



# ExtremeXOS Release Notes

*Software Version ExtremeXOS 21.1*

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# Preface

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## Conventions






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This section discusses the conventions used in this guide.

### Text Conventions

The following tables list text conventions that are used throughout this guide.

**Table 1: Notice Icons**

Icon	Notice Type	Alerts you to...
	General Notice	Helpful tips and notices for using the product.
	Note	Important features or instructions.
	Caution	Risk of personal injury, system damage, or loss of data.
	Warning	Risk of severe personal injury.
	New	This command or section is new for this release.

**Table 2: Text Conventions**

Convention	Description
Screen displays	This typeface indicates command syntax, or represents information as it appears on the screen.
The words <b>enter</b> and <b>type</b>	When you see the word “enter” in this guide, you must type something, and then press the Return or Enter key. Do not press the Return or Enter key when an instruction simply says “type.”
<b>[Key]</b> names	Key names are written with brackets, such as <b>[Return]</b> or <b>[Esc]</b> . If you must press two or more keys simultaneously, the key names are linked with a plus sign (+). Example: Press <b>[Ctrl]+[Alt]+[Del]</b>
<i>Words in italicized type</i>	Italics emphasize a point or denote new terms at the place where they are defined in the text. Italics are also used when referring to publication titles.

### Platform-Dependent Conventions

Unless otherwise noted, all information applies to all platforms supported by ExtremeXOS software, which are the following:

- Summit® family switches
- SummitStack™
- ExtremeSwitching

When a feature or feature implementation applies to specific platforms, the specific platform is noted in the heading for the section describing that implementation in the ExtremeXOS command documentation. In many cases, although the command is available on all platforms, each platform uses specific keywords. These keywords specific to each platform are shown in the Syntax Description and discussed in the Usage Guidelines.

## Terminology

When features, functionality, or operation is specific to a switch family, the family name is used. Explanations about features and operations that are the same across all product families simply refer to the product as the "switch."

## Providing Feedback to Us

We are always striving to improve our documentation and help you work better, so we want to hear from you! We welcome all feedback but especially want to know about:

- Content errors or confusing or conflicting information.
- Ideas for improvements to our documentation so you can find the information you need faster.
- Broken links or usability issues.

If you would like to provide feedback to the Extreme Networks Information Development team about this document, please contact us using our short [online feedback form](#). You can also email us directly at [internalinfodev@extremenetworks.com](mailto:internalinfodev@extremenetworks.com).

## Getting Help

If you require assistance, you can contact Extreme Networks using one of the following methods:

- **Global Technical Assistance Center (GTAC) for Immediate Support**
  - **Phone:** 1-800-872-8440 (toll-free in U.S. and Canada) or 1-603-952-5000. For the Extreme Networks support phone number in your country, visit: [www.extremenetworks.com/support/contact](http://www.extremenetworks.com/support/contact)
  - **Email:** [support@extremenetworks.com](mailto:support@extremenetworks.com). To expedite your message, enter the product name or model number in the subject line.
- **GTAC Knowledge** — Get on-demand and tested resolutions from the GTAC Knowledgebase, or create a help case if you need more guidance.
- **The Hub** — A forum for Extreme customers to connect with one another, get questions answered, share ideas and feedback, and get problems solved. This community is monitored by Extreme Networks employees, but is not intended to replace specific guidance from GTAC.
- **Support Portal** — Manage cases, downloads, service contracts, product licensing, and training and certifications.

Before contacting Extreme Networks for technical support, have the following information ready:

- Your Extreme Networks service contract number and/or serial numbers for all involved Extreme Network products
- A description of the failure
- A description of any action(s) already taken to resolve the problem
- A description of your network environment (such as layout, cable type, other relevant environmental information)
- Network load at the time of trouble (if known)
- The device history (for example, if you have returned the device before, or if this is a recurring problem)
- Any related Return Material Authorization (RMA) numbers

## Related Publications

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### ExtremeXOS Publications

- *ACL Solutions Guide*
- *EMS Messages Catalog*
- *ExtremeXOS Command Reference Guide*
- *ExtremeXOS Feature License Requirements*
- *ExtremeXOS OpenFlow User Guide*
- *ExtremeXOS User Guide*
- *ExtremeXOS Legacy CLI Quick Reference Guide*
- *ExtremeXOS Release Notes*
- *Extreme Hardware/Software Compatibility and Recommendation Matrices*
- *Switch Configuration with Chalet*
- *Using AVB with Extreme Switches*

### Hardware Documentation

- *Summit Family Switches Hardware Installation Guide for Switches Using ExtremeXOS 21.1*
- *Summit Family Switches Hardware Installation Guide for Switches Using ExtremeXOS 16 and Earlier*
- *Extreme Hardware/Software Compatibility and Recommendation Matrices*
- *Extreme Networks Pluggable Transceivers Installation Guide*

### NetSight Documentation

NetSight documentation, including release notes, are available at: <https://extranet.extremenetworks.com/>. You must have a valid customer account to access this site.

NetSight online help is available from the **Help** menu in all NetSight software applications. The online help provides detailed explanations of how to configure and manage your network using NetSight software applications.

For complete regulatory compliance and safety information, refer to the document *Intel® Server Products Product Safety and Regulatory Compliance*.

## Open Source Declarations

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# 1 Overview

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**New and Corrected Features in ExtremeXOS 21.1**  
**New Hardware Supported in ExtremeXOS 21.1**  
**Hardware No Longer Supported**  
**Circuit Emulation Service (CES) No Longer Supported**  
**OpenFlow and SSH Included in ExtremeXOS Base Image**  
**ExtremeXOS SSH Server Upgraded with OpenSSH v6.5**  
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**Extreme Hardware/Software Compatibility and Recommendation Matrices**  
**Compatibility with Extreme Control Center (Formerly NetSight)**  
**Upgrading ExtremeXOS**  
**Downloading Supported MIBs**  
**Tested Third-Party Products**  
**Extreme Switch Security Assessment**  
**Service Notifications**

These release notes document ExtremeXOS 21.1 which adds features, adds supported hardware, and resolves software deficiencies.

## New and Corrected Features in ExtremeXOS 21.1

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This section lists the new and corrected features supported in the ExtremeXOS 21.1 software:

### Virtual Extensible LAN (VXLAN) Gateway

Virtual Extensible LAN (VXLAN) is a layer 2 overlay scheme over a layer 3 network. Overlays are called VXLAN segments, and only virtual machines (VMs) within the same segment have Layer 2 connectivity. VXLAN segments are uniquely identified using an identifier called the VXLAN Network Identifier (VNI). The VNI is a 24-bit identifier; therefore, an administrative domain can support up to 16 million overlay networks.

As the scope of the MAC addresses originated by tenant VMs is restricted by the VNI, overlapping MAC addresses across segments can be supported without traffic leaking between tenant segments. When a tenant frame traverses a VXLAN overlay network, it is encapsulated by a VXLAN header that contains the VNI. This frame is further encapsulated in a UDP header and L2/L3 headers.

VXLAN can add up to a 54-byte header to the tenant VM's frame. For VXLAN to work correctly, this requires that the IP MTU be set to at least 1554 bytes on the network-side interfaces, and on all transit nodes which carry VXLAN traffic.



The role to encapsulate/decapsulate a frame is performed by a VXLAN Tunnel Endpoint (VTEP), also referred to as VXLAN gateway. A VXLAN gateway can be a Layer 2 gateway or Layer 3 gateway depending on its capacity. A Layer 2 gateway acts as a bridge connecting VXLAN segments to VLAN segments. A Layer 3 gateway performs all that of Layer 2 gateway, and capable of routing traffic between tenant VLANs.

**Note**

This feature implements only Layer 2 gateway.

At tunnel initiation, a gateway looks up the destination MAC address of the frame received from the tenant VM. If the MAC address to remote VTEP IP binding is known, the gateway adds the VXLAN header and the IP/UDP header to the frame and forwards toward the DC network. A gateway node that terminates a tunnel removes the encapsulation headers from the packet and determines the bridge domain of the inner frame by examining the VNID received in the VXLAN header. The gateway then looks up the inner MAC destination address (DA) in the tenant VLAN's filtering database and decides either to flood or forward the frame to tenant ports.

The VXLAN segments with the same virtual network ID form a virtual network with one Ethernet broadcast domain.

In multicast VXLAN, the VNI is mapped to a multicast group and multicast tunnels are used to distribute broadcast, unknown unicast and multicast (BUM) tenant traffic to remote endpoints (VTEPs). This requires that the Layer 3 network should support multicast. Unicast VXLAN uses unicast tunnels, and the BUM traffic is head-end replicated at each of the remote endpoints.

**Note**

This feature implements only unicast VXLAN.

*Supported Platforms*

Summit X770 and X670-G2 series switches (standalone), and stacks that have X770 and X670-G2 slots only.

*Limitations*

The following capabilities are not supported in ExtremeXOS 21.1:

- Layer 3 gateways
- Multicast VXLAN
- Ability to assign more than one VNI to a virtual network
- IPv6 addresses for local and remote VTEPs
- Assigning source IP addresses for VXLAN gateway encapsulation:
  - Per virtual router
  - Per virtual network or VNI
- Support for adding more than one tenant VLAN per VNI
- A physical port being part of both a tenant VLAN and an underlay (network) VLAN
- Routing in and out of tunnels
- Integration with any controllers
- Support for heterogeneous stack environments where at least one of the stack nodes is not VXLAN capable

- More than one next hop per (network) hop
- Tagged and untagged tenant VLANs on the same port
- Multicast underlay IP network, including PIM-Bidir
- Multiple VRs

### *New CLI Commands*

```

create virtual-network vn_name {flooding [standard | explicit-remotes]}

configure virtual-network vn_name vxlan vni [ vni | none ]

configure virtual-network vn_name [add | delete] [{vlan} vlan_name | vman
vman_name ]

configure virtual-network local-endpoint [ ipaddress ipaddress { vr vr_name } |
none ]

create virtual-network remote-endpoint vxlan ipaddress ipaddress {vr vr_name}

delete virtual-network remote-endpoint vxlan ipaddress ipaddress {vr vr_name}

configure virtual-network vn_name [add | delete] remote-endpoint vxlan ipaddress
ipaddress {vr vr_name}

enable learning {forward-packets | drop-packets}] vxlan {vr vr_name} ipaddress
remote_ipaddress

disable learning {forward-packets | drop-packets}] vxlan {vr vr_name} ipaddress
remote_ipaddress

show virtual-network { vn_name | vxlan vni vni | [vlan vlan_name | vman
vman_name]}

show virtual-network {vn_name} remote-endpoint vxlan {vni vni} {ipaddress
ipaddress { vr vr_name } }

configure fdb { mac_addr | broadcast | unknown-unicast | unknown-multicast } vlan
vlan_name [ add | delete ] vxlan {vr vr_name } {ipaddress} remote_ipaddress

configure virtual-network remote-endpoint vxlan ipaddress ipaddress { vr
vr_name } monitor [ on | off ]

show virtual-network { vn_name | remote-endpoint vxlan {ipaddress ipaddress} {vr
vr_name}} statistics {no-refresh}

clear counters virtual-network remote-endpoint vxlan [ all | ipaddress ipaddress ]

configure virtual-network vn_name monitor [ on | off ]

show virtual-network { vn_name | remote-endpoint remote-endpoint vxlan {ipaddress
ipaddress} {vr vr_name}} statistics {no-refresh}

clear counters virtual-network [ all | vn_name ]

```

### Changed CLI Commands

Changes are underlined.

```
[ create | delete ] fdb [ mac_addr vlan vlan_name [ ports port_list | blackhole |
vxlan { vr vr_name } {ipaddress} remote_ipaddress ] | broadcast vlan vlan_name
vxlan { vr vr_name } {ipaddress} remote_ipaddress | unknown-multicast vlan
vlan_name vxlan { vr vr_name } {ipaddress} remote_ipaddress | unknown-unicast
vlan vlan_name vxlan { vr vr_name } {ipaddress} remote_ipaddress ]

show fdb { {mac_addr | blackhole | permanent | {vlan} vlan_name | ports
port_list} {netlogin [all | mac-based-vlans]} | {vpls} {vpls_name} | openflow |
rbridge {nickname} | vxlan { vni } | virtual-network vn_name }

create vlan vlan-name {vr vr-name} {description vlan-desc} {tag [ tag | none ] }

configure {vlan} vlan-name {tag [tag {remote-mirroring} | none] }

configure {vlan} vlan_name add ports [port_list | all] {tagged {tag {- end_tag}}
| untagged | private-vlan translated }

configure {vlan} vlan_name delete ports [port_list | all] {tagged {tag} {-
end_tag}}
```

### Open Shortest Path First (OSPF) Exchanging Information for Virtual Extensible LAN (VXLANS)

ExtremeXOS leverages Open Shortest Path First (OSPF) to advertise and learn VTEPs dynamically in a VXLAN network. OSPFv2 advertises the triplet of VNI/Endpoint IP Address/Advertising Router ID through OSPFv2 domain using type 11 opaque link state advertisements (LSAs). The OSPFv2 VXLAN LSA link state ID uses opaque type 128. The remaining 24 bits of the field are set to the VXLAN VNI. Each locally configured VNI corresponds to a single opaque LSA advertised by the router. The OSPFv2 VXLAN LSA payload contains one top level TLV that specifies the locally configured IPv4 endpoint address on the advertising router.

#### Note



- The remote endpoints learned using OSPF are not saved to the configuration.
- The OSPFv2 VXLAN opaque LSA is only advertised if OSPF VXLAN extensions are enabled.
- OSPF VXLAN extensions can only be enabled when OSPFv2 is disabled.
- Local endpoint address can only be IPv4. IPv6 is not supported.

### Supported Platforms

Summit X770 and X670-G2 series switches (standalone), and stacks that have X770 and X670-G2 slots only.

### New CLI Commands

```
enable ospf vxlan-extensions
```

```
disable ospf vxlan-extensions
```

## Changed CLI Commands

The `show ospf` command output has been changed (shown in bold):

```
show ospf

OSPF                : Enabled                MPLS LSP as Next-Hop: No
RouterId            : 192.168.170.60        RouterId Selection  : Automatic
ASBR                : No                    ABR                : No
ExtLSA              : 0                    ExtLSAChecksum     : 0x0
OriginateNewLSA    : 190                  ReceivedNewLSA     : 102
SpfHoldTime        : 3                    Lsa Batch Interval : 30s
CapabilityOpaqueLSA : Enabled
10M Cost            : 10                   100M Cost          : 5
1000M Cost (1G)    : 4                    10000M Cost (10G) : 2
40000M Cost (40G) : 2
100000M Cost (100G) : 1
Router Alert       : Disabled
ASExternal LSALimit : Disabled                Import Policy File  :
(0)                Timeout (Count)       : Disabled
Originate Default  : Disabled
SNMP Traps         : Disabled
VXLAN Extensions : Enabled
Redistribute:
Protocol           Status  cost  Type  Tag      Policy
direct             Disabled 0     0     0        None
static             Disabled 0     0     0        None
rip                Disabled 0     0     0        None
e-bgp              Disabled 0     0     0        None
i-bgp              Disabled 0     0     0        None
isis-level-1       Disabled 0     0     0        None
isis-level-2       Disabled 0     0     0        None
isis-level-1-external Disabled 0     0     0        None
isis-level-2-external Disabled 0     0     0        None
```

## ONEPolicy Now Supported on New ExtremeSwitching X440-G2 and X620 Series Switches

ONEPolicy, which was released in ExtremexXOS 16.1, allows you create profiles for securing and provisioning network resources based upon the role the user or device plays within the enterprise. By first defining the user or device role, network resources can be tailored to a specific user, system, service, or port-based context by configuring and assigning rules to the policy role. A policy role can be configured for any combination of Class of Service, VLAN assignment, classification rule precedence, or default behavior based upon L2, L3, and L4 packet fields. Hybrid authentication allows either policy or dynamic VLAN assignment, or both, to be applied through RADIUS authorization.

This feature is now supported on the new ExtremeSwitching X440-G2 and X620 series switches.

### *Supported Platforms*

Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2 series switches

### *Limitations*

- When stacking switches that have different capacities, the stack goes to the lowest common level of capacities and functionality when possible. If the stack already has an existing configuration that

exceeds the new lower capacity, policy disallows the ports on the new switch to become policy-enabled.

- Only 'macdest', 'macsource', or 'port' policy rules can be applied to QinQ (that is, double-tagged) packets received on an untagged VMAN port.

## Cisco Discovery Protocol (CDPv2)

Support for Cisco Discovery Protocol (CDPv1) was added in ExtremeXOS 15.4. This update to the feature adds support for Cisco Discovery Protocol (CDPv2). CDPv2 is a proprietary protocol designed by Cisco to help administrators collect information about nearby, and directly connected, devices. Support of listening, lifting, processing, and periodic transmitting of the CDPv1/v2 control packets on a per-port basis is implemented in this current release.

### Supported Platforms

Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2 series switches

### Limitations

- SNMP is not supported.

### Changed CLI Commands

Changes are underlined.

```
configure cdp voip-vlan [vlan_name | vlan_id | dot1p | untagged | none] ports
[port_list | all]
```

```
configure cdp trust-extend [untrusted | trusted] ports [port_list | all]
```

```
configure cdp cos-extend cos_value ports [port_list | all]
```

```
show cdp ports {port_list} {configuration}
```

```
configure cdp power-available [advertise | no-advertise] ports [port_list | all]
```

The output of the following show commands is changed (shown in bold):

```
X460-48t.1 # show cdp
CDP Transmit time           : 60 seconds
CDP Hold time               : 180 seconds
CDP Device ID               : 00:04:96:8B:C2:CA
CDP Enabled ports         : 1-2, 7
Power Available TLV Enabled ports: 1-2,23
```

```
X460-48t.23 # show cdp ports
```

```
Neighbor Information
```

Port	Device-Id	Hold time	Remote CDP Version	Port ID
1	Eni-Extreme-x440-sw>	149	Version-1	Slot: 1, Port: 1
2	00:04:96:8B:9D:B0	160	Version-2	Slot: 1, Port: 2
7	00:04:96:8B:C1:ED	138	Version-2	Slot: 1, Port: 7

> indicates that the value was truncated to the column size in the output.  
Use the "show cdp neighbor detail" command to see the complete value.

```
X460-48t.3 # show cdp neighbor
Device Id          Local      Hold   Capability Platform      Port
Id
                   Interface   Time
-----
-----
Eni-Extreme-x440-sw> 1          150    T       X440-24t-10G
Slot: 1, P>
00:04:96:8B:9D:B0  2          171    T       X440-48t
Slot: 1, P>
00:04:96:8B:C1:ED  7          134    T       X460-48t
Slot: 1, P>
-----
-----
```

Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge,  
S - Switch, H - Host, I - IGMP, r - Repeater

> indicates that the value was truncated to the column size in the output.  
Use the "detail" option to see the complete value.

```
X460-48t.7 # show cdp neighbor detail
```

```
-----
--
Device ID           : Eni-Extreme-x440-switch-1
Port ID (outgoing port) : Slot: 1, Port: 1
Advertisement Version : 2
IP Addresses        : 10.10.10.2
Platform           : X440-24t-10G
Interface          : 1
Holdtime           : 173

Version            :
ExtremeXOS version 15.7.0.22 fixes_v1570b9 by kosharma
on Tue Feb 24 11:53:33 IST 2015

Native VLAN       : 1
Duplex           : Full
SysName          : X440-24t-10G
Location        : Chennai
Power Request Id : 24333
Power Management Id : 2
Power Drawn     : 1500 mW
Power Consumed  : 3454 mW
```

```
X460-48t.11 # show cdp ports configuration
```

```
Local Port Information
```

```
-----
Port      Trust      COS   Voice-VLAN
-----
1         Trusted    0     none
2         Untrusted  4     none
7         Untrusted  0     Default
```

## Virtual Router Redundancy Protocol (VRRP) Fabric Routing

Virtual Router Redundancy Protocol (VRRP) has one master router that does L3 routing and one or more backup routers that perform L2 forwarding of packets toward the master router, as per VRRP RFC specification. With this method, L3 routing capability of backup router goes unused. This also causes loss of bandwidth in the links that connect master and backup routers. This issue is present in any topology where host traffic is flowing using the backup routers. With multiple backup routers, traffic from hosts attached to some backup routers have to traverse multiple links to reach the master router. This causes loss of bandwidth in multiple links toward the master.

This feature allows backup routers to take part in L3 routing for the packets it receives with the destination address equal to VMAC. Backup routers enabled with this feature are called Fabric Routing Enabled Backup (FREB) routers. This feature allows

- Load sharing of traffic between VRRP routers
- Saves bandwidth on the links connecting master and backup routers

This solution is applicable for all topologies, such as MLAG, EAPS, or STP.

### Platform

Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2 series switches

### Limitations

- Fabric Routing feature will not be supported for VRRP VR for which Virtual IP is same as interface IP (owned IP).
- Traffic sent from host destined for VIP, will be L3 forwarded by FREB router if FREB router sits in between, even though both are in same subnet. VIP cannot be used to run protocols between host and VRRP router which will expect TTL value not be decremented, for example BFD.
- PVLAN configuration will not be supported in this release.
- VLAN Aggregation configuration will not be supported in this release.

### New CLI Commands

```
configure vrrp {vlan vlan_name vr vr_id | all} fabric-route-mode [on | off]
```

## Virtual Router Redundancy Protocol (VRRP) Host Mobility

The Virtual Router Redundancy Protocol (VRRP) Host mobility feature solves the Asymmetric routing problem associated with VRRP where the path to return to an end host may be different and longer than necessary. This feature uses host-routes to indicate where in the network an end host resides. Using other routing protocols such as OSPF, other routers then pick the shortest path back to the end host when multiple paths are available using Equal Cost Multi Path (ECMP) route entries.

