

FortiSwitch - Managed by FortiOS 6.2

Version 6.2.3

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FortiSwitch 6.2.3 Managed by FortiOS 6.2

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Change log

Date	Change Description
January 15, 2020	Initial document release for FortiOS 6.2.3
January 16, 2020	Updated the “Three-tier FortiLink MCLAG configuration” section.
February 3, 2020	Updated the “Sharing FortiSwitch ports between VDOMs” and “What’s new in FortiOS 6.2.3” sections.
February 20, 2020	Added a note to the beginning of the “Connecting FortiLink ports” chapter.
July 7, 2020	Updated the “Configuring dynamic ARP inspection (DAI)” section.
September 17, 2020	Updated the “Configuring FortiSwitch split ports (phy-mode) in FortiLink mode” and “FortiLink mode over a layer-3 network” sections.
October 14, 2020	Updated the following sections: <ul style="list-style-type: none">• “Support of FortiLink features”• “Network topologies”• “MCLAG configuration for access ports”
October 15, 2020	Updated the “HA-mode FortiGate units managing a stack of several FortiSwitch units” section.
November 20, 2020	Updated the “Replacing a managed FortiSwitch unit” section.
February 8, 2021	Updated the table in the beginning of the “Introduction” section.

What's new in FortiOS 6.2.3

The following list contains new managed FortiSwitch features added in FortiOS 6.2.3. Click on a link to navigate to that section for further information.

- A three-tier FortiLink MCLAG topology is now supported. See [Three-tier FortiLink MCLAG configuration on page 54](#).
- Under Administrative Access, CAPWAP and FortiTelemetry have been combined into one option labeled Fabric Connection. If either CAPWAP or FortiTelemetry was enabled on a particular interface, the new fabric option will be enabled after upgrading.

What's new in FortiOS 6.2.2

NOTE: Some new features in FortiOS 6.2.2 depend on FortiSwitch 6.2.2; these features will not work until FortiSwitch 6.2.2 is released.

The following list contains new managed FortiSwitch features added in FortiOS 6.2.2. Click on a link to navigate to that section for further information.

- FortiSwitch redundancy is now available for FortiGate models that do not support the FortiLink aggregate interface. See [HA-mode FortiGate units using hardware-switch interfaces and STP on page 57](#).
- You can now configure IGMP flood reports and traffic on automatically configured interfaces. See [Using automatic network detection and configuration on page 68](#).
- Power over Ethernet (PoE) type-length-value structures (TLVs) are now available for FortiSwitch LLDP profiles. See [Configure LLDP-MED on page 80](#).
- A new CLI command allows you to change which VLANs the `set allowed-vlans-all` command affects. See [Changing the VLAN configuration mode on page 79](#).
- Remote SPAN (RSPAN) is now supported. See [Configuring FortiSwitch port mirroring on page 113](#).
- You can now enable FortiLink VLAN optimization on FortiGate units. See [Enabling FortiLink VLAN optimization on page 79](#).
- You can now create a FortiLink aggregate interface without adding physical member ports. See [Configure FortiLink on a logical interface on page 29](#).
- You can now reset and restore port statistics counters on a managed FortiSwitch unit. See [Displaying, resetting, and restoring port statistics on page 136](#).
- FortiLink custom TLVs in the LLDP profile are now disabled with the `set auto-isl disable` command.
- When a device using DHCP is quarantined, you can now automatically toggle (bounce) the link of the switch port where the quarantined device was last seen. See [Using quarantine with DHCP on page 89](#).
- You can now use the aggregate interface as the FortiLink interface on all platforms: FGR-30D, FGR-35D, FGT-30E, FGT-30E-MI, FGT-30E-MN, FGT-50E, FGT-51E, FGT-52E, FGT-60E, FGT-60E-POE, FGT-61E, FGT-80D, FGT-80E, FGT-80E-POE, FGT-81E, FGT-81E-POE, FGT-90E, FGT-91E, FGT-92D, FWF-30E, FWF-30E-MI, FWF-30E-MN, FWF-50E, FWF-50E-2R, FWF-51E, FWF-60E, and FWF-61E.

What's new in FortiOS 6.2.1

The following list contains new managed FortiSwitch features added in FortiOS 6.2.1. Click on a link to navigate to that section for further information.

- Instead of exporting FortiSwitch logs to a FortiGate unit, you can send FortiSwitch logs to one or two remote Syslog servers. See [Sending logs to a remote Syslog server on page 134](#).
- You can now configure SNMP on FortiSwitch units. See [Configuring SNMP on page 71](#).
- You can now use quarantines with 802.1x MAC-based authentication. See [Using quarantine with 802.1x MAC-based authentication on page 90](#).
- You can now control when inactive MAC addresses are removed from the FortiSwitch hardware even when the mac-aging-interval is disabled. See [Controlling how long learned MAC addresses are saved on page 102](#).
- You can create Syslog entries when MAC addresses are learned, aged out, or removed. See [Logging changes to MAC addresses on page 104](#).

What's new in FortiOS 6.2.0

The following list contains new managed FortiSwitch features added in FortiOS 6.2.0. Click on a link to navigate to that section for further information.

- You can now have FortiGate units in HA mode that are managing FortiSwitch units in an MCLAG with LACP. See [Transitioning from a FortiLink split interface to a FortiLink MCLAG on page 64](#).
- You can now make the following global system configuration changes in FortiLink mode (asterisks indicate the default values):

```
config system global
    set admin-concurrent {enable* | disable}
    set admin-https-pki-required {enable | disable*}
    set admin-sport <443*>
    set admin-https-ssl-versions {tlsv1-0 | tlsv1-1* | tlsv1-2*}
end
```

WARNING: Before changing these settings, ensure that the configuration is valid for your system for proper operation.

- There are new commands that let you use automatic network detection and configuration. See [Using automatic network detection and configuration on page 68](#).
- FortiSwitch units in FortiLink mode now support dynamic VLAN assignment by group name.
- FortiLink interfaces are now configured on the new *WiFi & Switch Controller > FortiLink Interface* page. See [Configure the FortiLink interface on page 21](#).
- You can now combine the configuration of multiple standalone FortiSwitch units into a single FortiGate-compatible configuration. See [Migrating the configuration of standalone FortiSwitch units on page 67](#).
- You can make dynamically learned MAC addresses persistent (sticky) when the status of a managed FortiSwitch port changes (goes down or up). See [Persistent \(sticky\) MAC addresses on page 103](#).
- You can sample IP packets on managed FortiSwitch units and then export the data in NetFlow format or Internet Protocol Flow Information Export (IPFIX) format. You can choose to sample on a single ingress or egress port, on all FortiSwitch units, or on all FortiSwitch ingress ports. See [Configure flow tracking and export on page 85](#).
- FortiSwitch split ports are now supported. See [Configuring FortiSwitch split ports \(phy-mode\) in FortiLink mode on page 115](#).
- You can now use encapsulated remote switched port analyzer (ERSPAN) for port mirroring. See [Configuring FortiSwitch port mirroring on page 113](#).
- You can now use a traffic policy to control quarantined devices. See [Quarantining MAC addresses on page 87](#).
- Multiple Spanning Tree Protocol (MSTP) is now supported. See [Configure STP settings on page 83](#).
- The following features are now supported on FortiSwitch ports shared between VDOMs:
 - POE pre-standard detection (on a per-port basis if the FortiSwitch model supports this feature)
 - Learning limit for dynamic MAC addresses on ports, trunks, and VLANs (if the FortiSwitch unit supports this feature)
 - QoS egress CoS queue policy (if the FortiSwitch unit supports this feature)
 - Port security policy
- You can now use the GUI to configure a MCLAG. See [MCLAG configuration for access ports on page 35](#).
- The number of FortiSwitch units supported by certain FortiGate models has been increased. See [Introduction on page 13](#).

- You can change the ping setting to use the FortiSwitch serial number instead of the FortiSwitch IP address when checking that the FortiSwitch unit is accessible from the FortiGate unit. See [Using the FortiSwitch serial number for automatic name resolution on page 69](#).
- You can configure different access to the FortiSwitch management interface and the FortiSwitch internal interface. See [Configuring access to management and internal interfaces on page 70](#).
NOTE: After you upgrade to FortiOS 6.2, the allowaccess settings for the FortiSwitch mgmt and internal interfaces are overridden by the default local-access security policy.
- By default, two trunks are created in HA mode when there are managed FortiSwitch units. One trunk is created between the active FortiGate unit and FortiSwitch unit; another trunk is created between the backup FortiGate unit and FortiSwitch unit.
- You can use the `diagnose switch-controller switch-info qos-stats <FortiSwitch_serial_number> <port_name>` command to get QoS statistics on the specified port of a managed FortiSwitch unit.

Introduction

This section provides information about how to set up and configure managed FortiSwitch units using the FortiGate unit (termed “using FortiSwitch in FortiLink mode”).

NOTE: FortiLink is not supported in transparent mode.

The maximum number of supported FortiSwitch units depends on the FortiGate model:

FortiGate Model Range	Number of FortiSwitch Units Supported
FortiGate 30E, 40F, 50E, 80D, 91E, 92D, FortiGate-VM01	8
FortiGate 60E, 60E-POE, 60F, 61E, 80E, 80E-POE, 80F, 81E, 81E-POE, 90E	16
FortiGate-100D, 140D, 140D-POE, FortiGate-VM02	24
FortiGate 100E, 100EF, 100F, 101E, 140E, 140EP, 200E, 201E	32
FortiGate-300 to 5xx	48
FortiGate-600 to 900 and FortiGate-VM04	64
FortiGate-1000 and up	128
FortiGate-3xxx and up and FortiGate-VM08 and up	300

Supported models

Refer to the [FortiLink Compatibility table](#) to find which FortiSwitchOS versions support which FortiOS versions.



New models (NPI releases) might not support FortiLink. Contact [Customer Service & Support](#) to check support for FortiLink.

Support of FortiLink features

The following table lists the FortiSwitch models supported by FortiLink features.

FortiLink Features	FortiSwitch Models
Centralized VLAN Configuration	D-series, E-series
Switch POE Control	D-series, E-series
Link Aggregation Configuration	D-series, E-series
Spanning Tree Protocol (STP)	D-series, E-series
LLDP/MED	D-series, E-series
IGMP Snooping	D-series, E-series
802.1x Authentication (Port-based, MAC-based, MAB)	D-series, E-series
Syslog Collection	D-series, E-series
DHCP Snooping	Not supported on FS-1xxE-Series
Device Detection	D-series, E-series
Support FortiLink FortiGate in HA Cluster	D-series, E-series
LAG support for FortiLink Connection	D-series, E-series
Active-Active MCLAG from FortiGate to FortiSwitch units for Advanced Redundancy	Not supported on FS-1xx Series
sFlow	Not supported on FS-1xxE-Series
Dynamic ARP Inspection (DAI)	D-series, E-series
Port Mirroring	D-series, E-series
RADIUS Accounting	D-series, E-series
Centralized Configuration	D-series, E-series
Access VLAN	D-series, E-series
STP BPDU Guard, Root Guard, Edge Port	D-series, E-series
Loop Guard	D-series, E-series
Switch admin Password	D-series, E-series
Storm Control	D-series, E-series
802.1x-Authenticated Dynamic VLAN Assignment	D-series, E-series
Host Quarantine on Switch Port	D-series, E-series
QoS	Not supported on FS-1xxE Series and FSR-112D-POE
Centralized Firmware Management	D-series, E-series
Automatic network detection and configuration	D-series, E-series
Dynamic VLAN assignment by group name	D-series, E-series

FortiLink Features	FortiSwitch Models
Sticky MAC addresses	D-series, E-series
NetFlow and IPFIX flow tracking and export	D-series, E-series
FortiSwitch split ports	FS-524D, FS-524D-FPOE, FS-548D, FS-548D-FPOE, FS-1048E, FS-3032D, and FS-3032E
Encapsulated remote switched port analyzer (ERSPAN)	2xx and higher
MSTP instances NOTE: In FortiLink mode, the FortiGate unit supports 1-14 instances for all platforms.	D-series, E-series
QoS statistics	D-series, E-series
Configuring SNMP through FortiLink	D-series, E-series
IPv4 source guard	FSR-124D, FS-224D-FPOE, FS-248D, FS-424D-POE, FS-424D-FPOE, FS-448D-POE, FS-448D-FPOE, FS-424D, FS-448D, FS-2xxE, and FS-4xxE

Before you begin

Before you configure the managed FortiSwitch unit, the following assumptions have been made in the writing of this manual:

- You have completed the initial configuration of the FortiSwitch unit, as outlined in the QuickStart Guide for your FortiSwitch model, and you have administrative access to the FortiSwitch GUI and CLI.
- You have installed a FortiGate unit on your network and have administrative access to the FortiGate GUI and CLI.

How this guide is organized

This guide contains the following sections:

- [What's new in FortiOS 6.2.2](#) describes the new features for this release.
- [Introduction](#) lists supported FortiSwitch models, number of FortiSwitch units supported, and supported FortiLink features.
- [Connecting FortiLink ports](#) describes how to connect FortiSwitch ports to FortiGate ports.
- [Using the FortiGate GUI](#) describes how to use the FortiGate GUI for FortiLink configuration.
- [Using the FortiGate CLI](#) describes how to use the FortiGate CLI for FortiLink configuration.
- [Network topologies](#) describes the configuration for various network topologies.
- [MCLAG configuration for access ports](#) describes how to set up a multichassis LAG (MCLAG).
- [Optional setup tasks](#) describes other setup tasks that are optional.
- [FortiSwitch features configuration](#) describes how to configure managed FortiSwitch features, including VLANs.

- [FortiSwitch port features](#) describe how to configure ports and PoE from the FortiGate unit.
- [FortiSwitch port security policy](#) describes how to set up FortiSwitch security policies.
- [Additional capabilities](#) describes more FortiSwitch features.
- [Troubleshooting](#) describes techniques for troubleshooting common problems.

Special notices

There is an additional command available only on the FG-92D model:

```
config system global
    set hw-switch-ether-filter {enable | disable}
end
```

By default, the `hw-switch-ether-filter` command is enabled. When the command is enabled:

- ARP (0x0806), IPv4 (0x0800), and VLAN (0x8100) packets are allowed.
- BPDUs are dropped, and no STP loop results.
- PPPoE packets are dropped.
- IPv6 packets are dropped.
- FortiSwitch devices are not discovered.
- HA might fail to form depending on the network topology.

When the `hw-switch-ether-filter` command is disabled, all packet types are allowed, but, depending on the network topology, an STP loop might result.

To work around this issue:

1. Use either WAN1 or WAN2 as the HA heartbeat device.
2. Disable the `hw-switch-ether-filter` option.

Connecting FortiLink ports

This section contains information about the FortiSwitch and FortiGate ports that you connect to establish a FortiLink connection.

In FortiSwitchOS 3.3.0 and later releases, you can use any of the switch ports for FortiLink. Some or all of the switch ports (depending on the model) support auto-discovery of the FortiLink ports.

You can choose to connect a single FortiLink port or multiple FortiLink ports as a logical interface (link-aggregation group, hardware switch, or software switch).

NOTE: FortiSwitch units, when used in FortiLink mode, support only the default administrative access HTTPS port (443).

1. Enable the switch controller on the FortiGate unit

Before connecting the FortiSwitch and FortiGate units, ensure that the switch controller feature is enabled on the FortiGate unit with the FortiGate GUI or CLI to enable the switch controller. Depending on the FortiGate model and software release, this feature might be enabled by default.

Using the FortiGate GUI

1. Go to *System > Feature Visibility*.
2. Turn on the *Switch Controller* feature, which is in the *Basic Features* list.
3. Select *Apply*.

The menu option *WiFi & Switch Controller* now appears.

Using the FortiGate CLI

Use the following commands to enable the switch controller:

```
config system global
  set switch-controller enable
end
```

2. Connect the FortiSwitch unit and FortiGate unit

FortiSwitchOS 3.3.0 and later provides flexibility for FortiLink:

- Use any switch port for FortiLink
- Provides auto-discovery of the FortiLink ports on the FortiSwitch
- Choice of a single FortiLink port or multiple FortiLink ports in a link-aggregation group (LAG)

Auto-discovery of the FortiSwitch ports

In FortiSwitchOS 3.3.0 and later releases, D-series FortiSwitch models support FortiLink auto-discovery, on automatic detection of the port connected to the FortiGate unit.

You can use any of the switch ports for FortiLink. Before connecting the switch to the FortiGate unit, use the following FortiSwitch CLI commands to configure a port for FortiLink auto-discovery:

```
config switch interface
  edit <port>
    set auto-discovery-fortilink enable
end
```

By default, each FortiSwitch model provides a set of ports that are enabled for FortiLink auto-discovery. If you connect the FortiLink using one of these ports, no switch configuration is required.

In FortiSwitchOS 3.4.0 and later releases, the last four ports are the default auto-discovery FortiLink ports. You can also run the `show switch interface` command on the FortiSwitch unit to see the ports that have auto-discovery enabled.

The following table lists the default auto-discovery ports for each switch model.

NOTE: Any port can be used for FortiLink if it is manually configured.

FortiSwitch Model	Default Auto-FortiLink ports
FS-108D-POE	port9–port10
FS-108E, FS-108E-POE, FS-108E-FPOE	port7–port10
FSR-112D-POE	port5–port12
FS-124D, FS-124D-POE	port23–port26
FSR-124D	port1–port4, port21–port28
FS-124E, FS-124E-POE, FS-124E-FPOE	port21–port28
FS-148E, FS-148E-POE	port21–port52
FS-224D-POE	port21–port24
FS-224D-FPOE	port21–port28
FS-224E, FS-224E-POE	port21–port28
FS-248D, FS-248D-FPOE	port45–port52
FS-248D-POE	port47–port50
FS-248E-POE, FS-248E-FPOE	port45–port52
FS-424D, FS-424D-POE, FS-424D-FPOE	port23–port26
FS-424E-Fiber	port1–port30
FS-426E-FPOE-MG	port23–port30
FS-448D, FS-448D-POE, FS-448D-FPOE	port45–port52
FS-524D, FS-524D-FPOE	port21–port30

FortiSwitch Model	Default Auto-FortiLink ports
FS-548D	port39–port54
FS-548D-FPOE, FS-548DN	port45–port54
FS-1024D	port1–port24
FS-1048D, FS-1048E	port1–port52
FS-3032D, FS-3032E	port1–port32

Choosing the FortiGate ports

The FortiGate unit manages all of the switches through one active FortiLink. The FortiLink can consist of one port or multiple ports (for a LAG).

As a general rule, FortiLink is supported on all ports that are not listed as HA ports.

Using the FortiGate GUI

This section describes how to configure a FortiLink between a FortiSwitch unit and a FortiGate unit.

You can configure FortiLink using the FortiGate GUI or CLI. Fortinet recommends using the GUI because the CLI procedures are more complex (and therefore more prone to error).

If you use one of the auto-discovery FortiSwitch ports, you can establish the FortiLink connection with no configuration steps on the FortiSwitch and with a few simple configuration steps on the FortiGate unit.

Summary of the procedure

1. On the FortiGate unit, configure the FortiLink interface.
2. Authorize the managed FortiSwitch unit manually if you did not select *Automatically authorize devices*.

Configure the FortiLink interface

To configure the FortiLink interface on the FortiGate unit:

1. Go to *WiFi & Switch Controller > FortiLink Interface*.
2. Enter a name for the interface (11 characters maximum).
3. Select + in the Interface members field and then select the ports to add to the FortiLink interface. You can create a LAG type or software/hardware switch type of FortiLink interface; these types are more scalable than a physical interface.
NOTE: If you do not see any ports listed in the Select Entries pane, go to *Network > Interfaces*, right-click the FortiLink physical port, select *Edit*, delete the port from the Interface Members field, and then select *OK*.
4. Configure the *IP/Network Mask* for your network.
5. Select *Automatically authorize devices*.
6. Select *Apply*.

FortiLink split interface

You can use the FortiLink split interface to connect the FortiLink aggregate interface from one FortiGate unit to two FortiSwitch units. When the FortiLink split interface is enabled, only one link remains active.

The aggregate interface for this configuration must contain exactly two physical ports (one for each FortiSwitch unit).

The FortiLink split interface is enabled by default. You can configure this feature with the FortiGate GUI and CLI.

Using the FortiGate GUI:

1. Go to *WiFi & Switch Controller > FortiLink Interface*.
2. Move the *FortiLink split interface* slider

Using the FortiGate CLI:

```
config system interface
  edit <name of the FortiLink interface>
    set fortilink-split-interface {enable | disable}
  end
```

Authorizing the FortiSwitch unit

If you configured the FortiLink interface to manually authorize the FortiSwitch unit as a managed switch, perform the following steps:

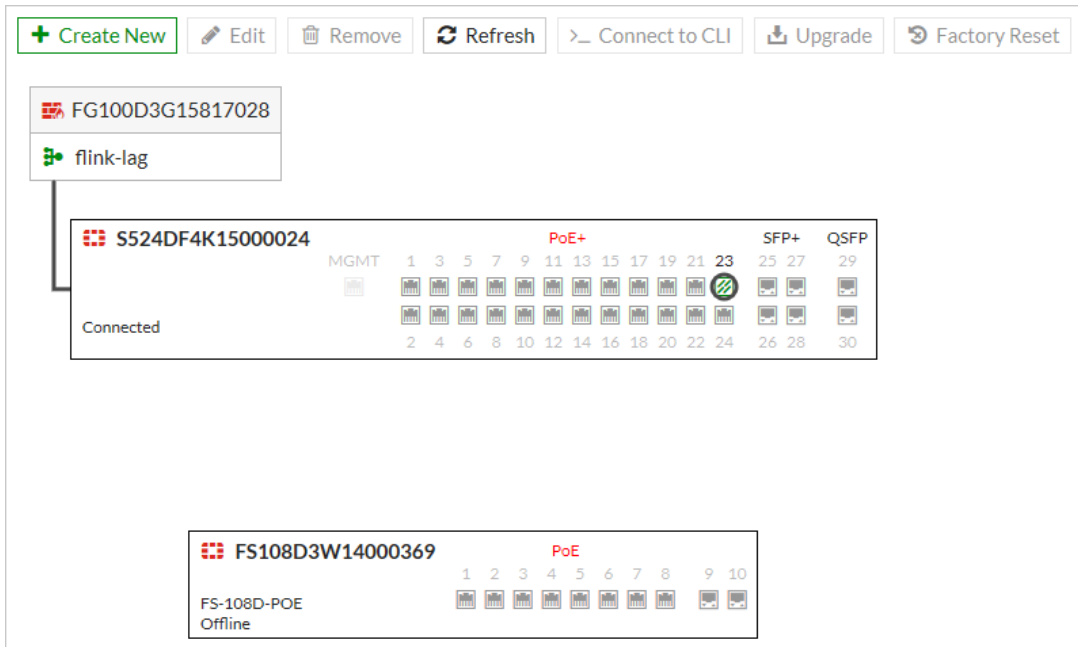
1. Go to *WiFi & Switch Controller > Managed FortiSwitch*.
2. Optionally, click on the FortiSwitch faceplate and click *Authorize*. This step is required only if you disabled the automatic authorization field of the interface.

Adding preauthorized FortiSwitch units

After you preauthorize a FortiSwitch unit, you can assign the FortiSwitch ports to a VLAN.

To preauthorize a FortiSwitch:

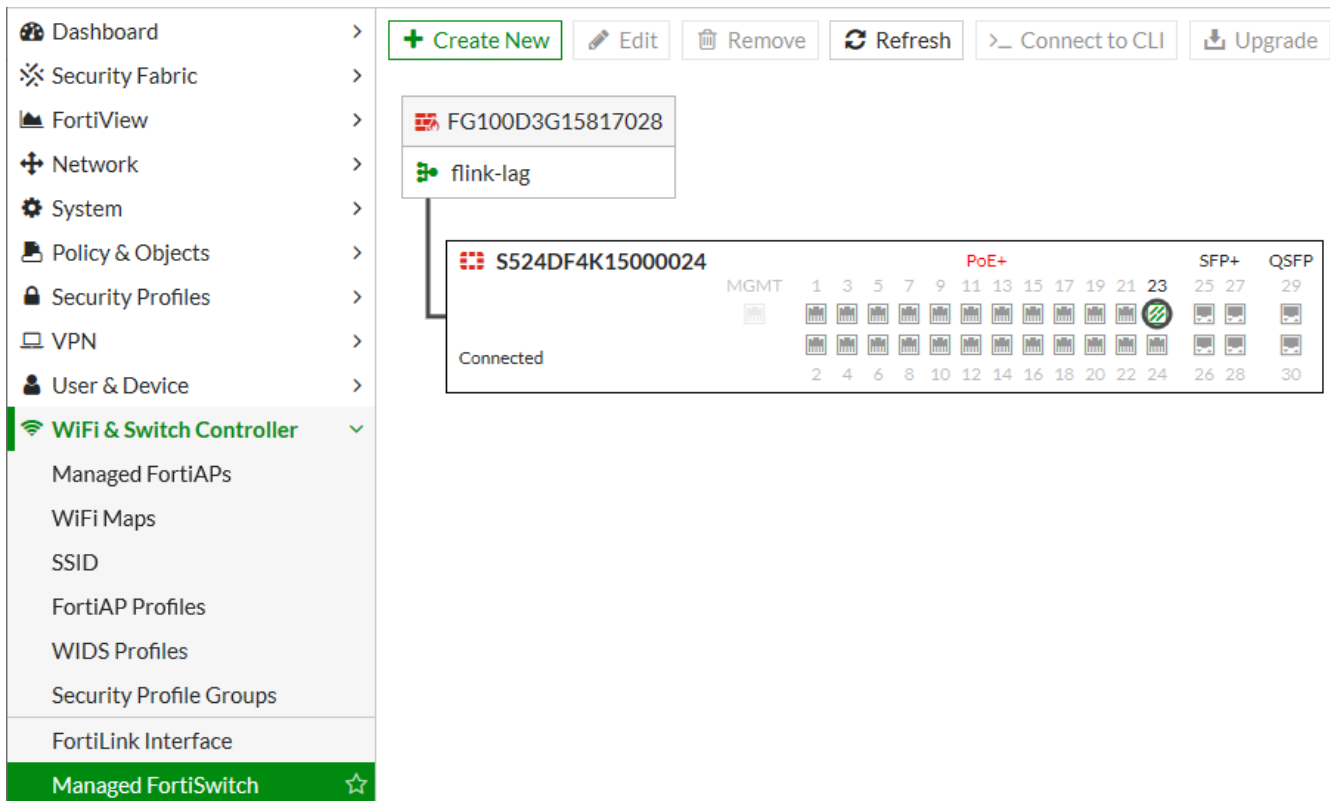
1. Go to *WiFi & Switch Controller > Managed FortiSwitch*.
2. Click *Create New*.
3. In the New Managed FortiSwitch page, enter the serial number, model name, and description of the FortiSwitch.
4. Move the *Authorized* slider to the right.
5. Select *OK*. The Managed FortiSwitch page shows a FortiSwitch faceplate for the preauthorized switch.



Managed FortiSwitch display

Go to *WiFi & Switch Controller > Managed FortiSwitch* to see all of the switches being managed by your FortiGate.

When the FortiLink is established successfully, the status is green (next to the FortiGate interface name and on the FortiSwitch faceplate), and the link between the ports is a solid line.



If the link has gone down for some reason, the line will be dashed, and a broken link icon will appear. You can still edit the FortiSwitch unit though and find more information about the status of the switch. The link to the FortiSwitch unit might be down for a number of reasons; for example, a problem with the cable linking the two devices, firmware versions being out of synch, and so on. You need to make sure the firmware running on the FortiSwitch unit is compatible with the firmware running on the FortiGate unit.

