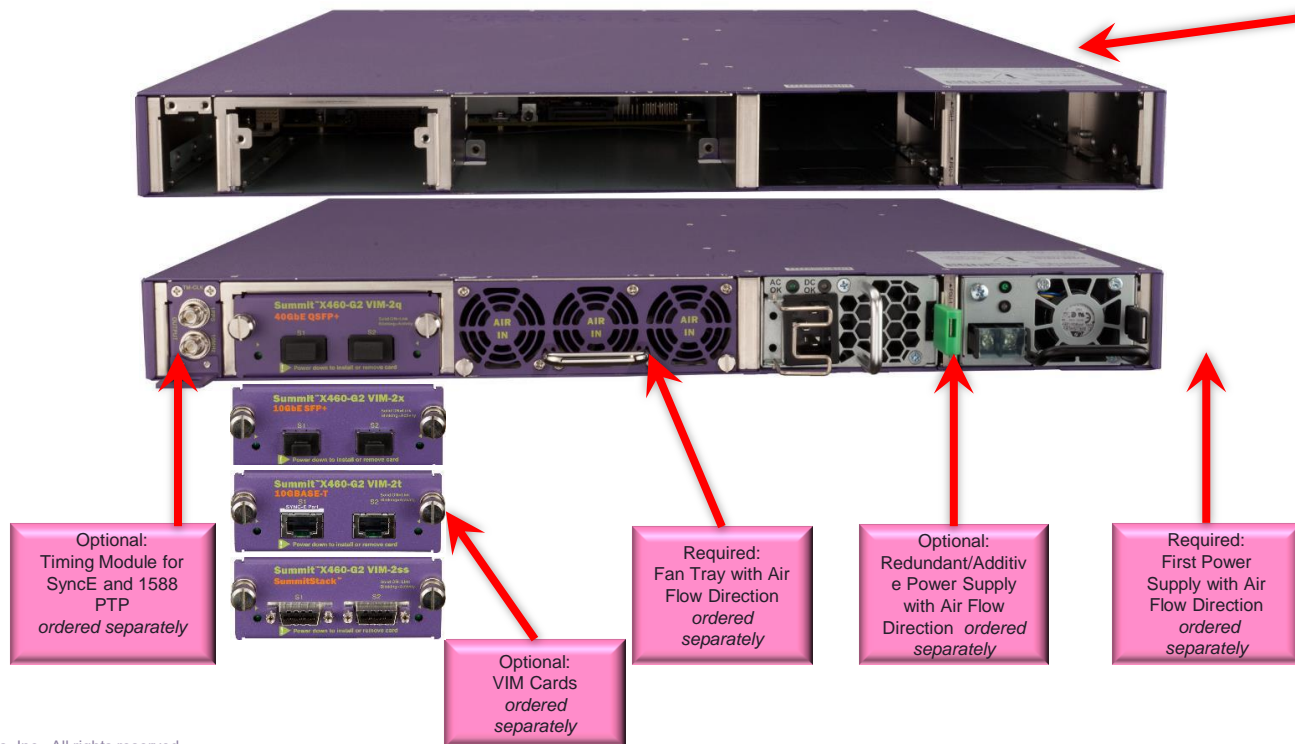
# ExtremeSwitching X460-G2 Switches

## Back Panel Components

Ordered Empty

➔ Power Supplies, Fan Tray, Timing Modules and VIMs are ordered separately

Shipped Empty  
with blank panels  
for 1 PSU slot, VIM  
slot & Timing  
Module slot



# ExtremeSwitching X450-G2 Family

- A family of eight switches
  - 24 and 48 PoE and non-PoE switches with quad 10Gb uplinks
  - 24 and 48 PoE and non-PoE switches with quad 1Gb uplinks