### Platform

Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2 series switches

### Limitations

- Bound to FDB's ARP limitations

- Bound to Route Manager's entry limitations

### Changed CLI Commands

Changes are underlined.

```
configure vrrp {vlan} vlan_name vrid vridval host-mobility [{on | off}] {exclude-ports [add | delete] port_list}]
```

```
configure iproute {ipv4} priority [static | blackhole | rip | bootp | icmp | ospf-intra | ospf-inter | ospf-as-external | ospf-extern1 | ospf-extern2 | ebgp | ibgp | mpls | isis | isis-level-1 | isis-level-2 | isis-level-1-external | isis-level-2-external | host-mobility] priority {vr vrname}
```

```
unconfigure iproute {ipv4} priority [static | blackhole | rip | bootp | icmp | ospf-intra | ospf-inter | ospf-as-external | ospf-extern1 | ospf-extern2 | ebgp | ibgp | mpls | isis | isis-level-1 | isis-level-2 | isis-level-1-external | isis-level-2-external | host-mobility | all ] {vr vrname}
```

```
configure iproute ipv6 priority [static | blackhole | ripng | icmp | ospfv3-intra | ospfv3-inter | ospfv3-as-external | ospfv3-extern1 | ospfv3-extern2 | isis | isis-level-1 | isis-level-2 | isis-level-1-external | isis-level-2-external | host-mobility] priority {vr vrname}
```

```
unconfigure iproute ipv6 priority [static | blackhole | ripng | icmp | ospfv3-intra | ospfv3-inter | ospfv3-as-external | ospfv3-extern1 | ospfv3-extern2 | isis | isis-level-1 | isis-level-2 | isis-level-1-external | isis-level-2-external | host-mobility | all ] {vr vrname}
```

The existing enable ospf export, disable ospf export, and configure ospf export commands are expanded to allow a new route type of "host-mobility". Configuring host-mobility to be exported causes OSPF to redistribute host-mobility routes.

The existing enable ospfv3 export and disable ospfv3 commands are expanded to allow a new route type of "host-mobility". Configuring host-mobility to be exported causes OSPFv3 to redistribute host-mobility routes.

The output of the following show commands is changed (shown in bold):

```
# show vrrp detail
VLAN:  vlan23  VRID:  1          VRRP:  Disabled State:  INIT
Virtual Router:  VR-Default
Priority:  100(backup)  Advertisement Interval:  1 sec
Version:  v3-v2  Preempt:  Yes  Preempt Delay:  0 sec
Virtual IP Addresses:
Accept mode:  Off
Host-Mobility:  On
Host-Mobility Exclude-Ports:  1, 10
Checksum:  Include pseudo-header
Tracking mode:  ALL
Tracked Pings:  -
Tracked IP Routes:  -
Tracked VLANs:  -
Fabric Routing:  Off
```



```
# show ospf
OSPF : Disabled MPLS LSP as Next-Hop: No
RouterId : 0.0.0.0 RouterId Selection : Automatic
ASBR : No ABR : No
ExtLSA : 0 ExtLSAChecksum : 0x0
OriginateNewLSA : 0 ReceivedNewLSA : 0
SpfHoldTime : 3 Lsa Batch Interval : 30s
CapabilityOpaqueLSA : Enabled
10M Cost : 10 100M Cost : 5
1000M Cost (1G) : 4 10000M Cost (10G) : 2
40000M Cost (40G) : 2
100000M Cost (100G) : 1
Router Alert : Disabled Import Policy File :
ASExternal LSALimit : Disabled Timeout (Count) : Disabled
(0)
Originate Default : Disabled
SNMP Traps : Disabled
VXLAN Extensions : Disabled
```

```
Redistribute:
Protocol      Status  cost  Type Tag      Policy
direct        Disabled 0      0  0      None
static        Disabled 0      0  0      None
rip           Disabled 0      0  0      None
e-bgp         Disabled 0      0  0      None
i-bgp         Disabled 0      0  0      None
isis-level-1  Disabled 0      0  0      None
isis-level-2  Disabled 0      0  0      None
isis-level-1-external Disabled 0      0  0      None
isis-level-2-external Disabled 0      0  0      None
host-mobility Enabled 0      2  0      None
```

```
# show ospfv3
OSPFv3 : Disabled RouterId : 0.0.0.0
RouterId Selection : Automatic ASBR : No
ABR : No ExtLSAs : 0
ExtLSAChecksum : 0x0 OriginateNewLSAs : 0
ReceivedNewLSAs : 0 SpfHoldTime : 3s
Num of Areas : 1 LSA Batch Interval : 0s
10M Cost : 100 100M Cost : 50
1000M Cost (1G) : 40 10000M Cost (10G) : 20
40000M Cost (40G) : 20 100000M Cost (100G) : 10
Graceful Restart : None Grace Period : 120s
Import Policy File : none
```

```
Redistribute:
Protocol      Status  Cost  Type Tag      Policy
direct        Disabled 20     2  --- none
e-bgp         Disabled 20     2  --- none
i-bgp         Disabled 20     2  --- none
ripng         Disabled 20     2  --- none
static        Disabled 20     2  --- none
isis-level-1  Disabled 20     2  --- none
isis-level-2  Disabled 20     2  --- none
isis-level-1-external Disabled 20     2  --- none
isis-level-2-external Disabled 20     2  --- none
host-mobility Enabled 0      2  --- none
```

```
show iproute
Ori Destination      Gateway      Mtr  Flags      VLAN
Duration
d 192.168.24.0/24    192.168.24.44 1  -----um---- vlan24 0d:
```

```

4h:20m:48s
*hm 192.168.23.1/32    192.168.23.1    1    UGHD---u---f- vlan23    0d:
0h:16m:5s

    (mo) MOSPF (o) OSPF, (o1) OSPFExt1, (o2) OSPFExt2,
    (oa) OSPFIntra, (oe) OSPFAsExt, (or) OSPFInter, (pd) PIM-DM, (ps)
PIM-SM,
    (r) RIP, (ra) RtAdvrt, (s) Static, (sv) SLB_VIP, (hm) Host-
mobility, (un) UnKnown,
    (*) Preferred unicast route (@) Preferred multicast route,
    (#) Preferred unicast and multicast route.

Flags: (b) BFD protection requested, (B) BlackHole, (c) Compressed, (D)
Dynamic,
    (f) Provided to FIB, (G) Gateway, (H) Host Route, (l) Calculated
LDP LSP,
    (L) Matching LDP LSP, (m) Multicast, (p) BFD protection active,
(P) LPM-routing,
    (R) Modified, (s) Static LSP, (S) Static, (t) Calculated RSVP-TE
LSP,
    (T) Matching RSVP-TE LSP, (u) Unicast, (U) Up, (3) L3VPN Route.

MPLS Label: (S) Bottom of Label Stack
Mask distribution:
    1 routes at length 24

Route Origin distribution:
    1 routes from Direct

Total number of routes = 1
Total number of compressed routes = 0

```

```

# show iproute ipv6
Ori Destination                Mtr  Flags
Duration
    Gateway                    Interface
*hm 2000::/128                 1    UGHD---u---f- 0d:
0h:0m:7s
    2000::2                   vlan23
#d 2000::/64                  1    U-----um--f- 0d:
20h:19m:46s
    2000::1                   vlan23
#d fe80::%vlan23/64          1    U-----um--f- 0d:
20h:19m:46s
    fe80::204:96ff:fe51:f96d   vlan23

Origin(Ori):(b) BlackHole, (be) EBGp, (bg) BGP, (bi) IBGP, (bo) BOOTP,
    (ct) CBT, (d) Direct, (df) DownIF, (dv) DVMRP, (e1)
ISISL1Ext,
    (e2) ISISL2Ext, (h) Hardcoded, (i) ICMP, (i1) ISISL1 (i2)
ISISL2,
    (is) ISIS, (mb) MBGP, (mbe) MBGPEExt, (mbi) MBGPInter, (ma)
MPLSIntra,
    (mr) MPLSInter, (mo) MOSPF (o) OSPFv3, (o1) OSPFv3Ext1, (o2)
OSPFv3Ext2,
    (oa) OSPFv3Intra, (oe) OSPFv3AsExt, (or) OSPFv3Inter, (pd)
PIM-DM, (ps) PIM-SM,
    (r) RIPng, (ra) RtAdvrt, (s) Static, (sv) SLB_VIP, (hm) Host-
mobility, (un) UnKnown,
    (*) Preferred unicast route (@) Preferred multicast route,

```

(#) Preferred unicast and multicast route.

Flags: (b) BFD protection requested, (B) BlackHole, (c) Compressed Route,  
 (D) Dynamic, (f) Provided to FIB, (G) Gateway, (H) Host Route,  
 (l) Calculated LDP LSP, (L) Matching LDP LSP, (m) Multicast,  
 (p) BFD protection active, (P) LPM-routing, (R) Modified, (s) Static LSP,  
 (S) Static, (t) Calculated RSVP-TE LSP, (T) Matching RSVP-TE LSP,  
 (u) Unicast, (U) Up, (3) L3VPN Route.

Mask distribution:  
 2 routes at length 64

Route Origin distribution:  
 2 routes from Direct

Total number of routes = 3  
 Total number of compressed routes = 0

```
# show iproute priority
Direct          10
MPLS            20
Blackhole       50

Static          1100
HostMobility   1150
ICMP            1200
EBGP            1700
IBGP            1900
OSPFIntra      2200
OSPFInter      2300
Isis            2350
IsisL1          2360
IsisL2          2370
RIP             2400
OSPFAsExt      3100
OSPFExt1       3200
OSPFExt2       3300
IsisL1Ext      3400
IsisL2Ext      3500
Bootp           5000
```

```
# show iproute ipv6 priority
Direct          10
Blackhole       50

Static          1100
HostMobility   1150
ICMP            1200
EBGP            1700
IBGP            1900
OSPFv3Intra    2200
OSPFv3Inter    2300
Isis            2350
IsisL1          2360
IsisL2          2370
RIPng           2400
OSPFv3AsExt    3100
OSPFv3Ext1     3200
```

OSPFv3Ext2	3300
IsisL1Ext	3400

## Internet Protocol Flow Information Export (IPFIX) Mirroring Enhancement

This feature enhances the mirroring capabilities in ExtremeXOS by adding IPFIX flow traffic support, in addition to the previously supported port and VLAN traffic. With the ability to mirror IPFIX flow traffic, you can leverage the combined capabilities of Internet Protocol Flow Information Export (IPFIX) and Purview to provide additional information about flows. IPFIX can detect flows and collect flow statistics, but it cannot do deep packet payload inspections. Purview, however, can do deep packet inspection beyond Layer 4, if it is provided with a copy of the packet payload. This feature mirrors the first 15 packets of any IPFIX flow to a port where Purview is able to receive the packets for deep packet inspection.

### Supported Platforms

Summit X460-G2 series switches

### Changed CLI Commands

Changes are underlined.

```
configure mirror {mirror_name | mirror_name_li} add | delete [vlan name { ingress
| port port {ingress} } | ip-fix | port port { vlan name {ingress} | ingress |
egress | ingress-and-egress | anomaly }]
```

The output of the following show command is changed (shown in bold):

```
# show mirror

DefaultMirror (Disabled)
  Description:    Default Mirror Instance, created automatically
  Mirror to port: -

MyMirror (Disabled)
  Description:
  Mirror to port: 2:1
  Source filters configured :
    Ports 2:2-3, all vlans, ingress and egress
    Port 2:5, ip-fix
```

## Border Gateway Protocol (BGP) Data Center Enhancements

The following Border Gateway Protocol (BGP) data center enhancements are now available:

- Sixty-four equal cost (ECMP) paths for BGP (previously eight).
- Support for maximum autonomous system path (AS-path) length filtering of BGP route updates.
- IPv4 peering sessions can carry IPv6 routes, and IPv6 peering sessions can carry IPv4 routes for the Unicast and Multicast sub-address families.

### Supported Platforms

Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2 series switches

### Limitations

- Support for maximum AS-Path length is on a BGP instance basis, not per peer.
- Enabling the capability to carry IPv6 Network Layer Reachability Information (NLRI) over IPv4 peering sessions and IPv4 NLRI over IPv6 sessions does not include the ability to have mismatching next-hops. You must use outbound route-policy to specify the BGP next-hop value to be a reachable subnet for the remote router or the remote router must have a means to reach the next-hop. For IPv6 NLRI carried over IPv4 peering sessions, in the absence of route policy to set the next-hop, the next-hop is automatically set to the mapped IPv6 address based on the IPv4 address of the outgoing interface. You should either override this with policy or program the downstream router with a static route to reach the mapped address. In either case, it is assumed the VLAN interface used for peering is configured with both IPv4 and IPv6 addresses.
- The ability to carry mismatching NLRI applies to the Unicast, Multicast, and VPNv4 Sub-Address-Families (SAFIs). The VPNv6 SAFI is not supported.

### New CLI Commands

```
configure bgp maximum-as-path-length max-as-path
```

### Changed CLI Commands

The following command now accepts 64 ECMP paths for *max-paths*:

```
configure bgp maximum-paths max-paths
```

The following commands now allows you to enable the capability to carry NLRI of address family indicator (AFI)/SAFI combinations even if the specified AFI does not match the address family of the peering sessions:

```
enable bgp neighbor ipv4 capability ipv6-unicast
```

```
enable bgp neighbor ipv6 capability ipv4-unicast
```

## Bidirectional Forwarding Detection (BFD) for the Border Gateway Protocol (BGP)

Bidirectional Forwarding Detection (BFD) protection of Border Gateway Protocol (BGP) peering sessions allows for the rapid detection of link failures such that peering sessions can be taken out of the "established" state within fractions of a second. This allows the protocol to select an alternate path (if available) to a destination immediately after the link failure, rather than waiting until the BGP hold timer expires (180 seconds by default). This feature applies to both IPv4 and IPv6 peering sessions. Both IPv6 global and link local peering sessions are supported.

### Supported Platforms

Summit X460-G2, X670-G2, X770 series switches, with Core License or above.

### Limitations

- The BFD setting can be applied on a per-peer basis, but the ability to set BFD on a peer-group or address-family basis is not currently supported.
- The BGP peer must be in the disabled admin state to modify its BFD setting.
- While BFD can be enabled on any BGP peering session, protection is only provided for directly connected EBGP peering sessions.

### New CLI Commands

```
configure bgp {neighbor [all|remoteaddr]} {bfd [on | off]}
```

### Changed CLI Commands

The show bgp neighbor command now shows BFD information (shown in bold):

```
show bgp neighbor 192.168.24.2
Peer Description      :
EBGP Peer            : 192.168.24.2      AS           : 300
Enabled              : Yes              OperStatus   : Up
Weight              : 1                Shutdown-Priority : 1024
ConnectRetry        : 120              MinAsOrig    : 30
HoldTimeCfg         : 180              KeepaliveCfg  : 60
Source Interface     : Not configured   RRClient     : No
EBGP-Multihop       : No               Remove Private AS : No
BFD                : Off              BFD Status   : Inactive
```

## Ethernet Ring Protection Switching (ERPS) Management Information Base (MIB) Support

Managed objects for Ethernet Ring Protection Switching (ERPS) Management Information Base (MIB) are defined in ExtremeXOS 21.1. ExtremeXOS 21.1 implements:

- extremeErpsProtectedVlanTable—contains the grouping of set of protected VLANs
- extremeErpsRingTable—each entry in extremeErpsRingTable has information about one ring in the switch
- extremeErpsStatsTable—contains statistics information for each of the rings present in the switch
- extremeErpsGlobalInfo—contains the information of ERPS configured globally in the switch
- extremeErpsNotification—contains two types of traps, extremeErpsStateChangeTrap and extremeErpsFailureTrap

### Supported Platforms

Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2 series switches

### Limitations

Groups and tables are implemented as read only.

## ExtremeCFM Management Information Base (MIB)

This feature introduces the proprietary ExtremeCFM Management Information Base (MIB) that provides information about the Connectivity Fault Management (CFM) Group. This is an extension to IEEE8021-CFM-MIB.

The following objects are defined in the CFM Group MIB module:

- extremeCfmNotifications
- extremeCfmMibObjects
- extremeCfmMibConformance

### *Supported Platforms*

Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2 series switches

### *Limitations*

Groups and tables are implemented as read only.

## Link Aggregation Control Protocol (LACP) Fallback Option

Preboot Execution Environment (PXE) is an industry standard client/server environment that allows workstations to boot from the server before their full operating system is up and running. PXE images are too small to take advantage of Link Aggregation Control Protocol (LACP) functionality, and therefore it is up to the administrator to statically configure the switch for correct connectivity. This also means that after the full operating system is up and running, the switch needs to be reconfigured for LACP. The LACP Fallback option automates this process.

The LACP Fallback feature lets you select a single port that is automatically added to the aggregator if LACP data units (LACPDUs) do not appear on any of the member ports within the specified period of time. If LACPDUs are exchanged before this timeout expires, an aggregator is formed using traditional means. If LACPDUs are not received, an active port with the lowest priority value is automatically added to the aggregator (enters fallback state). If ports have the same priority value, the lowest port number on the lowest slot number is chosen.

The selected port stays in the fallback state until fallback is disabled or until LACPDUs are received on any of the member ports, at which point the old aggregator is removed and a new one is selected based on information propagated in the LACPDUs. The new fallback port may also be re-elected if the existing fallback port changes its state (for example, port priority change, link bounce, port disable/enable, etc.).

The LACP fallback option configuration consists of:

- Selecting a fallback port by setting its LACP port priority (optional)
- Configuring the fallback timeout (optional)
- Enabling fallback (mandatory)

### *Supported Platforms*

Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2 series switches

*Limitations*

When using LACP fallback with MLAG, fallback port is selected only on the LACP master.

*New CLI Commands*

```
configure sharing portlacp fallback [enable | disable]
```

*Changed CLI Commands*

The show **lacp lag group-id detail** command now shows fallback information (shown in bold):

```
# show lacp lag 17 detail

Lag Actor Actor Partner Partner Partner Agg
Actor Actor Actor Actor Actor Actor Actor
MAC Sys-Pri Key MAC Sys-Pri Key Count
-----
17 0 0x03f9 00:00:00:00:00:00 0 0x0000 1
00:04:96:6d:55:13

Enabled : Yes
LAG State : Up
Unack count : 0
Wait-for-count : 0
Current timeout : Long
Activity mode : Active
Defaulted Action : Delete
Fallback : Enabled
Fallback timeout : 40 seconds
Receive state : Enabled
Transmit state : Enabled
Minimum active : 1
Selected count : 1
Standby count : 0
LAG Id flag : Yes
  S.pri:0 , S.id:00:04:96:6d:55:13, K:0x03f9
  T.pri:0 , T.id:00:00:00:00:00:00, L:0x0000

Port list:

Member Port Rx Sel Mux Actor
Partner Port Priority State Logic State Flags
-----
17 10 Initialize Unselected Detached A-G-----
0
18 5 Initialize Fallback Collect-Dist A-GSCD--
1018
19 5 Idle Unselected Detached -----
0

=====
Actor Flags: A-Activity, T-Timeout, G-Aggregation, S-Synchronization
              C-Collecting, D-Distributing, F-Defaulted, E-Expired
```



The show **lACP member-port port detail** command now shows fallback information (shown in bold):

```
# show lacp member-port 18 detail

Member      Port      Rx          Sel          Mux          Actor
Partner
Port        Priority  State       Logic        State        Flags
-----
-----
18          5          Initialize  Fallback    Collect-Dist A-GSCD--
1018
Up           : Yes
Enabled     : Yes
Link State  : Up
Actor Churn : False
Partner Churn : True
Ready_N     : Yes
Wait pending : No
Ack pending : No
LAG Id:
  S.pri:0    , S.id:00:04:96:6d:55:13, K:0x03f9, P.pri:65535, P.num:1018
  T.pri:0    , T.id:00:00:00:00:00:00, L:0x0000, Q.pri:65535, Q.num:1018
Stats:
  Rx - Accepted                               : 0
  Rx - Dropped due to error in verifying PDU   : 0
  Rx - Dropped due to LACP not being up on this port : 0
  Rx - Dropped due to matching own MAC        : 0

  Tx - Sent successfully                       : 1162
  Tx - Transmit error                          : 0
=====
Actor Flags: A-Activity, T-Timeout, G-Aggregation, S-Synchronization
              C-Collecting, D-Distributing, F-Defaulted, E-Expired
```

## Hardware Assisted Bidirectional Forwarding Detection (BFD)

The hardware assisted Bidirectional Forwarding Detection (BFD) feature expands on the existing ExtremeXOS BFD capabilities.

Bidirectional Forwarding Detection (BFD) hardware assist support provides the functionality to run a BFD session in hardware. Effective failure detection requires BFD to run at high frequencies (using aggressive timers as low as 3 ms), which is not possible in the software mode because of CPU and ExtremeXOS restrictions.

To make BFD sessions run in the hardware, the following configuration is required.

- Unused front panel port (not available for switching the user data traffic) configured as a loopback port. The port is used internally by the BFD hardware to send control packets.
- IPforwarding is enabled on the BFD interfaces.
- Nexthop MAC address of neighbor should be known for the session creation. BFD process triggers ARP to resolve the next hop MAC address, if not configured statically.