From the Managed FortiSwitch page, you can edit any of the managed FortiSwitch units, remove a FortiSwitch unit from the configuration, refresh the display, connect to the CLI of a FortiSwitch unit, or deauthorize a FortiSwitch unit.

Edit a managed FortiSwitch unit

To edit a managed FortiSwitch unit:

1. Go to *WiFi & Switch Controller > Managed FortiSwitch*.
2. Click on the FortiSwitch to and click *Edit*, right-click on a FortiSwitch unit and select *Edit*, or double-click on a FortiSwitch unit.

From the *Edit Managed FortiSwitch* form, you can:

- Change the *Name* and *Description* of the FortiSwitch unit.
- View the *Status* of the FortiSwitch unit.
- *Restart* the FortiSwitch.
- *Authorize* or deauthorize the FortiSwitch.
- *Update* the firmware running on the switch.

Network interface display

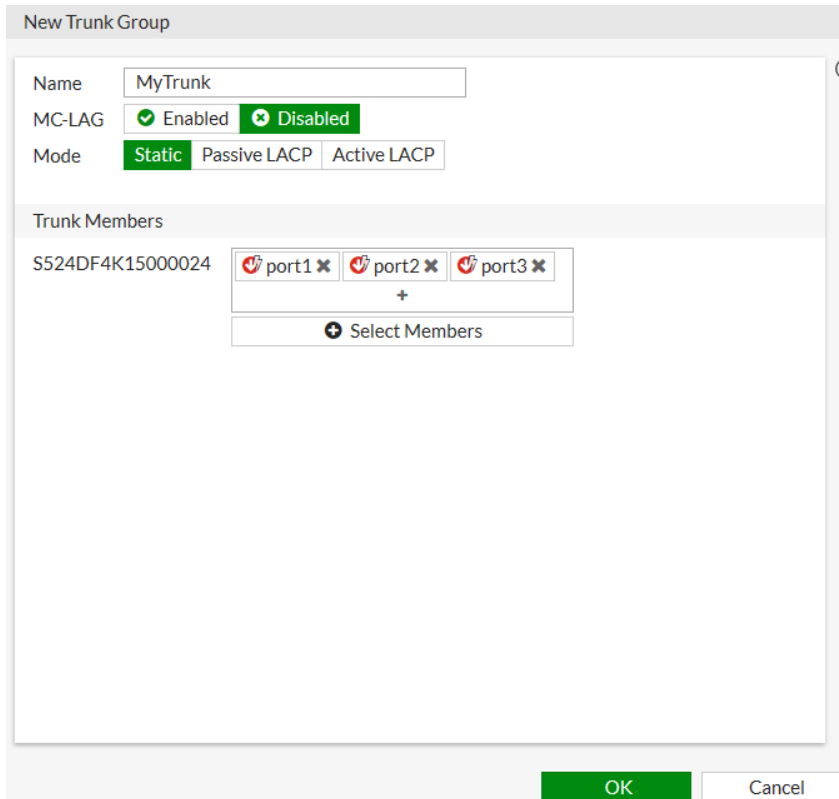
On the *Network > Interfaces* page, you can see the FortiGate interface connected to the FortiSwitch unit. The GUI indicates *Dedicated to FortiSwitch* in the IP/Netmask field.

Status	Name	Members	IP/Netmask	Type	Access	Transceiver	Ref.
Aggregate (6)							
🔄	flink-lag	port15, port16	Dedicated to FortiSwitch	802.3ad Aggregate (2)	PING CAPWAP		8
	cam.flink-lag		0.0.0.0/0.0.0.0	VLAN			0
	qtn.flink-lag		10.254.254.254/255.255.255.0	VLAN			81
	snf.flink-lag		10.254.253.254/255.255.254.0	VLAN	PING		1
	voi.flink-lag		0.0.0.0/0.0.0.0	VLAN			4
	vsw.flink-lag		0.0.0.0/0.0.0.0	VLAN			40

Add link aggregation groups (trunks)

To create a link aggregation group for FortiSwitch user ports:

1. Go to *WiFi & Switch Controller > FortiSwitch Ports*.
2. Click *Create New > Trunk*.
3. In the New Trunk Group page, enter a *Name* for the trunk group.
4. Select two or more physical ports to add to the trunk group and then select *Apply*.
5. Select the *Mode*: Static, Passive LACP, or Active LACP.
6. Select *Enabled* or *Disabled* for the MC-LAG.
7. Select *OK*.



Configure DHCP blocking, IGMP snooping, STP, and loop guard on managed FortiSwitch ports


Go to *WiFi & Switch Controller > FortiSwitch Ports*. Right-click any port and then enable or disable the following features:

- *DHCP blocking*—The DHCP blocking feature monitors the DHCP traffic from untrusted sources (for example, typically host ports and unknown DHCP servers) that might initiate traffic attacks or other hostile actions. To prevent this, DHCP blocking filters messages on untrusted ports.
- *IGMP snooping*—IGMP snooping allows the FortiSwitch to passively listen to the Internet Group Management Protocol (IGMP) network traffic between hosts and routers. The switch uses this information to determine which ports are interested in receiving each multicast feed. FortiSwitch can reduce unnecessary multicast traffic on the LAN by pruning multicast traffic from links that do not contain a multicast listener.
- *Spanning Tree Protocol (STP)*—STP is a link-management protocol that ensures a loop-free layer-2 network topology.
- *Loop guard*—A loop in a layer-2 network results in broadcast storms that have far-reaching and unwanted effects. Fortinet loop guard helps to prevent loops. When loop guard is enabled on a switch port, the port monitors its subtending network for any downstream loops. The loop guard feature is designed to work in concert with STP rather than as a replacement for STP.
- *STP root guard*—Root guard protects the interface on which it is enabled from becoming the path to root. When enabled on an interface, superior BPDUs received on that interface are ignored or dropped. Without using root guard, any switch that participates in STP maintains the ability to reroute the path to root. Rerouting might cause your network to transmit large amounts of traffic across suboptimal links or allow a malicious or misconfigured

device to pose a security risk by passing core traffic through an insecure device for packet capture or inspection. By enabling root guard on multiple interfaces, you can create a perimeter around your existing paths to root to enforce the specified network topology.

- **STP BPDU guard**—Similar to root guard, BPDU guard protects the designed network topology. When BPDU guard is enabled on STP edge ports, any BPDUs received cause the ports to go down for a specified number of minutes. The BPDUs are not forwarded, and the network edge is enforced.

STP is enabled on all ports by default. Loop guard is disabled by default on all ports.

 port	<ul style="list-style-type: none"> Edit Delete A Edit Description C Reset PoE Status PoE DHCP Snooping IGMP Snooping STP Loop Guard Edge Port STP BPDU Guard STP Root Guard 	<ul style="list-style-type: none"> Edge Port IGMP Snooping Spanning Tree Protocol Edge Port IGMP Snooping Spanning Tree Protocol Edge Port IGMP Snooping Spanning Tree Protocol Edge Port IGMP Snooping Spanning Tree Protocol Edge Port IGMP Snooping Spanning Tree Protocol 	<ul style="list-style-type: none"> vsw.flink-lag vsw.flink-lag vsw.flink-lag vsw.flink-lag vsw.flink-lag 	<ul style="list-style-type: none"> qtn.flink-lag qtn.flink-lag qtn.flink-lag qtn.flink-lag qtn.flink-lag 	<ul style="list-style-type: none"> Powered Powered Powered Powered Powered
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Using the FortiGate CLI

This section describes how to configure FortiLink using the FortiGate CLI. Fortinet recommends using the FortiGate GUI because the CLI procedures are more complex (and therefore more prone to error).

If you use one of the auto-discovery FortiSwitch ports, you can establish the FortiLink connection (single port or LAG) with no configuration steps on the FortiSwitch and with a few simple configuration steps on the FortiGate unit.

You can also configure FortiLink mode over a layer-3 network.

Summary of the procedure

1. Configure FortiLink on a physical port or configure FortiLink on a logical interface.
2. Configure NTP.
3. Authorize the managed FortiSwitch unit.
4. Configure DHCP.

Configure FortiLink on a physical port

Configure FortiLink on any physical port on the FortiGate unit and authorize the FortiSwitch unit as a managed switch.

In the following steps, port 1 is configured as the FortiLink port.

1. If required, remove port 1 from the `lan` interface:

```
config system virtual-switch
  edit lan
    config port
      delete port1
    end
  end
end
```

2. Configure port 1 as the FortiLink interface:

```
config system interface
  edit port1
    set auto-auth-extension-device enable
    set fortilink enable
  end
end
```

3. Configure an NTP server on port 1:

```
config system ntp
  set server-mode enable
  set interface port1
end
```

4. Authorize the FortiSwitch unit as a managed switch:

```
config switch-controller managed-switch
  edit FS224D3W14000370
    set fsw-wan1-admin enable
  end
end
```

5. The FortiSwitch unit will reboot when you issue the `set fsw-wan1-admin enable` command.

Configure FortiLink on a logical interface

You can configure FortiLink on a logical interface: link-aggregation group (LAG), hardware switch, or software switch.

LAG is supported on all FortiSwitch models and on FortiGate models FGT-100D and above. Hardware switch is supported on some FortiGate models.

Connect any of the FortiLink-capable ports on the FortiGate to the FortiSwitch unit. Ensure that you configure auto-discovery on the FortiSwitch ports (unless it is auto-discovery by default).

NOTE: Starting with FortiOS 6.2.2, you can use the default `fortilink` aggregate interface and then add ports. This configuration is available for all FortiGate E series models, 100 and higher. For FortiGate models lower than 100, you can use the default `fortilink` hardware switch or software switch interface and then add ports.

In the following procedure, port 4 and port 5 are configured as a FortiLink LAG.

1. If required, remove the FortiLink ports from the `lan` interface:

```
config system virtual-switch
  edit lan
    config port
      delete port4
      delete port5
    end
  end
end
```

2. Create a trunk with the two ports that you connected to the switch:

```
config system interface
  edit flink1 (enter a name, 11 characters maximum)
    set ip 169.254.3.1 255.255.255.0
    set allowaccess ping capwap https
    set vlanforward enable
    set type aggregate
    set member port4 port5
    set lacp-mode static
    set fortilink enable
    (optional) set fortilink-split-interface enable
  next
end
```

NOTE: If the members of the aggregate interface connect to more than one FortiSwitch, you must enable `fortilink-split-interface`.

3. Authorize the FortiSwitch unit as a managed switch:

```
config switch-controller managed-switch
  edit FS224D3W14000370
    set fsw-wan1-admin enable
  end
end
```

NOTE: FortiSwitch will reboot when you issue the `set fsw-wan1-admin enable` command.

Enable multiple FortiLink interfaces

NOTE: Only the first FortiLink interface has GUI support.

Use the following command to enable or disable multiple FortiLink interfaces.

```
config switch-controller global
  set allow-multiple-interfaces {enable | disable}
end
```

FortiLink mode over a layer-3 network

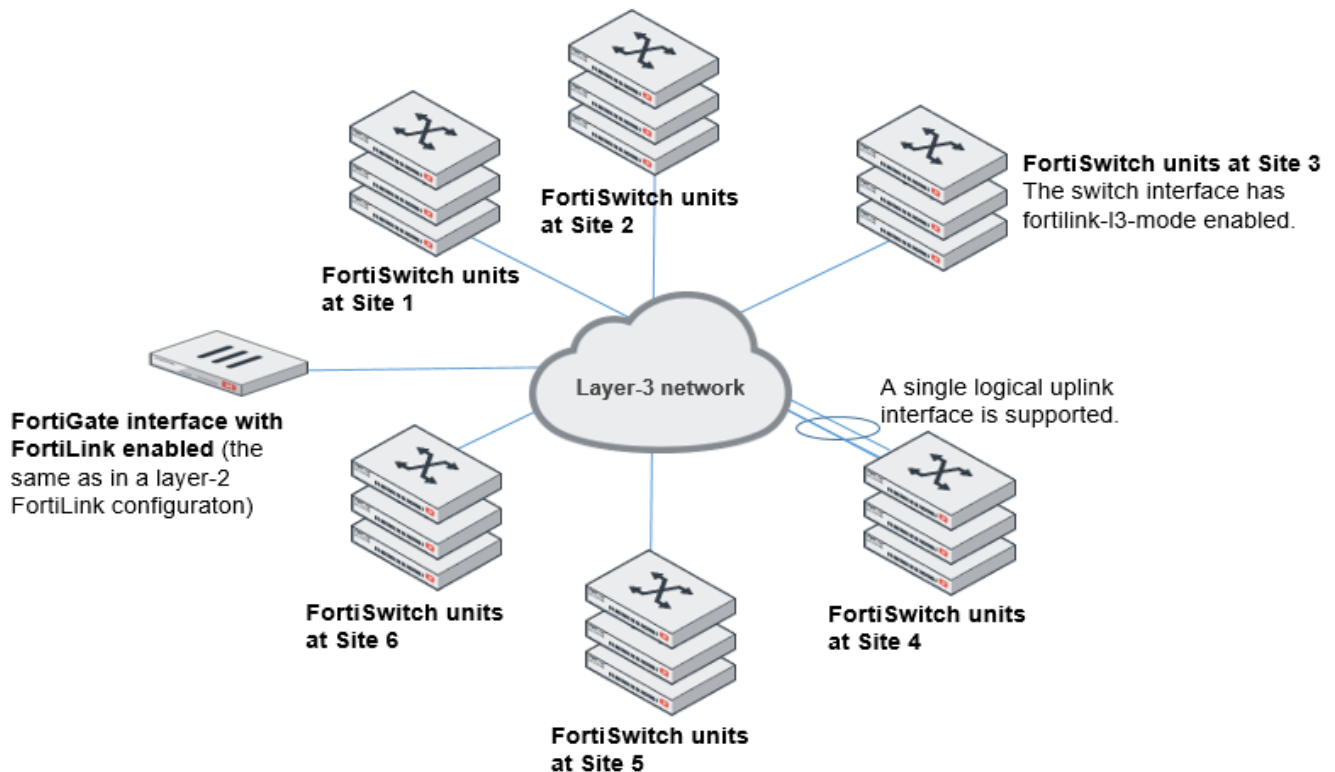
NOTE: Splitting ports is not supported when a FortiSwitch unit is managed through layer 3.

This feature allows FortiSwitch islands to operate in FortiLink mode over a layer-3 network, even though they are not directly connected to the switch-controller FortiGate unit. FortiSwitch islands contain one or more FortiSwitch units.

There are two main deployment scenarios for using FortiLink mode over a layer-3 network:

- In-band management, which uses the FortiSwitch unit's internal interface to connect to the layer-3 network
- Out-of-band management, which uses the FortiSwitch unit's mgmt interface to connect to the layer-3 network

In-band management



To configure a FortiSwitch unit to operate in a layer-3 network:

NOTE: You must enter these commands in the indicated order for this feature to work.

1. Reset the FortiSwitch to factory default settings with the `execute factoryreset` command.
2. Manually set the FortiSwitch unit to FortiLink mode:

```
config system global
  set switch-mgmt-mode fortilink
end
```

3. Configure the discovery setting for the FortiSwitch unit. You can either use DHCP discovery or static discovery to find the IP address of the FortiGate unit (switch controller) that manages this switch. The default `dhcp-option-code` is 138.

To use DHCP discovery:

```
config switch-controller global
  set ac-discovery-type dhcp
  set dhcp-option-code <integer>
end
```

To use static discovery:

```
config switch-controller global
  set ac-discovery-type static
  config ac-list
    edit <id>
      set ipv4-address <IPv4_address>
    next
  end
end
```

4. Configure only one physical port or LAG interface of the FortiSwitch unit as an uplink port. When the FortiSwitch unit is in FortiLink mode, VLAN 4094 is configured on an internal port, which can provide a path to the layer-3 network with the following commands:

```
config switch interface
  edit <port_number>
    set fortilink-l3-mode enable
  end
end
```

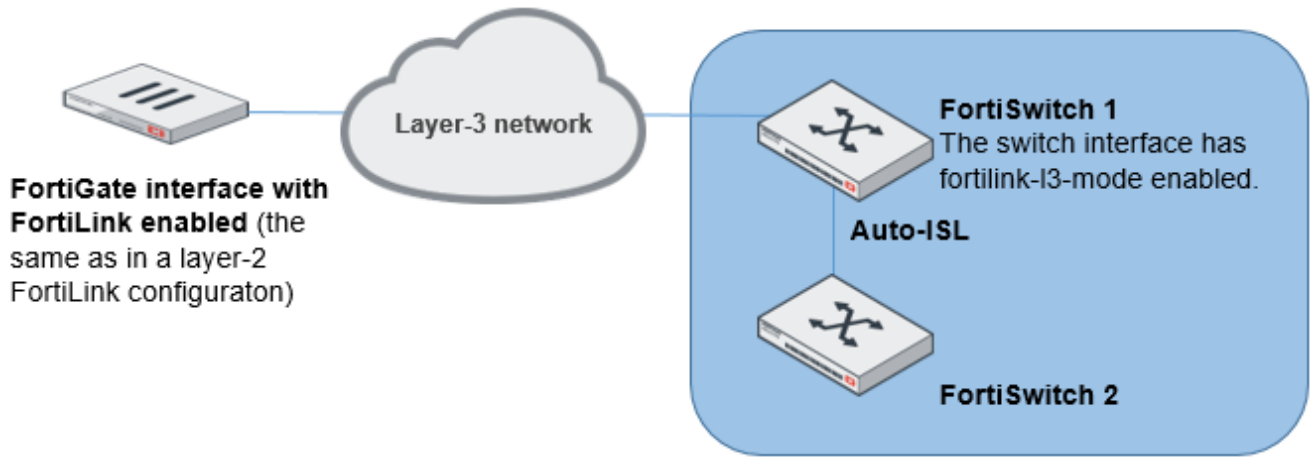
The `fortilink-l3-mode` command is only visible after you configure DHCP or static discovery.

NOTE:

- Make certain that each FortiSwitch unit can successfully ping the FortiGate unit.
- The NTP server must be configured on the FortiSwitch unit either manually or provided by DHCP. The NTP server must be reachable from the FortiSwitch unit.
- If more than one port (switch interface) has `fortilink-l3-mode` enabled, the FortiSwitch unit automatically forms a link aggregation group (LAG) trunk that contains all `fortilink-l3-mode-enabled` ports as a single logical interface.
- If you have more than one port with `fortilink-l3-mode` enabled, all ports are automatically added to the `__FoRtILnk0L3__` trunk. Make certain that the layer-3 network is also configured as a LAG with a matching LACP mode.
- In addition to the two layer-3 discovery modes (DHCP and static), there is the default layer-2 discovery broadcast mode. The layer-3 discovery multicast mode is unsupported.

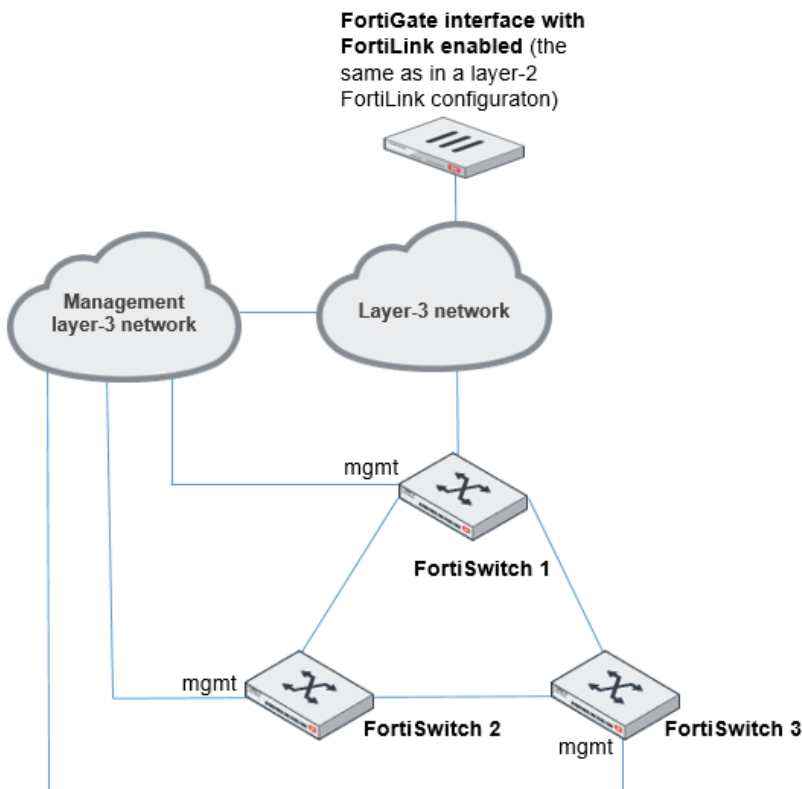
Connecting additional FortiSwitch units to the first FortiSwitch unit

In this scenario, the default FortiLink-enabled port of FortiSwitch 2 is connected to FortiSwitch 1, and the two switches then form an auto-ISL. You only need to configure the discovery settings (see [Step 3](#)) for additional switches (FortiSwitch 2 in the following diagram). You do not need to enable `fortilink-l3-mode` on the uplink port. Check that each FortiSwitch unit can reach the FortiGate unit.



Out-of-band management

If you use the mgmt port to connect to the layer-3 network, you do not need to enable `fortilink-l3-mode` on any physical port because the mgmt port is directly connected to the layer-3 network.





You can use the internal interface for one FortiSwitch island to connect to the layer-3 network and the mgmt interface for another FortiSwitch island to connect to the same layer-3 network. Do not mix the internal interface connection and mgmt interface connection within a single FortiSwitch island.

Other topologies

If you have a layer-2 loop topology, make certain that the alternative path can reach the FortiGate unit and that STP is enabled on the FortiLink layer-3 trunk.

If you have two FortiSwitch units separately connected to two different intermediary routers or switches, the uplink interfaces for both FortiSwitch units must have `fortilink-13-mode` enabled. If the FortiSwitch units are also connected to each other, an auto-ISL forms automatically, and STP must be enabled to avoid loops.

A single logical interface (which can be a LAG) is supported when they use the internal interface as the FortiLink management interface.

You can use a LAG connected to a single intermediary router or switch. A topology with multiple ports connected to different intermediary routers or switches is not supported.

Limitations

The following limitations apply to FortiSwitch islands operating in FortiLink mode over a layer-3 network:

- All FortiSwitch units using this feature must be included in the FortiGate preconfigured switch table.
- No layer-2 data path component, such as VLANs, can span across layer 3 between the FortiGate unit and the FortiSwitch unit.
- All FortiSwitch units within an FortiSwitch island must be connected to the same FortiGate unit.
- The FortiSwitch unit needs a functioning layer-3 routing configuration to reach the FortiGate unit or any feature-configured destination, such as syslog or 802.1x.
- Do not connect a layer-2 FortiGate unit and a layer-3 FortiGate unit to the same FortiSwitch unit.
- If the FortiSwitch management port is used for a layer-3 connection to the FortiGate unit, the FortiSwitch island can contain only one FortiSwitch unit. All switch ports must remain in standalone mode. If you need more than one physical link, you can group the links as a link aggregation group (LAG).
- Do not connect a FortiSwitch unit to a layer-3 network and a layer-2 network on the same segment.
- If the network has a wide geographic distribution, some features, such as software downloads, might operate slowly.
- After a topology change, make certain that every FortiSwitch unit can reach the FortiGate unit.

MCLAG configuration for access ports

A multichassis LAG (MCLAG) provides node-level redundancy by grouping two FortiSwitch models together so that they appear as a single switch on the network. If either switch fails, the MCLAG continues to function without any interruption, increasing network resiliency and eliminating the delays associated with the Spanning Tree Protocol (STP). For the network topologies, see [Dual-homed servers connected to a pair of FortiSwitch units using an MCLAG on page 46](#) and [Standalone FortiGate unit with dual-homed FortiSwitch access on page 48](#).

MCLAG requirements

- Both peer switches should be of the same hardware model and same software version. Mismatched configurations might work but are unsupported.
- There is a maximum of two FortiSwitch models per MCLAG.
- The routing feature is not available within an MCLAG.
- When `min_bundle` or `max_bundle` is combined with MCLAG, the bundle limit properties are applied only to the local aggregate interface.
- On the global switch level, `mclag-stp-aware` must be enabled, and STP must be enabled on *all* ICL trunks. They are both enabled by default.

NOTE: If you are going to use IGMP snooping with an MCLAG topology:

- On the global switch level, `mclag-igmp-aware` must be enabled.
- The `igmps-flood-traffic` and `igmps-flood-report` settings must be *disabled* on the ISL and FortiLink trunks; but the `igmps-flood-traffic` and `igmps-flood-report` settings must be *enabled* on ICL trunks. These settings are enabled by default.
- IGMP proxy must be enabled.

Using the GUI

1. Go to *WiFi & Switch Controller > FortiSwitch Ports*.
2. Select *Create New > Trunk*.
3. Enter a name for the MCLAG trunk.
4. For the MC-LAG status, select *Enabled* to create an active MCLAG trunk.
5. For the mode, select *Static*, *Passive LACP*, or *Active LACP*.
 - Set to *Static* for static aggregation. In this mode, no control messages are sent, and received control messages are ignored.
 - Set to *Passive LACP* to passively use LACP to negotiate 802.3ad aggregation.
 - Set to *Active LACP* to actively use LACP to negotiate 802.3ad aggregation.
6. For trunk members, select *Select Members*, select the ports to include in the MCLAG trunk, and then select *OK* to save the trunk members.
7. Select *OK* to save the MCLAG configuration.
The ports are listed as part of the MCLAG trunk on the FortiSwitch Ports page.

After the FortiSwitch units are configured as MCLAG peer switches, any port that supports advanced features on the FortiSwitch can become a LAG port. When `mclag` is enabled and the LAG port names match, an MCLAG peer set is automatically formed. The member ports for each FortiSwitch in the MCLAG do not need to be identical to the member ports on the peer FortiSwitch.



If you disable the MCLAG ICL (with the `set mclag-icl disable` command), you need to enable the `fortilink-split-interface`.

Using the CLI

Configure a trunk in each switch that is part of the MCLAG pair:

- The trunk name for each switch must be the same.
- The port members for each trunk can be different.
- After you enable MCLAG, you can enable LACP if needed.

```
config switch-controller managed-switch
edit "<switch-id>"
  config ports
    edit "<trunk name>"
      set type trunk
      set mode {static | lacp-passive | lacp-active}
      set members "<port>,<port>"
      set mclag enable
    next
  end
next
```

Variable	Description	Default
<switch-id>	FortiSwitch serial number.	No default
<trunk name>	Enter a name for the MCLAG trunk. NOTE: Each FortiSwitch unit that is part of the MCLAG must have the same MCLAG trunk name configured.	No default
type trunk	Set the interface type to a trunk port.	physical
mode {static lacp-passive lacp-active}	Set the LACP mode. —Set to <code>static</code> for static aggregation. In this mode, no control messages are sent, and received control messages are ignored. —Set to <code>lacp-passive</code> to passively use LACP to negotiate 802.3ad aggregation. —Set to <code>lacp-active</code> to actively use LACP to negotiate 802.3ad aggregation.	lacp-active
members "<port>,<port>"	Set the aggregated LAG bundle interfaces.	No default
mclag enable	Enable or disable the MCLAG.	disable

Log into each managed FortiSwitch to check the MCLAG configuration with the following command:

```
diagnose switch mclag
```

When an MCLAG is formed, the time on all FortiSwitch units is synchronized with an NTP server. To confirm that each FortiSwitch in the MCLAG is using an NTP server, use the following command:

```
show system ntp
```

Network topologies

The FortiGate unit requires only one active FortiLink to manage all of the subtending FortiSwitch units (called *stacking*).