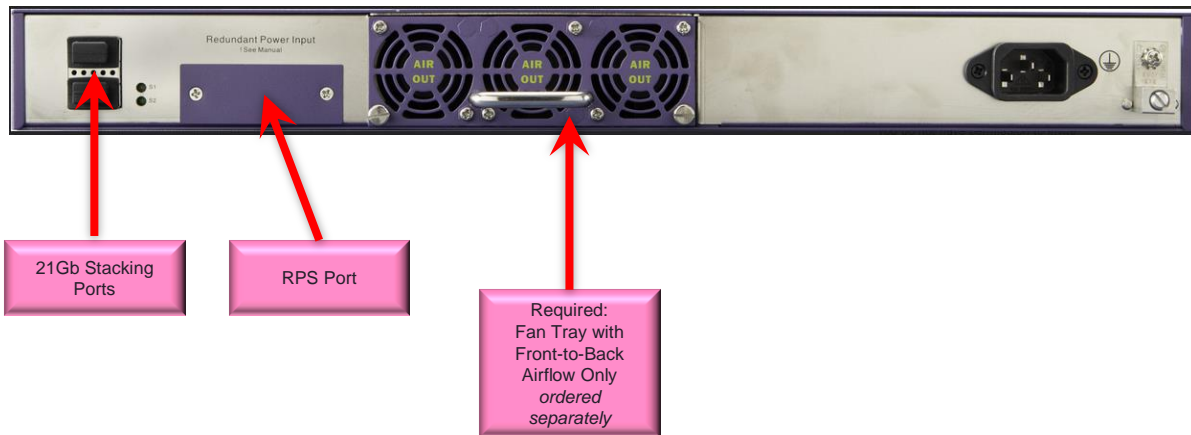


# ExtremeSwitching X450-G2 Switches

## Back Panel Components non-PoE models



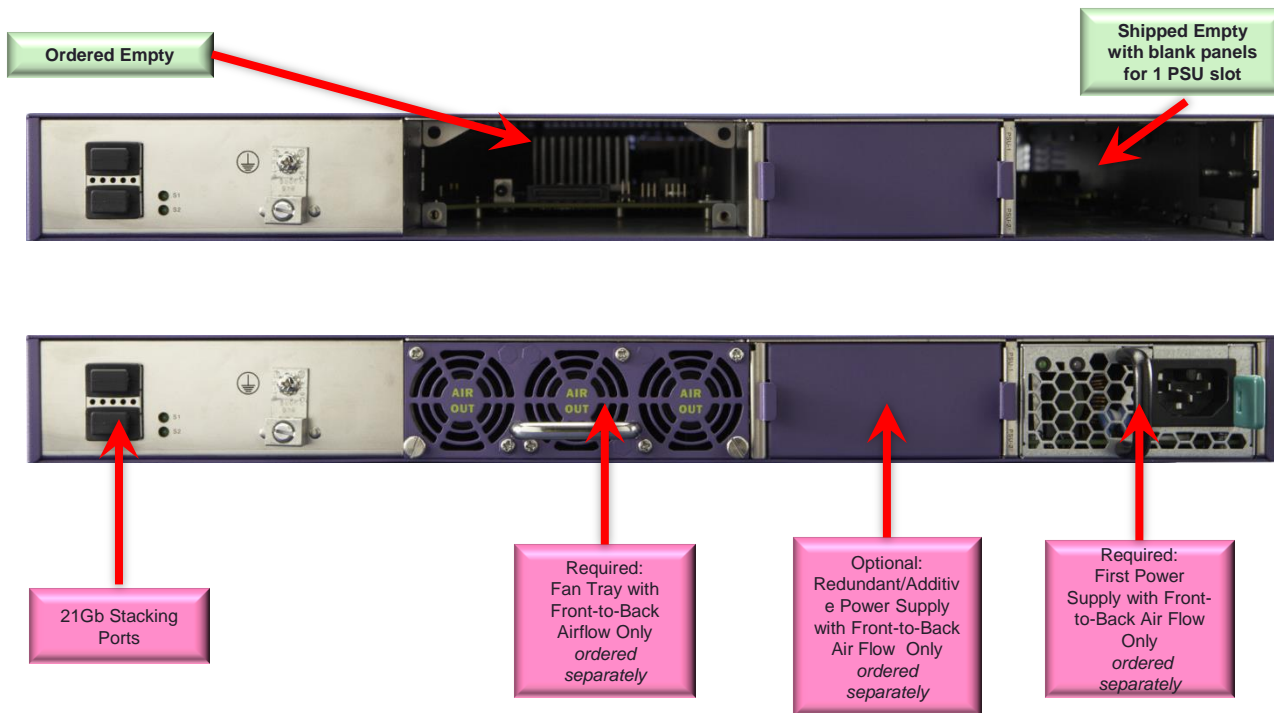
Fan Tray ordered separately



# ExtremeSwitching X450-G2 Switches

## Back Panel Components PoE models

**Power Supplies and Fan Tray are ordered separately**



# ExtremeSwitching X440-G2 Family



## 12 Models

- 12, 24 and 48 port PoE and non-PoE switches with quad 1Gb uplinks, AC power
- 24 and 48 non-PoE switches with quad 1Gb uplinks, DC
- 24 port SFP switch with quad 1Gb uplinks AC power
- 3 extended temperature models (0°C to 60°C) with quad 1Gb uplinks
- All models with fixed fans and one fixed power supply
- Energy Efficient Ethernet (EEE) supported on all copper Base-T ports
- Simultaneous support for stacking and 10GE uplinks
- Half duplex support on a some ports