*Supported Platforms*

- Summit X460-G2 series switches, standalone only

*New CLI Commands*

```
configure bfd hardware-assist [primary | secondary] loopback-port [ port | none]
```

*Changed CLI Commands*

The following show commands are changed to show the hardware assist information (shown in bold):

```
#show bfd
Number of sessions : 0
Sessions in Init State : 0
Sessions in Down State : 0
Sessions in Admin Down State : 0
Sessions in Up State : 0

SNMP Traps for session-down : Disabled
SNMP Traps for session-up : Disabled
SNMP Traps for Batch Delay : 1000 ms
Hardware Assist Operational State : Disabled(Loopback port not configured)
Hardware Assist Primary Loopback Port : 1
Hardware Assist Secondary Loopback Port : None
Maximum # of Hardware Assist Sessions : 900
```

```
# show bfd session detail vr all
  Neighbour      : 10.10.10.1          Local      : 10.10.10.2
  Vr-Name       : bfd_vr10           Interface  : bfd_vlan10
  Session Type  : Single Hop         State      : Up
  ...
  Up Count      : 1
  Last Valid Packet Rx : 00:51:49.300000
  Last Packet Tx : 00:51:48.8200000
  Hardware Assist : Yes

  Neighbour      : 10.10.11.1          Local      : 10.10.11.2
  Vr-Name       : bfd_vr10           Interface  : bfd_vlan11
  Session Type  : Single Hop         State      : Up
  ...
  Up Count      : 1
  Last Valid Packet Rx : 00:51:49.300000
  Last Packet Tx : 00:51:48.8200000
  Hardware Assist : Yes
```

## OpenSSL Federal Information Processing Standards (FIPS) Object Module v2.0

The feature adds Federal Information Processing Standards (FIPS) compliance Object Module v2.0 (an open source library named openssl-fips-ecp-2.0.9).

OpenSSL is a software library used in applications to secure communications against eavesdropping or to ascertain the identity of the party at the other end. This feature does not validate the OpenSSL

module itself, but instead implements a new software component called the OpenSSL FIPS Object Module.

#### *Supported Platforms*

Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2 series switches

#### *New CLI Commands*

```
configure security fips-mode [on | off]

show security fips-mode
```

## CE2.0 Certification Additions

This features adds CE2.0 (previously known as MEF) certification. This certification involves the following changes:

- Removal of the preamble and interframe gap (IFG) overhead for the rate policing and shaping functions
- Support for meter out-of-profile action for setting a specified 802.1p value
- Support for ACL match criteria “ccos” for matching customer 802.1p on UNI or NNI ports

#### *Supported Platforms*

Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2 series switches

#### *New CLI Commands*

```
configure forwarding rate-limitoverhead-bytes overhead_bytes
```

#### *Changed CLI Commands*

Changes are underlined>.

```
configure metermetername [{committed-rate circommitted-rate-unit {max-burst-size
burst-size [Kb | Mb | Gb | packets]}] {out-actions [{disable-port} {drop | set-
drop-precedence {dscp [dscp-value | none]}] {dot1p [dot1p-value | none]}}] {log}
{trap}}] {ports [port_group | port_list] }
```

The output of the `show forwarding configuration` command now shows rate limit information (shown in bold):

```
# show forwarding configuration
L2 and L3 Forwarding table hash algorithm:
  Configured hash algorithm:          crc32
  Current hash algorithm:             crc32
L3 Dual-Hash configuration: (Applies to "c", "xl"-series and 8900-40GX-
xm)
  Configured setting:                 on
  Current setting:                    on
  Dual-Hash Recursion Level:         1
Hash criteria for IP unicast traffic for L2 load sharing and ECMP route
sharing
  Sharing criteria:                   L3_L4
```

```

IP multicast:
  Group Table Compression:      on
  Local Network Forwarding:    slow-path
  Lookup-Key:                  (SourceIP, GroupIP, VlanId)
External lookup tables:
  Configured Setting:          12-and-13
  Current Setting:             12-and-13
Switch Settings:
  Switching mode:              store-and-forward
L2 Protocol:
  Fast convergence:            on

Rate Limit:
  Overhead Bytes:          20
Fabric Flow Control:
Fabric Flow Control:          auto

```

## Link Aggregation Group (LAG) Support for Audio Video Bridging (AVB)

This feature completes the capability to use Link Aggregation Group (LAG) ports with Audio Video Bridging (AVB) by adding support for LAG ports with Multiple Stream Reservation Protocol (MSRP).

This feature adds two modes for how MSRP calculates the available bandwidth of a LAG for use in making stream reservations:

- Single-port mode simply provides link redundancy and the LAG effective bandwidth is the same as the bandwidth of a single member port.
- Cumulative mode allows bandwidth aggregation and the LAG effective bandwidth is set to a configurable percent of aggregate bandwidth of the member ports in the LAG. This feature also adds generalized Precision Time Protocol (gPTP) configuration support at the LAG level. Only the LAG master port need be specified when making gPTP configurations. However, the protocol is still running on each member port at the physical port level.

### Supported Platforms

Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2 series switches

### Changed CLI Commands

```
show msrp ports {port_list} detail
```

For the preceding command, with LAG support, the port speed is replaced with “effective speed”. For physical ports, the effective speed is equivalent to the port speed (shown in bold).

Port Sr-Pvid	Enabled	Oper	<b>Effectv</b>	Dplx	Jumbo	Jumbo	Cls	Bndry	State	
App/Reg			<b>Speed</b>				Size			
*2g IN	Y	2	Up	150 M	Full	N	9216	A	N	QA/
IN		2						B	N	QA/
*48 IN	Y	2	Up	1000 M	Full	N	9216	A	N	QA/
IN		2								

IN	2	B	N	QA/
----	---	---	---	-----

With the **detail** option, and if the port is a LAG, additional information appears:

Load sharing ports:			
Port	Port Speed	BW Mode	Percentage
----	-----	-----	-----
*2g	200 M	Cumulative	40%

## Event Management System (EMS) IPv6 Syslog Server Support

This feature adds support for the Event Management System (EMS) to send log messages to Syslog servers having IPv6 addresses.

The Event Management System supports the logging of event occurrences to external Syslog server targets. Each Syslog server target is identified by its IP address, UDP port, VRID, and local use facility (for example: "local0" through "local7"). Previously, the IP address of a Syslog server target was limited to the IPv4 address family; but with this feature it can be of the IPv6 address family.

### Supported Platforms

Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2 series switches

### Changed CLI Commands

The existing EMS ("log") commands relevant to Syslog server targets now support IPv6 server (and source, as applicable) addresses:

```
configure syslog add [ipaddress {udp-port udp_port}|ipPort] {vr vr_name}
[local0...local7]
```

```
configure syslog delete [all | ipaddress {udp-port udp_port}| ipPort] {vr
vr_name}{local0...local7}
```

```
configure log target syslog [all | ipaddress {udp-port udp_port} | ipPort] {vr
vr_name} {local} from source-ip-address
```

```
[enable|disable] log target [ . . . | syslog [[all | ipaddress {udp-port
udp_port} | ipPort] {vr vr_name} {local}]]
```

```
configure log target syslog [ipaddress {udp-port udp_port} | ipPort] {vr vr_name}
[local] severity severity {only}
```

```
configure syslog [ipaddress {udp-port udp_port} | ipPort] {vr vr_name} [local]
severity severity {only}
```

```
configure log target [ . . . | syslog [all | ipaddress {udp-port udp_port} |
ipPort] {vr vr_name} {local}] match {any | regex}
```

```
configure log target syslog [all | ipaddress {udp-port udp_port} | ipPort] {vr
vr_name} {local} format
```

```

unconfigure log target [ . . . | syslog [all | ipaddress {udp-port udp_port} |
ipPort] {vr vr_name} {local} | . . . ] format

show log configuration {target { . . . | syslog {ipaddress {udp-port udp_port} |
ipPort} {vr vr_name} {local} } | filter {filter-name}}

```

## MAC Authentication Delay

Currently, when both dot1x and MAC authentication method is enabled on a port, a new MAC address detection triggers ExtremeXOS to send a RADIUS request to authenticate the new client on that port using MAC-based authentication. This feature allows you delay/bypass the MAC authentication by configuring a MAC authentication delay period on a per port basis. The MAC authentication delay period's default value is 0 seconds for backward compatibility, with a permissible range of 0 to 120 seconds.

### Supported Platforms

Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2 series switches

### Changed CLI Commands

Changes are underlined.

```

configure netlogin mac ports [port_list | all] timers [{reauth-period
[reauth_period]} {reauthentication [on|off]} {delay [delay]}]

```

The output of the `show netlogin` command now includes the authentication delay period value (shown in bold):

```

NetLogin Authentication Mode : web-based DISABLED; 802.1x DISABLED;
mac-based DISABLED
NetLogin VLAN                : Not Configured
NetLogin move-fail-action    : Deny
NetLogin Client Aging Time   : 5 minutes
Dynamic VLAN Creation        : Disabled
Dynamic VLAN Uplink Ports    : None
Authentication Protocol Order: 802.1x, web-based, mac-based (default)
SNIPPED
-----
MAC Mode Global Configuration
-----
Re-authentication period      : 0 (Re-authentication disabled)
Authentication Database       : Radius, Local-User database
Authentication Delay Period : 0 (Default)
-----
Number of Clients Authenticated : 0

```

## Configurable per Slot Link Aggregation Group (LAG) Member Port Distribution

Previously, ExtremeXOS switches would always distribute to all active members in a link aggregation group (LAG). This enhancement provides two options for specifying a subset of the active member

ports as eligible for distribution on a per slot basis: “local slot distribution” and “distribution port lists”. The specific choice of configuration is described in the command line syntax as a “distribution-mode”. The choice of distribution mode is configurable per LAG. You may dynamically switch between distribution modes using the `configure sharing distribution-mode` command.

### *Local Slot Distribution*

The “local-slot” distribution mode restricts distribution of unicast packets to the active LAG members on the same slot where the packet was received. If no active LAG members are present on the slot where the packet was received, all active LAG member ports are included in the distribution algorithm.

The “local-slot” distribution mode is useful for reducing the fabric bandwidth load of a switch. Reducing fabric bandwidth may be especially important for a SummitStack, which has significantly less fabric (inter-slot) bandwidth available in comparison to chassis switches. In many chassis or SummitStack hardware configurations, the “local-slot” distribution mode may reduce the switching latency of some flows distributed to a LAG.

### *Distribution Port Lists*

The “port-lists” distribution mode configures one or more LAG member ports to be eligible for unicast LAG distribution on each slot in a switch. If a slot does not have a distribution port list configured or if none of the configured member ports is active in the LAG, all active member ports are eligible for unicast distribution.

The use of the “port-lists” distribution mode should be taken into consideration when adding ports to a LAG with the `configure sharing` command. Any newly added port on a LAG is not available for unicast distribution unless it is also added to the distribution port list of at least one slot.

### *Supported Platforms*

Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2 series switches

### *Limitations*

The distribution modes affect only the distribution of known unicast packets on a LAG. Non-unicast packets are distributed among all active members of a LAG.

### *Changed CLI Commands*

Changes are underlined.

```
enable sharing master_port grouping member_port_list {algorithm [address-based
{L2 | L3 | L3_L4 | custom} | port-based]} {distribution-mode [all | local-slot |
portlists]} {lacp | health-check}
```

```
configure sharing master_port distribution-mode [all| local-slot | port-lists]
```

```
configure sharing master_port slot slot distributionlist [port_list | add
port_list | delete [port_list] | all]
```

The `show sharing` and `show ports port_list sharing` commands now display the distribution mode for a LAG under the “Flag” column:

Distribution Mode Flags:

A - All: Distribute to all members

L - Local: Distribute to members local to ingress slot

P - Port Lists: Distribute to per-slot configurable subset of members

The `show sharing` and `show ports port_list sharing` commands now display the configured distribution mode and distribution port lists for LAGs:

```
show {ports port_list} sharing {distribution configuration}
```

```
Config Distribution Distribution
Master Mode Lists
=====
1:1 Port Lists Slot 1: 1:1-10, 1:15
Slot 5: 1:11-22
1:25 Local Slot Slot 1: 1:25
Slot 5: 1:26
5:1 Port Lists
5:10 All Slot 1: 5:11
Slot 5: 5:10
```

## Port Customer VLAN ID (CVID) on Port-Based or Customer Edge Port (CEP) VMAN Service

This feature introduces an optional port customer VLAN ID (CVID) parameter to the existing untagged and CEP VMAN port configuration options. When present, any untagged packet received on the port is double tagged with the configured port CVID and the SVID associated with the VMAN. If the port is untagged, packets received with a single CID still have the SVID added. If the port is CEP, only untagged and any specifically configured CVIDs are allowed. As double tagged ports are received from tagged VMAN ports and forwarded to untagged VMAN ports, the SVID associated with the VMAN is stripped. Additionally, the CVID associated with the configured port CVID is also stripped in the same operation. If the port is CEP and CEP egress filtering is enabled, only the specified port CVID and CVIDs are allowed to egress.

### Supported Platforms

Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2 series switches

### Limitations

- Any limitations that currently exist with untagged VMAN ports also exist when the Port VLAN ID element is additionally applied.
- VPLS service VMANs are not allowed to have port-cvid configurations.

### Changed CLI Commands

Changes are underlined>.

```
configure vman vman_name add ports [port_list | all] {tagged | untagged {port-
cvid port_cvid} | cep [ cvid cvid_first { - cvid_last } { translate
cvid_first_xlate { - cvid_last_xlate } } | port-cvid port_cvid ] }
```



```

configure vman vman_name ports [port_list | all] add [cvid cvid_first { -
cvid_last } { translate cvid_first_xlate { - cvid_last_xlate } } | port-cvid
port_cvid]

configure vman vman_name ports [port_list | all] delete [cvid cvid_first { -
cvid_last } | port-cvid port_cvid]

configure vman vman_id add ports [port_list | all] {tagged | untagged {port-cvid
port_cvid} | cep [ cvid cvid_first { - cvid_last } { translate cvid_first_xlate
{ - cvid_last_xlate } } | port-cvid port_cvid ] }

configure vman vman_id ports [port_list | all] add [cvid cvid_first { -
cvid_last } { translate cvid_first_xlate { - cvid_last_xlate } } | port-cvid
port_cvid]

configure vman [vman_id | vman_list] ports [port_list | all] delete [cvid
cvid_first { - cvid_last } | port-cvid port_cvid]

```

## Resilient Hashing

Resilient Hashing is a hardware-based capability that minimizes the remapping of flows to aggregator member ports during aggregator member changes.

In conventional hashing, physical links are used to form fat logical pipes. The static hash scheme associates a flow with a physical link. When a link fails, even flows that did not originally flow through the failed link may be assigned to a new link. This reassignment may temporarily result in out-of-order packet deliver even for the flows that were not using the failed link. In contrast, a resilient hashing scheme associates flows with physical ports. When a link fails, only the affected flows are redistributed uniformly across the remaining good physical links. Flows using functioning links remain unaffected and are not reassigned to new links.

### *Supported Platforms*

Summit X770 and X670-G2, and on SummitStacks when at least one of the supported switches is included in the stack.

On SummitStacks, configuration of resilient hashing is not allowed unless at least one node in the stack supports resilient hashing. In a stack where one or more nodes support resilient hashing and one or more nodes do not support resilient hashing, resilient hashing is only in effect for flows received on ports on nodes where resilient hashing is supported by the hardware.

### *Limitations*

- Resilient hashing is available only on LAGs configured to use the “custom” distribution algorithm.
- Resilient Hashing applies only to the distribution of known unicast traffic.
- Traffic originating or forwarded by the system CPU is not distributed using Resilient Hashing.

### *New CLI Commands*

```
configure sharing master_port resilient-hashing [on | off]
```

### Changed CLI Commands

Changes are underlined>.

```
enable sharing master_port grouping member_port_list {algorithm [address-based
{L2 | L3 | L3_L4 | custom} | port-based]} {distribution-mode [all | local-slot |
port-lists]} {resilient-hashing [on | off]} {lacp | health-check}
```

## Open Shortest Path First (OSPFv3) Stack Upgrade

This feature upgrades Open Shortest Path First (OSPFv3) to the latest stack from Metaswitch, supporting some new features (see below) and also making future feature additions easier to implement.

- **Graceful OSPFv3 Restart**—RFC 3623 describes a way for OSPFv3 control functions to restart without disrupting traffic forwarding. Without graceful restart, adjacent routers assume that information previously received from the restarting router is stale and should not be used to forward traffic to that router. However, in many cases, two conditions exist that allow the router restarting OSPFv3 to continue to forward traffic correctly. The first condition is that forwarding can continue while the control function is restarted. Most modern router system designs separate the forwarding function from the control function so that traffic can still be forwarded independent of the state of the OSPFv3 function. Routes learned through OSPFv3 remain in the routing table and packets continue to be forwarded. The second condition required for graceful restart is that the network remain stable during the restart period. If the network topology is not changing, the current routing table remains correct. Often, networks can remain stable during the time for restarting OSPFv3.
- **Not-So-Stubby Area (NSSA)**—OSPFv3 Not-So-Stubby Area (NSSA) is an extension of OSPFv3 stub area. External routes originating from an ASBR connected to an NSSA can be advertised within the area and can be advertised to other areas as AS-external LSAs.

### Supported Platforms

Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2 series switches

### Limitations

- ExtremeXOS BGP does not support VPN-IPv6 routes, so there is no VPN VRF support for OSPFv3.
- Metaswitch has only partial support for OSPFv3 MIBs.

### New CLI Command

```
configure ospfv3 lsa-batch-interval seconds

configure ospfv3 area area-identifier nssa [nosummary | summary] stub-defaultcost
cost {translate}

configure ospfv3 restart [none | planned | unplanned | both]

configure ospfv3 restart grace-period seconds

configure ospfv3 [vlan [all | vlan-name] | vlan-name | area area-identifier]
restart-helper [none | planned | unplanned | both]
```

*Changed CLI Commands*

Changes are underlined.

```
configure ospfv3 area area_identifier add range ipv6netmask [advertise |
noadvertise] [inter-prefix | nssa]
```

```
configure ospfv3 area area-identifier delete range ipv6Netmask [inter-prefix |
nssa]
```

The following show commands now display additional information (shown in bold):

```
show ospfv3
```

```
OSPFv3                : Enabled                RouterId           : 10.1.1.1
RouterId Selection    : Configured              ASBR               : No
ABR                   : No                      ExtLSAs            : 0
ExtLSAChecksum        : 0x0                    OriginateNewLSAs   : 3
ReceivedNewLSAs       : 0                      SpfHoldTime        : 10s
Num of Areas         : 1                      10M Cost          :
100
100M Cost            : 50                                1000M Cost
(1G)                : 40
10000M Cost (10G)   : 20                                40000M Cost (40G) :
20
100000M Cost (100G) : 10
Num of Areas         : 1                      LSA Batch Interval : 30s
10M Cost            : 100                   100M Cost          : 50
1000M Cost (1G)     : 40                   10000M Cost (10G) : 20
40000M Cost (40G)   : 20                   100000M Cost (100G) : 10
Router Alert        : Disabled
ASExternal LSALimit : Disabled
(0)
Originate Default   : Disabled
Graceful Restart    : Both
Restart Status      : None
Last Restart Exit Reason: None
Import Policy File  : none
Redistribute:
  Protocol             Status    Cost    Type  Tag    Policy
  direct               Disabled  20      2     ---   none
  e-bgp                Disabled  20      2     ---   none
  i-bgp                Disabled  20      2     ---   none
  ripng                Disabled  20      2     ---   none
  static               Disabled  20      2     ---   none
  isis-level-1         Disabled  20      2     ---   none
  isis-level-2         Disabled  20      2     ---   none
  isis-level-1-external Disabled  20      2     ---   none
  isis-level-2-external Disabled  20      2     ---   none
```

```
show ospfv3 interfaces detail
```

```
Interface              : v100                Enabled            : ENABLED
Router                 : ENABLED             AreaID            : 0.0.0.0
RouterID               : 10.1.1.2         Link Type         : point-to-
point
Passive                : No                  Cost              : 40/A
Priority               : 1                  Transit Delay     : 1s
Hello Interval         : 10s                Rtr Dead Time     : 40s
```

```

Retransmit Interval : 5s                               Wait Timer           : 40s
Interface ID        : 19                               Instance ID          : 0
State               : P2P                             Number of state chg  : 1
Hello due in       : 7s                               Number of events     : 2
Total Num of Nbrs  : 1                               Nbrs in FULL State  : 1
Hellos Rxed        : 127733                         Hellos Txed         : 127739
DB Description Rxed : 4                               DB Description Txed  : 3
LSA Request Rxed   : 1                               LSA Request Txed    : 1
LSA Update Rxed    : 2121                           LSA Update Txed     : 6156
LSA Ack Rxed       : 5962                           LSA Ack Txed        : 2121
In Discards        : 0
DR RtId            : 0.0.0.0                         BDR RtId            : 0.0.0.0
Restart Helper      : Both
Restart Helper Strict LSA Checking: Enabled
BFD Protection     : Off