You can configure the FortiLink as a physical interface or as a logical interface (associated with one or more physical interfaces). Depending on the network topology, you can also configure a standby FortiLink.

NOTE: For any of the topologies:

- All of the managed FortiSwitch units will function as one Layer-2 stack where the FortiGate unit manages each FortiSwitch separately.
- The active FortiLink carries data as well as management traffic.

Supported topologies

Fortinet recommends the following topologies for managed FortiSwitch units:

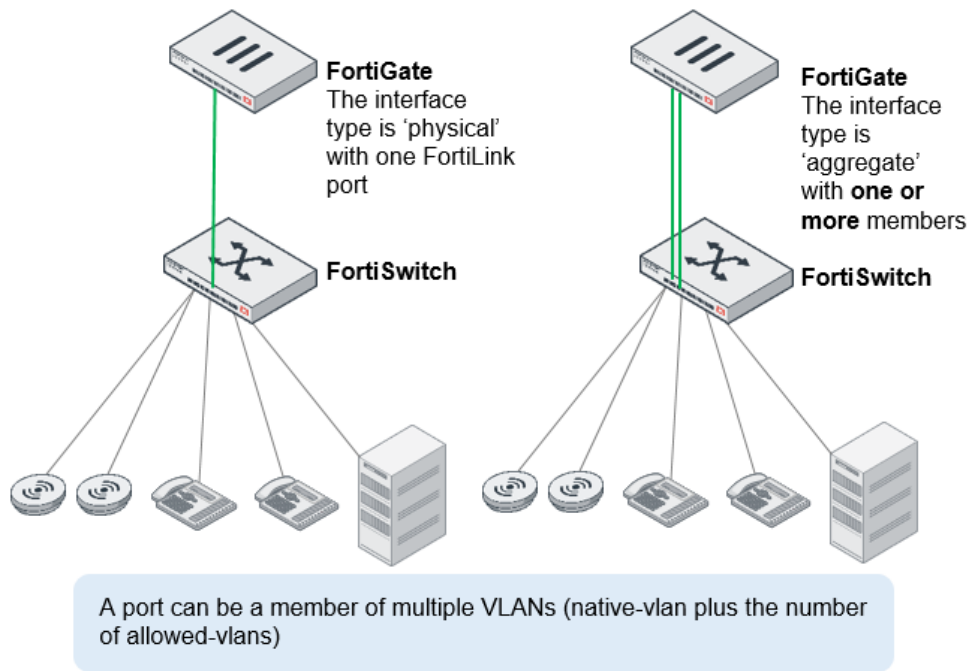
- [Single FortiGate managing a single FortiSwitch unit on page 39](#)
- [Single FortiGate unit managing a stack of several FortiSwitch units on page 40](#)
- [HA-mode FortiGate units managing a single FortiSwitch unit on page 41](#)
- [HA-mode FortiGate units managing a stack of several FortiSwitch units on page 42](#)
- [HA-mode FortiGate units managing a FortiSwitch two-tier topology on page 43](#)
- [Single FortiGate unit managing multiple FortiSwitch units \(using a hardware or software switch interface\) on page 44](#)
- [HA-mode one-tier MCLAG on page 45](#)
- [Dual-homed servers connected to a pair of FortiSwitch units using an MCLAG on page 46](#)
- [Standalone FortiGate unit with dual-homed FortiSwitch access on page 48](#)
- [HA-mode FortiGate units with dual-homed FortiSwitch access on page 49](#)
- [Multi-tiered MCLAG with HA-mode FortiGate units on page 50](#)
- [Three-tier FortiLink MCLAG configuration on page 54](#)
- [HA-mode FortiGate units using hardware-switch interfaces and STP on page 57](#)

Single FortiGate managing a single FortiSwitch unit

On the FortiGate unit, the FortiLink interface is configured as a physical or aggregate interface. The 802.3ad aggregate interface type provides a logical grouping of one or more physical interfaces.

NOTE:

- For the aggregate interface, you must disable the split interface on the FortiGate unit.
- When you are using the aggregate interface on the FortiGate unit for the FortiLink interface, the `lACP-mode` of the FortiLink aggregate interface must be set to `static`. Unless MCLAG is enabled and you are using 6.2.0 or later, see [Transitioning from a FortiLink split interface to a FortiLink MCLAG on page 64](#) for details.



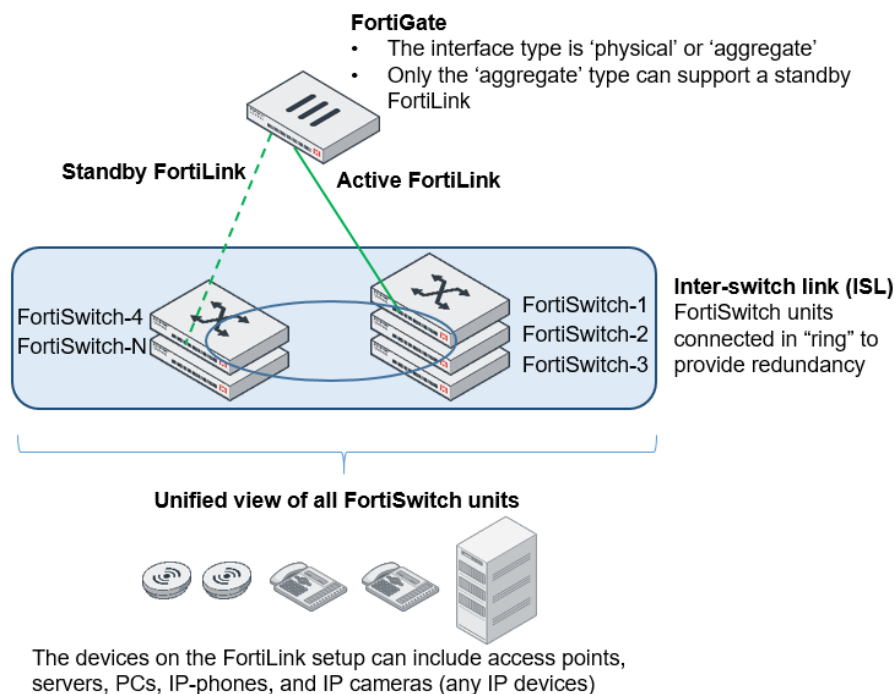
Single FortiGate unit managing a stack of several FortiSwitch units

The FortiGate unit connects directly to one FortiSwitch unit using a physical or aggregate interface. The remaining FortiSwitch units connect in a ring using inter-switch links (that is, ISL).

Optionally, you can connect a standby FortiLink connection to the last FortiSwitch unit. For this configuration, you create a FortiLink Split-Interface (an aggregate interface that contains one active link and one standby link).

NOTE:

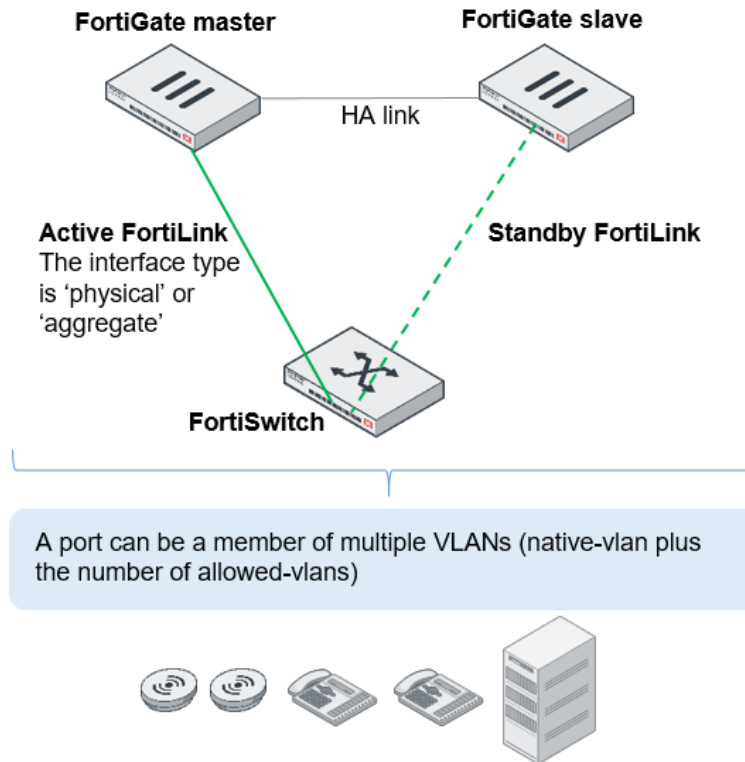
- When you are using the aggregate interface on the FortiGate unit for the FortiLink interface, the `lACP-mode` of the FortiLink aggregate interface must be set to `static`. Unless MCLAG is enabled and you are using 6.2.0 or later, see [Transitioning from a FortiLink split interface to a FortiLink MCLAG on page 64](#) for details.
- Do not create loops or rings with the FortiGate unit in the path.



HA-mode FortiGate units managing a single FortiSwitch unit

The master and slave FortiGate units both connect a FortiLink to the FortiSwitch unit. The FortiLink port(s) and interface type must match on the two FortiGate units.

NOTE: Before FortiOS 6.2.0, when using HA-mode FortiGate units to manage FortiSwitch units, the HA mode must be active-passive. Starting in FortiOS 6.2.0, the FortiGate HA mode can be either active-passive or active-active.



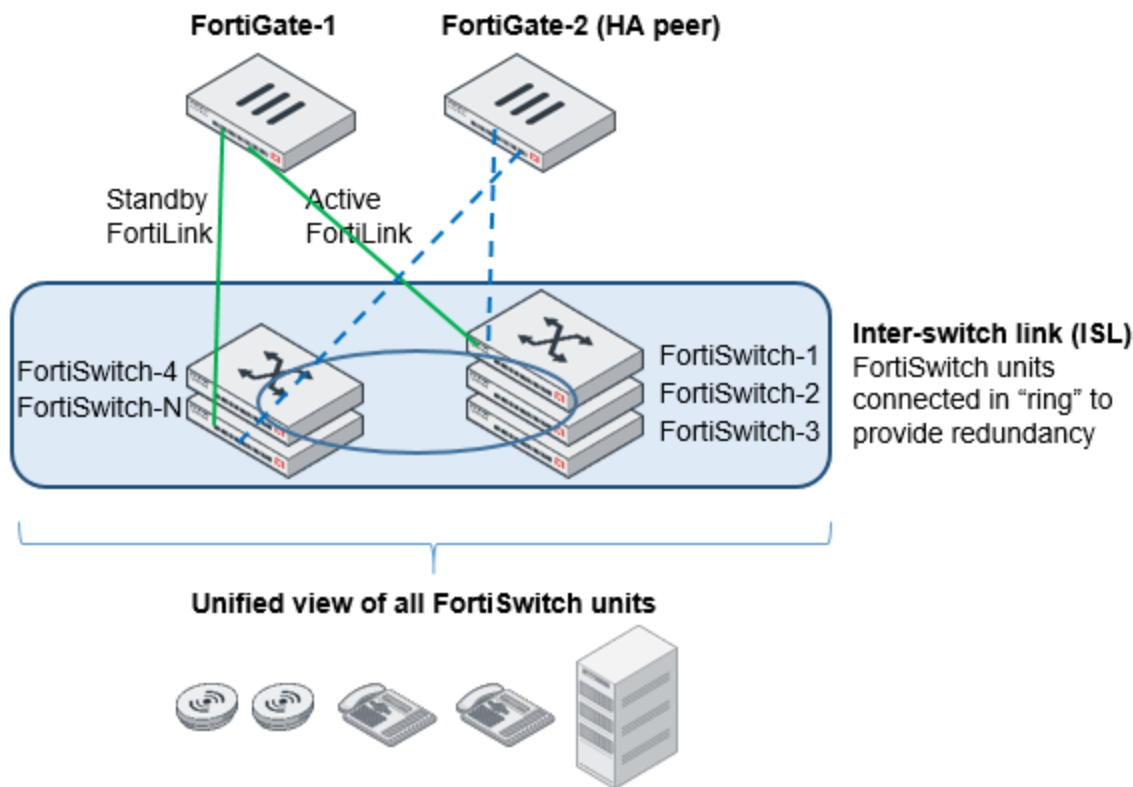
HA-mode FortiGate units managing a stack of several FortiSwitch units

The master and slave FortiGate units both connect a FortiLink to the first FortiSwitch unit and (optionally) to the last FortiSwitch unit. The FortiLink ports and interface type must match on the two FortiGate units.

When using an aggregate interface for the active/standby FortiLink configuration, make sure the FortiLink split interface is enabled (this forces one link to be active and the rest to be standby links, which avoids loops in the network). This option can be disabled later if you enable an MCLAG. See [Transitioning from a FortiLink split interface to a FortiLink MCLAG on page 64](#).

NOTE:

- When you are using the aggregate interface on the FortiGate unit for the FortiLink interface, the `lACP-mode` of the FortiLink aggregate interface must be set to `static`. Unless MCLAG is enabled and you are using 6.2.0 or later, see [Transitioning from a FortiLink split interface to a FortiLink MCLAG on page 64](#) for details.
- Before FortiOS 6.2.0, when using HA-mode FortiGate units to manage FortiSwitch units, the HA mode must be active-passive. Starting in FortiOS 6.2.0, the FortiGate HA mode can be either active-passive or active-active.

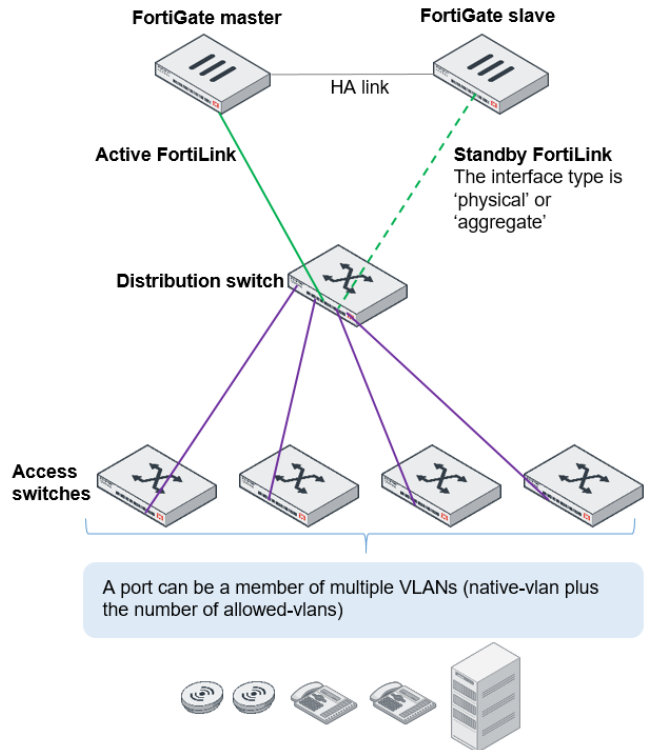


The devices on the FortiLink setup can include access points, servers, PCs, IP-phones, and IP cameras (any IP devices)

HA-mode FortiGate units managing a FortiSwitch two-tier topology

The distribution FortiSwitch unit connects to the master and slave FortiGate units. The FortiLink port(s) and interface type must match on the two FortiGate units.

NOTE: Before FortiOS 6.2.0, when using HA-mode FortiGate units to manage FortiSwitch units, the HA mode must be active-passive. Starting in FortiOS 6.2.0, the FortiGate HA mode can be either active-passive or active-active.



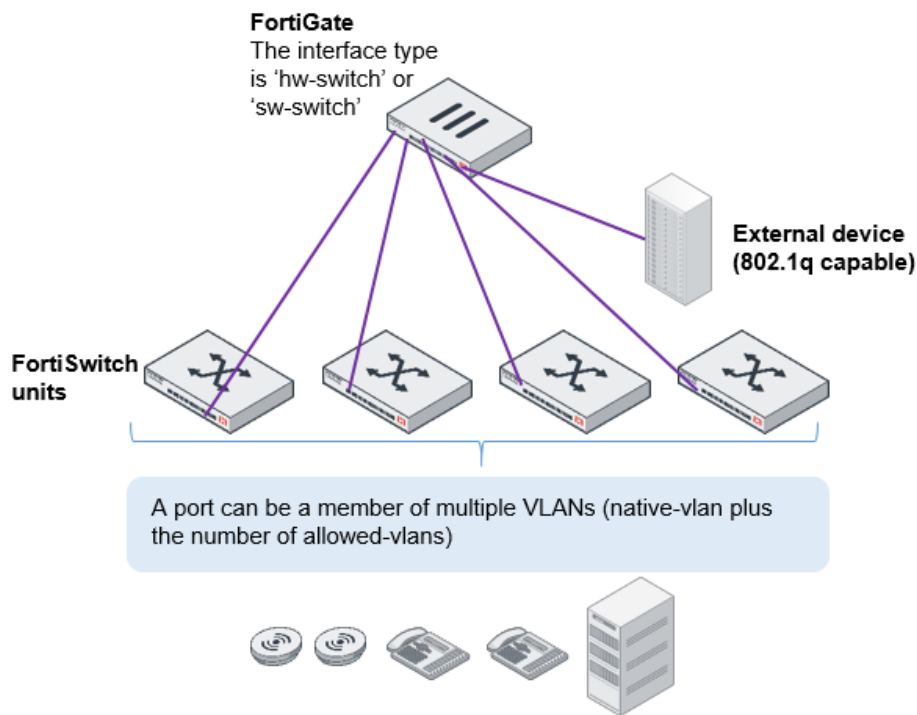
Single FortiGate unit managing multiple FortiSwitch units (using a hardware or software switch interface)

The FortiGate unit connects directly to each FortiSwitch unit. Each of these FortiLink ports is added to the logical hardware-switch or software-switch interface on the FortiGate unit.

Optionally, you can connect other devices to the FortiGate logical interface. These devices, which must support IEEE 802.1q VLAN tagging, will have Layer 2 connectivity with the FortiSwitch ports.

NOTE:

- Using the hardware or software switch interface in FortiLink mode is not recommended in most cases. It can be used when the traffic on the ports is very light because all traffic across the switches moves through the FortiGate unit.
- Do not create loops or rings in this topology.



HA-mode one-tier MCLAG

HA-mode FortiGate units connect to redundant distribution FortiSwitch units. Access FortiSwitch units are arranged in a stack in each IDF, connected to both distribution switches.

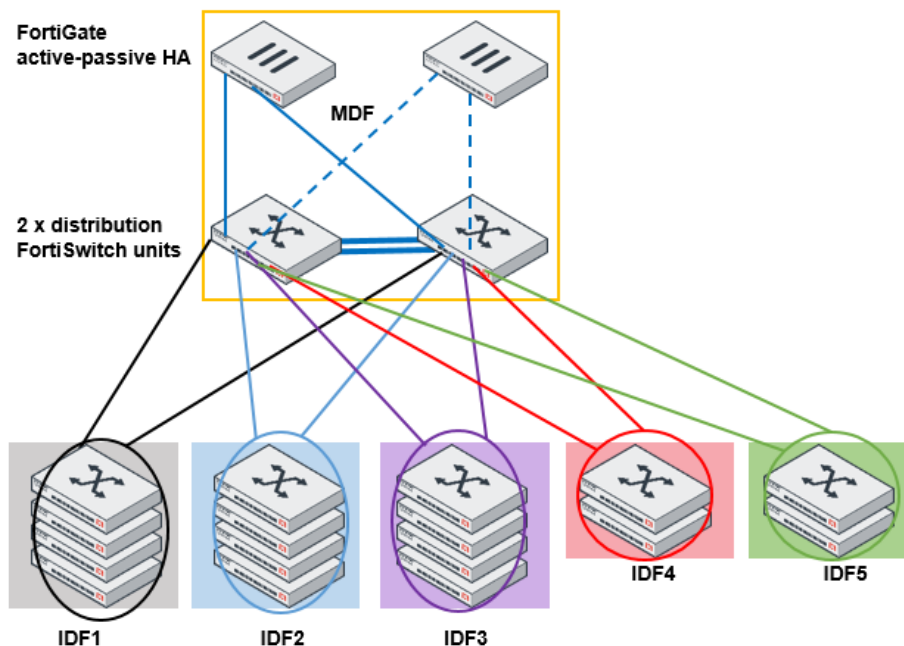
For the FortiLink connection to each distribution switch, you create a FortiLink split interface (an aggregate interface that contains one active link and one standby link).

NOTE:

- Before FortiSwitchOS 3.6.4, MCLAG was not supported when access rings were present. Starting with FortiSwitchOS 3.6.4, MCLAG is supported, even with access rings present.
- Before FortiOS 6.2.0, when using HA-mode FortiGate units to manage FortiSwitch units, the HA mode must be active-passive. Starting in FortiOS 6.2.0, the FortiGate HA mode can be either active-passive or active-active.
- When you are using the aggregate interface on the FortiGate unit for the FortiLink interface, the `lacp-mode` of the FortiLink aggregate interface must be set to `static`. Unless MCLAG is enabled and you are using 6.2.0 or later, see [Transitioning from a FortiLink split interface to a FortiLink MCLAG on page 64](#) for details.
- On the global switch level, `mclag-stp-aware` must be enabled, and STP must be enabled on all ICL trunks. They are both enabled by default.
- This is only an example topology. Other combinations of FortiGate units and FortiSwitch units can be used to create a similar topology.

NOTE: If you are going to use IGMP snooping with an MCLAG topology:

- On the global switch level, `mclag-igmp-aware` must be enabled. It is enabled by default.
- The `igmps-flood-traffic` and `igmps-flood-report` settings must be *disabled* on the ISL and FortiLink trunks; but the `igmps-flood-traffic` and `igmps-flood-report` settings must be *enabled* on ICL trunks. These settings are enabled by default.
- IGMP proxy must be enabled.



Dual-homed servers connected to a pair of FortiSwitch units using an MCLAG

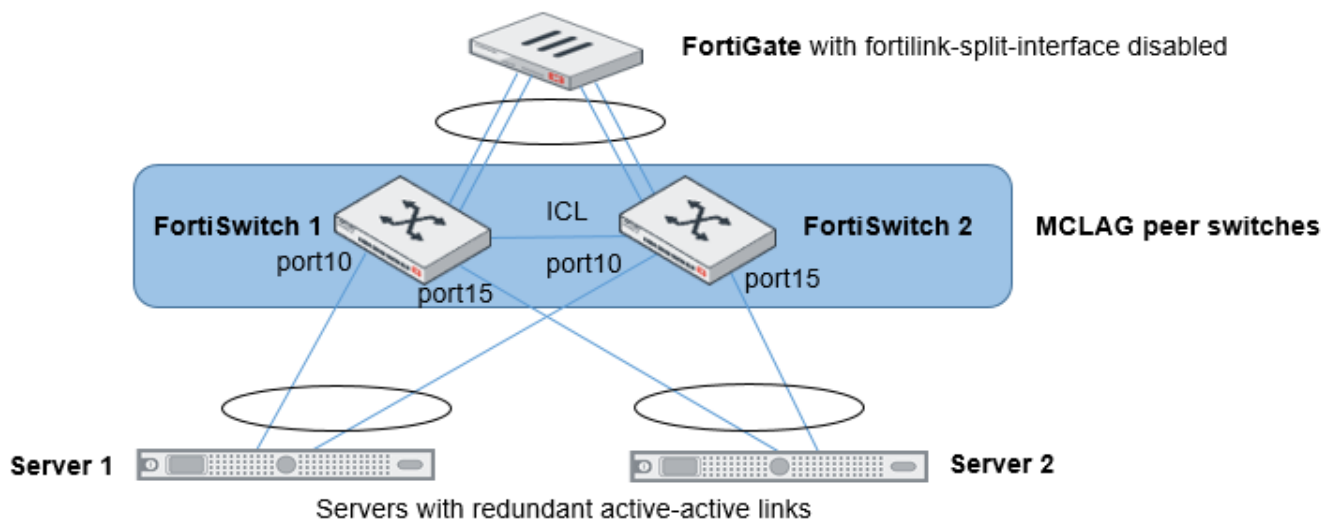
To configure a multichassis LAG, you need to configure FortiSwitch 1 and FortiSwitch 2 as MCLAG peer switches before creating a two-port LAG. See [Transitioning from a FortiLink split interface to a FortiLink MCLAG on page 64](#). Then you set up two MCLAGs towards the servers, each MCLAG using one port from each FortiSwitch unit.

This topology is supported when the FortiGate unit is in HA mode.

NOTE: On the global switch level, `mclag-stp-aware` must be enabled, and STP must be enabled on all ICL trunks. They are both enabled by default.

NOTE: If you are going to use IGMP snooping with an MCLAG topology:

- On the global switch level, `mclag-igmp-aware` must be enabled. It is enabled by default.
- The `igmps-flood-traffic` and `igmps-flood-report` settings must be *disabled* on the ISL and FortiLink trunks; but the `igmps-flood-traffic` and `igmps-flood-report` settings must be *enabled* on ICL trunks. These settings are enabled by default.
- IGMP proxy must be enabled.



Step 1: Ensure the MCLAG ICL is already configured between FortiSwitch 1 and FortiSwitch 2.

```
diagnose switch mclag icl
```

Step 2: Configure a trunk in FortiSwitch 1 and then configure a trunk in FortiSwitch 2.

The trunk names must match.

Step 3: Set up the servers.

To set up Server 1:

```
config switch trunk
```

```
edit server_1
  set members port10
  set mclag enable
next
edit server_2
  set members port15
  set mclag enable
next
end
```

To set up Server 2:

```
config switch trunk
  edit server_1
    set members port10
    set mclag enable
  next
  edit server_2
    set members port15
    set mclag enable
  next
end
```



If you disable the MCLAG ICL (with the `set mclag-icl disable` command), you need to enable the `fortilink-split-interface`.

Standalone FortiGate unit with dual-homed FortiSwitch access

This network topology provides high port density with two tiers of FortiSwitch units.

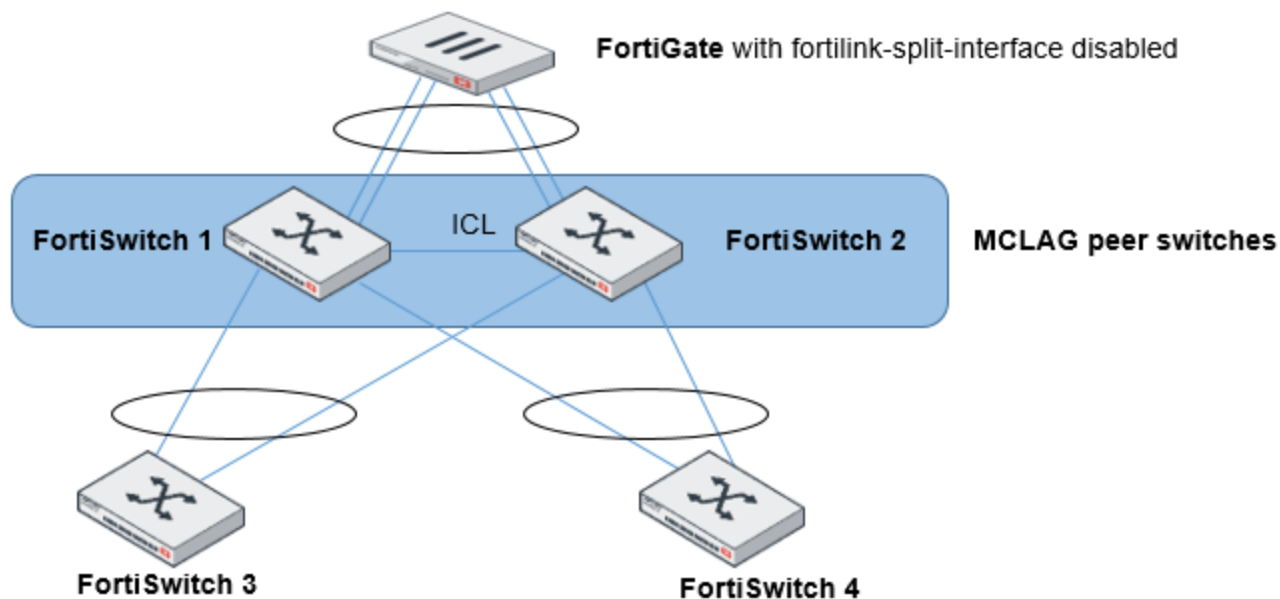
See [Transitioning from a FortiLink split interface to a FortiLink MCLAG](#) on page 64.