# ExtremeSwitching X440-G2 – 10/100/1000 Switch Models



- Four 1Gb SFP uplinks that are upgradable to 10GbE on the back panel
- Four SFP combo ports on the front panel



## **X440-G2-24x-10GE4**

20x SFP, 4x Combo, 4x SFP/SFP+ upgradeable

## **X440-G2-24p-10GE4**

20x 10/100/1000BT POE+, 4x Combo, 4x SFP/SFP+ upgradeable

## **X440-G2-24t-10GE4**

20x 10/100/1000BT, 4x Combo, 4x SFP/SFP+ upgradeable

## **X440-G2-24t-10GE4-DC**

20x 10/100/1000BT, 4x Combo, 4x SFP/SFP+ upgradeable, DC Power

## **X440-G2-48p-10GE4**

44x 10/100/1000BT POE+, 4x Combo, 4x SFP/SFP+ upgradeable

## **X440-G2-48t-10GE4**

44x 10/100/1000BT, 4x Combo, 4x SFP/SFP+ upgradeable

## **X440-G2-48t-10GE4-DC**

44x 10/100/1000BT, 4x Combo, 4x SFP/SFP+ upgradeable, DC Power



# ExtremeSwitching 12 Port X440-G2 Switch Models



- Four 1Gb SFP uplinks that are upgradable to 10GbE on the front panel



## **X440-G2-12p-10GE4**

12x 10/100/1000BT POE+, 4x SFP/SFP+ upgradeable

## **X440-G2-12t-10GE4**

12x 10/100/1000BT, 4x SFP/SFP+ upgradeable



# ExtremeSwitching X440-G2

## Extended Temperature Models - 1Gb Uplinks

- Support an operating temperature range of 0°C to 60°C
- Four 1Gb SFP uplinks (NOT upgradable to 10GbE)



### **X440-G2-12t8fx-GE4**

12x 10/100/1000BT, 8x 100Base-FX, 4x SFP

### **X440-G2-24t-GE4**

24x 10/100/1000BT, 4x SFP

### **X440-G2-24fx-GE4**

24x 100Base-FX, 4x SFP

# ExtremeSwitching X620 Product Family Overview



## **X620-8t-2x**

8 x 100Mb/1Gb/10GBASE-T + 2 x SFP+ 100Mb/1Gb/10Gb

## **X620-10x**

10 x SFP+ 100Mb/1Gb/10Gb

## **X620-16t**

12x100Mb/1Gb/10GBASE-T & 4 combo x 1Gb10GBASE-T / SFP+

## **X620-16x**

16 x 100Mb/1Gb/10Gb SFP+

## **X620-16p**

12x100Mb/1/2,5/5/10GBASE-T & 4 combo x 1Gb10GBASE-T / SFP+ w/PoE+/++

- Flexible family of enterprise grade compact 10Gb switches for high speed edge applications
- 16 port modular and 10 port compact fixed configurations
  - 10GBASE-T with EEE
  - Modular SFP+ fiber interfaces



# ExtremeSwitching X590



## **X590-24x-2c**

24 x 1/10SFP+ & 2 x 100Gb QSFP28



## **X590-24t-2c**

24 x 10GBASE-T & 2 x 100Gb QSFP28

- QSFP28 Ports are Multirate Ports (1x10Gb with adapter, 4x10Gb, 1x40Gb, 4x25Gb, 2x50Gb, 1x100Gb)
- SummitStack-V400 supported
  - Stacking with X690 and X870 supported
  - When using 2x100Gb ports for stacking, one 40Gb Ethernet port available as an uplink
- 24 Port SFP+ Fiber and 10GBASE-T versions based on X690
- 802.1br CB support
- Optional EXOS Core license
- Common power supply and fan module options as used on X690/X870



# ExtremeSwitching X690



## **X690-48x-2q-4c**

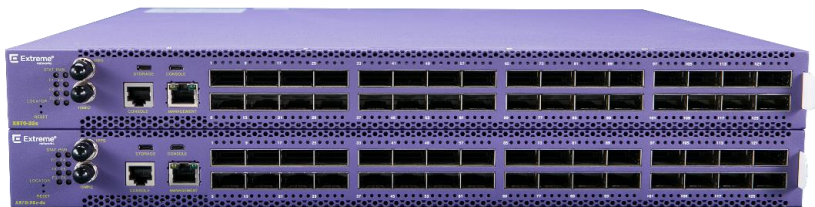
48x10Gb SFP+, 6xQSFP28 (4x100Gb or 2x100Gb+4x40Gb)