```

```
show ospfv3 area detail
```

```

Area Identifier      : 1.0.0.0                        Type                 : NORM
Router ID           : 10.1.1.2                      Num of Interfaces    : 1
Spf Runs            : 7                             Num ABRs             : 1
Num ASBRs          : 0                             Num DC-Bit LSAs     : 0
Num Indication LSAs : 0                             Num of DoNotAge LSAs : 0
Num LSAs           : 8                             LSA Chksum          : 0x4d0f7
Num ASBRs          : 1                             Num LSAs            : 2
Num Rtr LSAs       : 1                             Num Net LSAs        : 0
Num Inter-pref LSAs : 0                             Num Inter-rtr LSAs : 0
Num Intra-pref LSAs : 1                             Num NSSA LSAs       : 0
LSA Chksum         : 0xbe09
Num of Nbrs         : 1                             Num of Virtual Nbrs : 1
Interfaces:
Interface Name      :                               Ospf State   DR ID       BDR ID
vlan101             :                               E    BDR       3.0.0.0    2.0.0.0
Inter-Area route Filter: none
External route Filter : none
Configured Address Ranges:
Area: 0.0.0.1 Addr: 3100::/64 Type: 3 Advt: Yes
Addr: 3100::/64 Type: inter-prefix Advt: Yes
Addr: 3200::/64 Type: nssa           Advt: No

```

```
show ospfv3 area detail
```

```

Area Identifier      : 2.0.0.0                        Type                 : NSSA
Summary             : Yes                             Default Metric       : 10
Translate          : Candidate (Elected)
Router ID           : 10.1.4.1                      Num of Interfaces    : 1
Spf Runs            : 14                             Num ABRs             : 1
Num ASBRs           : 2                             Num LSAs             : 10
Num Rtr LSAs        : 2                             Num Net LSAs         : 1
Num Inter-pref LSAs : 4                             Num Inter-rtr LSAs   : 0
Num Intra-pref LSAs : 1                             Num NSSA LSAs        : 2
LSA Chksum          : 0x3b142
Num of Nbrs         : 1                             Num of Virtual Nbrs : 0
Interfaces:
Interface Name      :                               Ospf State   DR ID       BDR ID
vlan400             :                               E    BDR       0.0.0.4    0.0.0.3
Inter-Area route Filter: none
External route Filter : none

```

```

show ospfv3 lsdB area 0.0.0.2
      Router LSA for Area 0.0.0.2
Link State ID    ADV Router      Seq#           Age    Checksum    #Links
-----
0.0.0.0          0.0.0.3          0x80000004    835    0x9b19      1
0.0.0.0          0.0.0.4          0x80000004    837    0x8431      1

      Network LSA for Area 0.0.0.2
Link State ID    ADV Router      Seq#           Age    Checksum
-----
0.15.66.70      0.0.0.4          0x80000003    837    0x423c

      Inter Area Prefix LSA for Area 0.0.0.2
Link State ID    ADV Router      Seq#           Age    Checksum
-----
0.0.0.2          0.0.0.3          0x80000003    829    0x734d
0.0.0.3          0.0.0.3          0x80000003    829    0x5521
0.0.0.4          0.0.0.3          0x80000003    829    0x543
0.0.0.5          0.0.0.3          0x80000003    808    0x4560

      NSSA LSA for Area 0.0.0.2
Link State ID    ADV Router      Seq#           Age    Checksum    MetricType
-----
0.0.0.2          0.0.0.3          0x80000003    839    0x728f      type-1
0.0.0.8          0.0.0.4          0x80000003    898    0x5d7f      type-1

      Intra Area Prefix LSA for Area 0.0.0.2
Link State ID    ADV Router      Seq#           Age    Checksum    #Prefix
Reference
-----
0.1.0.0          0.0.0.4          0x80000005    838    0x6c9d      1
Network-LSA

show ospfv3 lsdB stats
Interface vlan100
-----
LSA Type          Count
-----
Link              2
Unknown          0

Interface vl1
-----
LSA Type          Count
-----
Link              0
Unknown          0

Area ID 0.0.0.0
-----
LSA Type          Count
-----
Router            3
Network           1
Inter-Area-Prefix 7

```

```

Inter-Area-Router  1
NSSA              0
Intra-Area-Prefix  1
Unknown            0

```

Global

```

-----
LSA Type           Count
-----
AS External        1
Unknown            0

```

```
show ospfv3 lsdbs stats lstype router
```

Area ID 0.0.0.0

```

-----
LSA Type           Count
-----
Router             3
Network          0
Inter-Area-Prefix 0
Inter-Area-Router 0
Intra-Area-Prefix 0
Unknown          0

```

*Deleted CLI Commands*

```
show ospfv3 memory {detail | memoryType}
```

## Secure Shell (SSH) Server Upgrade

OpenSSH server listens for incoming connections. After authenticating, the server provides the client either shell access or access to the CLI, or performs a file transfer of configuration files. The server uses various services in ExtremeXOS including AAA for authentication, Policy Manager for access control, Session Manager for session reporting, and EMS for logging.

SSHServer is migrated from SSH toolkit to OpenSSH, where the SSH server is added as part of the `exsshd` process. ExtremeXOS 21.1 supports SSH protocol version 2 from OpenSSH. Although the SSH server is added to `exsshd`, the key generation is not performed by `exsshd`. This is done separately by another module from OpenSSH, `ssh-keyGen`, which is invoked from `exsshd`. The generated key is stored in `/etc/ssh/ssh_host_dsa_key` and `/etc/ssh/ssh_host_dsa_key.pub`. The same format is used for any keys that are imported to OpenSSH.

*Supported Platforms*

Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2 series switches

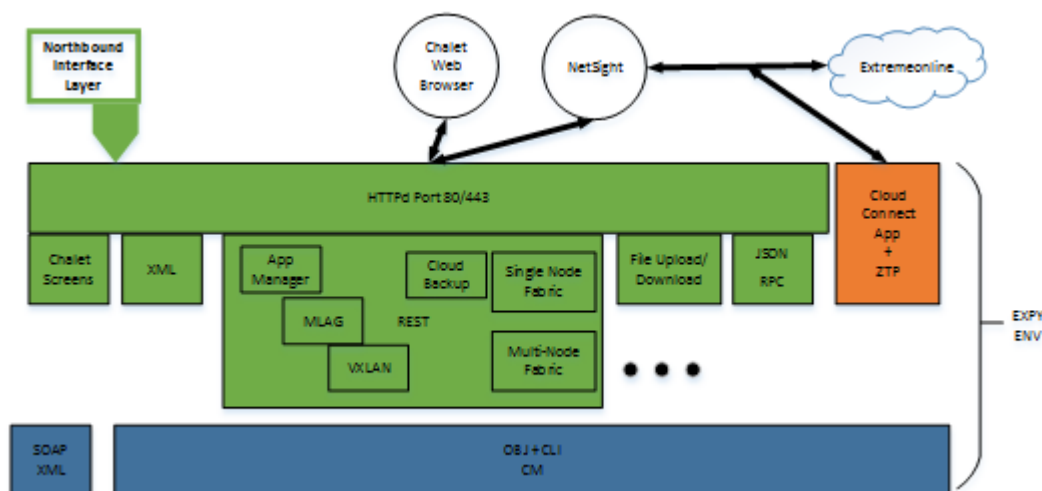
*Limitations*

- Keyboard interactive authentication is not supported.
- Host key algorithms are not configurable.

## ExtremeXOS Applications Environment

ExtremeXOS 21.1 introduces an environment that allows management applications, controllable through a web interface, that communicate directly with other switch management applications.

Applications are management software modules that manage, configure, or monitor specific functions within a switch. The applications leverage existing ExtremeXOS capabilities and protocols to simplify complex tasks. You may download applications to a switch independently from an ExtremeXOS release (see [ezServiceability \(File Upload/Download\)](#) on page 40).



**Figure 1: Application Environment Block Diagram**

The HTTP interface is now a Python application based on CherryPy (3.7.0). This environment includes the following previously available interfaces:

- Web interface (Chalet)
- SOAP/XML interface

Additionally, the following new capabilities have been introduced with ExtremeXOS 21.1:

- Service applications.
- File upload/download (see [ezServiceability \(File Upload/Download\)](#) on page 40)
- JSONRPC—provides a management automation interface (<http://www.jsonrpc.org/specification>). The JSONRPC implementation supports two methods:
  - CLI method—issues CLI commands to ExtremeXOS show commands and returns JSON data instead of formatted CLI data.
  - Python method—allows the remote system to send inline Python scripts to run on a switch. You can use inline Python scripting to perform complex tasks not available using the ExtremeXOS CLI.
- Configuration Applications.
- Application manager—provides the ability to dynamically add management applications at run time. Applications may be developed independently from the ExtremeXOS release cycle.
- MLAG—works with Chalet web screens and peer switches. It can communicate with peer switches to perform the complex task of setting up and maintaining MLAG configurations.
- VXLAN—works with Chalet to manage VXLAN configuration coordination across multiple switches.

### Supported Platforms

Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2 series switches

### ezServiceability (File Upload/Download)

ezServiceability is a web application that enables you to upload and download files to and from a switch instead of setting up a separate TFTP server. You can use this feature to push a new ExtremeXOS image to a switch directly when upgrading.

- The `app/file/<path>` URL provides the ability to send, retrieve, or delete files on a switch. The `<path>` parameter accepts the ExtremeXOS paths:
  - `/usr/local/cfg`
  - `/usr/local/tmp`
  - `/usr/local/ext`—Files located on a USB memory stick, if present.

The allowed file extensions for `<path>` are: .pol, cfg, xsf, py, pkt, and xml.

- The `app/file/cfg` URL is a shortcut for files in the `/usr/local/cfg` directory.

For example, `http://<ip>/app/file/usr/local/cfg/myfile.py` is equivalent to `http://<ip>/app/file/cfg/myfile.py`. Upgrading a switch with a new ExtremeXOS image is covered using the `app/upload` interface. Use this interface in concert with the `app/filelist`, which provides the following capabilities:

- Obtain the list of files on the switch.
- Determine which file operations are supported for each file.

This interface is useful for:

- Sending policy, script, or config files to a switch directly from a web browser.
- Retrieving files from a switch directly to a web browser, such as configuration files.
- Retrieves/edits/returns files to a switch (provides a user-friendly way of editing files).
- Deleting files on a switch.

## New Hardware Supported in ExtremeXOS 21.1

This section lists the new hardware supported in ExtremeXOS 21.1:

- ExtremeSwitching X440-G2 series switches:

X440-G2-24t-10GE4, X440-G2-24t-10GE4-DC, X440-G2-24p-10GE4, X440-G2-48t-10GE4, X440-G2-48t-10GE4-DC, X440-G2-48p-10GE4, X440-G2-12t-10GE4, X440-G-12p-10GE4, X440-G2-24x-10GE4, X440-G2-24fx-GE4, X440-G2-12t8fx-GE4, X440-G2-24t-GE4



#### Note

ExtremeSwitching X440-G2 10 Gigabit model switches require a license to upgrade the four SFP 1GbE ports to 10G. For more information, see *ExtremeXOS 21.1 Feature License Requirements*.

- ExtremeSwitching X620 series switches:

X620-10X, X620-8T-2X, X620-16X, X620-16T



---

## Hardware No Longer Supported

---

The following hardware is no longer supported in ExtremeXOS 21.1:

- Summit X430, X440, X460, X480, and X670 series switches
- E4G-200 and E4G-400 cell site routers
- BlackDiamond X8 and 8800 series switches



### Note

These hardware platforms *are* supported in the ExtremeXOS 16.x software.

---

---

## Circuit Emulation Service (CES) No Longer Supported

---

Starting with ExtremeXOS 21.1, Circuit emulation service (CES) is no longer supported.

---

## OpenFlow and SSH Included in ExtremeXOS Base Image

---

OpenFlow and SSH are now included in the ExtremeXOS base image starting with ExtremeXOS 21.1. A separate XMOD file is no longer required.

---

## ExtremeXOS SSH Server Upgraded with OpenSSH v6.5

---

ExtremeXOS 16.1 and earlier generated DSA-2048 keys using `ssh-keygen` provided by the SSH-Toolkit library. ExtremeXOS 21.1 now generates more secure RSA-2048 keys due to switching to using the OpenSSH library, which does not support DSA-2048.

When upgrading to ExtremeXOS 21.1, SSH keys generated by earlier ExtremeXOS versions (16.1 and earlier) are compatible and do *not* need to be re-generated.



### Note

If a switch is downgraded from ExtremeXOS 21.1 to previous releases, with RSA key saved, the key becomes invalid.

---

---

## CLI Command Output Format of Ports Lists

---

For ExtremeXOS 16.1 and later, the output of CLI commands showing ports lists does not display spaces between commas.

For example: “3:1,7:13” instead of “3:1, 7:13”

---

## Extreme Hardware/Software Compatibility and Recommendation Matrices

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The *Extreme Hardware/Software Compatibility and Recommendation Matrices* provide information about the minimum version of ExtremeXOS software required to support switches, as well as SFPs, XENPAKs, XFPs, and other pluggable interfaces.

This guide also provides information about which optics are supported on which hardware platforms, and the minimum software version required.

The latest version of this and other ExtremeXOS guides are at: <http://documentation.extremenetworks.com>

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## Compatibility with Extreme Control Center (Formerly NetSight)

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ExtremeXOS 21.1 is compatible with Extreme Control Center (formerly NetSight) version 7.0 and later.

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## Upgrading ExtremeXOS

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For instructions about upgrading ExtremeXOS software, see [Software Upgrade and Boot Options](#) in the *ExtremeXOS User Guide*.

Beginning with ExtremeXOS 12.1, an ExtremeXOS core image (.xos file) must be downloaded and installed on the alternate (non-active) partition. If you try to download to an active partition, the error message `Error: Image can only be installed to the non-active partition.` appears. An ExtremeXOS modular software package (.xmod file) can still be downloaded and installed on either the active or alternate partition.

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## Downloading Supported MIBs

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The Extreme Networks MIBs are located on the eSupport website under **Download Software Updates**, located at: <https://esupport.extremenetworks.com>.

You need to provide your serial number or agreement number, and then the MIBs are available under each release.

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## Tested Third-Party Products

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This section lists the third-party products tested for ExtremeXOS 21.1.

### Tested RADIUS Servers

The following RADIUS servers are fully tested:

- Microsoft—Internet Authentication Server
- Meetinghouse
- FreeRADIUS

### Tested Third-Party Clients

The following third-party clients are fully tested:

- Windows 7
- Windows Vista
- Linux (IPv4 and IPv6)
- Windows XP (IPv4)

## PoE Capable VoIP Phones

The following PoE capable VoIP phones are fully tested:

- Avaya 4620
- Avaya 4620SW IP telephone
- Avaya 9620
- Avaya 4602
- Avaya 9630
- Avaya 4621SW
- Avaya 4610
- Avaya 1616
- Avaya one-X
- Cisco 7970
- Cisco 7910
- Cisco 7960
- ShoreTel ShorePhone IP 212k
- ShoreTel ShorePhone IP 560
- ShoreTel ShorePhone IP 560g
- ShoreTel ShorePhone IP 8000
- ShoreTel ShorePhone IP BB 24
- Siemens OptiPoint 410 standard-2
- Siemens OpenStage 20
- Siemens OpenStage 40
- Siemens OpenStage 60
- Siemens OpenStage 80

## Extreme Switch Security Assessment

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### DoS Attack Assessment

Tools used to assess DoS attack vulnerability:

- Network Mapper (NMAP)

### ICMP Attack Assessment

Tools used to assess ICMP attack vulnerability:

- SSPing
- Twinge
- Nuke
- WinFreeze

### Port Scan Assessment

Tools used to assess port scan assessment:

- Nessus

## Service Notifications

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To receive proactive service notification about newly released software or technical service communications (for example, field notices, product change notices, etc.), please register at: [www.extremenetworks.com/support/service-notification-form](http://www.extremenetworks.com/support/service-notification-form)

# 2 Limits

This chapter summarizes the supported limits in ExtremeXOS 21.1.

**Table 3: Supported Limits** on page 45 summarizes tested metrics for a variety of features, as measured in a per-system basis unless otherwise noted. These limits may change, but represent the current status. The contents of this table supersede any values mentioned in the ExtremeXOS books.

The scaling and performance information shown in **Table 3: Supported Limits** on page 45 is provided for the purpose of assisting with network design. It is recommended that network architects and administrators design and manage networks with an appropriate level of network scaling “head room.” The scaling and performance figures provided have been verified using specific network topologies using limited switch configurations. There is no guarantee that the scaling and performance figures shown are applicable to all network topologies and switch configurations and are provided as a realistic estimation only. If you experience scaling and performance characteristics that you feel are sufficiently below what has been documented, contact Extreme Networks technical support for additional assistance.

The route limits shown in **Table 3: Supported Limits** on page 45 for IPv4 and IPv6 routing protocols are software limits only. The actual hardware limits may be higher or lower than the software limits, based on platform. The hardware limits for specific platforms are specified as “IPv4/IPv6 routes (LPM entries in hardware)” in the following table.

It is not advised to have greater than 25,000 total IP routes from all routing protocols. Adverse effects can occur with routing tables larger than this, especially when a single network event or CLI command affects a significant number of routes. For example, just after such a network event, the added system load will cause a save configuration command to time out.

**Table 3: Supported Limits**

Metric	Product	Limit
<b>AAA (local)</b> —maximum number of admin and local user accounts.	All platforms	8
<b>Access lists (meters)</b> —maximum number of meters.	ExtremeSwitching X620, X440-G2	1,024 ingress, 256 egress
	Summit X770, X670-G2	1,024 ingress, 512 egress
<b>Access lists (policies)</b> —suggested maximum number of lines in a single policy file.	All platforms	300,000
<b>Access lists (policies)</b> —maximum number of rules in a single policy file. <sup>a</sup>	Summit X460-G2, X450-G2, X770, X670-G2	4,096 ingress, 1,024 egress
	ExtremeSwitching X620, X440-G2	2,048 ingress, 512 egress

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
<b>Access lists (policies)</b> —maximum number of rules in a single policy file in first stage (VFP).	Summit X450-G2, X460-G2	2,048 ingress only
	Summit X670-G2, X770	1,024 ingress only
	ExtremeSwitching X620, X440-G2	512 ingress only
<b>Access lists (slices)</b> —number of ACL slices.	Summit X460-G2, X450-G2	16 ingress, 4 egress
	Summit X770, X670-G2	12 ingress, 4 egress
	ExtremeSwitching X440-G2, X620	8 ingress, 4 egress
<b>Access lists (slices)</b> —number of ACL slices in first stage (VFP).	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	4 ingress only
<b>ACL Per Port Meters</b> —number of meters supported per port.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	16
<b>Meters Packets-Per-Second Capable</b>	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	Yes
<b>AVB (audio video bridging)</b> —maximum number of active streams.	Summit X450-G2, X460-G2, X770, and ExtremeSwitching X620, X440-G2 Summit X670-G2	1,024 4,096
<b>BFD sessions (Software Mode)</b> —maximum number of BFD sessions.	Summit X460-G2, X670-G2, X450-G2, X770 (default timers—1 sec)	512 10 <sup>c</sup>
	Summit X460-G2, X670-G2, X450-G2, X770 (minimal timers—100 msec)	
<b>BFD sessions (Hardware Assisted)</b> —maximum number of BFD sessions.	Summit X460-G2	900 (PTP not enabled) 425 (PTP enabled) 256 (with 3 ms transmit interval)
<b>BGP (aggregates)</b> —maximum number of BGP aggregates.	Summit X460-G2, X670-G2, X770 with Core license or higher Summit X450-G2, and ExtremeSwitching X440-G2, X620	256 Not supported
<b>BGP (networks)</b> —maximum number of BGP networks.	Summit X460-G2, X670-G2, X770 with Core license or higher Summit X450-G2, and ExtremeSwitching X440-G2, X620	1,024 Not supported
<b>BGP (peers)</b> —maximum number of BGP peers.  <b>Note:</b> *With default keepalive and hold timers.	Summit X460-G2, X670-G2, X770 with Core license or higher Summit X450-G2, and ExtremeSwitching X440-G2, X620	128* Not supported
<b>BGP (peer groups)</b> —maximum number of BGP peer groups.	Summit X460-G2, X670-G2, X770 with Core license or higher Summit X450-G2, and ExtremeSwitching X440-G2, X620	64 Not supported
<b>BGP (policy entries)</b> —maximum number of BGP policy entries per route policy.	Summit X460-G2, X670-G2, X770 with Core license or higher Summit X450-G2, and ExtremeSwitching X440-G2, X620	256 Not supported

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
<b>BGP (policy statements)</b> —maximum number of BGP policy statements per route policy.	Summit X460-G2, X670-G2, X770 with Core license or higher Summit X450-G2, and ExtremeSwitching X440-G2, X620	1,024 Not supported
<b>BGP multicast address-family routes</b> —maximum number of multicast address-family routes.	Summit X460-G2, X670-G2, X770 Summit X450-G2, and ExtremeSwitching X440-G2, X620	25,000 Not supported
<b>BGP (unicast address-family routes)</b> —maximum number of unicast address-family routes.	Summit X460-G2, X670-G2, X770 Summit X450-G2, and ExtremeSwitching X440-G2, X620	25,000 Not supported
<b>BGP (non-unique routes)</b> —maximum number of non-unique BGP routes.	Summit X460-G2, X670-G2, X770 Summit X450-G2, and ExtremeSwitching X440-G2, X620	25,000 Not supported
<b>BGP ECMP</b> —maximum number of equalcost multipath for BGP and BGPv6.	Summit X460-G2, X670-G2, X770 Summit X450-G2, and ExtremeSwitching X440-G2, X620	2, 4, or 8 Not supported
<b>BGPv6 (unicast address-family routes)</b> —maximum number of unicast address family routes.	Summit X460-G2 Summit X670-G2, X770 Summit X450-G2, and ExtremeSwitching X440-G2, X620	6,000 8,000 Not supported
<b>BGPv6 (non-unique routes)</b> —maximum number of non-unique BGP routes.	Summit X460-G2 Summit X670-G2, X770 Summit X450-G2, and ExtremeSwitching X440-G2, X620	18,000 24,000 Not supported
<b>BOOTP/DHCP relay</b> —maximum number of BOOTP or DHCP servers per virtual router.  <b>Note:</b> User VRs not supported.	Summit X460-G2, X670-G2, X770, X450-G2, and ExtremeSwitching X440-G2*, X620*	4
<b>BOOTP/DHCP relay</b> —maximum number of BOOTP or DHCP servers per VLAN.	Summit X460-G2, X670-G2, X770, X450-G2, and ExtremeSwitching X440-G2, X620	4
<b>Connectivity fault management (CFM)</b> —maximum number of CFM domains.  <b>Note:</b> With Advanced Edge license or higher.	Summit X460-G2, X670-G2, X770, X450-G2, and ExtremeSwitching X440-G2, X620	8
<b>CFM</b> —maximum number of CFM associations.  <b>Note:</b> With Advanced Edge license or higher.	Summit X460-G2, X670-G2, X770, X450-G2, and ExtremeSwitching X440-G2, X620	256