After the MCLAG peer group is created between FortiSwitch 1 and FortiSwitch 2, the MCLAG trunks are automatically established with the access switches (FortiSwitch 3 and FortiSwitch 4).

NOTE: On the global switch level, `mclag-stp-aware` must be enabled, and STP must be enabled on all ICL trunks. They are both enabled by default.

NOTE: If you are going to use IGMP snooping with an MCLAG topology:

- On the global switch level, `mclag-igmp-aware` must be enabled. It is enabled by default.
- The `igmps-flood-traffic` and `igmps-flood-report` settings must be *disabled* on the ISL and FortiLink trunks; but the `igmps-flood-traffic` and `igmps-flood-report` settings must be *enabled* on ICL trunks. These settings are enabled by default.
- IGMP proxy must be enabled.



HA-mode FortiGate units with dual-homed FortiSwitch access

In HA mode, only one FortiGate is active at a time. If the active FortiGate unit fails, the backup FortiGate unit becomes active.

See [Transitioning from a FortiLink split interface to a FortiLink MCLAG on page 64](#).

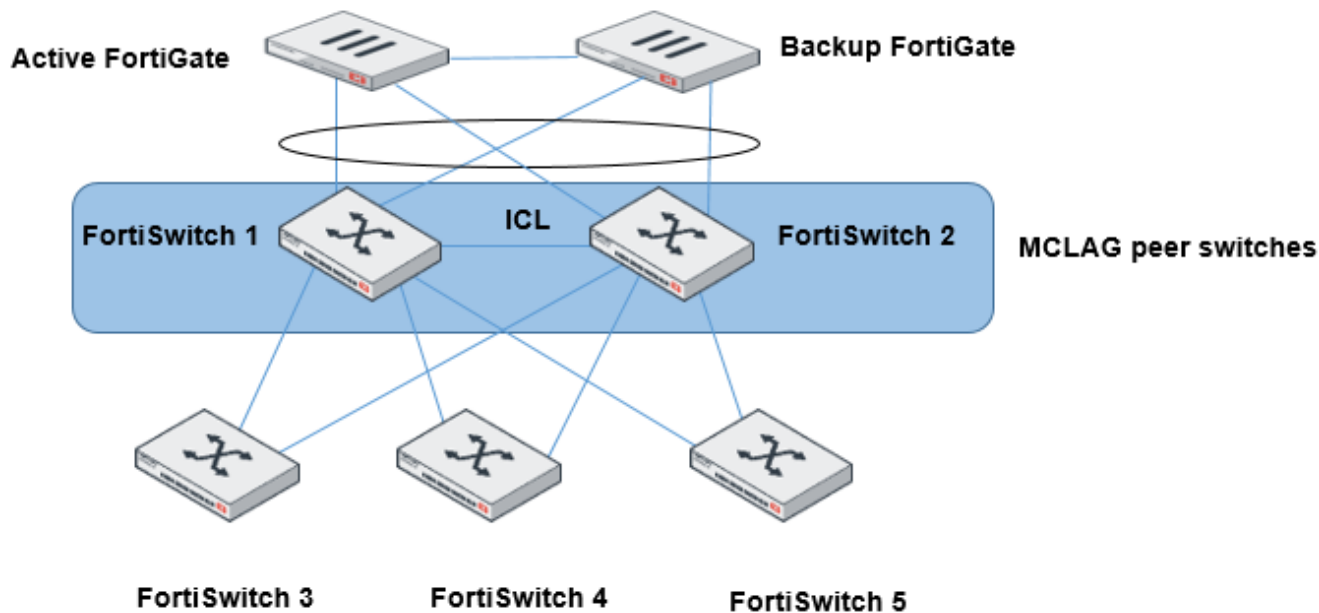
After the MCLAG peer group is created between FortiSwitch 1 and FortiSwitch 2, the MCLAG trunks are automatically established with the access switches (FortiSwitch 3, FortiSwitch 4, and FortiSwitch 5).

NOTE:

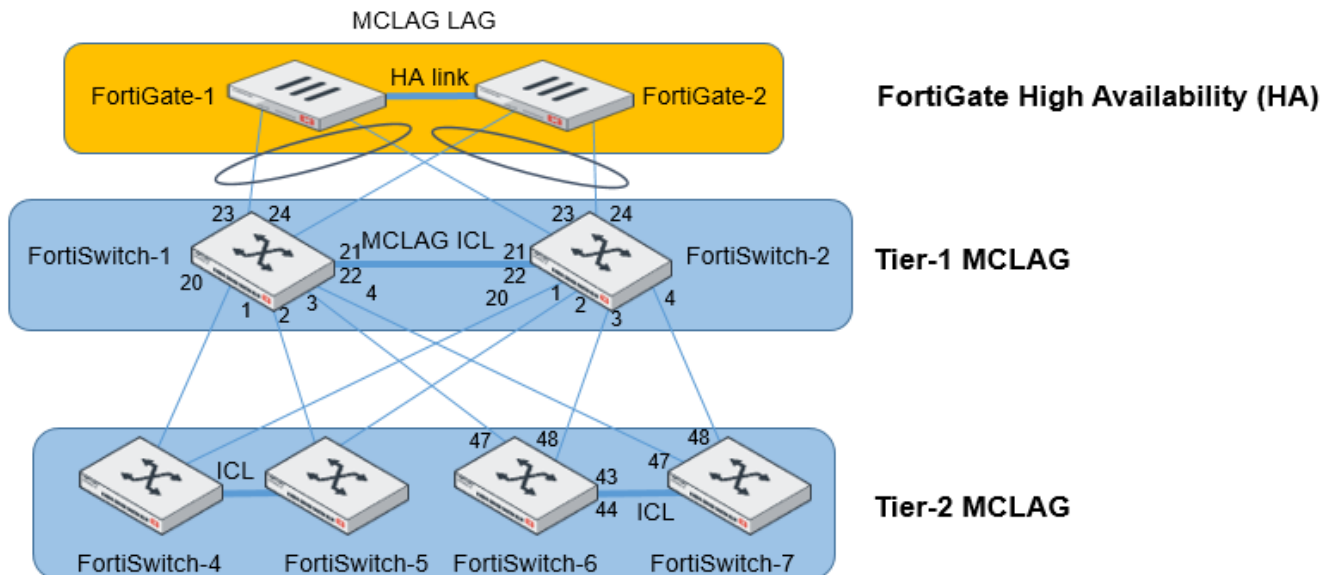
- Before FortiOS 6.2.0, when using HA-mode FortiGate units to manage FortiSwitch units, the HA mode must be active-passive. Starting in FortiOS 6.2.0, the FortiGate HA mode can be either active-passive or active-active.
- On the global switch level, `mclag-stp-aware` must be enabled, and STP must be enabled on all ICL trunks. They are both enabled by default.

NOTE: If you are going to use IGMP snooping with an MCLAG topology:

- On the global switch level, `mclag-igmp-aware` must be enabled. It is enabled by default.
- The `igmps-flood-traffic` and `igmps-flood-report` settings must be *disabled* on the ISL and FortiLink trunks; but the `igmps-flood-traffic` and `igmps-flood-report` settings must be *enabled* on ICL trunks. These settings are enabled by default.
- IGMP proxy must be enabled.



Multi-tiered MCLAG with HA-mode FortiGate units



NOTE:

- Before FortiOS 6.2.0, when using HA-mode FortiGate units to manage FortiSwitch units, the HA mode must be active-passive. Starting in FortiOS 6.2.0, the FortiGate HA mode can be either active-passive or active-active.
- In this topology, you must use the `auto-isl-port-group` setting as described in the following configuration example. This setting instructs the switches to group ports from MCLAG peers together into one MCLAG when the inter-switch link (ISL) is formed.
- The inter-chassis link (ICL) and `auto-isl-port-group` settings must be done directly on the FortiSwitch unit.
- On the global switch level, `mclag-stp-aware` must be enabled, and STP must be enabled on all ICL trunks. They are both enabled by default.
- CLI commands in red are manually configured.

NOTE: If you are going to use IGMP snooping with an MCLAG topology:

- On the global switch level, `mclag-igmp-aware` must be enabled. It is enabled by default.
- The `igmps-flood-traffic` and `igmps-flood-report` settings must be *disabled* on the ISL and FortiLink trunks; but the `igmps-flood-traffic` and `igmps-flood-report` settings must be *enabled* on ICL trunks. These settings are enabled by default.
- IGMP proxy must be enabled.

To configure a multi-tiered MCLAG with HA-mode FortiGate units:

1. Configure FortiSwitch-1 and FortiSwitch-2 for the tier-1 MCLAG:

For FortiSwitch-1, enable the ICL on the ISL formed with the MCLAG peer switch:

```
config switch trunk
  edit "D243Z14000288-0" // trunk name derived from FortiSwitch-2 SN
    set mode lacp-active
    set auto-isl 1
    set mclag-icl enable
    set members "port21" "port22"
```

```
end
```

For FortiSwitch-2, enable the ICL on the ISL formed with the MCLAG peer switch:

```
config switch trunk
  edit "D243Z14000289-0" // trunk name derived from FortiSwitch-1 SN
    set mode lacp-active
    set auto-isl 1
    set mclag-icl enable
    set members "port21" "port22"
  end
```

2. Continue to configure FortiSwitch-1 for the tier-1 MCLAG:

- a. Configure the two auto-isl-port-groups based on the topology diagram. The group name must match the name that is configured on the peer switch.**

```
config switch auto-isl-port-group
  edit "distribute-1"
    set members "port1" "port2"
  next
  edit "distribute-2"
    set members "port3" "port4"
  end
```

- b. After you complete the CLI commands in Steps 1 and 2a, the trunks are automatically formed:**

```
config switch trunk
  edit "D243Z14000288-0"
    set mode lacp-active
    set auto-isl 1
    set mclag-icl enable
    set members "port21" "port22"
  next
  edit "FG100D3G15817028" // trunk name derived from FortiGate-1
    set mclag enable
    set members "port24" "port23"
  next
  edit "distribute-1"
    set mode lacp-active
    set auto-isl 1
    set mclag enable
    set members "port1" "port2"
  next
  edit "distribute-2"
    set mode lacp-active
    set auto-isl 1
    set mclag enable
    set members "port3" "port4"
  next
end
```

3. Continue to configure FortiSwitch-2 for the tier-1 MCLAG:

- a. Configure the two auto-isl-port-groups based on the topology diagram. The group name must match the name that is configured on the peer switch.**

```
config switch auto-isl-port-group
  edit "distribute-1"
    set members "port1" "port2"
  next
  edit "distribute-2"
    set members "port3" "port4"
  end
```

- b.** After you complete the CLI commands in Steps 1 and 3a, the trunks are automatically formed:

```
config switch trunk
  edit "D243Z14000288-0"
    set mode lacp-active
    set auto-isl 1
    set mclag-icl enable
    set members "port21" "port22"
  next
  edit "FG100D3G15817032" // trunk name derived from FortiGate-2
    set mclag enable
    set members "port24" "port23"
  next
  edit "distribute-1"
    set mode lacp-active
    set auto-isl 1
    set mclag enable
    set members "port1" "port2"
  next
  edit "distribute-2"
    set mode lacp-active
    set auto-isl 1
    set mclag enable
    set members "port3" "port4"
  next
end
```

- 4.** Tier-2 MCLAGs. Enable the ICL between the MCLAG peer switches. For example, configure FortiSwitch-6 as follows.

- a.** Change the tier-2 MCLAG peer switches to FortiLink mode and connect them to each other. Enable the ICL on the ISL formed with the MCLAG peer switches.

```
config switch trunk
  edit "8DN3X15000026-0" // trunk name derived from FortiSwitch-7 SN
    set mode lacp-active
    set auto-isl 1
    set mclag-icl enable
    set members "port43" "port44"
  end
```

- b.** The trunks are automatically formed as below:

```
config switch trunk
  edit "8DN3X15000026-0"
    set mode lacp-active
    set auto-isl 1
    set mclag-icl enable
    set members "port43" "port44"
  next
  edit "_FlInK1_MLAG0_"
    set mode lacp-active
    set auto-isl 1
    set mclag enable
    set members "port48" "port47"
  next
end
```

5. Access FortiSwitch units. The access switch trunks are formed automatically as below.

On FortiSwitch-6:

```
config switch trunk
  edit "_FlInK1_MLAG0_"
    set mode lacp-active
    set auto-isl 1
    set mclag enable
    set members "port48" "port47"
  next
end
```

On FortiSwitch-7:

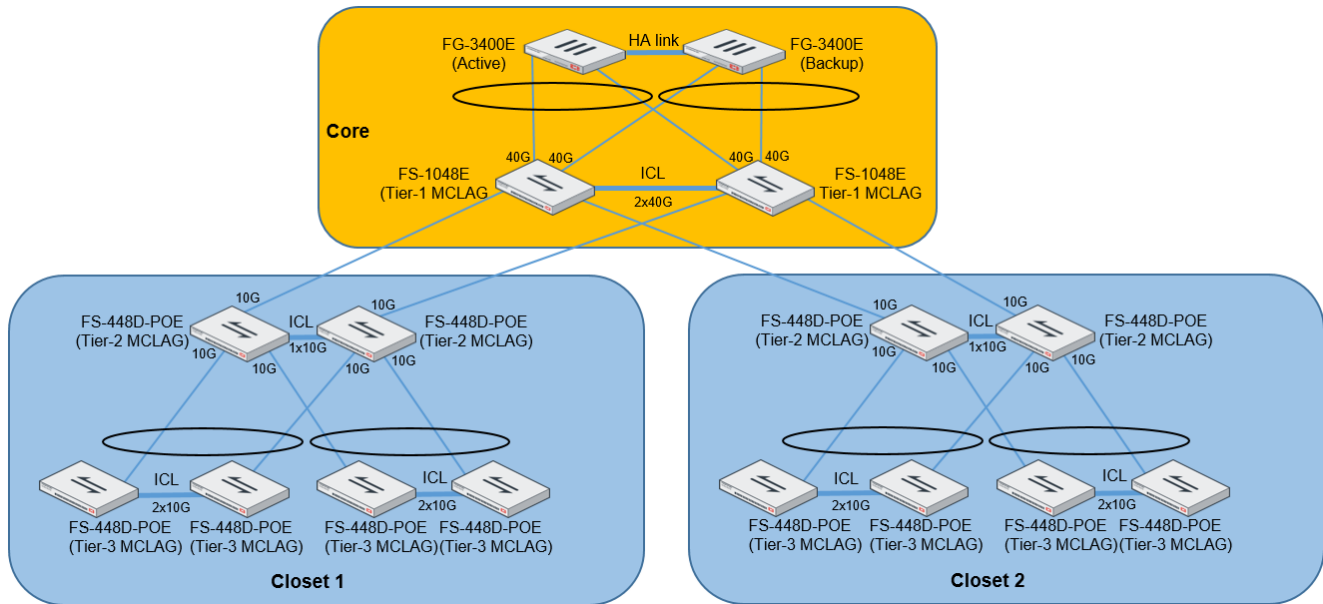
```
config switch trunk
  edit "_FlInK1_MLAG0_"
    set mode lacp-active
    set auto-isl 1
    set mclag enable
    set members "port47" "port48"
  next
end
```



If you disable the MCLAG ICL (with the `set mclag-icl disable` command), you need to enable the `fortilink-split-interface`.

Three-tier FortiLink MLAG configuration

To create a three-tier FortiLink MLAG topology, use FortiOS 6.2.3 GA or later and FortiSwitchOS 6.2.3 GA or later.



To configure the two FortiGate units:

1. Set up an active-passive or active-active HA configuration.
2. (Optional) Disable `override` in the HA CLI configuration.
3. Use the GUI or CLI to create the FortiLink interface.
4. Configure the FortiLink interface:

```
config system interface
  edit <FortiLink_interface>
    set lacp-mode active
    set fortilink-neighbor-detect lldp
    set fortilink-split-interface disable
    set lldp-reception enable
    set lldp-transmission enable
  next
end
```

To configure the FortiSwitch units in the core:

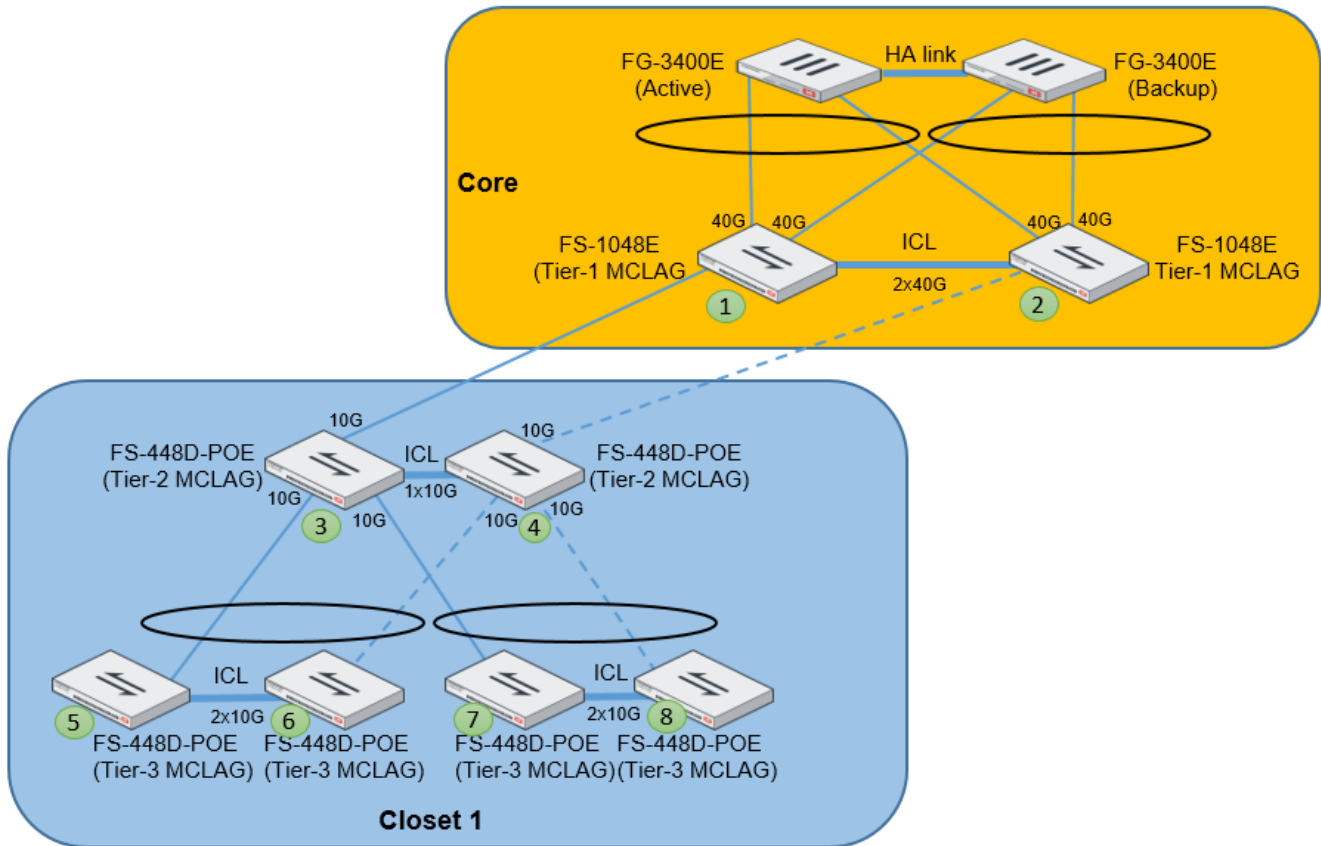
1. Find the trunk between the two MLAG switches. Enable `mclag-icl` on the MLAG-ICL trunk. The default name of the MLAG-ICL trunk is the last 13 characters of the peer switch name plus "-0".

```
config switch trunk
  edit <MCLAG-ICL_trunk_name>
    set mclag-icl enable
  next
end
```

2. Create downlink trunks on the MCLAG-ICL switches.

Note: Only the trunks from the higher tier MCLAG-ICL switches to the next tier MCLAG-ICL switches need this configuration.

To configure the three-tier MCLAG topology shown in the following figure:



1. Configure the tier-1 MCLAG switches.

- a. Connect switch 1 and switch 2 to the FortiGate units and interconnect switch 1 and switch 2.
- b. Wait for both switches to change to FortiLink mode and for both FortiLinks to be up.
- c. Configure the ICL trunks on the inter-switch trunks to form MCLAG switches in FortiLink mode.
- d. Use the diagnose switch mclag peer-consistency-check CLI command to verify that the MCLAG-ICL trunk formed successfully.
- e. Add an auto-isl-port-group for the tier-2 MCLAG switches on both switch 1 and switch 2:

```

config switch auto-isl-port-group
  edit tier2-closet-1
    set members port1
  next
  edit tier2-closet-2
    set members port2
  next
end
    
```

2. Wire all switches in closet 1 by following the figure. Do not make the dotted-line connections for now. Wait for all switches to be up in FortiLink mode.
3. Add two `auto-isl-port-groups` for the tier-3 MLAG switches on both switch 3 and switch 4:

```
config switch auto-isl-port-group
  edit tier-2-closet-<1>-downlink-trunk-A
    set member <port_name>
  next
  edit tier-2-closet-<1>-downlink-trunk-B
    set member <port_name>
  next
end
```

4. Enable the tier-2 MLAG-ICL trunk on switch 4 using the FortiOS CLI of the switch console port.
5. Enable the tier-3 MLAG-ICL trunks on switch 6 and switch 8.
NOTE: The trunk must be configured from the end of the daisy-chain switch.
6. Enable the tier-3 MLAG-ICL trunks on switch 5 and switch 7.
7. Enable the tier-2 MLAG-ICL trunk on switch 3.
8. Verify that all the FortiLinks are up and double-check that the MLAG-ICL configuration on each MLAG switch.
9. Connect switch 4 to switch 2.
10. Verify that the FortiLinks are up.
11. Connect switch 6 and switch 8 to switch 4.
12. Verify that the FortiLinks are up.
13. Use the `diagnose switch mlag peer` CLI command to verify that the tier-1, tier-2, and tier-3 MLAG-switches are formed correctly.
14. Check the traffic on switch 1 and switch 2 during the configuration.
15. Repeat steps 2 to 14 for closet 2.
16. All FortiLinks should be up.

HA-mode FortiGate units using hardware-switch interfaces and STP

In most FortiLink topologies, MCLAG or LAG configurations are used for FortiSwitch redundancy. However, some FortiGate models do not support the FortiLink aggregate interface, or some FortiSwitch models do not support MCLAG.

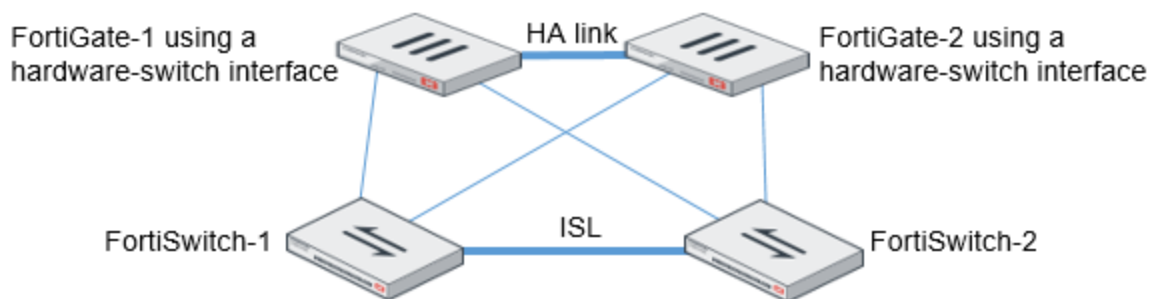
The following network topology uses a hardware-switch interface on each FortiGate unit. Each FortiSwitch unit is connected to a single port of the hardware-switch interface of the FortiGate unit. The inter-switch link (ISL) between the FortiSwitch units provides redundancy.

For this network topology to function, use the following commands on each FortiLink hardware-switch interface:

```
config system interface
  edit <FortiLink_hardware_switch_interface>
    set stp enable
  end
```

NOTE:

- The FortiLink interface uses the Link Layer Discovery Protocol (LLDP) for neighbor detection.
- Spanning Tree Protocol (STP) and STP forwarding are both supported by the FortiLink hardware-switch interface.
- The software-switch interface is not supported.



Grouping FortiSwitch units

You can simplify the configuration and management of complex topologies by creating FortiSwitch groups. A group can include one or more FortiSwitch units and you can include different models in a group.

```
config switch-controller switch-group
  edit <name>
    set description <string>
    set members <serial-number> <serial-number> ...
  end
end
```

Grouping FortiSwitch units allows you to restart all of the switches in the group instead of individually. For example, you can use the following command to restart all of the FortiSwitch units in a group named `my-sw-group`:

```
execute switch-controller switch-action restart delay switch-group my-sw-group
```

Upgrading the firmware of FortiSwitch groups is easier, too, because fewer commands are needed. See [Firmware upgrade of stacked or tiered FortiSwitch units on page 59](#).

Stacking configuration

To set up stacking:

1. Configure the active FortiLink interface on the FortiGate unit.
2. (Optional) Configure the standby FortiLink interface.
3. Connect the FortiSwitch units together, based on your chosen topology.

1. Configure the active FortiLink

Configure the FortiLink interface (as described in the [Using the FortiGate GUI](#) chapter).

When you configure the FortiLink interface, the stacking capability is enabled automatically.

2. Configure the standby FortiLink

Configure the standby FortiLink interface. Depending on your configuration, the standby FortiLink might connect to the same FortiGate unit as the active FortiLink or to a different FortiGate unit.

If the FortiGate unit receives discovery requests from two FortiSwitch units, the link from one FortiSwitch unit will be selected as active, and the link from other FortiSwitch unit will be selected as standby.

If the active FortiLink fails, the FortiGate unit converts the standby FortiLink to active.

3. Connect the FortiSwitch units

Refer to the topology diagrams to see how to connect the FortiSwitch units.

Inter-switch links (ISLs) form automatically between the stacked switches.