## **X690-48t-2q-4c**

48x10Gb 10GBASE-T, 6xQSFP28 (4x100Gb or 2x100Gb+4x40Gb)

- 10Gb leaf aggregation switches for fiber and 10GBASE-T applications with 100Gb Ethernet
- QSFP28 Ports are Multirate Ports (1x10Gb with adapter, 4x10Gb, 1x40Gb, 4x25Gb, 2x50Gb, 1x100Gb)
- SummitStack-V400 support
- 802.1br CB support
- Shares power supply and fan modules with X870

# ExtremeSwitching X870



## **X870-32c**

32x 100Gb QSFP28 ports

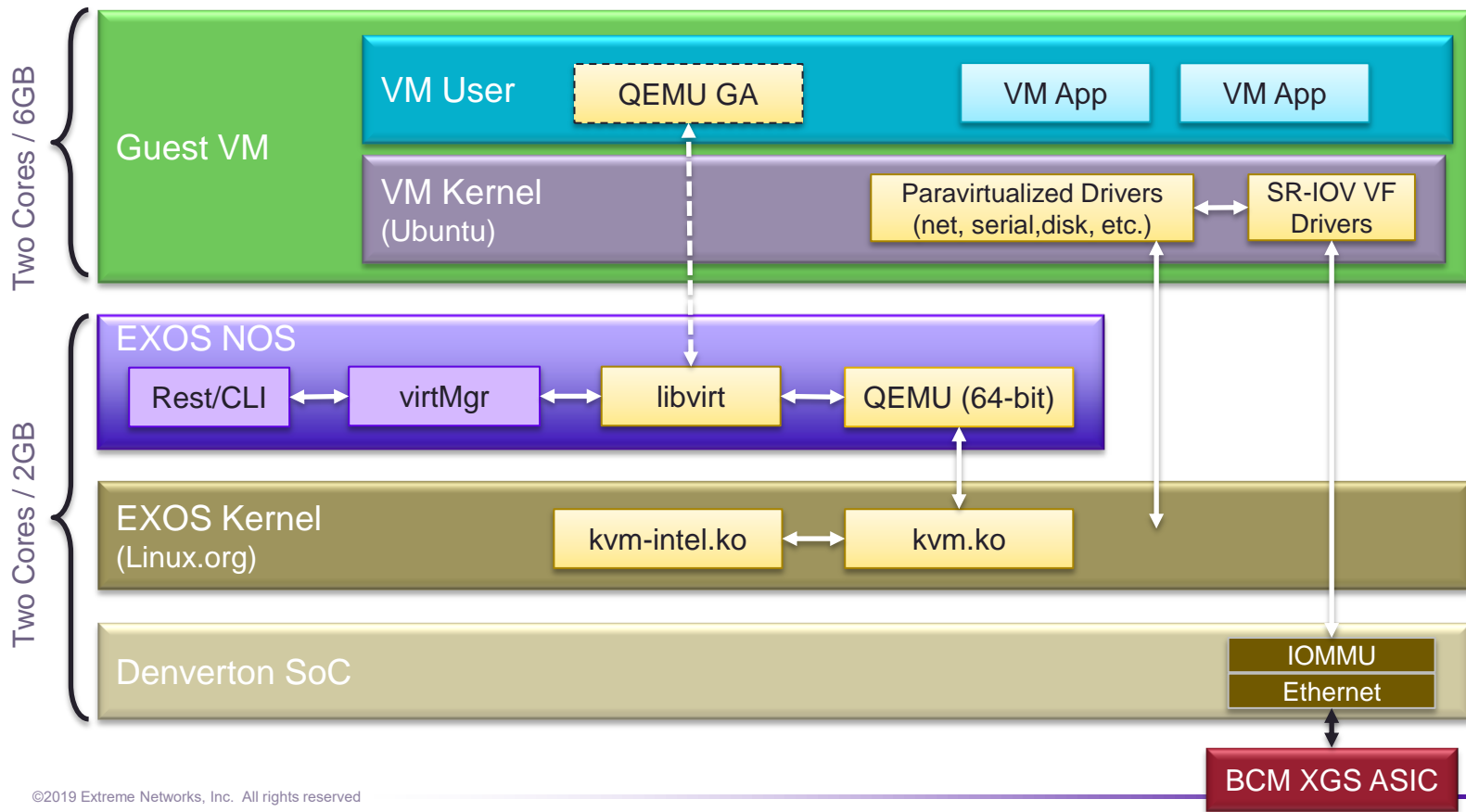
## **X870-96x-8c**

96 x 10Gb via QSFP, 8x 100Gb QSFP28 ports

- High density 100Gb Ethernet switch family for spine and leaf applications
- 32 QSFP28 ports supporting flexible interface rates
  - 32 x 100Gb Ethernet
  - 64 x 50Gb Ethernet
  - 128 x 25Gb Ethernet
  - 128 x 10Gb Ethernet
  - 32 x 40Gb Ethernet
- 6.4 Tbps switching capacity