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
<b>CFM</b> —maximum number of CFM up end points.  <b>Note:</b> With Advanced Edge license or higher.	Summit X460-G2, X670-G2, X770, X450-G2, and ExtremeSwitching X440-G2, X620	32
<b>CFM</b> —maximum number of CFM down end points.  <b>Note:</b> With Advanced Edge license or higher.	Summit X670-G2, X770, X450-G2, and ExtremeSwitching X440-G2, X620 Summit X460-G2	32 256 (non-load shared ports) 32 (load shared ports)
<b>CFM</b> —maximum number of CFM remote end points per up/down end point.  <b>Note:</b> With Advanced Edge license or higher.	Summit X460-G2, X670-G2, X770, X450-G2, and ExtremeSwitching X440-G2, X620	2,000
<b>CFM</b> —maximum number of dot1ag ports.  <b>Note:</b> With Advanced Edge license or higher.	Summit X460-G2, X670-G2, X770, X450-G2, and ExtremeSwitching X440-G2, X620	128
<b>CFM</b> —maximum number of CFM segments.  <b>Note:</b> With Advanced Edge license or higher.	Summit X460-G2, X670-G2, X770, X450-G2, and ExtremeSwitching X440-G2, X620	1,000
<b>CFM</b> —maximum number of MIPs.  <b>Note:</b> With Advanced Edge license or higher.	Summit X460-G2, X670-G2, X770, X450-G2, and ExtremeSwitching X620, X440-G2	256
<b>CLEAR-Flow</b> —total number of rules supported. The ACL rules plus CLEAR-Flow rules must be less than the total number of supported ACLs.	Summit X460-G2, X770, X670-G2, X450-G2 ExtremeSwitching X440-G2, X620	4,094 1,024
<b>Data Center Bridging eXchange (DCBX) protocol Type Length Value (TLVs)</b> —maximum number of DCBX application TLVs.	Summit X460-G2, X670-G2, X770, X450-G2, and ExtremeSwitching X440-G2, X620	8



**Table 3: Supported Limits (continued)**

Metric	Product	Limit
<b>DHCPv6 Prefix Delegation Snooping</b> —Maximum number of DHCPv6 prefix delegation snooped entries.	Summit X460-G2, X670-G2, X770, X450-G2, and ExtremeSwitching X620, X440-G2	256 (with Underlying Protocol Ripng) 128 (with Underlying protocol OSPFv3) 1,024 (with static routes)
<b>DHCP snooping entries</b> —maximum number of DHCP snooping entries.	Summit X460-G2, X670-G2, X770, X450-G2, and ExtremeSwitching X620, X440-G2	2,048
<b>Dynamic ACLs</b> —maximum number of ACLs processed per second.  <b>Note:</b> Limits are load dependent.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2  with 50 DACLs with 500 DACLs	10 5
<b>EAPS domains</b> —maximum number of EAPS domains.  <b>Note:</b> An EAPS ring that is being spatially reused cannot have more than four configured EAPS domains.	Summit X670-G2, X450-G2, and X770 Summit X460-G2, and ExtremeSwitching X440-G2, X620	64 32
<b>EAPSV1 protected VLANs</b> —maximum number of protected VLANs.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	1,000
<b>EAPSV2 protected VLANs</b> —maximum number of protected VLANs.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620 ExtremeSwitching X440-G2	500 Not supported
<b>ELSM (vlan-ports)</b> —maximum number of VLAN ports.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620	5,000
<b>ERPS domains</b> —maximum number of ERPS domains without CFM configured.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620	32
<b>ERPS domains</b> —maximum number of ERPS domains with CFM configured.	Summit X450-G2, X670-G2, X770, and ExtremeSwitching X620 Summit X460-G2	16 32
<b>ERPSV1 protected VLANs</b> —maximum number of protected VLANs.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	1,000
<b>ERPSV2 protected VLANs</b> —maximum number of protected VLANs.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	500
<b>ESRP groups</b> —maximum number of ESRP groups.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X440-G2, X620	31

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
<b>ESRP domains</b> —maximum number of ESRP domains.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	64
<b>ESRP VLANs</b> —maximum number of ESRP VLANs.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	1,000
<b>ESRP (maximum ping tracks)</b> —maximum number of ping tracks per VLAN.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	8
<b>ESRP (IP route tracks)</b> —maximum IP route tracks per VLAN.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	8
<b>ESRP (VLAN tracks)</b> —maximum number of VLAN tracks per VLAN.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	1
<b>Forwarding rate</b> —maximum L3 software forwarding rate.	Summit X770 Summit X670-G2 Summit X460-G2 Summit X450-G2 ExtremeSwitching X440-G2 ExtremeSwitching X620	11,000 pps 21,000 pps 25,000 pps 24,000 pps 21,000 pps 23,000 pps
<b>FDB (unicast blackhole entries)</b> —maximum number of unicast blackhole FDB entries.	Summit X460-G2 Summit X770, X670-G2 Summit X450-G2 ExtremeSwitching X620, X440-G2	49,152 <sup>f</sup> 294,912 <sup>f</sup> 34,816 <sup>f</sup> 16,384 <sup>f</sup>
<b>FDB (multicast blackhole entries)</b> —maximum number of multicast blackhole FDB entries.	Summit X460-G2, X450-G2, and ExtremeSwitching X440-G2, X620 Summit X770, X670-G2	1,024 4,096
<b>FDB (maximum L2 entries)</b> —maximum number of MAC addresses.	Summit X670-G2 Summit X460-G2 Summit X770 Summit X450-G2 ExtremeSwitching X620, X440-G2	294,912 <sup>f</sup> 98,300 <sup>f</sup> 294,912 <sup>f</sup> 68,000 <sup>f</sup> 16,384 <sup>f</sup>
<b>FDB (Maximum L2 entries)</b> —maximum number of multicast FDB entries.	Summit X770, X670-G2 Summit X450-G2, X460-G2, and ExtremeSwitching X620, X440-G2	4,096 1,024
<b>Identity management</b> —maximum number of Blacklist entries.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	512
<b>Identity management</b> —maximum number of Whitelist entries.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	512
<b>Identity management</b> —maximum number of roles that can be created.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	64

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
<b>Identity management</b> — maximum role hierarchy depth allowed.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	5
<b>Identity management</b> — maximum number of attribute value pairs in a role match criteria.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	16
<b>Identity management</b> — maximum of child roles for a role.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	8
<b>Identity management</b> — maximum number of policies/ dynamic ACLs that can be configured per role.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	8
<b>Identity management</b> — maximum number of LDAP servers that can be configured.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	8
<b>Identity management</b> — maximum number of Kerberos servers that can be configured.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	20
<b>Identity management</b> — maximum database memory-size.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	512
<b>Identity management</b> — recommended number of identities per switch.  <b>Note:</b> Number of identities per switch is for a default identity management database size (512 Kbytes) across all platforms.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	100
<b>Identity management</b> — recommended number of ACL entries per identity.  <b>Note:</b> Number of ACLs per identity based on system ACL limitation.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	20
<b>Identity management</b> — maximum number of dynamic ACL entries configured as an individual dynamic rule, or as an ACL entry in a policy file.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	500

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
<b>IGMP snooping per VLAN filters</b> —maximum number of VLANs supported in per-VLAN IGMP snooping mode.	Summit X460-G2 Summit X450-G2 Summit X770, X670-G2 ExtremeSwitching X620, X440-G2	1,500 2,048 2,000 1,000
<b>IGMPv1/v2 SSM-map entries</b> —maximum number of IGMPv1/v2 SSM mapping entries.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	500
<b>IGMPv1/v2 SSM-map entries</b> —maximum number of sources per group in IGMPv1/v2 SSM mapping entries.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	50
<b>IGMPv2 subscriber</b> —maximum number of IGMPv2 subscribers per port. <sup>n</sup>	Summit X770, X670-G2, X460-G2, X450-G2 ExtremeSwitching X440-G2, X620	4,000 3,500
<b>IGMPv2 subscriber</b> —maximum number of IGMPv2 subscribers per switch. <sup>n</sup>	Summit X770, X670-G2 Summit X460-G2, X450-G2 ExtremeSwitching X620, X440-G2	30,000 20,000 17,500
<b>IGMPv3 maximum source per group</b> —maximum number of source addresses per group.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	250
<b>IGMPv3 subscriber</b> —maximum number of IGMPv3 subscribers per port. <sup>n</sup>	Summit X770, X670-G2, X460-G2, X450-G2 ExtremeSwitching X440-G2, X620	4,000 3,500
<b>IGMPv3 subscriber</b> —maximum number of IGMPv3 subscribers per switch. <sup>n</sup>	Summit X460-G2, X450-G2 Summit X770, X670-G2 ExtremeSwitching X620, X440-G2	20,000 30,000 17,500
<b>IP ARP entries in software</b> —maximum number of IP ARP entries in software.  <b>Note:</b> May be limited by hardware capacity of FDB (maximum L2 entries).	Summit X670-G2, X770 Summit X460-G2 Summit X450-G2 ExtremeSwitching X440-G2, X620	131,072 (up to) <sup>h</sup> 57,344 (up to) <sup>h</sup> 47,000 (up to) <sup>h</sup> 20,480
<b>IPv4 ARP entries in hardware with minimum LPM routes</b> —maximum recommended number of IPv4 ARP entries in hardware, with minimum LPM routes present. Assumes number of IP route reserved entries is 100 or less.	Summit X460-G2 Summit X770, X670-G2 Summit X450-G2 ExtremeSwitching X620 ExtremeSwitching X440-G2	50,000 (up to) <sup>h</sup> 108,000 (up to) <sup>h</sup> 39,000 (up to) <sup>h</sup> 1,500 1,000

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
IPv4 ARP entries in hardware with maximum LPM routes—maximum recommended number of IPv4 ARP entries in hardware, with maximum LPM routes present. Assumes number of IP route reserved entries is “maximum.”	Summit X460-G2	43,000 (up to) <sup>h</sup>
	Summit X770, X670-G2	98,000 (up to) <sup>h</sup>
	Summit X450-G2	29,000 (up to) <sup>h</sup>
	ExtremeSwitching X620	1,500
	ExtremeSwitching X440-G2	1,000
IP flow information export (IPFIX)—number of simultaneous flows.	Summit X460-G2	2,048 ingress 2,048 egress
	Summit X450-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	N/A
IPv4 remote hosts in hardware with zero LPM routes—maximum recommended number of IPv4 remote hosts (hosts reachable through a gateway) in hardware when LPM routing is not used. Assumes number of IP route reserved entries is 0, and number of IPv4 ARP entries present is 100 or less.	Summit X460-G2	73,000 <sup>h</sup>
	Summit X770, X670-G2	176,000 (up to) <sup>h</sup>
	Summit X450-G2	61,000 (up to) <sup>h</sup>
	ExtremeSwitching X440-G2, X620	3,500
IPv4 routes—maximum number of IPv4 routes in software (combination of unicast and multicast routes).	Summit X670-G2, X460-G2, X450-G2, X440-G2, X620	25,000
IPv4 routes (LPM entries in hardware)—number of IPv4 routes in hardware.	Summit X460-G2	12,000
	Summit X770, X670-G2, X450-G2	16,000
	ExtremeSwitching X620, X440-G2	480
IPv6 addresses on an interface—maximum number of IPv6 addresses on an interface.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	255
IPv6 addresses on a switch—maximum number of IPv6 addresses on a switch.	Summit X770, X670-G2, X460-G2, X450-G2	2,048
	ExtremeSwitching X620, X440-G2	510
IPv6 host entries in hardware—maximum number of IPv6 neighbor entries in hardware.	Summit X770, X670-G2	36,750 <sup>i</sup>
	Summit X460-G2	22,000 <sup>i</sup>
	Summit X450-G2	12,000 <sup>i</sup>
	ExtremeSwitching X440-G2	1,000
	ExtremeSwitching X620	1,500
IPv6 routes (LPM entries in hardware)—maximum number of IPv6 routes in hardware.	Summit X460-G2	6,000
	Summit X670-G2, X770, X450-G2	8,000
	ExtremeSwitching X620, X440-G2	240

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
<b>IPv6 routes with a mask greater than 64 bits in hardware</b> —maximum number of such IPv6 LPM routes in hardware.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	256
<b>IPv6 route sharing in hardware</b> —route mask lengths for which ECMP is supported in hardware.  <b>Note:</b> * >64 single path only	Summit X460-G2, X670-G2, X770, X450-G2, and ExtremeSwitching X620 ExtremeSwitching X440-G2	0-64 * Not supported
<b>IPv6 routes in software</b> —maximum number of IPv6 routes in software.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	25,000
<b>IP router interfaces</b> —maximum number of VLANs performing IPv4 and/or IPv6 routing. Excludes sub-VLANs.	Summit X460-G2, X770, X670-G2, X450-G2 ExtremeSwitching X620, X440-G2	2,048 510
<b>IP multicast static routes</b> —maximum number of permanent multicast IP routes.	Summit X460-G2, X670-G2, X450-G2, X770	1,024
<b>IP unicast static routes</b> —maximum number of permanent IP unicast routes.	Summit X460-G2, X670-G2, X450-G2, X770 ExtremeSwitching X620, X440-G2	1,024 480
<b>IP route sharing (maximum gateways)</b> —Configurable maximum number of gateways used by equal cost multipath OSPF, BGP, IS-IS, static routes, or L2VPNs. Routing protocol OSPF is limited to 16 ECMP gateways per destination. Routing protocols BGP is limited to 64 ECMP gateways per destination, while IS-IS is limited to 8. Static routes are limited to 32 next-hops. L2VPNs are limited to 16 LSPs per pseudowire on platforms that support 32 gateways, and 64 LSPs per pseudowire on platforms that support 64 gateways.	Summit X460-G2, X670-G2, X450-G2, X770, and ExtremeSwitching X620 ExtremeSwitching X440-G2	2, 4, 8, 16, or 32 N/A

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
<b>IP route sharing (total destinations)</b> —maximum number of unique destinations used by multipath OSPF, OSPFv3, BGP, IS-IS, or static routes.	Summit X670-G2, X770, X450-G2	16,352
	Summit X460-G2 ExtremeSwitching X620 ExtremeSwitching X440-G2	12,256 480 N/A
<b>IP route sharing (total combinations of gateway sets)</b> —maximum number of combinations of sets of adjacent gateways used by multipath OSPF, BGP, IS-IS, or static routes.	<b>Note:</b> For platforms with limit of 524,256 or higher, the total number of "destination+gateway" pairs is limited to 2,097,024. For example, if the number of unique destinations is 524,256, only 2 gateways per destination is supported.  For other platforms, each limit is based on up to 8 gateways per destination for BGP and IS-IS routing protocols, up to 16 gateways per destination for OSPF, or up to 32 gateways per destination for static routes.	
	Summit X670-G2, X770 default maximum gateways of 4 if maximum gateways is 2 if maximum gateways is 8 if maximum gateways is 16 if maximum gateways is 32 if maximum gateways is 64  Summit X460-G2, X450-G2 default maximum gateways of 4 if maximum gateways is 2 if maximum gateways is 8 if maximum gateways is 16 if maximum gateways is 32 if maximum gateways is 64  ExtremeSwitching X620 default maximum gateways of 4 if maximum gateways is 2 if maximum gateways is 8 if maximum gateways is 16 if maximum gateways is 32 if maximum gateways is 64  ExtremeSwitching X440-G2	1,022 1,022 1,022 1,022 510 254  1,022 1,022 510 254 126 62  126 126 126 126 62 30  N/A
<b>IP multinetting (secondary IP addresses)</b> —maximum number of secondary IP addresses per VLAN.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	255
<b>IS-IS adjacencies</b> —maximum number of supported IS-IS adjacencies.	Summit X460-G2, X670-G2, X770 Summit X450-G2, and ExtremeSwitching X620, X440-G2	128 N/A

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
IS-IS ECMP—maximum number of equal cost multipath for IS-IS.	Summit X450-G2, X670-G2, X770, X460-G2 ExtremeSwitching X620, X440-G2	2, 4, or 8 N/A
IS-IS interfaces—maximum number of interfaces that can support IS-IS.	Summit X450-G2, X670-G2, X770, X460-G2 ExtremeSwitching X620, X440-G2	255 N/A
IS-IS routers in an area—recommended maximum number of IS-IS routers in an area.	Summit X450-G2, X670-G2, X770, X460-G2 ExtremeSwitching X620, X440-G2	256 N/A
IS-IS route origination—recommended maximum number of routes that can be originated by an IS-IS node.	Summit X450-G2, X460-G2, X670-G2, X770 ExtremeSwitching X620, X440-G2	20,000 N/A
IS-IS IPv4 L1 routes in an L1 router—recommended maximum number of IS-IS Level 1 routes in a Level 1 IS-IS router.	Summit X450-G2, X460-G2, X670-G2, X770 ExtremeSwitching X620, X440-G2	25,000 N/A
IS-IS IPv4 L2 routes—recommended maximum number of IS-IS Level 2 routes.	Summit X450-G2, X460-G2, X670-G2, X770 ExtremeSwitching X620, X440-G2	25,000 N/A
IS-IS IPv4 L1 routes in an L1/L2 router—recommended maximum number of IS-IS Level 1 routes in an L1/L2 IS-IS router.	Summit X450-G2, X460-G2, X670-G2, X770 ExtremeSwitching X620, X440-G2	20,000 N/A
IS-IS IPv6 L1 routes in an L1 router—recommended maximum number of IS-IS Level 1 routes in a Level 1 IS-IS router.	Summit X450-G2, X460-G2, X670-G2, X770 ExtremeSwitching X620, X440-G2	10,000 N/A
IS-IS IPv6 L2 routes—recommended maximum number of IS-IS Level 2 routes.	Summit X450-G2, X460-G2, X670-G2, X770 ExtremeSwitching X620, X440-G2	10,000 N/A
IS-IS IPv6 L1 routes in an L1/L2 router—recommended maximum number of IS-IS Level 1 routes in a L1/L2 router.	Summit X450-G2, X460-G2, X670-G2, X770 ExtremeSwitching X620, X440-G2	10,000 N/A
IS-IS IPv4/IPv6 L1 routes in an L1 router—recommended maximum number of IS-IS Level 1 routes in a Level 1 IS-IS router. The numbers documented are based on 50% IPv4 routes and 50% IPv6 routes.	Summit X450-G2, X460-G2, X670-G2, X770 ExtremeSwitching X620, X440-G2	20,000 N/A



**Table 3: Supported Limits (continued)**

Metric	Product	Limit
<b>IS-IS IPv4/IPv6 L2 routes in an L2 router</b> —recommended maximum number of IS-IS Level 2 routes in a Level 2 IS-IS router. The numbers documented are based on 50% IPv4 routes and 50% IPv6 routes.	Summit X450-G2, X460-G2, X670-G2, X770 ExtremeSwitching X620, X440-G2	20,000 N/A
<b>IS-IS IPv4/IPv6 L1 routes in an L1/L2 router</b> —recommended maximum number of IS-IS Level 1 routes in a Level 1/Level 2 IS-IS router. The numbers documented are based on 50% IPv4 routes and 50% IPv6 routes.	Summit X450-G2, X460-G2, X670-G2, X770 ExtremeSwitching X620, X440-G2	20,000 N/A
<b>Jumbo frames</b> —maximum size supported for jumbo frames, including the CRC.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	9,216
<b>L2 VPN: VCCV (pseudowire Virtual Circuit Connectivity Verification) VPNs per switch</b> —maximum number of VCCV enabled VPLS VPNs.	Summit X460-G2, X670-G2, X770 Summit X450-G2, and ExtremeSwitching X620, X440-G2	16 N/A
<b>L2 VPN: VPLS MAC addresses</b> —maximum number of MAC addresses learned by a switch.	Summit X770 Summit X670-G2 Summit X460-G2 Summit X450-G2, and ExtremeSwitching X620, X440-G2	128,000 140,000 55,000 N/A
<b>L2 VPN: VPLS VPNs</b> —maximum number of VPLS virtual private networks per switch.	Summit X460-G2, X770, X670-G2 Summit X450-G2, and ExtremeSwitching X620, X440-G2	1,023 N/A
<b>L2 VPN: VPLS peers</b> —maximum number of VPLS peers per VPLS instance.	Summit X770, X670-G2, X460-G2 Summit X450-G2, and ExtremeSwitching X620, X440-G2	64 N/A
<b>L2 VPN: LDP pseudowires</b> —maximum number of pseudowires per switch.	Summit X770 Summit X670-G2 Summit X460-G2 Summit X450-G2, and ExtremeSwitching X620, X440-G2	7,800 7,000 7,116 N/A
<b>L2 VPN: static pseudowires</b> —maximum number of static pseudowires per switch.	Summit X770 Summit X670-G2, X460-G2 Summit X450-G2, and ExtremeSwitching X620, X440-G2	15,308 7,000 N/A
<b>L2 VPN: Virtual Private Wire Service (VPWS) VPNs</b> —maximum number of virtual private networks per switch.	Summit X770 Summit X670-G2 Summit X460-G2 Summit X450-G2, and ExtremeSwitching X620, X440-G2	4,000 4,090 1,023 N/A