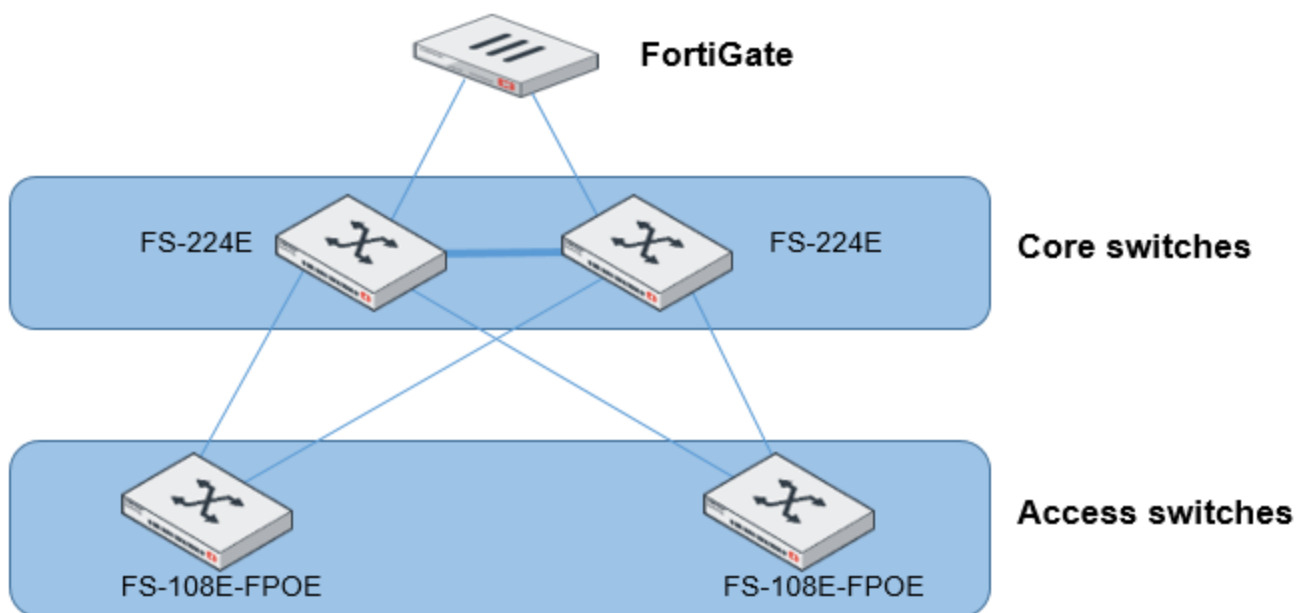
The FortiGate unit will discover and authorize all of the FortiSwitch units that are connected. After this, the FortiGate unit is ready to manage all of the authorized FortiSwitch units.

Disable stacking

To disable stacking, execute the following commands from the FortiGate CLI. In the following example, port4 is the FortiLink interface:

```
config system interface
  edit port4
    set fortilink-stacking disable
  end
end
```

Firmware upgrade of stacked or tiered FortiSwitch units



In this topology, the core FortiSwitch units are model FS-224E, and the access FortiSwitch units are model FS-108E-FPOE. Because the switches are stacked or tiered, the procedure to update the firmware is simpler. The FortiGate unit is running FOS 6.2.2 GA. In the following procedure, the four FortiSwitch units are upgraded from 6.2.1 to 6.2.2.

To upgrade the firmware of stacked or tiered FortiSwitch units:

1. Check that all of the FortiSwitch units are connected and which firmware versions they are running. For example:

```
FGT81ETK19001274 # execute switch-controller get-conn-status
Managed-devices in current vdom root:

STACK-NAME: FortiSwitch-Stack-flink
SWITCH-ID   VERSION          STATUS           FLAG  ADDRESS           JOIN-TIME        NAME
S108EF5918003577 v6.2.1 (176)   Authorized/Up   -    10.105.22.6      Thu Oct 24 10:47:27
2019      -
```

```

S108EP5918008265 v6.2.1 (176) Authorized/Up - 10.105.22.5 Thu Oct 24 10:47:20
2019 -
S224ENTF18001408 v6.2.1 (176) Authorized/Up - 10.105.22.2 Thu Oct 24 10:44:36
2019 -
S224ENTF18001432 v6.2.1 (176) Authorized/Up - 10.105.22.3 Thu Oct 24 10:44:49
2019 -

```

Flags: C=config sync, U=upgrading, S=staged, D=delayed reboot pending, E=configuration sync error

Managed-Switches: 4 (UP: 4 DOWN: 0)

2. (Optional) To speed up how fast the image is pushed from the FortiGate unit to the FortiSwitch units, enable the HTTPS image push instead of the CAPWAP image push. For example:

```

FGT81ETK19001274 # config switch-controller global
FGT81ETK19001274 (global) # set https-image-push enable
FGT81ETK19001274 (global) # end

```

3. Download the file for the FortiSwitchOS 6.2.2 GA build 194 in the FortiGate unit. For example:

```

FGT81ETK19001274 # execute switch-controller switch-software upload tftp FSW_224E-v6-
build0194-FORTINET.out 10.105.16.15

```

Downloading file FSW_224E-v6-build0194-FORTINET.out from tftp server 10.105.16.15...

#####

Image checking ...

Image MD5 calculating ...

Image Saving S224EN-IMG.swtp ...

Successful!

File Syncing...

```

FGT81ETK19001274 # execute switch-controller switch-software upload tftp FSW_108E_POE-v6-
build0194-FORTINET.out 10.105.16.15

```

Downloading file FSW_108E_POE-v6-build0194-FORTINET.out from tftp server 10.105.16.15...

#####

Image checking ...

Image MD5 calculating ...

Image Saving S108EP-IMG.swtp ...

Successful!

File Syncing...

```

FGT81ETK19001274 # execute switch-controller switch-software upload tftp FSW_108E_FPOE-v6-
build0194-FORTINET.out 10.105.16.15

```

Downloading file FSW_108E_FPOE-v6-build0194-FORTINET.out from tftp server 10.105.16.15...

#####

Image checking ...

Image MD5 calculating ...

Image Saving S108EF-IMG.swtp ...

Successful!

File Syncing...

```

FGT81ETK19001274 #

```

4. Check the downloaded FortiSwitch image. For example:

```
FGT81ETK19001274 # execute switch-controller switch-software list-available

ImageName           ImageSize (B)   ImageInfo           Uploaded Time
S108EF-IMG.swtp     19574769        S108EF-v6.2-build194  Thu Oct 24 13:03:51 2019
S108EP-IMG.swtp     19583362        S108EP-v6.2-build194  Thu Oct 24 13:03:23 2019
S224EN-IMG.swtp     27159659        S224EN-v6.2-build194  Thu Oct 24 13:03:02 2019

FGT81ETK19001274 #
```

5. Start the image staging. For example:

```
FGT81ETK19001274 # execute switch-controller switch-software stage all S224EN-IMG.swtp
Staged Image Version S224EN-v6.2-build194
Image staging operation is started for FortiSwitch S224ENTF18001408 ...
Image staging operation is started for FortiSwitch S224ENTF18001432 ...

FGT81ETK19001274 # execute switch-controller switch-software stage all S108EF-IMG.swtp
Staged Image Version S108EF-v6.2-build194
Image staging operation is started for FortiSwitch S108EF5918003577 ...

FGT81ETK19001274 # execute switch-controller switch-software stage all S108EP-IMG.swtp
Staged Image Version S108EP-v6.2-build194
Image staging operation is started for FortiSwitch S108EP5918008265 ...
```

6. Check the status of the image staging. For example:

```
FGT81ETK19001274 # execute switch-controller get-upgrade-status
Device      Running-version           Status           Next-boot
=====
VDMOM : root
S224ENTF18001408 S224EN-v6.2.1-build176,190620 (GA)           (100/0/0)  S224EN-v6.2-
build176      (Staging)
S224ENTF18001432 S224EN-v6.2.1-build176,190620 (GA)           (100/0/0)  S224EN-v6.2-
build176      (Staging)
S108EP5918008265 S108EP-v6.2.1-build176,190620 (GA)           (18/0/0)   S108EP-v6.2-
build176      (Staging)
S108EF5918003577 S108EF-v6.2.1-build176,190620 (GA)           (25/0/0)   S108EF-v6.2-
build176      (Staging)
```

7. Verify that the image staging has completed. For example:

```
FGT81ETK19001274 # execute switch-controller get-upgrade-status
Device      Running-version           Status           Next-boot
=====
VDMOM : root
S224ENTF18001408 S224EN-v6.2.1-build176,190620 (GA)           (0/100/100) S224EN-v6.2-
build194      (Idle)
S224ENTF18001432 S224EN-v6.2.1-build176,190620 (GA)           (0/100/100) S224EN-v6.2-
build194      (Idle)
S108EP5918008265 S108EP-v6.2.1-build176,190620 (GA)           (0/100/100) S108EP-v6.2-
build194      (Idle)
S108EF5918003577 S108EF-v6.2.1-build176,190620 (GA)           (0/100/100) S108EF-v6.2-
build194      (Idle)
```

8. Reboot all switches (or reboot the switches by group). For example:

```
FGT81ETK19001274 # execute switch-controller switch-action restart delay all
Delayed restart operation is requested for FortiSwitch S224ENTF18001408 ...
```

```
Delayed restart operation is requested for FortiSwitch S224ENTF18001432 ...
Delayed restart operation is requested for FortiSwitch S108EP5918008265 ...
Delayed restart operation is requested for FortiSwitch S108EF5918003577 ...
```

9. Check the status of the switch reboot. For example:

```
FGT81ETK19001274 # execute switch-controller switch-action restart delay all
Delayed restart operation is requested for FortiSwitch S224ENTF18001408 ...
Delayed restart operation is requested for FortiSwitch S224ENTF18001432 ...
Delayed restart operation is requested for FortiSwitch S108EP5918008265 ...
Delayed restart operation is requested for FortiSwitch S108EF5918003577 ...
```

```
FGT81ETK19001274 # execute switch-controller get-upgrade-status
Device      Running-version                               Status      Next-boot
=====
VDMOM : root
S224ENTF18001408                               Prepping for delayed restart triggered ... please
wait for switch to reboot in a moment
S224ENTF18001432                               Prepping for delayed restart triggered ... please
wait for switch to reboot in a moment
S108EP5918008265                               Prepping for delayed restart triggered ... please
wait for switch to reboot in a moment
S108EF5918003577                               Prepping for delayed restart triggered ... please
wait for switch to reboot in a moment
```

```
FGT81ETK19001274 # execute switch-controller get-conn-status
Managed-devices in current vdom root:
```

```
STACK-NAME: FortiSwitch-Stack-flink
SWITCH-ID      VERSION      STATUS      FLAG      ADDRESS      JOIN-TIME      NAME
S108EF5918003577 v6.2.1 ()      Authorized/Down D  0.0.0.0      N/A            -
S108EP5918008265 v6.2.1 ()      Authorized/Down D  0.0.0.0      N/A            -
S224ENTF18001408 v6.2.1 ()      Authorized/Down D  0.0.0.0      N/A            -
S224ENTF18001432 v6.2.1 ()      Authorized/Down D  0.0.0.0      N/A            -
```

```
Flags: C=config sync, U=upgrading, S=staged, D=delayed reboot pending, E=configuration sync
error
Managed-Switches: 4 (UP: 0 DOWN: 4)
```

```
FGT81ETK19001274 #
```

10. Wait for a while before checking that all switches are online. For example:

```
FGT81ETK19001274 # execute switch-controller get-upgrade-status
Device      Running-version                               Status      Next-boot
=====
VDMOM : root
S224ENTF18001408 S224EN-v6.2.2-build194,191018 (GA)      (0/100/100) S224EN-v6.2-
build194      (Idle)
S224ENTF18001432 S224EN-v6.2.2-build194,191018 (GA)      (0/100/100) S224EN-v6.2-
build194      (Idle)
S108EP5918008265 S108EP-v6.2.2-build194,191018 (GA)      (0/100/100) S108EP-v6.2-
build194      (Idle)
```

Network topologies

S108EF5918003577 S108EF-v6.2.2-build194,191018 (GA) (0/100/100) S108EF-v6.2-build194 (Idle)

FGT81ETK19001274 # execute switch-controller get-conn-status
Managed-devices in current vdom root:

STACK-NAME: FortiSwitch-Stack-flink

SWITCH-ID	VERSION	STATUS	FLAG	ADDRESS	JOIN-TIME
S108EF5918003577 2019 -	v6.2.2 (194)	Authorized/Up	-	10.105.22.6	Thu Oct 24 13:22:27
S108EP5918008265 2019 -	v6.2.2 (194)	Authorized/Up	-	10.105.22.5	Thu Oct 24 13:22:41
S224ENTF18001408 2019 -	v6.2.2 (194)	Authorized/Up	-	10.105.22.2	Thu Oct 24 13:20:11
S224ENTF18001432 2019 -	v6.2.2 (194)	Authorized/Up	-	10.105.22.3	Thu Oct 24 13:19:58

Flags: C=config sync, U=upgrading, S=staged, D=delayed reboot pending, E=configuration sync error

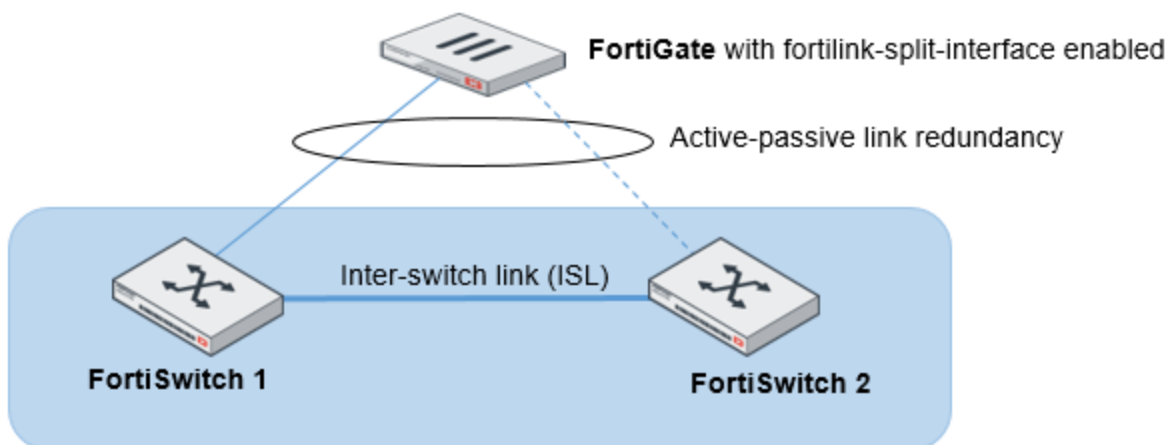
Managed-Switches: 4 (UP: 4 DOWN: 0)

FGT81ETK19001274 #

Transitioning from a FortiLink split interface to a FortiLink MCLAG

You can use the FortiLink split interface to connect the FortiLink aggregate interface from one FortiGate unit to two FortiSwitch units. When the FortiLink split interface is enabled, only one link remains active.

In this topology, the FortiLink split interface connects a FortiLink aggregate interface from one FortiGate unit to two FortiSwitch units. The aggregate interface of the FortiGate unit for this configuration contains at least one physical port connected to each FortiSwitch unit.



NOTE:

- Make sure that the split interface is enabled.
- This procedure also applies to a FortiGate unit in HA mode.
- More links can be added between the FortiGate unit and FortiSwitch unit.
- On the global switch level, `mclag-stp-aware` must be enabled, and STP must be enabled on all ICL trunks. They are both enabled by default.

NOTE: If you are going to use IGMP snooping with an MCLAG topology:

- On the global switch level, `mclag-igmp-aware` must be enabled. It is enabled by default.
- The `igmps-flood-traffic` and `igmps-flood-report` settings must be *disabled* on the ISL and FortiLink trunks; but the `igmps-flood-traffic` and `igmps-flood-report` settings must be *enabled* on ICL trunks. These settings are enabled by default.
- IGMP proxy must be enabled.

The following procedure uses zero-touch provisioning to change the configuration of the FortiSwitch units without losing their management from the FortiGate unit. The MCLAG-ICL can also be enabled directly using console cables or management ports.

1. Log into FortiSwitch 2 using the *Connect to CLI* button in the FortiGate GUI, use the `get switch lldp auto-isl-status` command to find out the name of the trunk connecting the peer switches, and change the ISL to an ICL. For example:

```
get switch lldp auto-isl-status

config switch trunk
  edit <trunk_name>
    set
      mclag-icl enable
  next
```


end

2. Log into FortiSwitch 1 using the *Connect to CLI* button in the FortiGate GUI, use the `get switch lldp auto-isl-status` command to find out the name of the trunk connecting the peer switches, and change the ISL to an ICL. For example:

```
get switch lldp auto-isl-status
```

```
config switch trunk
  edit <trunk_name>
    set mclag-icl enable
  next
end
```

3. Log into the FortiGate unit and disable the split interface. For example:

```
config system interface
  edit <aggregate_name>
    set fortilink-split-interface disable
  next
end
```

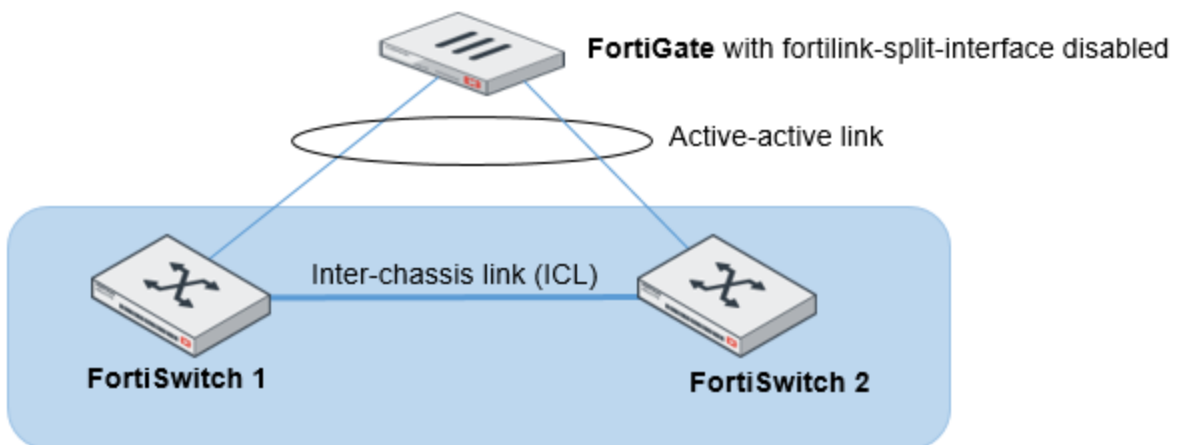
4. From the FortiGate unit, enable the LACP static mode:

```
config system interface
  edit <aggregate_name>
    set lacp-mode static
  next
end
```

NOTE: If you are using FortiOS 6.2 or later, use the `set lacp-mode active` command instead.

5. Check that the LAG is working correctly. For example:

```
diagnose netlink aggregate name <aggregate_name>
```



If you disable the MCLAG ICL (with the `set mclag-icl disable` command), you need to enable the fortilink-split-interface.

Optional setup tasks

This section describes the following tasks:

- [Configuring the FortiSwitch management port on page 66](#)
- [Migrating the configuration of standalone FortiSwitch units on page 67](#)
- [Converting to FortiSwitch standalone mode on page 67](#)
- [Changing the admin password on the FortiGate for all managed FortiSwitch units on page 68](#)
- [Enabling network-assisted device detection on page 68](#)
- [Using automatic network detection and configuration on page 68](#)
- [Limiting the number of parallel process for FortiSwitch configuration on page 69](#)
- [Using the FortiSwitch serial number for automatic name resolution on page 69](#)
- [Configuring access to management and internal interfaces on page 70](#)
- [Configuring SNMP on page 71](#)

Configuring the FortiSwitch management port

If the FortiSwitch model has a dedicated management port, you can configure remote management to the FortiSwitch. In FortiLink mode, the FortiGate is the default gateway, so you need to configure an explicit route for the FortiSwitch management port.

Using the Web administration GUI

1. Go to *Network > Static Routes > Create New > Route*.
2. Set *Destination* to *Subnet* and enter a subnetwork and mask.
3. Set *Device* to the management interface.
4. Add a *Gateway* IP address.

Using the FortiSwitch CLI

Enter the following commands:

```
config router static
  edit 1
    set device mgmt
    set gateway <router IP address>
    set dst <router subnet> <subnet mask>
  end
end
```

In the following example, the FortiSwitch management port is connected to a router with IP address 192.168.0.10:

```
config router static
  edit 1
    set device mgmt
```

```
set gateway 192.168.0.10
set dst 192.168.0.0 255.255.0.0
end
end
```

Migrating the configuration of standalone FortiSwitch units

When a configured standalone FortiSwitch unit is converted to FortiLink mode, the standalone configuration is lost. To save time, use the `fortilinkify.py` utility to migrate your standalone configuration from one or more FortiSwitch units to a combined FortiGate-compatible configuration.

To get the script and instructions, go to:

<https://fndn.fortinet.net/index.php?/tools/file/68-fortiswitch-configuration-migration-tool/>

Converting to FortiSwitch standalone mode

Use one of the following commands to convert a FortiSwitch from FortiLink mode to standalone mode so that it will no longer be managed by a FortiGate:

- `execute switch-controller factory-reset <switch-id>`—This command returns the FortiSwitch to the factory defaults and then reboots the FortiSwitch. If the FortiSwitch is configured for FortiLink auto-discovery, FortiGate can detect and automatically authorize the FortiSwitch. For example:`execute switch-controller factory-reset S1234567890`
- `execute switch-controller switch-action set-standalone <switch-id>`—This command returns the FortiSwitch to the factory defaults, reboots the FortiSwitch, and prevents the FortiGate from automatically detecting and authorizing the FortiSwitch. For example:`execute switch-controller set-standalone S1234567890`

You can disable FortiLink auto-discovery on multiple FortiSwitch units using the following commands:

```
config switch-controller global
  set disable-discovery <switch-id>
end
```

For example:

```
config switch-controller global
  set disable-discovery S1234567890
end
```

You can also add or remove entries from the list of FortiSwitch units that have FortiLink auto-discovery disabled using the following commands:

```
config switch-controller global
  append disable-discovery <switch-id>
  unselect disable-discovery <switch-id>
end
```

For example:

```
config switch-controller global
  append disable-discovery S012345678
```

```
unselect disable-discovery S1234567890
end
```

Changing the admin password on the FortiGate for all managed FortiSwitch units

By default, each FortiSwitch has an admin account without a password. To replace the admin passwords for all FortiSwitch units managed by a FortiGate, use the following commands from the FortiGate CLI:

```
config switch-controller switch-profile
  edit default
    set login-passwd-override {enable | disable}
    set login-passwd <password>
  next
end
```

If you had already applied a profile with the override enabled and the password set and then decide to remove the admin password, you need to apply a profile with the override enabled and no password set; otherwise, your previously set password will remain in the FortiSwitch. For example:

```
config switch-controller switch-profile
  edit default
    set login-passwd-override enable
    unset login-passwd
  next
end
```

Enabling network-assisted device detection

Network-assisted device detection allows the FortiGate unit to use the information about connected devices detected by the managed FortiSwitch unit.

To enable network-assisted device detection on a VDOM:

```
config switch-controller network-monitor-settings
  set network-monitoring enable
end
```

You can display a list of detected devices from the *Device Inventory* menu in the GUI. To list the detected devices in the CLI, enter the following command:

```
diagnose user device list
```

Using automatic network detection and configuration

There are three commands that let you use automatic network detection and configuration.

To specify which policies can override the defaults for a specific ISL, ICI, or FortiLink interface:

```
config switch-controller auto-config custom
```

```
edit <automatically configured FortiLink, ISL, or ICL interface name>
  config switch-binding
    edit "switch serial number"
      set policy "custom automatic-configuration policy"
    end
  end
```

To specify policies that are applied automatically for all ISL, ICL, and FortiLink interfaces:

```
config switch-controller auto-config default
  set fgt-policy <default FortiLink automatic-configuration policy>
  set isl-policy <default ISL automatic-configuration policy>
  set icl-policy <default ICL automatic-configuration policy>
end
```

NOTE: The ICL automatic-configuration policy requires FortiOS 6.2.0 or later.

To specify policy definitions that define the behavior on automatically configured interfaces:

```
config switch-controller auto-config policy
  edit <policy_name>
    set qos-policy <automatic-configuration QoS policy>
    set storm-control-policy <automatic-configuration storm-control policy>
    set poe-status {enable | disable}
    set igmp-flood-report {enable | disable}
    set igmp-flood-traffic {enable | disable}
  end
end
```

Limiting the number of parallel process for FortiSwitch configuration

Use the following CLI commands to reduce the number of parallel process that the switch controller uses for configuring FortiSwitch units:

```
config global
  config switch-controller system
    set parallel-process-override enable
    set parallel-process <1-300>
  end
end
```

Using the FortiSwitch serial number for automatic name resolution

By default, you can check that FortiSwitch unit is accessible from the FortiGate unit with the `execute ping <FortiSwitch_IP_address>` command. If you want to use the FortiSwitch serial number instead of the FortiSwitch IP address, use the following commands:

```
config switch-controller global
  set sn-dns-resolution enable
end
```

Then you can use the `execute ping <FortiSwitch_serial_number>.<domain_name>` command to check if the FortiSwitch unit is accessible from the FortiGate unit. For example:

```
FG100D3G15817028 (root) # execute ping S524DF4K15000024.fsw
PING S524DF4K15000024.fsw (123.456.7.8): 56 data bytes
64 bytes from 123.456.7.8: icmp_seq=0 ttl=64 time=0.0 ms
64 bytes from 123.456.7.8: icmp_seq=1 ttl=64 time=0.0 ms
64 bytes from 123.456.7.8: icmp_seq=2 ttl=64 time=0.0 ms
64 bytes from 123.456.7.8: icmp_seq=3 ttl=64 time=0.0 ms
64 bytes from 123.456.7.8: icmp_seq=4 ttl=64 time=0.0 ms
```

Optionally, you can omit the domain name (`.fsw`) from the command by setting the default DNS domain on the FortiGate unit.

```
config system dns
  set domain "fsw"
end
```

Now you can use the `execute ping <FortiSwitch_serial_number>` command to check if the FortiSwitch unit is accessible from the FortiGate unit. For example:

```
FG100D3G15817028 (root) # execute ping S524DF4K15000024
PING S524DF4K15000024.fsw (123.456.7.8): 56 data bytes
64 bytes from 123.456.7.8: icmp_seq=0 ttl=64 time=0.0 ms
64 bytes from 123.456.7.8: icmp_seq=1 ttl=64 time=0.0 ms
64 bytes from 123.456.7.8: icmp_seq=2 ttl=64 time=0.0 ms
64 bytes from 123.456.7.8: icmp_seq=3 ttl=64 time=0.0 ms
64 bytes from 123.456.7.8: icmp_seq=4 ttl=64 time=0.0 ms

--- S524DF4K15000024.fsw ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 0.0/0.0/0.0 ms
```

Configuring access to management and internal interfaces

The `set allowaccess` command configures access to all interfaces on a FortiSwitch unit. If you need to have different access to the FortiSwitch management interface and the FortiSwitch internal interface, you can set up a local-access security policy with the following commands:

```
config switch-controller security-policy local-access
  edit <policy_name>
    set mgmt-allowaccess {https | ping | ssh | snmp | http | telnet | radius-acct}
    set internal-allowaccess {https | ping | ssh | snmp | http | telnet | radius-acct}
  end
config switch-controller managed-switch
  edit <FortiSwitch_serial_number>
    set access-profile <name_of_policy>
  end
```

For example:

```
config switch-controller security-policy local-access
  edit policy1
    set mgmt-allowaccess https ping ssh radius-acct
    set internal-allowaccess https ssh snmp telnet
```

```
end
config switch-controller managed-switch
  edit S524DF4K15000024
    set access-profile policy1
  end
```

NOTE: After you upgrade to FortiOS 6.2, the allowaccess settings for the FortiSwitch mgmt and internal interfaces are overridden by the default local-access security policy.