# Enable InSight Architecture

# Smart OmniEdge Support “InSight Architecture”



## X465 CPU

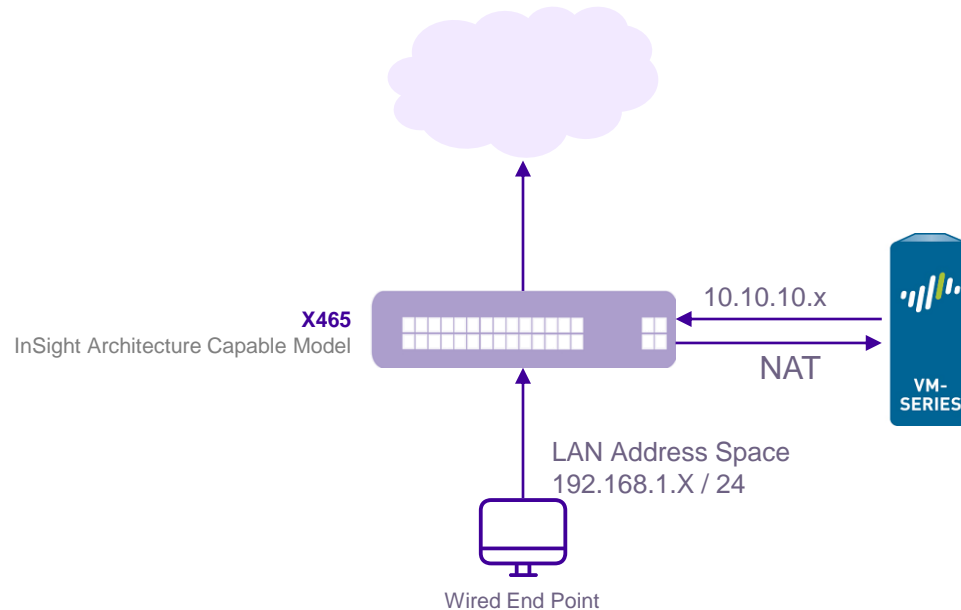
- CPU allocation via CPU pinning.
- EXOS will be allocated 2x CPU cores & remaining cores allocated for Guest VM usage.

## ExtremeXOS

- KVM: Kernel Virtual Machine
- QEMU: Hypervisor
- Libvirt: Multi-HV VM Management