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
<p><b>Layer-2 IPMC forwarding caches</b>—(IGMP/MLD/PIM snooping) in mac-vlan mode.</p> <p><b>Note:</b></p> <ul style="list-style-type: none"> <li>The internal lookup table configuration used is "l2-and-l3".</li> <li>IPv6 and IPv4 L2 IPMC scaling is the same for this mode.</li> <li>Layer-2 IPMC forwarding cache limits—(IGMP/MLD/PIM snooping) in mixed-mode are same.</li> </ul>	<p>Summit X770, X670-G2 Summit X460-G2 Summit X450-G2 ExtremeSwitching X620, X440-G2</p>	<p>73,000 24,000 14,000 5,000</p>
<p><b>Layer-3 IPv4 Multicast</b>—maximum number of &lt;S,G,V&gt; entries installed in the hardware (IP multicast compression enabled).</p> <p><b>Note:</b></p> <ul style="list-style-type: none"> <li>Limit value same for MVR senders, PIM Snooping entries, PIM SSM cache, IGMP senders, PIM cache.</li> <li>The internal lookup table configuration used is "more l3-and-ipmc".</li> <li>Assumes source-group-vlan mode as look up key.</li> <li>Layer 3 IPMC cache limit in mixed mode also has the same value.</li> </ul>	<p>Summit X460-G2 Summit X450-G2 Summit X770, X670-G2 ExtremeSwitching X620, X440-G2</p>	<p>26,000 21,000 77,500 1,500</p>

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
<b>Layer-3 IPv6 Multicast</b> —maximum number of <S,G,V> entries installed in the hardware (IP multicast compression enabled).  <b>Note:</b> <ul style="list-style-type: none"> <li>Limit value same for MLD sender per switch,PIM IPv6 cache.</li> <li>The internal lookup table configuration used is "more l3-and-ipmc".</li> <li>Assumes source-group-vlan mode as look up key.</li> </ul>	Summit X770, X670-G2 Summit X460-G2 Summit X450-G2 ExtremeSwitching X620, X440-G2	30,000 14,000 10,000 700
<b>Load sharing</b> —maximum number of load sharing groups.  <b>Note:</b> The actual number of load-sharing groups that can be configured is limited by the number of physical ports present in the switch or SummitStack.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	128
<b>Load sharing</b> —maximum number of ports per load-sharing group.	ExtremeSwitching X620, X440-G2 (standalone and stacked)	8
	Summit X770 (standalone) Summit X670-G2 (standalone) Summit X460-G2 (standalone) Summit X450-G2 (standalone)	32
	Summit X770 (stacked) Summit X670-G2 (stacked) Summit X460-G2 (stacked) Summit X450-G2 (stacked) Summit X670-G2	64
<b>Logged messages</b> —maximum number of messages logged locally on the system.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	20,000
<b>MAC-based security</b> —maximum number of MAC-based security policies.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	1,024
<b>MAC Locking</b> —Maximum number of MAC locking stations that can be learned on a port.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	64 (static MAC locking stations) 600 (first arrival MAC locking stations)

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
<b>Meters</b> —maximum number of meters supported.	Summit X460-G2, X450-G2, X670-G2, X770 ExtremeSwitching X440-G2, X620	2,048 N/A
<b>Maximum mirroring instances</b>	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2  <b>Note:</b> Only two or four mirroring instance will be active at a time depending on the mirroring filter added to it. There are four hardware resource slots. Each single instance uses one such slot, while each ingress plus egress instance uses two slots. So this allows the you to use a total of four slots, while there are no more then two egress instances. The maximum possible combination for mirroring instances:  1 4 ingress 2 3 ingress + 1 egress 3 2 ingress + 2 egress 4 2 (ingress + egress) 5 1 (ingress + egress) + 2 ingress 6 1 (ingress + egress) + 1 egress + 1 ingress	16 (including default mirroring instance)
<b>Mirroring (filters)</b> —maximum number of mirroring filters.  <b>Note:</b> This is the number of filters across all the active mirroring instances.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	128
<b>Mirroring, one-to-many (filters)</b> —maximum number of one-to-many mirroring filters.  <b>Note:</b> This is the number of filters across all the active mirroring instances	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	128
<b>Mirroring, one-to-many (monitor port)</b> —maximum number of one-to-many monitor ports.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	16
<b>MLAG ports</b> —maximum number of MLAG ports allowed.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	768
<b>MLAG peers</b> —maximum number of MLAG peers allowed.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	2
<b>MPLS RSVP-TE interfaces</b> —maximum number of interfaces.	Summit X460-G2, X670-G2, X770 Summit X450-G2, and ExtremeSwitching X440-G2, X620	32 N/A

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
MPLS RSVP-TE ingress LSPs—maximum number of ingress LSPs.	Summit X460-G2, X670-G2, X770 Summit X450-G2, and ExtremeSwitching X440-G2, X620	2,000 N/A
MPLS RSVP-TE egress LSPs—maximum number of egress LSPs.	Summit X460-G2, X670-G2, X770 Summit X450-G2, and ExtremeSwitching X440-G2, X620	2,000 N/A
MPLS RSVP-TE transit LSPs—maximum number of transit LSPs.	Summit X460-G2, X670-G2, X770 Summit X450-G2, and ExtremeSwitching X440-G2, X620	2,000 N/A
MPLS RSVP-TE paths—maximum number of paths.	Summit X460-G2, X770 Summit X670-G2 Summit X450-G2, and ExtremeSwitching X440-G2, X620	1,000 2,000 N/A
MPLS RSVP-TE profiles—maximum number of profiles.	Summit X460-G2, X770 Summit X670-G2 Summit X450-G2, and ExtremeSwitching X440-G2, X620	1,000 2,000 N/A
MPLS RSVP-TE EROs—maximum number of EROs per path.	Summit X460-G2, X670-G2, X770 Summit X450-G2, and ExtremeSwitching X440-G2, X620	64 N/A
MPLS LDP peers—maximum number of MPLS LDP peers per switch.	Summit X770 Summit X670-G2, X460-G2 Summit X450-G2, and ExtremeSwitching X440-G2, X620	64 128 N/A
MPLS LDP adjacencies—maximum number of MPLS LDP adjacencies per switch.	Summit X460-G2 Summit X770, X670-G2 Summit X450-G2, and ExtremeSwitching X440-G2, X620	50 64 N/A
MPLS LDP ingress LSPs—maximum number of MPLS LSPs that can originate from a switch.	Summit X770, X670-G2 Summit X460-G2 Summit X450-G2, and ExtremeSwitching X440-G2, X620	2,048 4,000 N/A
MPLS LDP-enabled interfaces—maximum number of MPLS LDP configured interfaces per switch.	Summit X770 Summit X670-G2, X460-G2 Summit X450-G2, and ExtremeSwitching X440-G2, X620	64 128 N/A
MPLS LDP Sessions—maximum number of MPLS LDP sessions.	Summit X770 Summit X670-G2, X460-G2 Summit X450-G2, and ExtremeSwitching X440-G2, X620	64 128 N/A
MPLS LDP transit LSPs—maximum number of MPLS transit LSPs per switch.	Summit X770, X670-G2, X460-G2 Summit X450-G2, and ExtremeSwitching X440-G2, X620	4,000 N/A
MPLS LDP egress LSPs—maximum number of MPLS egress LSPs that can terminate on a switch.	Summit X770 Summit X670-G2, X460-G2 Summit X450-G2, and ExtremeSwitching X440-G2, X620	8,000 4,000 N/A
MPLS static egress LSPs—maximum number of static egress LSPs.	Summit X460-G2 Summit X770 Summit X670-G2 Summit X450-G2, and ExtremeSwitching X440-G2, X620	7,116 8,000 15,308 N/A

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
MPLS static ingress LSPs—maximum number of static ingress LSPs.	Summit X460-G2 Summit X770, X670-G2 Summit X450-G2, and ExtremeSwitching X440-G2, X620	4,000 2,048 N/A
MPLS static transit LSPs—maximum number of static transit LSPs	Summit X770, X670-G2, X460-G2 Summit X450-G2, and ExtremeSwitching X440-G2, X620	4,000 N/A
MSDP active peers—maximum number of active MSDP peers.	Summit X770, X670-G2, X460-G2 Summit X450-G2, and ExtremeSwitching X440-G2, X620	64 N/A
MSDP SA cache entries—maximum number of entries in SA cache.	Summit X670-G2, X770 Summit X460-G2 Summit X450-G2, and ExtremeSwitching X440-G2, X620	14,000 10,000 N/A
MSDP maximum mesh groups—maximum number of MSDP mesh groups.	Summit X770, X670-G2, X460-G2 Summit X450-G2, and ExtremeSwitching X440-G2, X620	16 N/A
Multicast listener discovery (MLD) snooping per-VLAN filters—maximum number of VLANs supported in per-VLAN MLD snooping mode.	Summit X460-G2 Summit X770, X670-G2 Summit X450-G2 ExtremeSwitching X620, X440-G2	1,200 1,200 512 600
Multicast listener discovery (MLD)v1 subscribers—maximum number of MLDv1 subscribers per port. <sup>1</sup>	Summit X770, X670-G2, X450-G2, X460-G2 ExtremeSwitching X620, X440-G2	4,000 3,500
Multicast listener discovery (MLD)v1 subscribers—maximum number of MLDv1 subscribers per switch. <sup>1</sup>	Summit X460-G2, X450-G2 Summit X770, X670-G2 ExtremeSwitching X620, X440-G2	10,000 30,000 10,000
Multicast listener discovery (MLD)v2 subscribers—maximum number of MLDv2 subscribers per port. <sup>1</sup>	Summit X450-G2 SummitStack Summit X770, X670-G2, X460-G2 ExtremeSwitching X620, X440-G2	4,000 2,000 4,000 3,500
Multicast listener discovery (MLD)v2 subscribers—maximum number of MLDv2 subscribers per switch. <sup>1</sup>	SummitStack Summit X460-G2, X450-G2 Summit X770, X670-G2 ExtremeSwitching X620, X440-G2	5,000 10,000 30,000 10,000
Multicast listener discovery (MLD)v2 maximum source per group—maximum number of source addresses per group.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	200
Multicast listener discovery (MLD) SSM-map entries—maximum number of MLD SSM mapping entries.	Summit X450-G2, X460-G2, X670-G2, X770 ExtremeSwitching X440-G2, X620	500 50

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
<b>Multicast listener discovery (MLD) SSM-MAP entries</b> —maximum number of sources per group in MLD SSM mapping entries.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	50
<b>Network login</b> —maximum number of clients being authenticated on MAC-based VLAN enabled ports.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	1,024
<b>Network login</b> —maximum number of clients being authenticated with policy mode enabled.	Summit X450-G2, X460-G2 Summit X670-G2, X770 ExtremeSwitching X620, X440-G2	1,024 512 256
<b>Network login</b> —maximum number of dynamic VLANs.	Summit X460-G2, X450-G2, X670-G2, X770 ExtremeSwitching X440-G2, X620	2,000 1,024
<b>Network login VLAN VSAs</b> —maximum number of VLANs a client can be authenticated on at any given time.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	10
<b>ONEPolicy Roles/Profiles</b> —maximum number of policy roles/profiles.	Summit X450-G2, X460-G2, X670-G2, X770 ExtremeSwitching X620, X440-G2	63 64
<b>ONEPolicy Rules per Role/Profile</b> —maximum number of rules per role/policy.	Summit X450-G2	IPv6 rules: 256 IPv4 rules: 256 L2 Rules: 184 MAC Rules: 256
	Summit X460-G2	IPv6 Rules: 512 IPv4 Rules: 512 L2 Rules: 440 MAC Rules: 512
	Summit X670-G2, X770	IPv6 Rules: 256 L2 Rules: 184 MAC Rules: 256 IPv4 Rules: 256
	ExtremeSwitching X620, X440-G2	IPv6 and Mac Rules: 0 Ipv4 Rules: 256 (per switch) L2 Rules: 184 (per switch)
<b>ONEPolicy Authenticated Users per Switch</b> —maximum number of authenticated users per switch.	Summit X450-G2, X460-G2 Summit X670-G2, X770 ExtremeSwitching X620, X440-G2	Up to 1,024 Up to 512 Up to 256

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
<b>ONEPolicy Authenticated Users</b> — maximum authenticated users with a combination of TCI disabled/enabled profiles.	Summit X450-G2, X460-G2 Summit X670-G2, X770 ExtremeSwitching X620, X440-G2	682-1,022 341-510 TCI disabled: 170 TCI enabled: 256
<b>ONEPolicy Authenticated Users per Port</b> —maximum number of authenticated users per port.	Summit X450-G2, X460-G2  Summit X670-G2, X770  ExtremeSwitching X620, X440-G2	Unlimited up to 1,024 Unlimited up to 512 Unlimited up 256
<b>ONEPolicy Permit/Deny Traffic Classification Rules Types</b> — total maximum number of unique permit/deny traffic classification rules types (system/stack).	Summit X450-G2, X460-G2, X670-G2, X770 ExtremeSwitching X620, X440-G2	952 440
<b>ONEPolicy Permit/Deny Traffic Classification Rules Types</b> — maximum number of unique MAC permit/deny traffic classification rules types (macsource/macdest).	Summit X450-G2, X460-G2, X670-G2, X770 ExtremeSwitching X620, X440-G2	256 N/A
<b>ONEPolicy Permit/Deny Traffic Classification Rules Types</b> — maximum number of unique IPv6 permit/deny traffic classification rules types (ipv6dest).	Summit X450-G2, X460-G2, X670-G2, X770 ExtremeSwitching X620, X440-G2	256 N/A
<b>ONEPolicy Permit/Deny Traffic Classification Rules Types</b> — maximum number of unique IPv4 permit/deny traffic classification rules (typesipsource / ipdest / ipfrag / udpsourceportIP / udpdestportIP / tcpsourceportIP / tcpdestportIP / ipttl / iptos / iptype).	Summit X450-G2, X460-G2, X670-G2, X770 ExtremeSwitching X620, X440-G2	256 256
<b>ONEPolicy Permit/Deny Traffic Classification Rules Types</b> — maximum number of unique Layer 2 permit/deny traffic classification rules (ethertype/port).	Summit X450-G2, X460-G2, X670-G2, X770 ExtremeSwitching X620, X440-G2	184 184
<b>OSPFv2/v3 ECMP</b> —maximum number of equal cost multipath OSPFv2 and OSPFv3.	Summit X460-G2, X670-G2, X770 Summit X450-G2, and ExtremeSwitching X440-G2, X620	16 4



**Table 3: Supported Limits (continued)**

Metric	Product	Limit
OSPFv2 areas—as an ABR, how many OSPF areas are supported within the same switch.	Summit X460-G2, X670-G2, X770, X450-G2	8
	ExtremeSwitching X440-G2, X620	4
OSPFv2 external routes—recommended maximum number of external routes contained in an OSPF LSDB.	Summit X770, X670-G2, X460-G2, X450-G2 ExtremeSwitching X440-G2, X620	5,000 2,400
OSPFv2 inter- or intra-area routes—recommended maximum number of inter- or intra-area routes contained in an OSPF LSDB with one ABR in OSPF domain.	Summit X670-G2, X460-G2 Summit X770 Summit X450-G2, and ExtremeSwitching X440-G2, X620	2,000 7,000 1,000
OSPFv2 interfaces—recommended maximum number of OSPF interfaces on a switch (active interfaces only).	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	4 (with Advanced Edge licence)
	Summit X450-G2, X460-G2, X670-G2, X770	400 (with Core license or higher)
OSPFv2 links—maximum number of links in the router LSA.	Summit X460-G2, X670-G2	400
	Summit X450-G2, and ExtremeSwitching X620, X440-G2	4
	Summit X770	419
OSPFv2 neighbors—maximum number of supported OSPF adjacencies.	Summit X770, X670-G2, X460-G2 Summit X450-G2, and ExtremeSwitching X440-G2, X620	128 4
OSPFv2 routers in a single area—recommended maximum number of routers in a single OSPF area.	Summit X770, X670-G2, X460-G2, X450-G2 ExtremeSwitching X440-G2, X620	50 4
OSPFv2 virtual links—maximum number of supported OSPF virtual links.	Summit X460-G2, X670-G2, X770	32
	Summit X450-G2, and ExtremeSwitching X440-G2, X620	4
OSPFv3 areas—as an ABR, the maximum number of supported OSPFv3 areas.	Summit X460-G2, X670-G2, X770 ExtremeSwitching X440-G2, X620	16 N/A
OSPFv3 external routes—recommended maximum number of external routes.	Summit X770, X670-G2, X460-G2, X450-G2 ExtremeSwitching X440-G2, X620	10,000 1,200
OSPFv3 inter- or intra-area routes—recommended maximum number of inter- or intra-area routes.	Summit X770, X670-G2, X460-G2, X450-G2 ExtremeSwitching X440-G2, X620	3,000 N/A

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
OSPFv3 interfaces—maximum number of OSPFv3 interfaces.	Summit X770, X670-G2, X460-G2, X450-G2 ExtremeSwitching X440-G2, X620  <b>Note:</b> Active interfaces limit, with Advanced Edge license. (See below for Core license limits.)	4 N/A
	Summit X770, X450-G2 Summit X670-G2, X460-G2 ExtremeSwitching X440-G2, X620  <b>Note:</b> With Core license or higher. (See above for Advanced Edge license limits.)	128 256 N/A
OSPFv3 neighbors—maximum number of OSPFv3 neighbors.	Summit X770, X670-G2, X460-G2, X450-G2 ExtremeSwitching X440-G2, X620	64 N/A
OSPFv3 virtual links—maximum number of OSPFv3 virtual links supported.	Summit X770, X670-G2, X460-G2 with Core license or higher Summit X450-G2 ExtremeSwitching X440-G2, X620	16 4 N/A
PIM IPv4 (maximum interfaces)—maximum number of PIM active interfaces.	Summit X460-G2, X670-G2, X770 Summit X450-G2, and ExtremeSwitching X440-G2, X620, (Advanced Edge License)	512 4
PIM IPv4 (maximum interfaces)—maximum number of PIM-snooping enabled interfaces.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	512
PIM IPv4 Limits—maximum number of multicast groups per rendezvous point.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	180
PIM IPv4 Limits—maximum number of multicast sources per group.	Summit X460-G2, X670-G2, X770, X450-G2 ExtremeSwitching X440-G2, X620	5,000 1,500
PIM IPv4 Limits—maximum number of dynamic rendezvous points per multicast group.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	145
PIM IPv4 Limits—static rendezvous points.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	32
PIM IPv6 (maximum interfaces)—maximum number of PIM active interfaces.	Summit X460-G2, X670-G2, X770 Summit X450-G2, and ExtremeSwitching X440-G2, X620 (Advanced Edge License)	512 4
PIM IPv6 Limits—maximum number of multicast groups per rendezvous point.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	70
PIM IPv6 Limits—maximum number of multicast sources per group.	Summit X460-G2, X670-G2 Summit X450-G2 Summit X770 ExtremeSwitching X440-G2, X620	2,500 2,000 2,500 550

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
<b>PIM IPv6 Limits</b> —maximum number of dynamic rendezvous points per multicast group.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	64
<b>PIM IPv6 Limits</b> —maximum number of secondary address per interface.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	70
<b>PIM IPv6 Limits</b> —static rendezvous points.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	32
<b>Policy-based routing (PBR) redundancy</b> —maximum number of flow-redirects.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	256°
<b>Policy-based routing (PBR) redundancy</b> —maximum number of next hops per each flow-direct.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	32°
<b>Port-specific VLAN tags</b> —maximum number of port-specific VLAN tags.	Summit X460-G2, X670-G2, X770 Summit X450-G2, and ExtremeSwitching X440-G2, X620	1,023 N/A
<b>Port-specific VLAN tags</b> —maximum number of port-specific VLAN tag ports.	Summit X770, X670-G2 Summit X460-G2 Summit X450-G2, and ExtremeSwitching X440-G2, X620	6,400 4,000 N/A
<b>Private VLANs</b> —maximum number of subscribers. Assumes a minimum of one port per network and subscriber VLAN.	Summit X770 Summit X670-G2 Summit X460-G2 Summit X450-G2 ExtremeSwitching X440-G2 ExtremeSwitching X620	103 63 53 51 47 15
<b>Private VLANs</b> —maximum number of private VLANs with an IP address on the network VLAN.  <b>Note:</b> This limit is dependent on the maximum number of private VLANs in an L2-only environment if the configuration has tagged and translated ports.	Summit X770, X670-G2, X460-G2, X450-G2 ExtremeSwitching X440-G2 ExtremeSwitching X620	1,024 255 510
<b>Private VLANs</b> —maximum number of private VLANs in an L2-only environment.	Summit X770, X670-G2, X460-G2, X450-G2 ExtremeSwitching X440-G2, X620	1,280 255
<b>PTP/1588v2 Clock Ports</b>	Summit X770, X460-G2, X670-G2 ExtremeSwitching X440-G2, X620	32 for boundary clock 1 for ordinary clock N/A