Configuring SNMP

Simple Network Management Protocol (SNMP) enables you to monitor hardware on your network.

The managed FortiSwitch SNMP implementation is read-only. SNMP v1-compliant and v2c-compliant SNMP managers have read-only access to FortiSwitch system information through queries and can receive trap messages from the managed FortiSwitch unit.

To monitor FortiSwitch system information and receive FortiSwitch traps, you must first compile the Fortinet and FortiSwitch management information base (MIB) files. A MIB is a text file that describes a list of SNMP data objects that are used by the SNMP manager. These MIBs provide information that the SNMP manager needs to interpret the SNMP trap, event, and query messages sent by the FortiSwitch SNMP agent.

FortiSwitch core MIB files are available for download by going to *System > Config > SNMP > Settings* and selecting the *FortiSwitch MIB File* download link.

You configure SNMP on a global level so that all managed FortiSwitch units use the same settings. If you want one of the FortiSwitch units to use different settings from the global settings, configure SNMP locally.

Configuring SNMP globally

To configure SNMP globally, configure the following settings:

1. Configure the SNMP system information.
2. Configure the SNMP community.
3. Configure the SNMP trap threshold values.
4. Configure the SNMP user.

To configure the SNMP system information globally:

```
config switch-controller snmp-sysinfo
  set status enable
  set engine-id <local_SNMP_engine_ID (the maximum is 24 characters)>
  set description <system_description>
  set contact-info <contact_information>
  set location <FortiGate_location>
end
```

To configure the SNMP community globally:

```
config switch-controller snmp-community
  edit <SNMP_community_ID>
```

```
set status enable
set query-v1-status enable
set query-v1-port <0-65535; the default is 161>
set query-v2c-status enable
set query-v2c-port <0-65535; the default is 161>
set trap-v1-status enable
set trap-v1-lport <0-65535; the default is 162>
set trap-v1-rport <0-65535; the default is 162>
set trap-v2c-status enable
set trap-v2c-lport <0-65535; the default is 162>
set trap-v2c-rport <0-65535; the default is 162>
set events {cpu-high mem-low log-full intf-ip ent-conf-change}
config hosts
  edit <host_entry_ID>
    set ip <IPv4_address_of_the_SNMP_manager>
  end
end
```

To configure the SNMP trap threshold values globally:

```
config switch-controller snmp-trap-threshold
  set trap-high-cpu-threshold <percentage_value; the default is 80>
  set trap-low-memory-threshold <percentage_value; the default is 80>
  set trap-log-full-threshold <percentage_value; the default is 90>
end
```

To configure the SNMP user globally:

```
config switch-controller snmp-user
  edit <SNMP_user_name>
    set queries enable
    set query-port <0-65535; the default is 161>
    set security-level {auth-priv | auth-no-priv | no-auth-no-priv}
    set auth-proto {md5 | sha}
    set auth-pwd <password_for_authentication_protocol>
    set priv-proto {aes | des}
    set priv-pwd <password_for_encryption_protocol>
  end
```

Configuring SNMP locally

To configure SNMP for a specific FortiSwitch unit, configure the following settings:

1. Configure the SNMP system information.
2. Configure the SNMP community.
3. Configure the SNMP trap threshold values.
4. Configure the SNMP user.

To configure the SNMP system information locally:

```
config switch-controller managed-switch
  set override-snmp-sysinfo enable
  config snmp-sysinfo
    set status enable
```



```
    set engine-id <local_SNMP_engine_ID (the maximum is 24 characters)>
    set description <system_description>
    set contact-info <contact_information>
    set location <FortiGate_location>
end
end
```

To configure the SNMP community locally:

```
config switch-controller managed-switch
  set override-snmp-community enable
  config snmp-community
    edit <SNMP_community_ID>
      set status enable
      set query-v1-status enable
      set query-v1-port <0-65535; the default is 161>
      set query-v2c-status enable
      set query-v2c-port <0-65535; the default is 161>
      set trap-v1-status enable
      set trap-v1-lport <0-65535; the default is 162>
      set trap-v1-rport <0-65535; the default is 162>
      set trap-v2c-status enable
      set trap-v2c-lport <0-65535; the default is 162>
      set trap-v2c-rport <0-65535; the default is 162>
      set events {cpu-high mem-low log-full intf-ip ent-conf-change}
    config hosts
      edit <host_entry_ID>
        set ip <IPv4_address_of_the_SNMP_manager>
      end
    end
  end
```

To configure the SNMP trap threshold values locally:

```
config switch-controller managed-switch
  set override-snmp-trap-threshold enable
  config snmp-trap-threshold
    set trap-high-cpu-threshold <percentage_value; the default is 80>
    set trap-low-memory-threshold <percentage_value; the default is 80>
    set trap-log-full-threshold <percentage_value; the default is 90>
  end
end
```

To configure the SNMP user locally:

```
config switch-controller managed-switch
  set override-snmp-user enable
  config snmp-user
    edit <SNMP_user_name>
      set queries enable
      set query-port <0-65535; the default is 161>
      set security-level {auth-priv | auth-no-priv | no-auth-no-priv}
      set auth-proto {md5 | sha}
      set auth-pwd <password_for_authentication_protocol>
      set priv-proto {aes | des}
      set priv-pwd <password_for_encryption_protocol>
    end
```

end

FortiSwitch features configuration

This section describes how to configure global FortiSwitch settings using FortiGate CLI commands. These settings will apply to all of the managed FortiSwitch units. You can also override some of the settings on individual FortiSwitch units.

This chapter covers the following topics:

- [Configure VLANs on page 75](#)
- [Configure IGMP snooping settings on page 79](#)
- [Configure LLDP-MED on page 80](#)
- [Configure the MAC sync interval on page 83](#)
- [Configure STP settings on page 83](#)
- [Configure flow tracking and export on page 85](#)
- [Quarantines on page 86](#)

Configure VLANs

Use Virtual Local Area Networks (VLANs) to logically separate a LAN into smaller broadcast domains. VLANs allow you to define different policies for different types of users and to set finer control on the LAN traffic. (Traffic is only sent automatically within the VLAN. You must configure routing for traffic between VLANs.)

From the FortiGate unit, you can centrally configure and manage VLANs for the managed FortiSwitch units.

In FortiSwitchOS 3.3.0 and later releases, the FortiSwitch supports untagged and tagged frames in FortiLink mode. The switch supports up to 1,023 user-defined VLANs. You can assign a VLAN number (ranging from 1-4095) to each of the VLANs. For FortiSwitch units in FortiLink mode (FortiOS 6.2.0 and later), you can assign a name to each VLAN.

You can configure the default VLAN for each FortiSwitch port as well as a set of allowed VLANs for each FortiSwitch port.

Creating VLANs

Setting up a VLAN requires you to create the VLAN and assign FortiSwitch ports to the VLAN. You can do this with either the Web GUI or CLI.

Using the Web administration GUI

To create the VLAN:

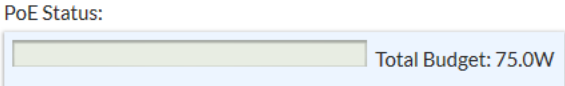
1. Go to *WiFi & Switch Controller > FortiSwitch VLANS*, select *Create New*, and change the following settings:

Interface Name	VLAN name
VLAN ID	Enter a number (1-4094)
Color	Choose a unique color for each VLAN, for ease of visual display.
IP/Network Mask	IP address and network mask for this VLAN.

2. Enable *DHCP Server* and set the IP range.
3. Set the *Admission Control* options as required.
4. Select *OK*.

To assign FortiSwitch ports to the VLAN:

1. Go to *WiFi & Switch Controller > FortiSwitch Ports*.
2. Click the desired port row.
3. Click the *Native VLAN* column in one of the selected entries to change the native VLAN.
4. Select a VLAN from the displayed list. The new value is assigned to the selected ports.
5. Click the + icon in the *Allowed VLANs* column to change the allowed VLANs.
6. Select one or more of the VLANs (or the value *all*) from the displayed list. The new value is assigned to the selected port.

Port	Description	Native VLAN	Allowed VLANs	Device Information	PoE	Bytes (Sent/Received)
My-Switch - FS108D3W16001177 (10)						
						
port1	vsw.port3				Powered	0B
port2	vsw.port3				Powered	0B
port3	vlan45				Powered	0B
port4	vlan45				Powered	0B
port5	vlan45				Powered	0B
port6	vsw.port3		vlan44		Powered	0B
port7	vsw.port3		vlan44		Powered	0B
port8	vsw.port3		vlan44		Powered	0B
port9	vsw.port3		vlan44			0B
port10	FGVM010000088418					33.27 MB

Using the FortiSwitch CLI

1. Create the marketing VLAN.

```
config system interface
  edit <vlan name>
    set vlanid <1-4094>
    set color <1-32>
    set interface <FortiLink-enabled interface>
  end
```

2. Set the VLAN's IP address.

```
config system interface
  edit <vlan name>
    set ip <IP address> <Network mask>
  end
```

3. Enable a DHCP Server.

```
config system dhcp server
  edit 1
    set default-gateway <IP address>
    set dns-service default
    set interface <vlan name>
    config ip-range
      set start-ip <IP address>
      set end-ip <IP address>
    end
    set netmask <Network mask>
  end
```

4. Assign ports to the VLAN.

```
config switch-controller managed-switch
  edit <Switch ID>
    config ports
      edit <port name>
        set vlan <vlan name>
        set allowed-vlans <vlan name>
        or
        set allowed-vlans-all enable
      next
    end
  end
```

Assign untagged VLANs to a managed FortiSwitch port:

```
config switch-controller managed-switch
  edit <managed-switch>
    config ports
      edit <port>
        set untagged-vlans <VLAN-name>
      next
    end
  next
end
```

Viewing FortiSwitch VLANs

The *WiFi & Switch Controller > FortiSwitch VLANs* page displays VLAN information for the managed switches.

Name	VLAN ID	IP/Netmask	Access	Ref.
vlan44	44	192.168.2.1 255.255.255.0	SNMP	0
vlan45	45	10.10.10.1 255.255.255.0		1
vsw.port3	1	172.20.20.10 255.255.255.0	HTTPS HTTP	10

Each entry in the VLAN list displays the following information:

- *Name*—name of the VLAN
- *VLAN ID*—the VLAN number
- *IP/Netmask*—address and mask of the subnetwork that corresponds to this VLAN
- *Access*—administrative access settings for the VLAN
- *Ref*—number of configuration objects referencing this VLAN

Enabling and disabling switch-controller access VLANs through the FortiGate unit

Access VLANs are VLANs that aggregate client traffic solely to the FortiGate unit. This prevents direct client-to-client traffic visibility at the layer-2 VLAN layer. Clients can only communicate with the FortiGate unit. After the client traffic reaches the FortiGate, the FortiGate unit can then determine whether to allow various levels of access to the client by shifting the client's network VLAN as appropriate.

NOTE: IPv6 is not supported between clients within a switch-controller access VLAN.

Use `enable` to allow traffic only to and from the FortiGate and to block FortiSwitch port-to-port traffic on the specified VLAN. Use `disable` to allow normal traffic on the specified VLAN.

```
config system interface
  edit <VLAN name>
    set switch-controller-access-vlan {enable | disable}
  next
end
```

NOTE: You must configure the proxy ARP with the `config system proxy-arp` CLI command to be able to use the access VLANs. For example:

```
config system proxy-arp
  edit 1
    set interface "V100"
    set ip 1.1.1.1
    set end-ip 1.1.1.200
  next
end
```

Changing the VLAN configuration mode

You can change which VLANs the `set allowed-vlans` command affects.

If you want the `set allowed-vlans` command to apply to all user-defined VLANs, use the following CLI commands:

```
config switch-controller global
    set vlan-all-mode defined
end
```

If you want the `set allowed-vlans` command to apply to all possible VLANs (1-4094), use the following CLI commands:

```
config switch-controller global
    set vlan-all-mode all
end
```

NOTE: You cannot use the `set vlan-all-mode all` command with the `set vlan-optimization enable` command.

Enabling FortiLink VLAN optimization

When inter-switch links (ISLs) are automatically formed on trunks, the switch controller allows VLANs 1-4093 on ISL ports. This configuration can increase data processing on the FortiSwitch unit. When VLAN optimization is enabled, the FortiSwitch unit allows only user-defined VLANs on the automatically generated trunks. By default, VLAN optimization is disabled.

To enable FortiLink VLAN optimization on FortiSwitch units from the FortiGate unit:

```
config switch-controller global
    set vlan-optimization enable
end
```

NOTE: You cannot use the `set vlan-all-mode all` command with the `set vlan-optimization enable` command.

Configure IGMP snooping settings

Use the following commands to configure the global IGMP snooping settings.

Aging time is the maximum number of seconds that the system will retain a multicast snooping entry. Enter an integer value from 15 to 3600. The default value is 300.

Flood-unknown-multicast controls whether the system will flood unknown multicast messages within the VLAN.

```
config switch-controller igmp-snooping
    set aging-time <15-3600>
    set flood-unknown-multicast {enable | disable}
end
```

Configure LLDP-MED

To configure LLDP profiles:

```

config switch-controller lldp-profile
  edit <profile_name>
    set med-tlvs (inventory-management | network-policy | power-management | location-
      identification)
    set 802.1-tlvs port-vlan-id
    set 802.3-tlvs {max-frame-size | power-negotiation}
    set auto-isl {enable | disable}
    set auto-isl-hello-timer <1-30>
    set auto-isl-port-group <0-9>
    set auto-isl-receive-timeout <3-90>
    config med-network-policy
      edit {guest-voice | guest-voice-signaling | softphone-voice | streaming-video | video-
        conferencing | video-signaling | voice | voice-signaling}
        set status {enable | disable}
        set vlan-intf <string>
        set priority <0-7>
        set dscp <0-63>
      next
    end
    config med-location-service
      edit {address-civic | coordinates | elin-number}
        set status {enable | disable}
        set sys-location-id <string>
      next
    end
    config-tlvs
      edit <TLV_name>
        set oui <hexadecimal_number>
        set subtype <0-255>
        set information-string <0-507>
      next
    end
  next
end

```

Variable	Description
<profile_name>	Enable or disable
med-tlvs (inventory-management network-policy power-management location-identification)	Select which LLDP-MED type-length-value descriptions (TLVs) to transmit: inventory-management TLVs, network-policy TLVs, power-management TLVs for PoE, and location-identification TLVs. You can select one or more option. Separate multiple options with a space.
802.1-tlvs port-vlan-id	Transmit the IEEE 802.1 port native-VLAN TLV.
802.3-tlvs {max-frame-size power-negotiation}	Select whether to transmit the IEEE 802.3 maximum frame size TLV, the power-negotiation TLV for PoE, or both. Separate multiple options with a space.

Variable	Description
auto-isl {enable disable}	Enable or disable the automatic inter-switch LAG.
auto-isl-hello-timer <1-30>	If you enabled auto-isl, you can set the number of seconds for the automatic inter-switch LAG hello timer. The default value is 3 seconds.
auto-isl-port-group <0-9>	If you enabled auto-isl, you can set the automatic inter-switch LAG port group identifier.
auto-isl-receive-timeout <3-90>	If you enabled auto-isl, you can set the number of seconds before the automatic inter-switch LAG times out if no response is received. The default value is 9 seconds.
config med-network-policy	
{guest-voice guest-voice-signaling softphone-voice streaming-video video-conferencing video-signaling voice voice-signaling}	Select which Media Endpoint Discovery (MED) network policy type-length-value (TLV) category to edit.
status {enable disable}	Enable or disable whether this TLV is transmitted.
vlan-intf <string>	If you enabled the status, you can enter the VLAN interface to advertise. The maximum length is 15 characters.
priority <0-7>	If you enabled the status, you can enter the advertised Layer-2 priority. Set to 7 for the highest priority.
dscp <0-63>	If you enabled the status, you can enter the advertised Differentiated Services Code Point (DSCP) value to indicate the level of service requested for the traffic.
config med-location-service	
{address-civic coordinates elin-number}	Select which Media Endpoint Discovery (MED) location type-length-value (TLV) category to edit.
status {enable disable}	Enable or disable whether this TLV is transmitted.
sys-location-id <string>	If you enabled the status, you can enter the location service identifier. The maximum length is 63 characters.
config-tlvs	
<TLV_name>	Enter the name of a custom TLV entry.
oui <hexadecimal_number>	Enter the organizationally unique identifier (OUI), a 3-byte hexadecimal number, for this TLV.
subtype <0-255>	Enter the organizationally defined subtype.
information-string <0-507>	Enter the organizationally defined information string in hexadecimal bytes.

To configure LLDP settings:

```
config switch-controller lldp-settings
  set status {enable | disable}
  set tx-hold <int>
```

```

set tx-interval <int>
set fast-start-interval <int>
set management-interface {internal | management}
end

```

Variable	Description
status	Enable or disable
tx-hold	Number of tx-intervals before the local LLDP data expires. Therefore, the packet TTL (in seconds) is tx-hold times tx-interval . The range for tx-hold is 1 to 16, and the default value is 4.
tx-interval	How often the FortiSwitch transmits the LLDP PDU. The range is 5 to 4095 seconds, and the default is 30 seconds.
fast-start-interval	How often the FortiSwitch transmits the first 4 LLDP packets when a link comes up. The range is 2 to 5 seconds, and the default is 2 seconds. Set this variable to zero to disable fast start.
management-interface	Primary management interface to be advertised in LLDP and CDP PDUs.

Create LLDP asset tags for each managed FortiSwitch

You can use the following commands to add an LLDP asset tag for a managed FortiSwitch:

```

config switch-controller managed-switch
  edit <fsw>
    set switch-device-tag <string>
  end

```

Add media endpoint discovery (MED) to an LLDP configuration

You can use the following commands to add media endpoint discovery (MED) features to an LLDP profile:

```

config switch-controller lldp-profile
  edit <lldp-profile>
    config med-network-policy
      edit guest-voice
        set status {disable | enable}
      next
      edit guest-voice-signaling
        set status {disable | enable}
      next
      edit guest-voice-signaling
        set status {disable | enable}
      next
      edit softphone-voice
        set status {disable | enable}
      next
      edit streaming-video
        set status {disable | enable}
      next
      edit video-conferencing
    end
  end

```

```
        set status {disable | enable}
    next
    edit video-signaling
        set status {disable | enable}
    next
    edit voice
        set status {disable | enable}
    next
    edit voice-signaling
        set status {disable | enable}
    end
config custom-tlvs
    edit <name>
        set oui <identifier>
        set subtype <subtype>
        set information-string <string>
    end
end
```

Display LLDP information

You can use the following commands to display LLDP information:

```
diagnose switch-controller switch-info lldp stats <switch> <port>
diagnose switch-controller switch-info lldp neighbors-summary <switch>
diagnose switch-controller switch-info lldp neighbors-detail <switch>
```

Configure the MAC sync interval

Use the following commands to configure the global MAC sync interval.

The MAC sync interval is the time interval between MAC synchronizations. The range is 30 to 600 seconds, and the default value is 60.

```
config switch-controller mac-sync-settings
    set mac-sync-interval <30-600>
end
```

Configure STP settings

NOTE: STP is not supported between a FortiGate unit and a FortiSwitch unit in FortiLink mode.

The managed FortiSwitch unit supports Spanning Tree Protocol (a link-management protocol that ensures a loop-free layer-2 network topology) as well as Multiple Spanning Tree Protocol (MSTP), which is defined in the IEEE 802.1Q standard.

MSTP supports multiple spanning tree instances, where each instance carries traffic for one or more VLANs (the mapping of VLANs to instances is configurable). MSTP is backward-compatible with STP and Rapid Spanning Tree

Protocol (RSTP). A layer-2 network can contain switches that are running MSTP, STP, or RSTP. MSTP is built on RSTP, so it provides fast recovery from network faults and fast convergence times.

To configure STP for all managed FortiSwitch units:

```
config switch-controller stp-settings
  set name <name>
  set revision <stp revision>
  set hello-time <hello time>
  set forward-time <forwarding delay>
  set max-age <maximum aging time>
  set max-hops <maximum number of hops>
end
```

To override the global STP settings for a specific FortiSwitch unit:

```
config switch-controller managed-switch
  edit <switch-id>
    config stp-settings
      set local-override enable
    end
end
```

To configure MSTP instances:

```
config switch-controller stp-instance
  edit <id>
    config vlan-range <list of VLAN names>
  end
config switch-controller managed-switch
  edit <FortiSwitch_serial_number>
    config stp-instance
      edit <id>
        set priority <0 | 4096 | 8192 | 12288 | 16384 | 20480 | 24576 | 28672 | 32768 |
          36864 | 40960 | 45056 | 49152 | 53248 | 57344 | 61440>
      next
    end
  next
end
```

For example:

```
config switch-controller stp-instance
  edit 1
    config vlan-range vlan1 vlan2 vlan3
  end
config switch-controller managed-switch
  edit S524DF4K15000024
    config stp-instance
      edit 1
        set priority 16384
      next
    end
  next
end
```

Configure flow tracking and export

You can sample IP packets on managed FortiSwitch units and then export the data in NetFlow format or Internet Protocol Flow Information Export (IPFIX) format. You can choose to sample on a single ingress or egress port, on all FortiSwitch units, or on all FortiSwitch ingress ports.

When a new FortiSwitch unit or trunk port is added, the flow-tracking configuration is updated automatically based on the specified sampling mode. When a FortiSwitch port becomes part of an ISL or ICL or is removed, the flow-tracking configuration is updated automatically based on the specified sampling mode.

The maximum number of concurrent flows is defined by the FortiSwitch model. When this limit is exceeded, the oldest flow expires and is exported.

To configure flow tracking on managed FortiSwitch units:

```
config switch-controller flow-tracking
  set sample-mode {local | perimeter | device-ingress}
  set sample-rate <0-99999>
  set format {netflow1 | netflow5 | netflow9 | ipfix}
  set collector-ip <collector IP address>
  set collector-port <0-65535; default is 0>
  set transport {udp | tcp | sctp}
  set level {vlan | ip | port | proto}
  set filter <string>
  set max-export-pkt-size <512-9216 bytes; default is 512>.
  set timeout-general <60-604800 seconds; default is 3600>
  set timeout-icmp <60-604800 seconds; default is 300>.
  set timeout-max <60-604800 seconds; default is 604800>
  set timeout-tcp <60-604800 seconds; default is 3600>
  set timeout-tcp-fin <60-604800 seconds; default is 300>
  set timeout-tcp-rst <60-604800 seconds; default is 120>
  set timeout-udp <60-604800 seconds; default is 300>
end
```

Configure the sampling mode

You can set the sampling mode to local, perimeter, or device-ingress.

- The local mode samples packets on a specific FortiSwitch port.
- The perimeter mode samples packets on all FortiSwitch ports that receive data traffic, except for ISL and ICL ports. For perimeter mode, you can also configure the sampling rate.
- The device-ingress mode samples packets on all FortiSwitch ports that receive data traffic for hop-by-hop tracking. For device-ingress mode, you can also configure the sampling rate.

Configure the sampling rate

For perimeter or device-ingress sampling, you can set the sampling rate, which samples 1 out of the specified number of packets. The default sampling rate is 1 out of 512 packets.

Configure the flow-tracking protocol

You can set the format of exported flow data as NetFlow version 1, NetFlow version 5, NetFlow version 9, or IPFIX sampling.

Configure collector IP address

The default is 0.0.0.0. Setting the value to "0.0.0.0" or "" disables this feature. The format is xxx.xxx.xxx.xxx.

Configure the transport protocol

You can set exported packets to use UDP, TCP, or SCTP for transport.

Configure the flow-tracking level

You can set the flow-tracking level to one of the following:

- `vlan`—The FortiSwitch unit collects source IP address, destination IP address, source port, destination port, protocol, Type of Service, and VLAN from the sample packet.
- `ip`—The FortiSwitch unit collects source IP address and destination IP address from the sample packet.
- `port`—The FortiSwitch unit collects source IP address, destination IP address, source port, destination port, and protocol from the sample packet.
- `proto`—The FortiSwitch unit collects source IP address, destination IP address, and protocol from the sample packet.

Configure the filter

Use the Berkeley Packet Filter to specify what packets to sample.

Configure the maximum exported packet size

You can set the maximum size of exported packets in the application level.

To remove flow reports from a managed FortiSwitch unit:

```
execute switch-controller switch-action flow-tracking {delete-flows-all | expire-flows-all}
    <FortiSwitch_serial_number>
```

Expired flows are exported.

To view flow statistics for a managed FortiSwitch unit:

```
diagnose switch-controller switch-info flow-tracking statistics <FortiSwitch_serial_number>
```

To view raw flow records for a managed FortiSwitch unit:

```
diagnose switch-controller switch-info flow-tracking flows-raw <FortiSwitch_serial_number>
```

To view flow record data for a managed FortiSwitch unit:

```
diagnose switch-controller switch-info flow-tracking flows {number_of_records | all} {IP_
    address | all} <FortiSwitch_serial_number> <FortiSwitch_port_name>
```

For example:

```
diagnose switch-controller switch-info flow-tracking flows 100 all S524DF4K15000024 port6
```

Quarantines

Administrators can use MAC addresses to quarantine hosts and users connected to a FortiSwitch unit. Quarantined MAC addresses are isolated from the rest of the network and LAN by using a separate VLAN.

Quarantining MAC addresses

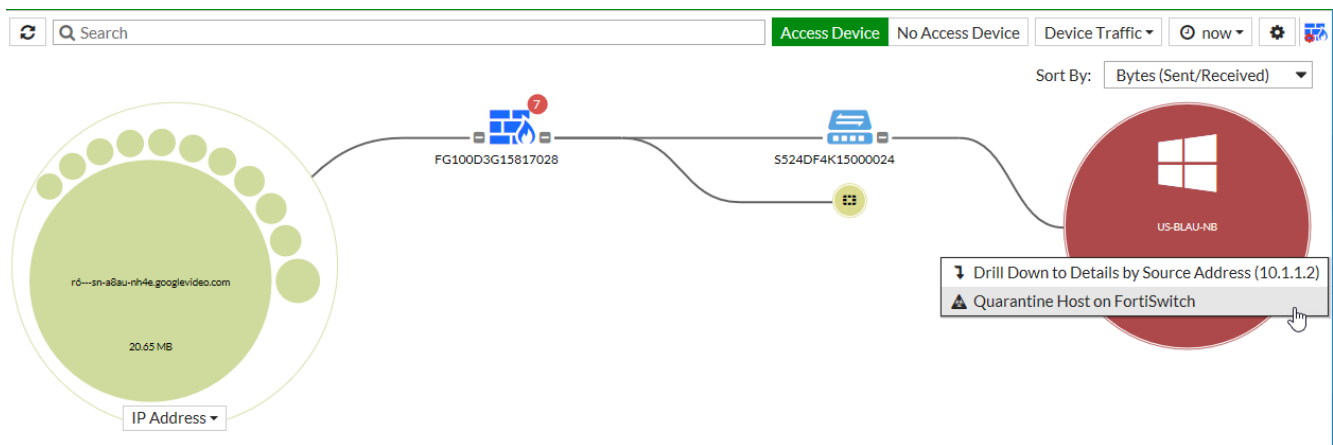
You can use the FortiGate GUI or CLI to quarantine a MAC address.