# Smart OmniEdge Support “InSight Architecture Demo”

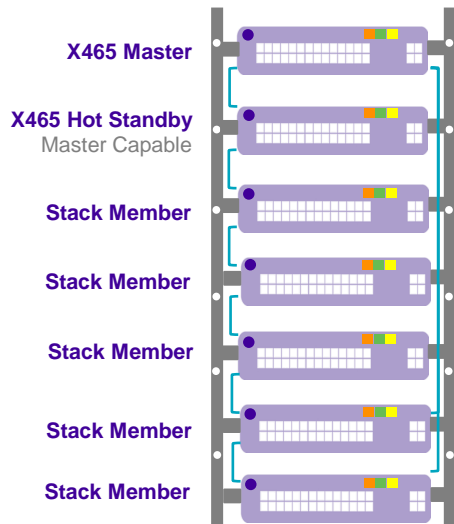


Utilize Palo Alto & “NAT” guest traffic at remote branch

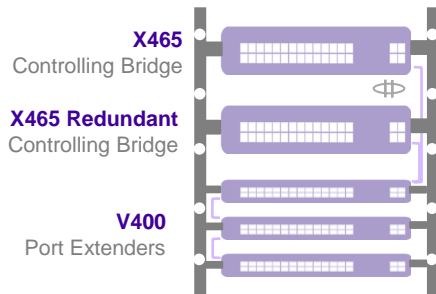
# Edge Simplification



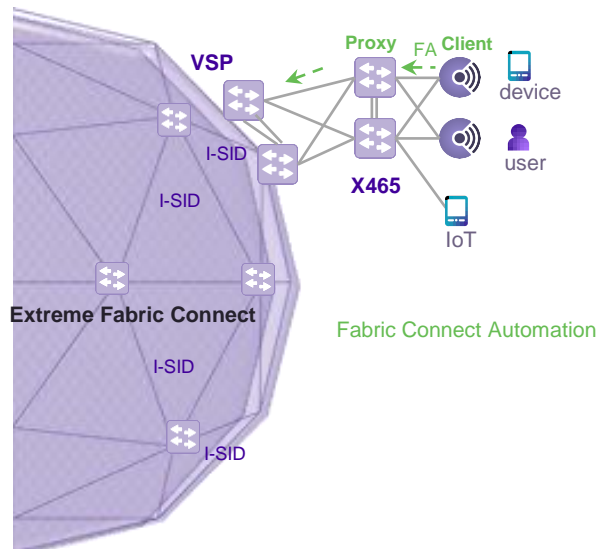
**Simpler Stacking**



**Automated Edge**



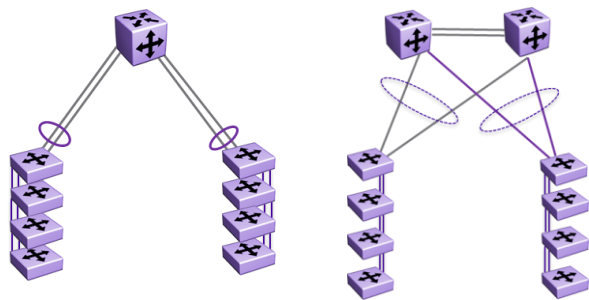
**Any Campus+**



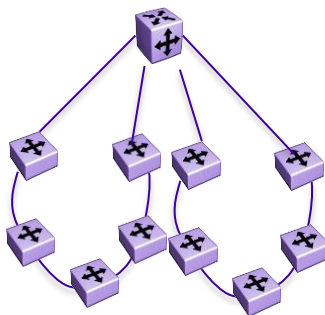
# What is Extended Edge?

# Extended Edge Topologies

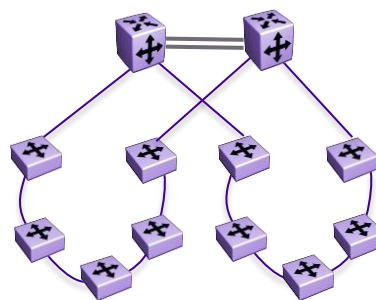
- Topology Guidelines:
  - Cascade ports can be LAG or single ports
  - Up to 4 x V400's in cascade and up to 8 x V400's in a single ring
  - No limit on number of rings (except V400 aggregate limit below)
  - Non-Redundant CB and Redundancy CB options
  - Up to 48 V400's in aggregate (~2300 ports)