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
PTP/1588v2 Clock Instances	Summit X770, X670-G2, X460-G2 ExtremeSwitching X440-G2, X620	2 combinations: <ul style="list-style-type: none"> <li>Transparent clock + ordinary clock</li> <li>Transparent clock + boundary clock</li> </ul> N/A
PTP/1588v2 Unicast Static Slaves	Summit X770, X670-G2, X460-G2 ExtremeSwitching X440-G2, X620	40 entries per clock port N/A
PTP/1588v2 Unicast Static Masters	Summit X770, X670-G2, X460-G2 ExtremeSwitching X440-G2, X620	10 entries per clock type N/A
Route policies—suggested maximum number of lines in a route policy file.	Summit X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	10,000
RIP Learned Routes—maximum number of RIP routes supported without aggregation.	Summit X770, X670-G2, X460-G2, and ExtremeSwitching X440-G2, X620	10,000
RIP interfaces on a single router—recommended maximum number of RIP routed interfaces on a switch.	Summit X670-G2, X460-G2 Summit X770, X450-G2 ExtremeSwitching X440-G2, X620	256 256 128
RIPng learned routes—maximum number of RIPng routes.	Summit X670-G2, X460-G2, X770, X450-G2 ExtremeSwitching X440-G2, X620	3,000 N/A
Spanning Tree (maximum STPDs)—maximum number of Spanning Tree Domains on port mode EMISTP.	Summit X450-G2, X770, X670-G2, X460-G2, and ExtremeSwitching X620 ExtremeSwitching X440-G2	64 32
Spanning Tree PVST+—maximum number of port mode PVST domains.  <b>Note:</b> <ul style="list-style-type: none"> <li>Maximum of 10 active ports per PVST domain when 256 PVST domains are configured.</li> <li>Maximum of 7 active ports per PVST domain when 128 PVST domains are configured.</li> </ul>	Summit X770, X670-G2, and ExtremeSwitching X620 Summit X460-G2, X450-G2, and ExtremeSwitching X440-G2	256 128

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
<b>Spanning Tree</b> —maximum number of multiple spanning tree instances (MSTI) domains.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620 ExtremeSwitching X440-G2	64 32
<b>Spanning Tree</b> —maximum number of VLANs per MSTI.  <b>Note:</b> Maximum number of 10 active ports per VLAN when all 500 VLANs are in one MSTI.	Summit X770, X670-G2 Summit X460-G2, X450-G2 ExtremeSwitching X440-G2 ExtremeSwitching X620	500 600 256 600
<b>Spanning Tree</b> —maximum number of VLANs on all MSTP instances.	Summit X770 Summit X670-G2 Summit X460-G2, X450-G2 ExtremeSwitching X440-G2 ExtremeSwitching X620	1,024 1,000 1,024 512 1,024
<b>Spanning Tree (802.1d domains)</b> —maximum number of 802.1d domains per port.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	1
<b>Spanning Tree (number of ports)</b> —maximum number of ports including all Spanning Tree domains.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620 Summit X440-G2	4,096 2,048
<b>Spanning Tree (maximum VLANs)</b> —maximum number of STP-protected VLANs (dot1d and dot1w).	Summit X770, and ExtremeSwitching X620 Summit X670-G2 Summit X460-G2, X450-G2 ExtremeSwitching X440-G2	1,024 560 600 500
<b>SSH (number of sessions)</b> —maximum number of simultaneous SSH sessions.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	8
<b>Static MAC multicast FDB entries</b> —maximum number of permanent multicast MAC entries configured into the FDB.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	1,024
<b>Syslog servers</b> —maximum number of simultaneous syslog servers that are supported.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	4
<b>Telnet (number of sessions)</b> —maximum number of simultaneous Telnet sessions.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	8

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
<p><b>Virtual routers</b>—maximum number of user-created virtual routers that can be created on a switch.</p> <p><b>Note:</b> Virtual routers are not supported on Summit X440 series switches.</p>	Summit X460-G2, X670-G2, X770, X450-G2 ExtremeSwitching X440-G2, X620	63 N/A
<p><b>Virtual router forwarding (VRFs)</b>—maximum number of VRFs that can be created on a switch.</p> <p><b>Note:</b> * Subject to other system limitations.</p>	Summit X460-G2, X670-G2, X770, X450-G2 ExtremeSwitching X440-G2, X620	960 * N/A
<p><b>Virtual router protocols per VR</b>—maximum number of routing protocols per VR.</p>	Summit X460-G2, X670-G2, X770, X450-G2 ExtremeSwitching X440-G2, X620	8 N/A
<p><b>Virtual router protocols per switch</b>—maximum number of VR protocols per switch.</p>	Summit X460-G2, X670-G2, X770, X450-G2 ExtremeSwitching X440-G2, X620	64 N/A
<p><b>VLAN aggregation</b>—maximum number of port-VLAN combinations on any one superVLAN and all of its subVLANs.</p>	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	1,000
<p><b>VLANs</b>—includes all VLANs.</p> <p><b>Note:</b> ExtremeXOS supports only 4,092 user-configurable VLANs. (VLAN 1 is the default VLAN, and 4,095 is the management VLAN, and you may not configure them.)</p>	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	4,094
<p><b>VLANs</b>—maximum number of port-specific tag VLANs.</p>	Summit X770, X670-G2, X460-G2 ExtremeSwitching X440-G2, X620	4,093 N/A
<p><b>VLANs</b>—maximum number of port-specific tag VLAN ports.</p>	Summit X460-G2 Summit X770, X670-G2 Summit X450-G2, and ExtremeSwitching X440-G2, X620	4,096 8,192 N/A
<p><b>VLANs (Layer 2)</b>—maximum number of Layer 2 VLANs.</p>	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	4,094
<p><b>VLANs (Layer 3)</b>—maximum number of VLANs performing IPv4 and/or IPv6 routing. Excludes sub-VLANs.</p>	Summit X460-G2, X770, X670-G2, X450-G2 ExtremeSwitching X440-G2, X620	2,048 510

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
<b>VLANs (maximum active port-based)</b> —maximum active ports per VLAN when 4,094 VLANs are configured with default license.	Summit X770, X670-G2, X460-G2, X450-G2, and ExtremeSwitching X440G2 ExtremeSwitching X620	32 16
<b>VLANs (maximum active protocol-sensitive filters)</b> —number of simultaneously active protocol filters in the switch.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	16
<b>VLAN translation</b> —maximum number of translation VLANs. Assumes a minimum of one port per translation and member VLAN.	Summit X770 Summit X670-G2 Summit X460-G2 Summit X450-G2 ExtremeSwitching X620 ExtremeSwitching X440-G2	103 63 53 51 15 47
<b>VLAN translation</b> —maximum number of translation VLAN pairs with an IP address on the translation VLAN.  <b>Note:</b> This limit is dependent on the maximum number of translation VLAN pairs in an L2-only environment if the configuration has tagged and translated ports.	Summit X770, X670-G2, X450-G2 ExtremeSwitching X620 ExtremeSwitching X440-G2	1,024 512 255
<b>VLAN translation</b> —maximum number of translation VLAN pairs in an L2-only environment.	Summit X460-G2 Summit X450-G2, X770, X670-G2 ExtremeSwitching X440-G2, X620	2,046 1,024 512
<b>VRRP (v2/v3-IPv4) (maximum instances)</b> —maximum number of VRRP instances for a single switch, with Advanced Edge license or higher.  <b>Note:</b> These limits are applicable for Fabric Routing configuration also.	Summit X770, X670-G2, X460-G2, X450-G2 ExtremeSwitching X440-G2, X620	511 128

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
<b>VRRP (v3-IPv6) (maximum instances)</b> —maximum number of VRRP instances for a single switch, with Advanced Edge license or higher. (VRRP-VRRPv3-IPv6)  <b>Note:</b> These limits are applicable for Fabric Routing configuration also.	Summit X770, X670-G2, X460-G2, X450-G2 ExtremeSwitching X440-G2, X620	511 128
<b>VRRP (v2/v3-IPv4/IPv6) (maximum VRID)</b> —maximum number of unique VRID numbers per switch.	Summit X770, X670-G2, X460-G2, X450-G2 ExtremeSwitching X440-G2, X620  <b>Note:</b> With Advanced Edge license or higher	7 31
<b>VRRP (v2/v3-IPv4/IPv6) (maximum VRIDs per VLAN)</b> —maximum number of VRIDs per VLAN.	Summit X770, X670-G2, X460-G2, X450-G2 ExtremeSwitching X440-G2, X620  <b>Note:</b> With Advanced Edge license or higher	7 31
<b>VRRP (v2/v3-IPv4/IPv6) (maximum ping tracks)</b> —maximum number of ping tracks per VLAN.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2  <b>Note:</b> With Advanced Edge license or higher	8
<b>VRRP (maximum ping tracks)</b> —maximum number of ping tracks per VRRP Instance under 128 VRRP instances, with Advanced Edge license or higher.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	8 (20 centisecond or 1 second hello interval)
<b>VRRP (v3-IPv6) (maximum ping tracks)</b> —maximum number of ping tracks per VRRP Instance under 128 VRRP instances, with Advanced Edge license or higher.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	8 (20 centisecond or 1 second hello interval)
<b>VRRP (v2/v3-IPv4/IPv6) (maximum iproute tracks)</b> —maximum number of IP route tracks per VLAN.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	8
<b>VRRP (v2/v3-IPv4/IPv6)</b> —maximum number of VLAN tracks per VLAN.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	8



**Table 3: Supported Limits (continued)**

Metric	Product	Limit
<p><b>VXLAN</b>—maximum virtual networks.</p> <p><b>Note:</b> Every VPLS instance/PSTag VLAN reduces this limit by 1. Assumption is all BUM (broadcast/unknown-unicast/multicast) FDB entries are pointing to the same set of RTEPs when all VNETs use explicit flooding. Depends on whether all VNETs use standard or explicit and the number of tenant VLAN ports.</p>	Summit X670-G2, X770 Summit X460-G2, X450-G2, and ExtremeSwitching X440-G2, X620	2,048–4,000 N/A
<p><b>VXLAN</b>—maximum tenant VLAN plus port combinations</p> <p><b>Note:</b> Every (VPLS/PSTag VLAN/ TRILL access VLAN) + port reduces the limit by 1.</p>	Summit X670-G2, X770 Summit X460-G2, X450-G2, and ExtremeSwitching X440-G2, X620	4,096 N/A
<p><b>VXLAN</b>—maximum static MAC to IP bindings.</p> <p><b>Note:</b> Every FDB entry configured reduces this limit by 1</p>	Summit X670-G2, X770 Summit X460-G2, X450-G2, and ExtremeSwitching X440-G2, X620	64,000 N/A
<p><b>VXLAN</b>—maximum RTEP IP addresses</p>	Summit X670-G2, X770 Summit X460-G2, X450-G2, and ExtremeSwitching X440-G2, X620	512 N/A
<p><b>VXLAN</b>—maximum virtual networks with dynamic learning and OSPF extensions for VXLAN</p>	Summit X670-G2, X770 Summit X460-G2, X450-G2, and ExtremeSwitching X440-G2, X620	4,000 N/A
<p><b>XML requests</b>—maximum number of XML requests per second.</p> <p><b>Note:</b> Limits are dependent on load and type of XML request. These values are dynamic ACL data requests.</p>	Summit X450-G2, and ExtremeSwitching X440G2, X620	10 with 100 DACLs
<p><b>XNV authentication</b>—maximum number of VMs that can be processed (combination of local and network VMs).</p>	Summit X460-G2, X670-G2, X770 Summit X450-G2, and ExtremeSwitching X440-G2, X620	2,048 1,024

**Table 3: Supported Limits (continued)**

Metric	Product	Limit
<b>XNV database entries</b> —maximum number of VM database entries (combination of local and network VMs).	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	16,000
<b>XNV database entries</b> —maximum number of VPP database entries (combination of local and network VPPs).	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	2,048
<b>XNV dynamic VLAN</b> —Maximum number of dynamic VLANs created (from VPPs / local VMs).	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	2,048
<b>XNV local VPPs</b> —maximum number of XNV local VPPs.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	2,048 ingress 512 egress
<b>XNV policies/dynamic ACLs</b> —maximum number of policies/dynamic ACLs that can be configured per VPP.	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	8 ingress 4 egress
<b>XNV network VPPs</b> —maximum number of XNV network VPPs. <sup>p</sup>	Summit X450-G2, X460-G2, X670-G2, X770, and ExtremeSwitching X620, X440-G2	2,048 ingress 512 egress

<sup>a</sup> The table shows the total available.

<sup>b</sup> Limit depends on setting configured for "configure forwarding external-tables".

<sup>c</sup> When there are BFD sessions with minimal timer, sessions with default timer should not be used.

<sup>d</sup> Based on in "none more-l2" mode.

<sup>e</sup> Based on forwarding internal table configuration "more l2".

<sup>f</sup> Effective capacity varies based on actual MAC addresses and VLAN IDs used and hash algorithm selected.

<sup>g</sup> Based on "l2-only mode".

<sup>h</sup> Based on forwarding internal table configuration "more l3-and-ipmc".

<sup>i</sup> Based on forwarding external table configuration "l3-only ipv4".

<sup>j</sup> The limit depends on setting configured with configure iproute reserved-entries.

<sup>k</sup> Based on forwarding external table configuration "l3-only ipv4".

<sup>l</sup> Based on forwarding external table configuration "l3-only ipv6".

<sup>m</sup> The IPv4 and IPv6 multicast entries share the same hardware tables, so the effective number of IPv6 multicast entries depends on the number of IPv4 multicast entries present and vice-versa.

<sup>n</sup> If IGMP and MLD are simultaneously configured on the switch, the number of effective subscribers supported would be appropriately lessened.

<sup>o</sup> Sum total of all PBR next hops on all flow redirects should not exceed 4,096.

<sup>p</sup> The number of XNV authentications supported based on system ACL limitations.

# 3 Open Issues, Known Behaviors, and Resolved Issues

## Open Issues Known Behaviors Resolved Issues in ExtremeXOS 21.1

This chapter lists open software issues, limitations in ExtremeXOS system architecture (known issues), and resolved issues in ExtremeXOS.

### Open Issues

The following are new open issues for supported features found in ExtremeXOS 21.1.

**Table 4: Open Issues, Platform-Specific, and Feature Change Requests (CRs)**

CR Number	Description
<b>General</b>	
xos0062584	The command <code>configure web http access-profile</code> is missing the option <code>access-profile</code> .
xos0062966	When rendezvous point receives (*, G) join, and it has (S, G, RPT) entry, the entry should be converted to (S, G), and (S, G) join should be sent upstream. However, sometimes wrong assert is triggered and this new entry is dropped after a minute, resulting in complete traffic loss.  <b>Note:</b> Disable, and then re-enable PIM.
xos0063346	With multiple (greater than two) VRRP instances and host-mobility enabled, FDB flush sent during topology change from other L2 protocols does not occur.
xos0063247	Duplicate packets occur after MLAG recovery.
xos0063396	While enabling 1G links, unexpected link-down PDU is received in EAPS master.
xos0048715	IPv6 ECMP works for hardware-forwarded traffic, but does not work for slow-path traffic.  <b>Note:</b> Either use BFD to keep all router neighbors alive, or configure static neighbors and static FDB entries for all router neighbors. BFD is the preferred method.
xos0062399	IPv6 BFD session for OSPFv3 flaps after disabling, and then enabling VLAN port.
<b>SummitStack</b>	
xos0062386	With BGPv6, after port flap or failovers, some peers go into idle state.

**Table 4: Open Issues, Platform-Specific, and Feature Change Requests (CRs)  
(continued)**

CR Number	Description
xos0061909	<p>Creating an IPFIX mirroring instance to a monitor port, deleting the mirroring instance, and then recreating it again with to a different monitor port, causes the following error message (similar to the one below) to appear, and IPFIX mirroring does not work:</p> <pre>&lt;Error:HAL.Mirror.Error&gt; Slot-1: Failed to create mirroring destination for slot 2, unit 9 Entry exists</pre> <p><b>Note:</b> If the error appears in the log, disable and delete the mirror instance, and then add it back again.</p>
<b>ExtremeSwitching X620 Series Switches</b>	
xos0062729	<p>On ExtremeSwitching X620 series switches, for ports with Base-T SFP optics and explicitly configured at 1,000 speed, link comes up at peer end, but link stays down at local end after either rebooting, or removing, and then re-inserting optics.</p> <p><b>Note:</b> Manually set autoneg to "off" on the host side, which allows the link to be established.</p>
xos0062636	<p>Unexpected link switchover behavior occurs when exchanging copper and fiber cables on ExtremeSwitching X620 combo ports.</p> <p><b>Note:</b></p> <ul style="list-style-type: none"> <li>When 10G combo ports are used at 1G for redundancy between fiber and copper, then set the preferred medium to copper (<code>configure ports port_list preferred-medium copper</code>), otherwise sometimes the copper link might not come up.</li> <li>When 10G combo ports are used at 10G for redundancy between fiber and copper, then set the preferred medium to fiber (<code>configure ports port_list preferred-medium fiber</code>), otherwise sometimes the copper link might not come up.</li> </ul>
xos0062620	<p>For ExtremeXOS 21.1, do not use copper DAC cables for stacking on ExtremeSwitching X620-16T switches.</p>
<b>Summit X670-G2 Series Switches</b>	
xos0063170	<p>On Summit X670-G2 series switches, greater EAPS convergence time occurs with multiple VLANs (1,000 protected VLANs).</p>
<b>Summit X460-G2 Series Switches</b>	

**Table 4: Open Issues, Platform-Specific, and Feature Change Requests (CRs) (continued)**

CR Number	Description
xos0063811	<p>Summit X460-G2 series switches with ExtremeXOS 15.6 through 21.1, have the following limitations for SyncE input reference frequency:</p> <ul style="list-style-type: none"> <li>Network clock does not lock with input SyncE source port 52 (both at 10G and 1G speed) on all 48-port models (X460-G2-48t, 48x and 48p).</li> </ul> <p><b>Note:</b> For SyncE input at 10G, avoid port 52.</p> <ul style="list-style-type: none"> <li>When the 10G ports operate at 1G speed, the network clock does not lock. Models with Ethernet BASE-T or Power over Ethernet (PoE) ports may lock on initial configuration, but do not lock after a save and reboot.</li> </ul> <p><b>Note:</b> For SyncE input at 1G, use a 1G port, not a 10G port.</p>
<b>BGP</b>	
xos0060641	When BGP is administratively shut down, it does not send notifications to peers.
xos0063778	If an applied BGP import policy is edited such that previously permitted routes are now denied, the BGP RIB ( <code>show bgp routes</code> command) still shows the newly denied route(s) as active. The routing table is, however, updated correctly to reflect the new policy.
xos0063698	A BGP route is not replaced in the routing table by a new instance of the same prefix and length containing a different metric value. This condition can occur if an applied BGP import-policy file is edited to modify the route metric.

## Known Behaviors

The following are limitations in ExtremeXOS system architecture that have yet to be resolved.

**Table 5: Known Issues, Platform-Specific, and Feature Change Requests (CRs)**

CR Number	Description
<b>General</b>	
xos0062115	For ExtremeSwitching X440-G2 and X620 series switches, Dot1p is not set properly in the CVID translated packet.
xos0062068	For extremeErpsRingNodeType, node type of RPL Neighbor returns value "nonRplOwner" for SNMP get.
xos0062131	In VMANs, CEP port does not transmit ELRP packets, unlike untagged/tagged ports.
xos0062466	For ExtremeSwitching X440-G2 and X620 series switches, VLAN traffic is not dropped if the port is classified both as VLAN tagged and VMAN CEP port. However, Dot1p value is set to "0" in egress for all priorities in VLAN traffic.
xos0062119, xos0063047	For ExtremeSwitching X440-G2 and X620 series switches, "qosmonitor congestion counter" for egress port does not appear in the output of the <code>show ports qosmonitor congestion</code> command when a port list is specified, instead of a single egress port.

**Table 5: Known Issues, Platform-Specific, and Feature Change Requests (CRs)  
(continued)**

CR Number	Description
xos0063413	In Chalet, when switching between earlier versions of ExtremeXOS to version ExtremeXOS 21.1, the <b>Apps</b> tab does not appear.  <b>Note:</b> Reload the web page or clear the cache.
<b>SSH</b>	
xos0063327	If a switch is downgraded from ExtremeXOS 21.1 to previous releases, with RSA key saved, the key becomes invalid.
<b>VXLAN</b>	
xos0060213	Same port cannot be a part of network as well as tenant VLANs.
xos0063148	Rate-limit actions do not work when the port is added as VXLAN tenant on VLAN ports.
xos0059594	Egress mirroring of VXLAN traffic is not supported.
xos0059464	With no network ports configured and the switch receives VXLAN traffic from the access VLAN side, traffic is sent to the CPU, causing high BCMRx usage (around 50%), which in turn affects other parts of the system, such as OSPF (neighbor flap), pings etc. The frames are going to the CPU because they have the MAC DA and Destination IP address of the local switch. This behavior is no different than if the switch were a non-VXLAN-capable switch. By default all ports can terminate VXLAN traffic. If network ports are deleted with <code>configure virtual-network delete network ports portlist</code> any VXLAN traffic on these ports is sent to the CPU.
xos0062919	With VXLAN configuration, after rebooting the following error appears: <code>&lt;Error:HAL.Ipv4Mc.GrpTblFull&gt; IPv4 multicast entry not added. Hardware Group Table full.</code>
<b>Summits and ExtremeSwitching Series Switches</b>	
xos0063046	On ExtremeSwitching X440-G2 and Summit X460-G2 series switches, for the 1G combo ports if fiber is the preferred medium and a copper cable is inserted, and then a fiber cable is also inserted, the link switches from copper mode to fiber mode, and a link flap occurs.
<b>Summit X460-G2 Series Switches</b>	
xos0062225	For Summit X4460-G2 switches, when HwBFD session is enabled, configuring authentication is ineffective (session stays up despite a password mismatch between the neighbors).
<b>Summit X670-G2 Series Switches</b>	
xos0062486	For Summit X670-G2 series switches, configuring overhead bytes using <code>configure forwarding rate-limit overhead-bytes</code> does not work with egress ACL meter.
<b>SummitStack</b>	
xos0062687	For Summit X450-G2 and X620 SummitStacks, after stack reboots, the following error message appears: <code>&lt;Warn:DM.Warning&gt; Slot-2: mcmgr cannot write msg_id 5 to MASTER connection 0</code> This error can be ignored. No functional problem has occurred.