NOTE: If you have multiple FortiLink interfaces, only the first quarantine VLAN is created successfully (with an IP address of 10.254.254.254). Additional quarantine VLANs will have an empty IP address.

Using the FortiGate GUI

In the FortiGate GUI, the quarantine feature is automatically enabled when you quarantine a host.

- Select the host to quarantine.
 - Go to *Security Fabric > Physical Topology*, right-click on a host, and select *Quarantine Host on FortiSwitch*.
 - Go to *Security Fabric > Logical Topology*, right-click on a host, and select *Quarantine Host on FortiSwitch*.
 - Go to *FortiView > Sources*, right-click on an entry in the Source column, and select *Quarantine Host on FortiSwitch*.
- Select **Accept** to confirm that you want to quarantine the host.



Using the FortiGate CLI

NOTE: Previously, this feature used the `config switch-controller quarantine` CLI command.

By default, the quarantine feature is enabled. When you upgrade a FortiGate unit from an older to a newer firmware version, the FortiGate unit uses the quarantine feature status from the older configuration. If the quarantine feature was disabled in the older configuration, it will be disabled after the upgrade.

You can add MAC addresses to be quarantined even when the quarantine feature is disabled. The MAC addresses are only quarantined when the quarantine feature is enabled.

The table size limit for the quarantine entry is 512. There is no limit for how many MAC addresses can be quarantined per quarantine entry.

Optionally, you can configure a traffic policy for quarantined devices to control how much bandwidth and burst they use and which class of service (CoS) queue they are assigned to. Without a traffic policy, you cannot control how much network resources quarantined devices use.

To set up a quarantine:

```

config user quarantine
  set quarantine enable
  set traffic-policy <traffic_policy_name>
  config targets
    edit <quarantine_entry_name>
      set description <string>
      config macs
        edit <MAC_address_1>
          next
        edit <MAC_address_2>
          next
        edit <MAC_address_3>
          next
      end
    end
  end
end

```

Option	Description
traffic-policy <traffic_policy_name>	Optional. A name for the traffic policy that controls quarantined devices. If you do add a traffic policy, you need to configure it with the <code>config switch-controller traffic-policy</code> command.
quarantine_entry_name	A name for this quarantine entry.
string	Optional. A description of the MAC addresses being quarantined.
MAC_address_1, MAC_address_2, MAC_address_3	A layer-2 MAC address in the following format: 12:34:56:aa:bb:cc

For example:

```

config user quarantine
  set quarantine enable
  set traffic-policy qtrafficp
  config targets
    edit quarantinel
      config macs
        set description "infected by virus"
        edit 00:00:00:aa:bb:cc
          next
        edit 00:11:22:33:44:55
          next
        edit 00:01:02:03:04:05
          next
      end
    end
  end
end

```

To configure a traffic policy for quarantined devices:

```

config switch-controller traffic-policy
  edit <traffic_policy_name>
    set description <string>
    set policer-status enable
  end
end

```



```

set guaranteed-bandwidth <0-524287000>
set guaranteed-burst <0-4294967295>
set maximum-burst <0-4294967295>
set cos-queue <0-7>
end

```

Option	Description
traffic-policy <traffic_policy_name>	Enter a name for the traffic policy that controls quarantined devices.
description <string>	Enter an optional description of the traffic policy.
policer-status enable	Enable the policer configuration to control quarantined devices. It is enabled by default.
guaranteed-bandwidth <0-524287000>	Enter the guaranteed bandwidth in kbps. The maximum value is 524287000. The default value is 0.
guaranteed-burst <0-4294967295>	Enter the guaranteed burst size in bytes. The maximum value is 4294967295. The default value is 0.
maximum-burst <0-4294967295>	The maximum burst size is in bytes. The maximum value is 4294967295. The default value is 0.
set cos-queue <0-7>	Set the class of service for the VLAN traffic. Use the <code>unset cos-queue</code> command to disable this setting.

For example:

```

config switch-controller traffic-policy
edit qtrafficp
set description "quarantined traffic policy"
set policer-status enable
set guaranteed-bandwidth 10000
set guaranteed-burst 10000
set maximum-burst 10000
unset cos-queue
end

```

Using quarantine with DHCP

When a device using DHCP is quarantined, the device becomes inaccessible until the DHCP is renewed. To avoid this problem, enable the `bounce-quarantined-link` option, which shuts down the switch port where the quarantined device was last seen and then brings it back up again. Bouncing the port when the device is quarantined and when the device is released from quarantine causes the DHCP to be renewed so that the device is connected to the correct network. By default, the `bounce-quarantined-link` option is disabled.

To bounce the switch port where a quarantined device was last seen:

```

config switch-controller global
set bounce-quarantined-link {enable | disable}
end

```

Using quarantine with 802.1x MAC-based authentication

After a device is authorized with IEEE 802.1x MAC-based authentication, you can quarantine that device. If the device was quarantined before 802.1x MAC-based authentication was enabled, the device's traffic remains in the quarantine VLAN 4093 after 802.1x MAC-based authentication is enabled.

To use quarantines with IEEE 802.1x MAC-based authentication:

1. By default, detecting the quarantine VLAN is enabled on a global level on the managed FortiSwitch unit. You can verify that quarantine-vlan is enabled with the following commands:

```
S448DF3X16000118 # config switch global
S448DF3X16000118 (global) # config port-security
S448DF3X16000118 (port-security) # get
link-down-auth : set-unauth
mab-reauth : disable
quarantine-vlan : enable
reauth-period : 60
max-reauth-attempt : 0
```

2. By default, 802.1x MAC-based authentication and quarantine VLAN detection are enabled on a port level on the managed FortiSwitch unit. You can verify the settings for the port-security-mode and quarantine-vlan. For example:

```
S448DF3X16000118 (port17) # show switch interface port17
config switch interface
  edit "port17"
    set allowed-vlans 4093
    set untagged-vlans 4093
    set security-groups "group1"
    set snmp-index 17
    config port-security
      set auth-fail-vlan disable
      set eap-passthru enable
      set framevid-apply enable
      set guest-auth-delay 30
      set guest-vlan disable
      set mac-auth-bypass enable
      set open-auth disable
      set port-security-mode 802.1X-mac-based
      set quarantine-vlan enable
      set radius-timeout-overwrite disable
      set auth-fail-vlanid 200
      set guest-vlanid 100
    end
  next
end
```

3. On the FortiGate unit, quarantine a MAC address. For example:

```
config user quarantine
  edit "quarantine1"
    config macs
      edit 00:05:65:ad:15:03
```

```

        next
    end
    next
end

```

- The FortiGate unit pushes the MAC-VLAN binding to the managed FortiSwitch unit. You can verify that the managed FortiSwitch unit received the MAC-VLAN binding with the following command:

```

S448DF3X16000118 # show switch vlan 4093
config switch vlan
  edit 4093
    set description "qtn.FLNK10"
    set dhcp-snooping enable
    set access-vlan enable
    config member-by-mac
      edit 1
        set mac 00:05:65:ad:15:03
      next
    end
  next
end

```

- The 802.1x session shows that the MAC address is quarantined in VLAN 4093. You can verify that the managed FortiSwitch port has the quarantined MAC address. For example:

```

S448DF3X16000118 # diagnose switch 8 status port17

port17: Mode: mac-based (mac-by-pass enable)
Link: Link up
Port State: authorized: ( )
EAP pass-through mode : Enable
Quarantine VLAN (4093) detection : Enable
Native Vlan : 1
Allowed Vlan list: 1,4093
Untagged Vlan list: 1,4093
Guest VLAN :
Auth-Fail Vlan :

Switch sessions 3/480, Local port sessions:1/20
Client MAC Type Vlan Dynamic-Vlan
Quarantined
00:05:65:ad:15:03 802.1x 1 4093

Sessions info:
00:50:56:ad:51:81 Type=802.1x,PEAP,state=AUTHENTICATED,etime=0,eap_cnt=41
  params:reAuth=1800

```

- The MAC address table also shows the MAC address in VLAN 4093. You can verify the entries in the MAC address table with the following commands:

```

S448DF3X16000118 # diagnose switch vlan assignment mac list
00:05:65:ad:15:03 VLAN: 4093 Installed: yes
Source: 802.1X-MAC-Radius
Description: port17

S448DF3X16000118 # diagnose switch mac list | grep "VLAN: 4093"

```

MAC: 00:05:65:ad:15:03 VLAN: 4093 Port: port17 (port-id 17)

Viewing quarantine entries

Quarantine entries are created on the FortiGate unit that is managing the FortiSwitch unit.

Using the FortiGate GUI

1. Go to *Monitor > Quarantine Monitor*.
2. Click *Quarantined on FortiSwitch*. The Quarantined on FortiSwitch button is only available if a device is detected behind the FortiSwitch unit, which requires Device Detection to be enabled.

Type	Details	Source	Expires	Description
MAC address	18:dbf2:32:52:e7 (US-BLAU-NB)	Administrative	Never	Hostname: US-BLAU-NB, Use...

Using the FortiGate CLI

Use the following command to view the quarantine list of MAC addresses:

```
show user quarantine
```

For example:

```
show user quarantine

config user quarantine
  set quarantine enable
  config targets
    edit quarantine1
      config macs
        set description "infected by virus"
        edit 00:00:00:aa:bb:cc
        next
        edit 00:11:22:33:44:55
        next
        edit 00:01:02:03:04:05
        next
      end
    end
  end
```

When the quarantine feature is enabled on the FortiGate unit, it creates a quarantine VLAN (qtn.<FortiLink_port_name>) and a quarantine DHCP server (with the quarantine VLAN as default gateway) on the virtual domain. The quarantine VLAN is applied to the allowed and untagged VLANs on all connected FortiSwitch ports.

Use the following command to view the quarantine VLAN:

```
show system interface qtn.<FortiLink_port_name>
```

For example:

```
show system interface qtn.port7

config system interface
  edit "qtn.port7"
    set vdom "vdom1"
    set ip 10.254.254.254 255.255.255.0
    set description "Quarantine VLAN"
    set security-mode captive-portal
    set replacemsg-override-group "auth-intf-qtn.port7"
    set device-identification enable
    set device-identification-active-scan enable
    set snmp-index 34
    set switch-controller-access-vlan enable
    set color 6
    set interface "port7"
    set vlanid 4093
  next
end
```

Use the following commands to view the quarantine DHCP server:

```
show system dhcp server
config system dhcp server
  edit 2
    set dns-service default
    set default-gateway 10.254.254.254
    set netmask 255.255.255.0
    set interface "qtn.port7"
    config ip-range
      edit 1
        set start-ip 10.254.254.192
        set end-ip 10.254.254.253
      next
    end
    set timezone-option default
  next
end
```

Use the following command to view how the quarantine VLAN is applied to the allowed and untagged VLANs on all connected FortiSwitch ports:

```
show switch-controller managed-switch
```

For example:

```
show switch-controller managed-switch

config switch-controller managed-switch
  edit "FS1D483Z15000036"
    set fsw-wan1-peer "port7"
    set fsw-wan1-admin enable
    set version 1
    set dynamic-capability 503
    config ports
      edit "port1"
```

```

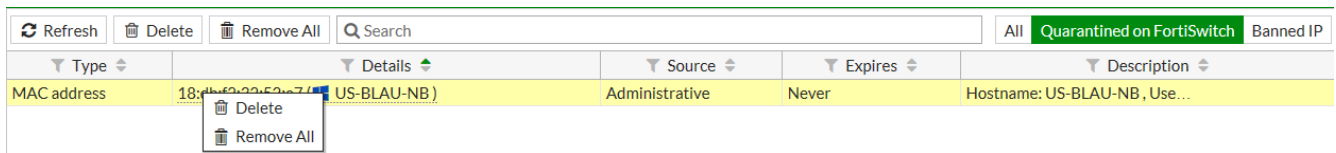
        set vlan "vsw.port7"
        set allowed-vlans "qtn.port7"
        set untagged-vlans "qtn.port7"
    next
edit "port2"
    set vlan "vsw.port7"
    set allowed-vlans "qtn.port7"
    set untagged-vlans "qtn.port7"
next
edit "port3"
    set vlan "vsw.port7"
    set allowed-vlans "qtn.port7"
    set untagged-vlans "qtn.port7"
next
...
end
end

```

Releasing MAC addresses from quarantine

Using the FortiGate GUI

1. Go to *Monitor > Quarantine Monitor*.
2. Click *Quarantined on FortiSwitch*.
3. Right-click on one of the entries and select *Delete* or *Remove All*.
4. Click *OK* to confirm your choice.



Using the FortiGate CLI

To release MAC addresses from quarantine, you can delete a single MAC address or delete a quarantine entry, which will delete all of the MAC addresses listed in the entry. You can also disable the quarantine feature, which releases all quarantined MAC addresses from quarantine.

To delete a single quarantined MAC address:

```

config user quarantine
  config targets
    edit <quarantine_entry_name>
      config macs
        delete <MAC_address_1>
      end
    end
  end
end
end

```

To delete all MAC addresses in a quarantine entry:

```
config user quarantine
  config targets
    delete <quarantine_entry_name>
  end
end
```

To disable the quarantine feature:

```
config user quarantine
  set quarantine disable
end
```

FortiSwitch port features

You can configure the FortiSwitch port feature settings from the FortiGate using the FortiSwitch CLI or web administration GUI.

FortiSwitch ports display

The *WiFi & Switch Controller > FortiSwitch Ports* page displays port information about each of the managed switches.

The following figure shows the display for a FortiSwitch 524D-FPOE:

Port	Trunk	Enabled Features	Native VLAN	Allowed VLANs	PoE	Device Information	DHCP Snooping	Transceiver
FS108D3W14000369 - FS-108D-POE 10								
S524DF4K15000024 30								
port1		Edge Port IGMP Snooping Spanning Tree Protocol	vsw.flink-lag	qtn.flink-lag	Powered		Untrusted	
port2		Edge Port IGMP Snooping Spanning Tree Protocol	vsw.flink-lag	qtn.flink-lag	Powered		Untrusted	
port3		Edge Port IGMP Snooping Spanning Tree Protocol	vsw.flink-lag	qtn.flink-lag	Powered		Untrusted	

Select *Faceplates* to get the following information:

- active ports (green)
- PoE-enabled ports (blue rectangle)
- FortiLink port (link icon)

If you device has PoE, the Faceplates page displays the total power budget and the actual power currently allocated.

The allocated power displays a blue bar for the used power (currently being consumed) and a green bar for the reserved power (power available for additional devices on the POE ports).

Each entry in the port list displays the following information:

- Port status (red for down, green for up)
- Port name
- Enabled features
- Native VLAN
- Allowed VLANs
- PoE status
- Device information
- DHCP snooping status
- Transceiver information

Configuring ports using the GUI

You can use the *WiFi & Switch Controller > FortiSwitch Ports* page to do the following with FortiSwitch switch ports:

- Set the native VLAN and add more VLANs
- Edit the description of the port
- Enable or disable the port
- Enable or disable PoE for the port
- Enable or disable DHCP blocking (if supported by the port)
- Enable or disable IGMP snooping (if supported by the port)
- Enable or disable whether a port is an edge port
- Enable or disable STP (if supported by the port)
- Enable or disable loop guard (if supported by the port)
- Enable or disable STP BPDU guard (if supported by the port)
- Enable or disable STP root guard (if supported by the port)

Resetting PoE-enabled ports

If you need to reset PoE-enabled ports, go to *WiFi & Switch Control > FortiSwitch Ports*, right-click on one or more PoE-enabled ports and select *Reset PoE* from the context menu.

You can also go to *WiFi & Switch Control > Managed FortiSwitch* and click on a port icon for the FortiSwitch of interest. In the FortiSwitch Ports page, right-click on one or more PoE-enabled ports and select *Reset PoE* from the context menu.

Configuring ports using the FortiGate CLI

You can configure the following FortiSwitch port settings using the FortiGate CLI:

- [Configuring port speed and status on page 98](#)
- [Configure a VLAN on the port \(see \[Configure VLANs\]\(#\)\)](#)
- [Sharing FortiSwitch ports between VDOMs on page 98](#)
- [Dynamic MAC address learning on page 101](#)
- [Configuring the DHCP trust setting on page 104](#)
- [Configuring PoE on page 104](#)
- [Configuring edge ports on page 105](#)
- [Configuring STP on page 106](#)
- [Configuring STP root guard on page 108](#)
- [Configuring STP BPDU guard on page 108](#)
- [Configuring loop guard on page 110](#)
- [Configuring LLDP settings on page 110](#)
- [Configuring IGMP snooping settings on page 111](#)
- [Configuring sFlow on page 111](#)
- [Configuring dynamic ARP inspection \(DAI\) on page 112](#)

- [Configuring FortiSwitch port mirroring on page 113](#)
- [Configuring FortiSwitch split ports \(phy-mode\) in FortiLink mode on page 115](#)

Configuring port speed and status

Use the following commands to set port speed and other base port settings:

```
config switch-controller managed-switch
  edit <FortiSwitch_serial_number>
    config ports
      edit <port_name>
        set description <text>
        set speed <speed>
        set status {down | up}
      end
    end
  end
```

For example:

```
config switch-controller managed-switch
  edit S524DF4K15000024
    config ports
      edit port1
        set description "First port"
        set speed auto
        set status up
      end
    end
  end
```

Sharing FortiSwitch ports between VDOMs

Virtual domains (VDOMs) are a method of dividing a FortiGate unit into two or more virtual units that function as multiple independent units. VDOMs provide separate security domains that allow separate zones, user authentication, security policies, routing, and VPN configurations.

FortiSwitch ports can now be shared between VDOMs.

Starting in FortiOS 6.2.0, the following features are supported on FortiSwitch ports shared between VDOMs:

- POE pre-standard detection (on a per-port basis if the FortiSwitch model supports this feature)
- Learning limit for dynamic MAC addresses on ports, trunks, and VLANs (if the FortiSwitch unit supports this feature)
- QoS egress CoS queue policy (if the FortiSwitch unit supports this feature)
- Port security policy

The following example shows how to share FortiSwitch ports between VDOMs:

1. In the tenant VDOM named `bbb`, create a VLAN interface using the following CLI commands (not supported in the GUI):

```
FG5H0E3917900081 (bbb) #
  config system interface
    edit "bbb-vlan99"
      set vdom "bbb"
```

```

        set allowaccess ping
        set device-identification enable
        set role lan
        set snmp-index 58
        set switch-controller-igmp-snooping enable
        set switch-controller-dhcp-snooping enable
        set interface "flink-lag" // this is the FortiLink interface in the root VDOM
        set vlanid 99
    next
end

config switch-controller global
    set default-virtual-switch-vlan "bbb-vlan99"
end

```

2. Go back to the root VDOM. Pick a switch port to share between VDOMs, port10 in this case.

```

FG5H0E3917900081 (vdom) # edit root
current vf=root:0
FG5H0E3917900081 (root) # config switch-controller managed-switch
FG5H0E3917900081 (managed-switch) # edit S548DF4K15000276
FG5H0E3917900081 (S548DF4K15000276) # config ports
FG5H0E3917900081 (ports) # edit port10
FG5H0E3917900081 (port10) # set export-to bbb

```

If you want to use the virtual-pool feature instead:

```

FG5H0E3917900081 (root) # config switch-controller virtual-port-pool
    edit "bbb-pool"
        set description "bbb-vlan-pool"
    end

FG5H0E3917900081 (root) # config switch-controller managed-switch
FG5H0E3917900081 (managed-switch) # edit S548DF4K15000276
FG5H0E3917900081 (S548DF4K15000276) # config port
FG5H0E3917900081 (ports) # edit port11
FG5H0E3917900081 (port11) # set export-to-pool bbb-pool

```

3. Go back to the bbb VDOM to claim port11 because it is in the virtual pool but not directly exported to the VDOM yet. (The administrator might want to pre-assign some ports in the tenant VDOM and let the tenant VDOM administrator claim them before they are used.)

```

FG5H0E3917900081 (bbb) # execute switch-controller virtual-port-pool request
    S548DF4K15000276 port11
FG5H0E3917900081 (bbb) # config switch-controller managed-switch // The switch port is now
    in the bbb VDOM even though there is no FortiLink interface in the bbb VDOM.
FG5H0E3917900081 (managed-switch) # show
config switch-controller managed-switch
    edit "S548DF4K15000276"
        set poe-detection-type 1
        set type virtual
        set owner-vdom "root"
    config ports
        edit "port10"
            set poe-capable 1
            set vlan "bbb-vlan99"

```

```
        next
        edit "port11"
            set poe-capable 1
            set vlan "bbb-vlan99"
        next
    end
next
end
```

4. Check your configuration on the root VDOM:

```
FG5H0E3917900081 (port10) # show
config ports
    edit "port10"
        set poe-capable 1
        set export-to "bbb"
    next
end
```

```
FG5H0E3917900081 (port11) # show
config ports
    edit "port11"
        set poe-capable 1
        set export-to-pool "bbb-pool"
        set export-to "bbb"
    next
end
```

5. Check your configuration on the tenant VDOM:

```
FG5H0E3917900081 (ports) # show
config ports
    edit "port10"
        set poe-capable 1
        set vlan "bbb-vlan99"
    next
    edit "port11"
        set poe-capable 1
        set vlan "bbb-vlan99"
    next
end
```

You can create your own export tags using the following CLI commands:

```
config switch-controller switch-interface-tag
    edit <tag_name>
end
```

Use the following CLI command to list the contents of a specific VPP:

```
execute switch-controller virtual-port-pool show-by-pool <VPP_name>
```

Use the following CLI command to list all VPPs and their contents:

```
execute switch-controller virtual-port-pool show
```

NOTE: Shared ports do not support the following features:

- LLDP
- STP
- BPDU guard
- Root guard
- DHCP snooping
- IGMP snooping
- MCLAG
- Quarantines

Dynamic MAC address learning

You can enable or disable dynamic MAC address learning on a port or VLAN. The existing dynamic MAC entries are flushed when you change this setting. If you disable MAC address learning, you can set the behavior for an incoming packet with an unknown MAC address (to drop or forward the packet).

Limiting the number of learned MAC addresses on a FortiSwitch interface

You can limit the number of MAC addresses learned on a FortiSwitch interface (port or VLAN). The limit ranges from 1 to 128. If the limit is set to the default value zero, there is no learning limit.

NOTE: Static MAC addresses are not counted in the limit. The limit refers only to learned MAC addresses.

Use the following CLI commands to limit MAC address learning on a VLAN:

```
config switch vlan
  edit <integer>
    set switch-controller-learning-limit <limit>
  end
end
```

For example:

```
config switch vlan
  edit 100
    set switch-controller-learning-limit 20
  end
end
```

Use the following CLI commands to limit MAC address learning on a port:

```
config switch-controller managed-switch
  edit <FortiSwitch_serial_number>
    config ports
      edit <port_name>
        set learning-limit <limit>
      next
    end
  end
end
```

For example:

```
config switch-controller managed-switch
  edit S524DF4K15000024
```

```
config ports
  edit port3
    set learning-limit 50
  next
end
end
end
```

Controlling how long learned MAC addresses are saved

You can change how long learned MAC addresses are stored. By default, each learned MAC address is aged out after 300 seconds. After this amount of time, the inactive MAC address is deleted from the FortiSwitch hardware. The value ranges from 10 to 1000,000 seconds. Set the value to 0 to disable MAC address aging.

```
config switch-controller global
  set mac-aging-interval <10 to 1000000>
end
```

For example:

```
config switch-controller global
  set mac-aging-interval 500
end
```

If the `mac-aging-interval` is disabled by being set to 0, you can still control when inactive MAC addresses are removed from the FortiSwitch hardware. By default, inactive MAC addresses are removed after 24 hours. The value ranges from 0 to 168 hours. Set the value to 0 to use the `mac-aging-interval` setting to control when inactive MAC addresses are deleted.

```
config switch-controller global
  set mac-retention-period <0 to 168>
end
```

For example:

```
config switch-controller global
  set mac-retention-period 36
end
```

Logging violations of the MAC address learning limit

If you want to see the first MAC address that exceeded the learning limit for an interface or VLAN, you can enable the learning-limit violation log for a managed FortiSwitch unit. Only one violation is recorded per interface or VLAN.

By default, logging is disabled. The most recent violation that occurred on each interface or VLAN is recorded in the system log. After that, no more violations are logged until the log is reset for the triggered interface or VLAN. Only the most recent 128 violations are displayed in the console.

Use the following commands to control the learning-limit violation log and to control how long learned MAC addresses are saved:

```
config switch-controller global
  set mac-violation-timer <0-1500>
  set log-mac-limit-violations {enable | disable}
end
```

For example:

```
config switch-controller global
```

```
set mac-violation-timer 1000
set log-mac-limit-violations enable
end
```

To view the content of the learning-limit violation log for a managed FortiSwitch unit, use one of the following commands:

- `diagnose switch-controller switch-info mac-limit-violations all <FortiSwitch_serial_number>`
- `diagnose switch-controller switch-info mac-limit-violations interface <FortiSwitch_serial_number> <port_name>`
- `diagnose switch-controller switch-info mac-limit-violations vlan <FortiSwitch_serial_number> <VLAN_ID>`

For example, to set the learning-limit violation log for VLAN 5 on a managed FortiSwitch unit:

```
diagnose switch-controller switch-info mac-limit-violations vlan S124DP3XS12345678 5
```

To reset the learning-limit violation log for a managed FortiSwitch unit, use one of the following commands:

- `execute switch-controller mac-limit-violation reset all <FortiSwitch_serial_number>`
- `execute switch-controller mac-limit-violation reset vlan <FortiSwitch_serial_number> <VLAN_ID>`
- `execute switch-controller mac-limit-violation reset interface <FortiSwitch_serial_number> <port_name>`

For example, to clear the learning-limit violation log for port 5 of a managed FortiSwitch unit:

```
execute switch-controller mac-limit-violation reset interface S124DP3XS12345678 port5
```

Persistent (sticky) MAC addresses

You can make dynamically learned MAC addresses persistent when the status of a FortiSwitch port changes (goes down or up). By default, MAC addresses are not persistent.

Use the following commands to configure the persistence of MAC addresses on an interface:

```
config switch-controller managed-switch
edit <FortiSwitch_serial_number>
config ports
edit <port_name>
set sticky-mac {enable | disable}
next
end
```

You can also save persistent MAC addresses to the FortiSwitch configuration file so that they are automatically loaded when the FortiSwitch unit is rebooted. By default, persistent entries are lost when a FortiSwitch unit is rebooted. Use the following commands to save persistent MAC addresses for a specific interface or all interfaces:

```
execute switch-controller switch-action sticky-mac save interface <FortiSwitch_serial_number>
<port_name>
execute switch-controller switch-action sticky-mac save all <FortiSwitch_serial_number>
```

Use one of the following commands to delete the persistent MAC addresses instead of saving them in the FortiSwitch configuration file:

```
execute switch-controller switch-action delete sticky-mac delete-unsaved all <FortiSwitch_serial_number>
```

```
execute switch-controller switch-action delete sticky-mac delete-unsaved interface
  <FortiSwitch_serial_number> <port_name>
```

Logging changes to MAC addresses

Use the following commands to create syslog entries for when MAC addresses are learned, aged out, and removed:

```
config switch-controller global
  set mac-event-logging enable
end
```

Configuring the DHCP trust setting

The DHCP blocking feature monitors the DHCP traffic from untrusted sources (for example, typically host ports and unknown DHCP servers) that might initiate traffic attacks or other hostile actions. To prevent this, DHCP blocking filters messages on untrusted ports.