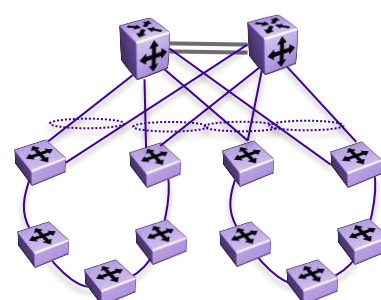
Redundant CB's  
w/ cascading BPE's



Resilient cascading BPE's



Redundant CB's  
w/ Resilient cascading BPE's

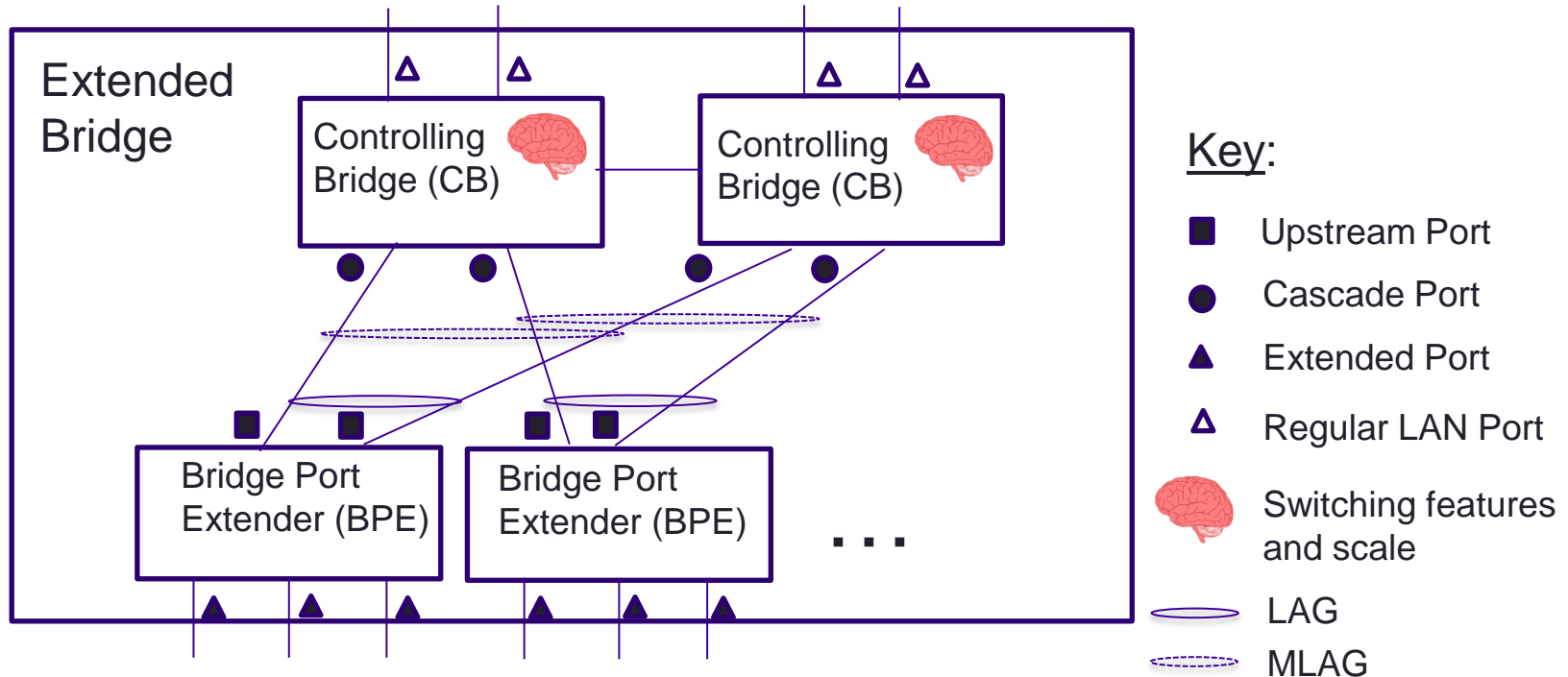


22.5 / 22.6 / 30.2

22.7 / 30.4



# VPEX High-level Architecture and Terminology Refresher



# Controlling Bridge Lineup

## X670-G2

48x10G + 4x40G



- Higher-density 10Gb
- Leaf edge and TOR switch
- Low Latency
- PTP

## X690

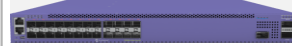
48x10G + 6x100G



- Higher-density 10Gb
- Leaf edge and TOR switch
- Low Latency
- 100G uplinks

## X590

24x10G + 2x100G



- Mid-density 10Gb
- Leaf edge and TOR switch
- Low Latency
- 100G uplinks

## X465

24-48 GE/MG Ports



- 160Gbps Stacking
- L3, MPLS & VXLAN
- 2000W POE+
- 60W / 90W UPOE
- 10/25G/40G uplinks
- MACSec
- Insight Architecture

NEW



# V400 – 24/48 port POE and non-POE models



**V400 24t-10GE2**



**V400 48t-10GE4**



**V400 24p-10GE2**



**V400 48p-10GE4**

Model	Port Configuration
V400 24t-10GE2	24 10/100/1000BASE-T, 2 SFP+ ports, w/ USB and RJ45 console port
V400 24p-10GE2	24 10/100/1000 ports and 2 SFP+ ports, w/ USB and RJ45 console port. 380 watt POE budget. 802.3 af/at – RPS Optional
V400 48t-10GE4	48 10/100/1000 ports and 4 SFP+ ports, w/ USB and RJ45 console port.
V400 48p-10GE4	48 10/100/1000 ports and 4 SFP+ ports, w/ USB and RJ45 console port. 740 watt POE budget. 802.3 af/at – RPS Optional
VX-RPS-CH3	V400 3 Slot Redundant Power Supply Shelf
VX-RPS-1000	V400 1000W Redundant Power Supply