## Resolved Issues in ExtremeXOS 21.1

The following issues were resolved in ExtremeXOS 21.1. ExtremeXOS 21.1 includes all fixes up to and including ExtremeXOS 11.6.5.3, and earlier, ExtremeXOS 12.0.5, ExtremeXOS 12.1.7, ExtremeXOS 12.2.2-patch1-12, ExtremeXOS 12.3.6, ExtremeXOS 12.4.5, ExtremeXOS 12.5.5, ExtremeXOS 12.6.3, ExtremeXOS 12.6.5, ExtremeXOS 12.7.1, ExtremeXOS 15.1.5, ExtremeXOS 15.2.4, ExtremeXOS 15.3.3, ExtremeXOS 15.4.1, ExtremeXOS 15.5.1, ExtremeXOS 15.5.2, ExtremeXOS 15.6.1, ExtremeXOS 15.6.2, ExtremeXOS 15.7.1, ExtremeXOS 16.1, ExtremeXOS 16.1.2, and ExtremeXOS 16.1.3. For information about those fixes, see the release notes for the specific release.

**Table 6: Resolved Issues, Platform-Specific, and Feature Change Requests (CRs)**

CR Number	Description
<b>General</b>	
xos0050771	The command <code>show access-list dynamic counters</code> does not display the complete MAC address of VMs and it may not be possible to read the counters correctly from the output.
xos0052723	With L3VPN configured (also: OSPF, BGP, MPLS, LSP) and routes are being advertised and installed in the VRF routing table, after restarting process OSPF, VPN routes are not installed.
xos0056829	Switches do not re-send the Group Specific Query following the <code>last_member_query_interval</code> (1 second).
xos0057231	An FDB entry created by ARP with "i" flag set is not removed from the FDB table after a static entry for the same IP address is added with a different MAC value.
xos0057269	SNMP trap <code>extremelpSecurityViolation</code> is sent with incorrect VLAN description.
xos0057374	Switch odometer value is reinitialized when Master Switch Fabric Module (MSM) fails to read the value.
xos0057672	The process <code>rtmgr</code> ends unexpectedly when disabling GRE tunnels.
xos0058669	DHCPv6 client: After changing the client identifier type, and then restarting the port, old IPv6 addresses are not released, causing the <code>show vlan</code> command to show multiple IPv6 addresses.
xos0058750	Neighbor discovery packets are duplicated in L2 VLANs when IPv6 addresses are configured for other VLANs that do not have any ports.
xos0059942	SSH connection ends when show commands produce lengthy output.
xos0060092	Fetching values using SNMP for "extremePortQosStatsTable" does not work correctly.
xos0060643	Commands for downloading and installing images should use active/inactive options when specifying partitions (in addition to current primary/secondary options).
xos0061085	Kernel oops occurs while deleting VR with enable BGP export and IPARP proxy configurations.
xos0061173	L2PT packets are dropped when ingress port is configured with software learning.
xos0061198	Disabling VPN-VRF affects traffic on another VPN-VRF.

**Table 6: Resolved Issues, Platform-Specific, and Feature Change Requests (CRs) (continued)**

CR Number	Description
xos0061219	Parallel-mode-enabled DHCP offer is sent using primary IPv4 address to the client for multiple offers received from server for different IPv4 addresses.
xos0061247	Configuring IPv6 Syslog target in a specific format produces an incomplete command error, even though the command is complete.
xos0061331	Bootprelay for VRF is not supported. Commands to configure bootprelay should reflect this.
xos0061445	After creating and enabling an STPD, the command <code>configure "Default" add ports 1 tagged stpd "s1"</code> adds ports to the Default VLAN, but not with STPD domain, even though the error <code>"Command Aborted and no changes were made"</code> appears.
xos0061465	IPv6 source address that is not configured on any VLAN in the given VR is accepted as from source IP. Issue does not occur with IPv4.
xos0061507	SNMPget on EXTREME-SOFTWARE-MONITOR table returns value with incorrect OID.
xos0061517	LACP adjacency fails while forwarding the PDU with l2pt profile over L2VPN tunnels when MPLS PHP is enabled.
xos0061565	The TCL function, "clock scan," generates errors with default time zone configuration.
xos0061656	Nodes remain in the "FDBSync" state due to temp-flooding while rebooting the stack.
xos0061788	The process devmgr ends unexpectedly during snmpwalk when continuous EMS logs are sent to the switch console.
xos0062017	DHCP trusted port configuration is lost after disabling, and then re-enabling LAG.
xos0062018	For IPv6 routes with mask lengths greater than 64-bits, IPv6 unicast packets destined for the switch CPU can be dropped if another IPv6 route is present with a matching prefix and mask length less than or equal to 64-bits. This issue affects Summit X460-G2, X670-G2, and X770 switches.
xos0062133	STP flush event does not happen after ports are quickly disabled, and then enabled.
xos0062145	With QoS configuration, ACL process signal 11 ends unexpectedly after rebooting.
xos0062240	Port that was administratively disabled becomes up after enabling rx pause.
xos0062271	CLI memory leak occurs when executing show commands with include option through script.
xos0062277	The command <code>show vlan vlan_list</code> does not show information for dynamic VLANs nor the Default VLAN. Error appears.
xos0062290	Due to ExtremeXOS reflection RSTP BPDU support, upstream bridges believe that they are receiving their own BPDUs (contain the bridge's ID), thus causing multisource events during topology changes, which can cause slow convergence times when Ip is configured (upwards of 30 seconds).



**Table 6: Resolved Issues, Platform-Specific, and Feature Change Requests (CRs) (continued)**

CR Number	Description
xos0062427	EDP process ends unexpectedly when CDP packets without portId TLV are received.
xos0062441	The process rtMgr ends unexpectedly when IPv6 static route is deleted.
xos0062472	Source MAC addresses learned through CDP packets received on EAPS-blocked ports cause traffic to be dropped.
xos0062570	In SummitStacks, executing the command enable sflow ports all enables sFlow inappropriately on stacking ports.
xos0062705	Kernel oops can occur after clearing IPMC FDB in a stack.
xos0062789	Disabling learning on LAG ports does not flush FDB entries.
xos0062879	Transceiver information shows same Rx power value for 4x10G partition ports even though some ports are in ready state.
xos0063089	Kernel oops triggered infrequently during continuous addition/deletion of ARP entries for long durations.
xos0063359	The process rtmgr might end unexpectedly after executing <code>&lt;i&gt;disable bgp&lt;/i&gt;</code> , and then <code>&lt;i&gt;enable bgp&lt;/i&gt;</code> , or after <code>&lt;i&gt;disable port&lt;/i&gt;</code> , and then <code>&lt;i&gt;enable port&lt;/i&gt;</code> , or after rebooting a switch containing BGP routes.
xos0063368	In an MLAG configured switch, FDBs are not installed in hardware after reboot if there are frequent MACMoves between MLAG port and ISC.
<b>Summit X460-G2 Series Switches</b>	
xos0061486	Combo ports have unsupported autonegotiation and half-duplex settings.
xos0062425	On Summit X460-G2 series switches, the primary port is incorrectly set as 40 when it should be 41. Under certain conditions, this can cause a kernel crash.
xos0062855	On the Summit X460-G2 series switches, VPLS packets are forwarded with two tags when the service VLAN ports are also members of an untagged VMAN.
xos0063071	Add support for ONEPolicy IP socket classification.
<b>Summit X450-G2 Series Switches</b>	
xos0060129	On Summit X450-G2 series switches, 10/100/1000BASE-T SFP+ optics do not link to similar optics when in the SFP/SFP+ ports. They do link or partially link when connected to a regular triple speed copper port.
xos0061704	With SSH2 enabled, reboot the switch and force some other standby node to become the master node. Key becomes invalid on new master node.
<b>Summit X670-G2</b>	
xos0061791	On SummitStacks containing master and standby nodes of different switches, the standby node may go to failed state after a node reboot.
xos0062166	On Summit X670-G2 series switches configured with L3VPN, executing the <code>clear iparp</code> command causes the switch to reboot with Kernel Oops.
xos0063204	Traffic stops on LAG ports when frequently modifying the sharing group.
<b>SummitStack</b>	

**Table 6: Resolved Issues, Platform-Specific, and Feature Change Requests (CRs) (continued)**

CR Number	Description
xos0057835	In SummitStacks, clear-flow sampling period is incorrectly calculated.
xos0061799	Precedence order between policy port rules and policy MAC-based rules is not preserved following a master/backup Failover.
xos0061841	FDB entries are not learned again after limit learning is unconfigured, and then configured again, with PSTAG configuration in SummitStacks.
xos0061957	HAL process ends unexpectedly during failover when switches have ACL policy without meter action.
xos0062084	Rebooting modules with only policy configurations clears their policy port configurations when they rejoins the stack.
xos0062123	Port groups do not appear in the <code>show configuration</code> command. However, they do appear in the <code>show ports group</code> command.
xos0062238	On a stacked system, configuration of a user-defined CoS value's <code>etsysCos8021dPriority</code> using the MIB can return success when the set actually failed (as seen by a subsequent <code>get</code> ).
xos0062291	Applying the same policy MAC admin rule to multiple ports produces the following error message: <b>hardware configuration of rule failed for policy.</b>
xos0062367	ACL process ends unexpectedly on repeated refresh of ACL policy with clear-flow action.
xos0062504	You can set a GPTP "peer delay current interval" outside of the correct range of -3 to 17..
xos0062522	In SummitStack switches, standby slots go to failed state when a very large number of log messages are continuously generated in the switch.
xos0063242	Stacks configured as DHCP clients do not respond to pinging after failover.
xos0063344	With MLAG and LAG configurations, when a stack node comes up after a reboot, FDB entries flooded from other slots are programmed on incorrect ports internally.
<b>ACL</b>	
xos0054348	Cannot delete flow names after deleting, and then creating, the flow while the ACL is installed.
xos0054714	When ACLs are applied in both ingress and egress directions, you cannot see egress direction using SNMP. When a policy has more than one counter, using SNMP, you can only check the updates from the first counter, and subsequent counters do not appear.
xos0059924	The output of the command <code>show access-list meter ports</code> displays additional meter name when only one meter is applied using ACL policy.
xos0060716	Need support for new ACL action "redirect-vlan" to redirect matched packets to all ports in specified VLANs.
xos0061922	Dynamic ACLs applied as "any" fail to install in hardware after upgrading ExtremeXOS from any release other than EXOS 15.3.

**Table 6: Resolved Issues, Platform-Specific, and Feature Change Requests (CRs) (continued)**

CR Number	Description
xos0062156	ACL Manager API slice type can be off by one.
xos0062537	HAL crash occurs when redirect-port-list action contains more than 64 ports.
xos0062619	SSH access-profile using policy does not work with IPv6 addresses.
xos0063172	ACL action "redirect-port-list" does not take effect when another slice has a rule to match all packets with deny action.
<b>AVB</b>	
xos0062494	Source MAC addresses learned through MVRP packets on a blocked port (STP) cause traffic to be dropped.
<b>BGP</b>	
xos0058441	After creating a BGP peering session between link local IPv6 addresses with the scope ID specified, deleting the VLAN containing link local IPv6 address, and then issuing the command <code>show configuration bgp</code> , switch reboots with <code>Epm application wdg timer warning</code> error message.
xos0060641	When BGP is administratively shut down, it does not send notifications to peers.
xos0060680	Switch stops responding after executing <code>clear bgp neighbor all counters</code> on a switch without BGP configuration.
xos0060749	Configuring, enabling, disabling, or deleting BGP neighbors using link local address results in the following error message: <code>Error: cmBackendXmlParseEnd Failed to convert "bgpCfgPeerRemoteAddr" value "fe80::204:96ff:fe97:efef/brian-to-112"</code>
xos0061129	In a multi-peer setup with many routes (over 150K), a few routes from the preferred peer do not become active in the BGP RIB. Disabling, and then re-enabling peer, restores all routes.
xos0061411	Route table installs sub-optimal BGP routes (next-hop) to kernel, while the BGP RIB shows different paths when same routes are received from two different peers in local-RIB <
xos0061505	After a topology change in the network, BGP routes requiring two levels of recursive lookup are programmed in hardware with incorrect next hops.
xos0062260	BGP process ends unexpectedly when local address or password is changed for BGP neighbor, and then you immediately execute a BGP show/configuration command.
<b>Chalet</b>	
xos0060354	ExtremeXOS Chalet using IPv6 does not work with HTTPS.
xos0062016	Command line process memory leak occurs when accessing switches with Chalet.
xos0063255	In Chalet, VLANs are sorted incorrectly.
<b>ClearFlow</b>	

**Table 6: Resolved Issues, Platform-Specific, and Feature Change Requests (CRs) (continued)**

CR Number	Description
xos0062629	Clearflow rule does not work properly if there is dot(.) in the ACL counter.
<b>EAPS</b>	
xos0061038	Loops occur in EAPS-protected VLANs, after peer reboot, if a VLAN's port is also protected by ELSM.
xos0061385	EAPS process ends unexpectedly after deleting EAPS shared-port configuration.
<b>ELRP</b>	
xos0062460	The <code>show configuration</code> command output shows incorrect ELRP configuration.
xos0062618	ELRP forgets the disabled port information if the port is deleted from another VLAN that also has ELRP enabled. As a result, the disabled port stays disabled unless manually enabled.
<b>ESRP</b>	
xos0061965	Configuring ESRP member VLANs (VRRP-enabled) produces errors.
<b>IGMP</b>	
xos0062914	The process mcmgr ends unexpectedly after receiving corrupted IGMPv3 join packets on MLAG ports.
<b>LAG</b>	
xos0062428	Member ports with a modified speed configuration that is different than the master port should not be allowed in LAG.
xos0063365	Frequent MLAG bulk syncs observed due to checksum mismatch between MLAG peers when ISC port was added as an untagged port to a tagged VLAN and VRRP was running between the peers.
<b>MPLS</b>	
xos0059596	Can add more than one LSP a pseudo-wire when it is associated with a VPWS.
xos0061092	Traffic forwarding on VPLS-serviced VMAN stops after link flap.
xos0061943	MPLS process ends unexpectedly when get-next is done with incomplete OID for mplsXCIndex.
xos0062045	LLDP packets are tunnelled over L2VPn.
xos0062300	CEP CVID Ranges, other than first VLAN, fail when access port is a trunk.
xos0062301	Packet drops occurs between customer edge switches when VMAN and CVID tag are the same.
xos0062380	Switch rejects incorrect LSP configurations as expected, but this operation still uses LSP indexes in hardware.
xos0062754	VPLS traffic egresses out with dot1q tag when secondary EtherType is configured.
xos0063271	Layer 3 packets in non-default virtual routers are slow-path forwarded after disabling MPLS in the peer switch.

**Table 6: Resolved Issues, Platform-Specific, and Feature Change Requests (CRs) (continued)**

CR Number	Description
xos0063478	Traffic drop occurs while adding new member port to the existing LAG group and PSTAG is configured on the port.
<b>OpenFlow</b>	
xos0060531	Deleting VMAN deletes the VLAN configuration, but not associated OpenFlow logical ports.
<b>Optics</b>	
xos0059007	QSFP+ to SFP+ adapter support is added to work with all optical SFP+ transceivers with the exception of LRM and passive copper direct attach cables.
xos0060018	With a 0.5M, 40G QSFP MOLEX passive copper cable inserted, disabling the port where the optic is inserted, rebooting, and then enabling the port, the port stays in the ready state and doesn't come up as enabled.
xos0060264	The output of the <code>show port transceiver info</code> command for optics inserted in 40G/100G ports might be abnormally lengthy if the same command is executed from two different CLI sessions simultaneously.
xos0062719	Allow use of 3rd-party optics without any additional license.
xos0063120	Error message "CFP2 modules >= 18 W unsupported" incorrectly appears for Finisar Corp CFP2 LR4 optics.
<b>OPSFV2</b>	
xos0061855	Configured OSPF neighbor is not retained after rebooting.
xos0063380	Error message appears after rebooting switch with OSPF configuration: "Error while loading "ospfInterface": ERROR: 0.0.0.0 is not a valid configured neighbor for interface".
<b>Power</b>	
xos0062113	The <code>show power</code> command output does not display power usage for PSUs with part numbers starting with "800515".
<b>QoS</b>	
xos0061027	For SummitStacks, creating or deleting non-default QoS profiles may cause some ports to flap.
xos0062050	QoS committed rate configurations for port groups are not loaded properly after a save and reboot.
<b>Security</b>	
xos0057679	Account user name and password are not encrypted in logs when cli-config-logging is enabled.
xos0058808	Rarely, MAC addresses of authenticated clients learned on NetLogin-enabled ports are not programmed in hardware.
xos0060909	In UPM profiles the variable EVENT.TIME incorrectly has the current time rather than the time when the event was queued/triggered.
xos0061433	extremeNetloginUserLogoutTrap is received with errors.

**Table 6: Resolved Issues, Platform-Specific, and Feature Change Requests (CRs) (continued)**

CR Number	Description
xos0061597	After authenticating a NetLogin client, executing the command <code>clear netlogin state port</code> , and then checking that ID-mgmt has deleted the clients, log displays UnDscvrld EMS message, which does not indicate the identity user.
xos0061652	Netlogin Dot1x: Authenticated value should be "Yes, Local" for clients with invalid password authenticated on auth failure VLAN.
xos0061781	Identity manager entries become stale when clients are moved from one port to another in sub-VLANs.
xos0061797	Dot1x client moves to authentication failure VLAN if authentication failed due to incorrect supplicant password or framework failure, such as error in VLAN movement, etc.; even if web-based NetLogin is enabled.
xos0061820	Dot1x clients move to authentication failure VLAN when web-based NetLogin is enabled globally.
xos0061868	With protocol order as MAC dot1x, web-based UPM profile is not executed for the client, which is authenticated as MAC.
xos0062366	After rebooting, DHCP binding entries are not restored using vr-default.
xos0062674	UPM profile fails to set the variables received from the RADIUS server using VSA 212.
xos0062965	Policy process ends unexpectedly with signal 6 when master node goes down.
xos0063090	Netlogin client does not move into authfail VLAN when user is absent from local database.
xos0063248	NTP MD5 authentication with NTP server is failing.
xos0063445	NetLogin: FDB is not in synch when changing VLAN VSA's dynamically.
xos0063506	Traceroute MAC address in CFM domain does not return information about destination switch.
<b>SNMP</b>	
xos0059964	SNMP poll for MIB dot3StatsDuplexStatus always returns unknown(1) when ports are configured with auto-negotiation on.
xos0060792	SNMP authentication failure log message and trap is inappropriately generated when switch detects "Not In Time Windows" error.
xos0061379	Switch temperature value retrieved using SNMP get operation is incorrect.
xos0061886	SNMP master process ends unexpectedly with signal 6 with certain sequence of <code>snmpbulkget</code> and <code>snmpget</code> .
xos0061945	<code>SnmpSubagent</code> crash occurs when <code>snmpset</code> executed on the last row in <code>EAPSMbrVlanEntry</code> .
xos0063349	Switch stops responding to SNMP requests if SNMP get for multiple OIDs is continuously initiated.
<b>STP</b>	
xos0062701	HAL timeout occurs while rebooting a stack with STP configuration.

**Table 6: Resolved Issues, Platform-Specific, and Feature Change Requests (CRs)  
(continued)**

CR Number	Description
TWAMP	
xos0062217	In SummitStacks with eight nodes and sFlow configuration, "Hardware L3 Table full" error messages appear when the stacks have a large number of Layer 3 entries.
VLANs	
xos0054039	IP multicast traffic is not forwarded on PSTAG VLANs when it shares ports with other IGMP snooping-enabled VLANs or other L3 VLANs.
xos0060184	After configuring MVRP registration forbidden, the command is accepted and registration is forbidden. However, the <code>show configuration mrvp</code> command does not display this configuration and this configuration is not saved after a reboot.
xos0062255	CEP CVID configurations is missing after adding/deleting the port from sharing.
xos0063207	Error occurs while adding LAG ports as tagged in one VMAN and untagged in another VMAN, even though the VMAN EtherType is primary.
xos0063257	Saving configuration fails/times-out when VLANs added to a mirror filters are renamed.
xos0063274	VLAN packets are egressing with VMAN ethertype when an egress port is deleted from a VMAN that is also part of a VLAN.