# Introducing Extended Edge V300


## GE Compact Fan Less Extended Edge Switches

**POE Powered V300-8P-2T-W June 2019 !**

**Additional V300 products – Q04CY19\***

### Mounting Options

DIN Rail  
Wall or Under Counter  
Single 19" Rack  
Side by Side 19" Rack

Model*	Description	Temp	Power	Form Factor
V300HT-8P-2X	<b>High Temp</b> Industrial 8 port 10/100/1000 w/ half duplex support poe+ w/ 2xSFP+ uplinks 180W PoE+ - support optional DIN rail bracket	<b>-40 - +70 C</b> <b>IP 42</b> DIN, wall, undercounter, rack mount options, RJ45 retention	External AC / DC Power Supplies 80+ Bronze 180W POE budget	<div>New for 2019</div> 
V300HT-8T-2X	<b>High Temp</b> Industrial 8 port 10/100/1000 w/ half duplex support w/ 2xSFP+ uplinks - support optional DIN rail bracket			
V300-8P-2X	8 port 10/100/1000 w/ half duplex support poe+ w/ 2xSFP+ uplinks 180W PoE+ 9" wide - support optional 19" rack mount bracket	0 - +50 C Wall, desk, undercounter, rack mount options	External AC / DC Power Supplies 80+ Bronze 180W POE budget	
V300-8T-2X	8 port 10/100/1000 w/ half duplex support w/ 2xSFP+ uplinks 9" wide - support optional 19" rack mount bracket			
V300-8P-2T-W	8 port 10/100/1000 w/ half duplex support Poe+ 2x1G 802.3bt type4 uplinks 100W PoE budget 9" wide	0 - +60C IP 40,Wall, desk, undercounter, rack mount options, RJ45 Protective Cover	<b>POE Powered 60W/90W Uplinks</b> 100W POE+ budget for access ports	

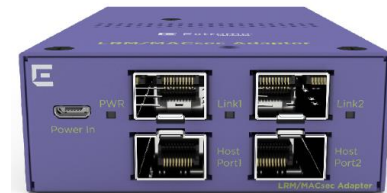
*This product roadmap represents Extreme Networks® current product direction. All product releases will be on a when-and-if available basis. Actual feature development and timing of releases will be at the sole discretion of Extreme Networks.  
Not all features are supported on all platforms. Presentation of the product roadmap does not create a commitment by Extreme Networks to deliver a specific feature.  
Contents of this roadmap are subject to change without notice.*



# LRM / MACsec Adapter

## Enhance your existing Switch

- Enables two ports of 10Gbps LRM and/or MACsec on an existing switch
  - Simultaneous LRM and MACsec
  - Multiple Adapters per switch
- Available on multiple ExtremeSwitching platforms
  - X440-G2, X450-G2, X460-G2, X590\*, X620, X670-G2, X690
- LRM driven from the host switch's SFP+ ports
- 128 or 256-bit MACsec encryption also supported
  - Requires MACsec license on host switch



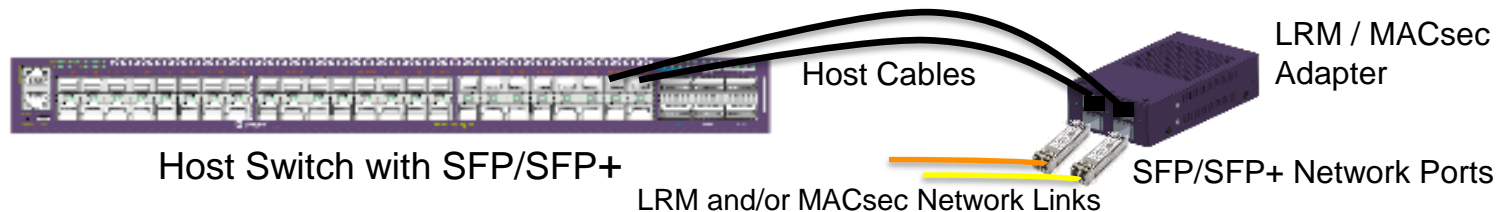
### Highlights

- ▶ External adapter for ExtremeSwitching EXOS systems
- ▶ Configured from host switch; no local set-up required
- ▶ Fan-less device
- ▶ Includes host cables to connect to host switch
- ▶ Power received from host switch; USB (micro-B) cable included for auxiliary power
- ▶ Rack mount options available for single or multiple Adapters



# LRM / MACsec Adapter

## Benefits



Adapter uses one or two SFP / SFP+ ports on host switch

- Allows LRM to be run on switches that do not otherwise support it
- Allows retrofit of existing switches to make them security compliant
  - Avoids a full switch HW upgrade; what other competitors must do
  - Allows safe investment in non-MACsec switches; if no immediate need, MACsec capability can be easily added in the future



Extreme<sup>TM</sup>

Customer-Driven Networking

[WWW.EXTREMENETWORKS.COM](http://WWW.EXTREMENETWORKS.COM)