Set the port as a trusted or untrusted DHCP-snooping interface:

```
config switch-controller managed-switch
  edit <FortiSwitch_serial_number>
    config ports
      edit <port_name>
        set dhcp-snooping {trusted | untrusted}
      end
    end
end
```

For example:

```
config switch-controller managed-switch
  edit S524DF4K15000024
    config ports
      edit port1
        set dhcp-snooping trusted
      end
    end
end
```

Configuring PoE

The following PoE CLI commands are available starting in FortiSwitchOS 3.3.0.

Enable PoE on the port

```
config switch-controller managed-switch
  edit <FortiSwitch_serial_number>
    config ports
      edit <port_name>
        set poe-status {enable | disable}
      end
    end
end
```

For example:

```
config switch-controller managed-switch
```



```
edit S524DF4K15000024
  config ports
    edit port1
      set poe-status enable
    end
  end
```

Reset the PoE port

Power over Ethernet (PoE) describes any system that passes electric power along with data on twisted pair Ethernet cabling. Doing this allows a single cable to provide both data connection and electric power to devices (for example, wireless access points, IP cameras, and VoIP phones).

The following command resets PoE on the port:

```
execute switch-controller poe-reset <fortiswitch-id> <port_name>
```

Display general PoE status

```
get switch-controller <fortiswitch-id> <port_name>
```

The following example displays the PoE status for port 6 on the specified switch:

```
# get switch-controller poe FS108D3W14000967 port6
Port(6) Power:3.90W, Power-Status: Delivering Power
Power-Up Mode: Normal Mode
Remote Power Device Type: IEEE802.3AT PD
Power Class: 4
Defined Max Power: 30.0W, Priority:3
Voltage: 54.00V
Current: 78mA
```

Configuring edge ports

Use the following commands to enable or disable an interface as an edge port:

```
config switch-controller managed-switch
  edit <FortiSwitch_serial_number>
    config ports
      edit <port_name>
        set edge-port {enable | disable}
      end
    end
  end
```

For example:

```
config switch-controller managed-switch
  edit S524DF4K15000024
    config ports
      edit port1
        set edge-port enable
      end
    end
  end
```

Configuring STP

Starting with FortiSwitch Release 3.4.2, STP is enabled by default for the non-FortiLink ports on the managed FortiSwitch units. STP is a link-management protocol that ensures a loop-free layer-2 network topology.

NOTE: STP is not supported between a FortiGate unit and a FortiSwitch unit in FortiLink mode.

To configure global STP settings, see [Configure STP settings on page 83](#).

Use the following commands to enable or disable STP on FortiSwitch ports:

```
config switch-controller managed-switch
  edit <FortiSwitch_serial_number>
    config ports
      edit <port_name>
        set stp-state {enabled | disabled}
      end
    end
  end
```

For example:

```
config switch-controller managed-switch
  edit S524DF4K15000024
    config ports
      edit port1
        set stp-state enabled
      end
    end
  end
```

To check the STP configuration on a FortiSwitch, use the following command:

```
diagnose switch-controller switch-info stp <FortiSwitch_serial_number> <instance_number>
```

For example:

```
FG100D3G15817028 # diagnose switch-controller switch-info stp S524DF4K15000024 0
MST Instance Information, primary-Channel:
Instance ID : 0
Switch Priority : 24576
Root MAC Address : 085b0ef195e4
Root Priority: 24576
Root Pathcost: 0
Regional Root MAC Address : 085b0ef195e4
Regional Root Priority: 24576
Regional Root Path Cost: 0
Remaining Hops: 20
This Bridge MAC Address : 085b0ef195e4
This bridge is the root
```

Port	Speed	Cost	Priority	Role	State	Edge	STP-Status
Loop Protection							
port1 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port2 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port3 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED

FortiSwitch port features

port4 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port5 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port6 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port7 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port8 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port9 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port10 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port11 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port12 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port13 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port14 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port15 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port16 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port17 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port18 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port19 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port20 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port21 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port22 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port23 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port25 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port26 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port27 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port28 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port29 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
port30 NO	-	200000000	128	DISABLED	DISCARDING	YES	ENABLED
internal NO	1G	20000	128	DESIGNATED	FORWARDING	YES	DISABLED
__FoRtI1LiNk0__ NO	1G	20000	128	DESIGNATED	FORWARDING	YES	DISABLED

Configuring STP root guard

Root guard protects the interface on which it is enabled from becoming the path to root. When enabled on an interface, superior BPDUs received on that interface are ignored or dropped. Without using root guard, any switch that participates in STP maintains the ability to reroute the path to root. Rerouting might cause your network to transmit large amounts of traffic across suboptimal links or allow a malicious or misconfigured device to pose a security risk by passing core traffic through an insecure device for packet capture or inspection. By enabling root guard on multiple interfaces, you can create a perimeter around your existing paths to root to enforce the specified network topology.

Enable root guard on all ports that should not be root bridges. Do not enable root guard on the root port. You must have STP enabled to be able to use root guard.

Use the following commands to enable or disable STP root guard on FortiSwitch ports:

```
config switch-controller managed-switch
  edit <FortiSwitch_serial_number>
    config ports
      edit <port_name>
        set stp-root-guard {enabled | disabled}
      end
    end
end
```

For example:

```
config switch-controller managed-switch
  edit S524DF4K15000024
    config ports
      edit port1
        set stp-root-guard enabled
      end
    end
end
```

Configuring STP BPDU guard

Similar to root guard, BPDU guard protects the designed network topology. When BPDU guard is enabled on STP edge ports, any BPDUs received cause the ports to go down for a specified number of minutes. The BPDUs are not forwarded, and the network edge is enforced.

There are two prerequisites for using BPDU guard:

- You must define the port as an edge port with the `set edge-port enable` command.
- You must enable STP on the switch interface with the `set stp-state enabled` command.

You can set how long the port will go down when a BPDU is received for a maximum of 120 minutes. The default port timeout is 5 minutes. If you set the timeout value to 0, the port will not go down when a BPDU is received, but you will have manually reset the port.

Use the following commands to enable or disable STP BPDU guard on FortiSwitch ports:

```
config switch-controller managed-switch
  edit <FortiSwitch_serial_number>
    config ports
      edit <port_name>
        set stp-bpdu-guard {enabled | disabled}
        set stp-bpdu-guard-time <0-120>
      end
    end
end
```

```

    end
end

```

For example:

```

config switch-controller managed-switch
  edit S524DF4K15000024
    config ports
      edit port1
        set stp-bpdu-guard enabled
        set stp-bpdu-guard-time 10
      end
    end
end

```

To check the configuration of STP BPDU guard on a FortiSwitch unit, use the following command:

```
diagnose switch-controller switch-info bpdu-guard-status <FortiSwitch_serial_number>
```

For example:

```

FG100D3G15817028 # diagnose switch-controller switch-info bpdu-guard-status S524DF4K15000024
Managed Switch : S524DF4K15000024 0

```

Portname	State	Status	Timeout (m)	Count	Last-Event
port1	enabled	-	10	0	-
port2	disabled	-	-	-	-
port3	disabled	-	-	-	-
port4	disabled	-	-	-	-
port5	disabled	-	-	-	-
port6	disabled	-	-	-	-
port7	disabled	-	-	-	-
port8	disabled	-	-	-	-
port9	disabled	-	-	-	-
port10	disabled	-	-	-	-
port11	disabled	-	-	-	-
port12	disabled	-	-	-	-
port13	disabled	-	-	-	-
port14	disabled	-	-	-	-
port15	disabled	-	-	-	-
port16	disabled	-	-	-	-
port17	disabled	-	-	-	-
port18	disabled	-	-	-	-
port19	disabled	-	-	-	-
port20	disabled	-	-	-	-
port21	disabled	-	-	-	-
port22	disabled	-	-	-	-
port23	disabled	-	-	-	-
port25	disabled	-	-	-	-
port26	disabled	-	-	-	-
port27	disabled	-	-	-	-
port28	disabled	-	-	-	-
port29	disabled	-	-	-	-
port30	disabled	-	-	-	-
__FoRtI1LiNk0__	disabled	-	-	-	-

Configuring loop guard

A loop in a layer-2 network results in broadcast storms that have far-reaching and unwanted effects. Fortinet loop guard helps to prevent loops. When loop guard is enabled on a switch port, the port monitors its subtending network for any downstream loops. Loop guard and STP should be used separately for loop protection. By default, loop guard is disabled on all ports.

Use the following commands to configure loop guard on a FortiSwitch port:

```
config switch-controller managed-switch
  edit <FortiSwitch_serial_number>
    config ports
      edit <port_name>
        set loop-guard {enabled | disabled}
        set loop-guard-timeout <0-120 minutes>
      end
    end
  end
```

For example:

```
config switch-controller managed-switch
  edit S524DF4K15000024
    config ports
      edit port1
        set loop-guard enabled
        set loop-guard-timeout 10
      end
    end
  end
```

Configuring LLDP settings

The Fortinet data center switches support the Link Layer Discovery Protocol (LLDP) for transmission and reception wherein the switch will multicast LLDP packets to advertise its identity and capabilities. A switch receives the equivalent information from adjacent layer-2 peers.

Use the following commands to configure LLDP on a FortiSwitch port:

```
config switch-controller managed-switch
  edit <FortiSwitch_serial_number>
    config ports
      edit <port_name>
        set lldp-status {rx-only | tx-only | tx-rx | disable}
        set lldp-profile <profile name>
      end
    end
  end
```

For example:

```
config switch-controller managed-switch
  edit S524DF4K15000024
    config ports
      edit port2
        set lldp-status tx-rx
        set lldp-profile default
      end
    end
  end
```

Configuring IGMP snooping settings

IGMP snooping allows the FortiSwitch to passively listen to the Internet Group Management Protocol (IGMP) network traffic between hosts and routers. The switch uses this information to determine which ports are interested in receiving each multicast feed. FortiSwitch can reduce unnecessary multicast traffic on the LAN by pruning multicast traffic from links that do not contain a multicast listener.

Use the following commands to configure IGMP settings on a FortiSwitch port:

```
config switch-controller managed-switch
  edit <FortiSwitch_serial_number>
    config ports
      edit <port_name>
        set igmp-snooping {enable | disable}
        set igmps-flood-reports {enable | disable}
      end
    end
  end
```

For example:

```
config switch-controller managed-switch
  edit S524DF4K15000024
    config ports
      edit port3
        set igmp-snooping enable
        set igmps-flood-reports enable
      end
    end
  end
```

Configuring sFlow

sFlow is a method of monitoring the traffic on your network to identify areas on the network that might impact performance and throughput. With sFlow, you can export truncated packets and interface counters. FortiSwitch implements sFlow version 5 and supports trunks and VLANs.

NOTE: Because sFlow is CPU intensive, Fortinet does not recommend high rates of sampling for long periods.

sFlow uses packet sampling to monitor network traffic. The sFlow agent captures packet information at defined intervals and sends them to an sFlow collector for analysis, providing real-time data analysis. To minimize the impact on network throughput, the information sent is only a sampling of the data.

The sFlow collector is a central server running software that analyzes and reports on network traffic. The sampled packets and counter information, referred to as flow samples and counter samples, respectively, are sent as sFlow datagrams to a collector. Upon receiving the datagrams, the sFlow collector provides real-time analysis and graphing to indicate the source of potential traffic issues. sFlow collector software is available from a number of third-party software vendors. You must configure a FortiGate policy to transmit the samples from the FortiSwitch unit to the sFlow collector.

sFlow can monitor network traffic in two ways:

- Flow samples—You specify the percentage of packets (one out of n packets) to randomly sample.
- Counter samples—You specify how often (in seconds) the network device sends interface counters.

Use the following CLI commands to specify the IP address and port for the sFlow collector. By default, the IP address is 0.0.0.0, and the port number is 6343.

```
config switch-controller sflow
  collector-ip <x.x.x.x>
```

```
    collector-port <port_number>
end
```

Use the following CLI commands to configure sFlow:

```
config switch-controller managed-switch
  edit <FortiSwitch_serial_number>
    config ports
      edit <port_name>
        set sflow-sampler <disabled | enabled>
        set sflow-sample-rate <0-99999>
        set sflow-counter-interval <1-255>
      next
    next
  end
```

For example:

```
config switch-controller sflow
  collector-ip 1.2.3.4
  collector-port 10
end

config switch-controller managed-switch
  edit S524DF4K15000024
    config ports
      edit port5
        set sflow-sampler enabled
        set sflow-sample-rate 10
        set sflow-counter-interval 60
      next
    next
  end
```

Configuring dynamic ARP inspection (DAI)

DAI prevents man-in-the-middle attacks and IP address spoofing by checking that packets from untrusted ports have valid IP-MAC-address binding. DAI allows only valid ARP requests and responses to be forwarded.

To use DAI, you must first enable the DHCP-snooping feature, enable DAI, and then enable DAI for each VLAN. By default, DAI is disabled on all VLANs.

After enabling DHCP snooping with the `set switch-controller-dhcp-snooping enable` command, use the following CLI commands to enable DAI and then enable DAI for a VLAN:

```
config system interface
  edit vsw.test
    set switch-controller-arp-inpsection <enable | disable>
  end

config switch-controller managed-switch
  edit <FortiSwitch_serial_number>
    config ports
      edit <port_name>
        arp-inspection-trust <untrusted | trusted>
      next
    end
  next
```


end

Use the following CLI command to check DAI statistics for a FortiSwitch unit:

```
diagnose switch-controller switch-info arp-inspection stats <FortiSwitch_serial_number>
```

Use the following CLI command to delete DAI statistics for a specific VLAN:

```
diagnose switch-controller switch-info arp-inspection stats-clear <VLAN_ID> <FortiSwitch_serial_number>
```

Configuring FortiSwitch port mirroring

The FortiSwitch unit can send a copy of any ingress or egress packet on a port to egress on another port of the same FortiSwitch unit. The original traffic is unaffected. This process is known as port-based mirroring and is typically used for external analysis and capture.

Using remote SPAN (RSPAN) or encapsulated RSPAN (ERSPAN) allows you to send the collected packets across layer-2 domains for analysis. You can have multiple RSPAN sessions but only one ERSPAN session.

In RSPAN mode, traffic is encapsulated in VLAN 4092. The FortiSwitch unit assigns the uplink port and the dst port. The switching functionality is enabled on the dst interface when mirroring.

NOTE: RSPAN is supported on FSR-112D-POE and on platforms 2xx and higher.

In ERSPAN mode, traffic is encapsulated in Ethernet, IPv4, and generic routing encapsulation (GRE) headers. By focusing on traffic to and from specified ports and traffic to a specified MAC or IP address, ERSPAN reduces the amount of traffic being mirrored. The ERSPAN traffic is sent to a specified IP address, which must be reachable by IPv4 ICMP ping. If no IP address is specified, the traffic is not mirrored.

NOTE: ERSPAN is supported on platforms 2xx and higher. ERSPAN cannot be used with the other FortiSwitch port-mirroring method.

To configure FortiSwitch port-based mirroring:

```
config switch-controller managed-switch
  edit <FortiSwitch_Serial_Number>
    config mirror
      edit <mirror_name>
        set status {active | inactive} // Required
        set dst <port_name> // Required
        set switching-packet {enable | disable}
        set src-ingress <port_name>
        set src-egress <port_name>
      next
    end
  next
```

For example:

```
config switch-controller managed-switch
  edit S524DF4K15000024
    config mirror
      edit 2
        set status active
        set dst port1
        set switching-packet enable
        set src-ingress port2 port3
```

```
        set src-egress port4 port5
    next
end
next
```

To configure FortiSwitch RSPAN:

```
config switch-controller traffic-sniffer
  set mode rspan
  config target-mac
    edit <MM:MM:MM:SS:SS:SS> // mirror traffic sent FROM this source MAC address
      set description <string>
    end
  config target-ip
    edit <xxx.xxx.xxx.xxx> // mirror traffic sent FROM this source IP address
      set description <string>
    end
  config target-port
    edit <FortiSwitch_serial_number>
      set description <string>
      set in-ports <portx porty portz ...> // mirror any traffic sent to these ports
      set out-ports <portx porty portz ...> // mirror any traffic sent from these ports
    end
  end
end
```

For example:

```
config switch-controller traffic-sniffer
  set mode rspan
  config target-mac
    edit 00:00:00:aa:bb:cc
      set description MACtarget1
    end
  config target-ip
    edit 10.254.254.192
      set description IPtarget1
    end
  config target-port
    edit S524DF4K15000024
      set description PortTargets1
      set in-ports port5 port6 port7
      set out-ports port10
    end
  end
end
```

To configure FortiSwitch ERSPAN:

```
config switch-controller traffic-sniffer
  set mode erspan-auto
  set erspan-ip <xxx.xxx.xxx.xxx> // IPv4 address where ERSPAN traffic is sent
  config target-mac
    edit <MM:MM:MM:SS:SS:SS> // mirror traffic sent to this MAC address
      set description <string>
    end
  config target-ip
    edit <xxx.xxx.xxx.xxx> // mirror traffic sent to this IPv4 address
      set description <string>
    end
end
```

```
config target-port
  edit <FortiSwitch_serial_number>
    set description <string>
    set in-ports <portx porty portz ...> // mirror traffic sent to these ports
    set out-ports <portx porty portz ...> // mirror traffic sent from these ports
  end
end
```

For example:

```
config switch-controller traffic-sniffer
  set mode erspan-auto
  set erspan-ip 10.254.254.254
  config target-mac
    edit 00:00:00:aa:bb:cc
      set description MACtarget1
    end
  config target-ip
    edit 10.254.254.192
      set description IPTarget1
    end
  config target-port
    edit S524DF4K15000024
      set description PortTargets1
      set in-ports port5 port6 port7
      set out-ports port10
    end
  end
end
```

To disable FortiSwitch port mirroring:

```
config switch-controller traffic-sniffer
  set mode none
end
```

Configuring FortiSwitch split ports (phy-mode) in FortiLink mode

On some FortiSwitch models that provide QSFP (quad small form-factor pluggable) interfaces, you can install a breakout cable to convert one interface into four interfaces. See the list of supported FortiSwitch models in the notes in this section.

FortiLink mode supports the FortiSwitch split-port configuration:

- [Configuring split ports on a previously discovered FortiSwitch unit on page 116](#)
- [Configuring split ports with a new FortiSwitch unit on page 116](#)
- [Configuring ports using the FortiGate CLI on page 97](#)

Notes

- Splitting ports is not supported when a FortiSwitch unit is managed through layer 3.
- Split ports are not configured for pre-configured FortiSwitch units.
- Splitting ports is supported on the following FortiSwitch models:
 - 3032D (ports 5 to 28 are splittable)
 - 524D, 524D-FPOE (ports 29 and 30 are splittable)

- 548D, 548D-FPOE (ports 53 and 54 are splittable)
- 1048E (In the 4 x 100G configuration, ports 49, 50, 51, and 52 are splittable as 4 x 25G.)
- 1048E (In the 6 x 40G configuration, ports 49, 50, 51, 52, 53, 54 are splittable as 4 x 10G.)

Use the `set port-configuration ?` command to check which ports are supported for each model.

- Currently, the maximum number of ports supported in software is 64 (including the management port). Therefore, only 10 QSFP ports can be split. This limitation applies to all of the models, but only the 3032D and the 1048E models have enough ports to encounter this limit.

Configuring split ports on a previously discovered FortiSwitch unit

1. On the FortiSwitch unit, configure the split ports. See [Configuring a split port on the FortiSwitch unit on page 116](#).
2. Restart the FortiSwitch unit.
3. Remove the FortiSwitch from being managed:


```
config switch-controller managed-switch
  delete <FortiSwitch_serial_number>
end
```
4. Discover the FortiSwitch unit.
5. Authorize the FortiSwitch unit.

Configuring split ports with a new FortiSwitch unit

1. Discover the FortiSwitch unit.
2. Authorize the FortiSwitch unit.
3. Restart the FortiSwitch unit.
4. On the FortiSwitch unit, configure the split ports. See [Configuring a split port on the FortiSwitch unit on page 116](#).
5. Restart the FortiSwitch unit.
6. Remove the FortiSwitch from being managed:


```
config switch-controller managed-switch
  delete <FortiSwitch_serial_number>
end
```
7. Discover the FortiSwitch unit.
8. Authorize the FortiSwitch unit.

Configuring a split port on the FortiSwitch unit

Use the following commands to configure a split port:

```
config switch phy-mode
  set port-configuration <default | disable-port54 | disable-port41-48 | 4x100G | 6x40G>
  set <port_name>-phy-mode <1x40G | 4x10G>
  ...
  (one entry for each port that supports split port)
end
```

The following settings are available:

- `disable-port54`—For 548D and 548D-FPOE, only port 53 is splittable; port 54 is unavailable.
- `disable-port41-48`—For 548D and 548D-FPOE, ports 41 to 48 are unavailable, but you can configure ports 53 and 54 in split-port mode.

- 4x100G—For 1048E, enable the maximum speed (100G) of ports 49 through 52. Ports 53 and 54 are disabled.
- 6x40G—For 1048E, enable the maximum speed (40G) of ports 49 through 54.

In the following example, a FortiSwitch 3032D is configured with ports 10, 14, and 28 set to 4x10G:

```
config switch phy-mode
  set port5-phy-mode 1x40G
  set port6-phy-mode 1x40G
  set port7-phy-mode 1x40G
  set port8-phy-mode 1x40G
  set port9-phy-mode 1x40G
  set port10-phy-mode 4x10G
  set port11-phy-mode 1x40G
  set port12-phy-mode 1x40G
  set port13-phy-mode 1x40G
  set port14-phy-mode 4x10G
  set port15-phy-mode 1x40G
  set port16-phy-mode 1x40G
  set port17-phy-mode 1x40G
  set port18-phy-mode 1x40G
  set port19-phy-mode 1x40G
  set port20-phy-mode 1x40G
  set port21-phy-mode 1x40G
  set port22-phy-mode 1x40G
  set port23-phy-mode 1x40G
  set port24-phy-mode 1x40G
  set port25-phy-mode 1x40G
  set port26-phy-mode 1x40G
  set port27-phy-mode 1x40G
  set port28-phy-mode 4x10G
end
```

The system applies the configuration only after you enter the `end` command, displaying the following message:

```
This change will cause a ports to be added and removed, this will cause loss of configuration
  on removed ports. The system will have to reboot to apply this change.
Do you want to continue? (y/n)y
```

To configure one of the split ports, use the notation `".x"` to specify the split port:

```
config switch physical-port
  edit "port1"
    set lldp-profile "default-auto-isl"
    set speed 40000full
  next
  edit "port2"
    set lldp-profile "default-auto-isl"
    set speed 40000full
  next
  edit "port3"
    set lldp-profile "default-auto-isl"
    set speed 40000full
  next
  edit "port4"
    set lldp-profile "default-auto-isl"
    set speed 40000full
  next
  edit "port5.1"
    set speed 10000full
```

```
next
edit "port5.2"
    set speed 10000full
next
edit "port5.3"
    set speed 10000full
next
edit "port5.4"
    set speed 10000full
next
end
```

FortiSwitch port security policy

To control network access, the managed FortiSwitch unit supports IEEE 802.1x authentication. A supplicant connected to a port on the switch must be authenticated by a RADIUS/Diameter server to gain access to the network. The supplicant and the authentication server communicate using the switch using the EAP protocol. The managed FortiSwitch unit supports EAP-PEAP, EAP-TTLS, EAP-TLS, and EAP-MD5.

To use the RADIUS server for authentication, you must configure the server before configuring the users or user groups on the managed FortiSwitch unit.

NOTE: In FortiLink mode, you must manually create a firewall policy to allow RADIUS traffic for 802.1x authentication from the FortiSwitch unit (for example, from the FortiLink interface) to the RADIUS server through the FortiGate.

The managed FortiSwitch unit implements MAC-based authentication. The switch saves the MAC address of each supplicant's device. The switch provides network access only to devices that have successfully been authenticated.

You can enable the MAC Authentication Bypass (MAB) option for devices (such as network printers) that cannot respond to the 802.1x authentication request. With MAB enabled on the port, the system will use the device MAC address as the user name and password for authentication.

Optionally, you can configure a guest VLAN for unauthorized users. Alternatively, you can specify a VLAN for users whose authentication was unsuccessful.

When you are testing your system configuration for 802.1x authentication, you can use the monitor mode to allow network traffic to flow, even if there are configuration problems or authentication failures.



Fortinet recommends an 802.1x setup rate of 5 to 10 sessions per second.

This chapter covers the following topics:

- [Increased number of devices supported per port for 802.1x MAC-based authentication on page 120](#)
- [Configure the 802.1X settings for a virtual domain on page 120](#)
- [Override the virtual domain settings on page 121](#)
- [Define an 802.1X security policy on page 121](#)
- [Apply an 802.1X security policy to a FortiSwitch port on page 123](#)
- [Test 802.1x authentication with monitor mode on page 123](#)
- [Restrict the type of frames allowed through IEEE 802.1Q ports on page 124](#)
- [RADIUS accounting support on page 124](#)
- [RADIUS change of authorization \(CoA\) support on page 125](#)
- [802.1x authentication deployment example on page 127](#)
- [Detailed deployment notes on page 129](#)

Increased number of devices supported per port for 802.1x MAC-based authentication

The FortiSwitch unit supports up to 20 devices per port for 802.1x MAC-based authentication. System-wide, the FortiSwitch unit now supports a total of 10 times the number of interfaces for 802.1x MAC-based authentication:

Model	Total number of devices supported per switch
108	80
112	120
124/224/424/524/1024	240
148/248/448/548/1048	480
3032	320

Configure the 802.1X settings for a virtual domain

To configure the 802.1X security policy for a virtual domain, use the following commands:

```
config switch-controller 802-1X-settings
  set reauth-period <integer>
  set max-reauth-attempt <integer>
  set link-down-auth {*set-unauth | no-action}
end
```

Option	Description
<code>set link-down-auth</code>	If a link is down, this command determines the authentication state. Choosing <code>set-auth</code> sets the interface to unauthenticated when a link is down, and reauthentication is needed. Choosing <code>no-auth</code> means that the interface does not need to be reauthenticated when a link is down.
<code>set reauth-period</code>	This command sets how often reauthentication is needed. The range is 1-1440 minutes. The default is 60 minutes. Setting the value to 0 minutes disables reauthentication. NOTE: Setting the reauth-period to 0 is supported only in the CLI. The RADIUS dynamic session timeout and CoA session timeout do not support setting the Session Timeout to 0.
<code>set max-reauth-attempt</code>	This command sets the maximum number of reauthentication attempts. The range is 1-15. The default is 3. Setting the value to 0 disables reauthentication.

Override the virtual domain settings

You can override the virtual domain settings for the 802.1X security policy.

Using the FortiGate GUI

To override the 802.1X settings for a virtual domain:

1. Go to *WiFi & Switch Controller > Managed FortiSwitch*.
2. Click on a FortiSwitch faceplate and select *Edit*.
3. In the Edit Managed FortiSwitch page, move the *Override 802-1X settings* slider to the right.
4. In the Reauthentication Interval field, enter the number of minutes before reauthentication is required. The maximum interval is 1,440 minutes. Setting the value to 0 minutes disables reauthentication.
5. In the Max Reauthentication Attempts field, enter the maximum times that reauthentication is attempted. The maximum number of attempts is 15. Setting the value to 0 disables reauthentication.
6. Select *Deauthenticate* or *None* for the link down action. Selecting *Deauthenticate* sets the interface to unauthenticated when a link is down, and reauthentication is needed. Selecting *None* means that the interface does not need to be reauthenticated when a link is down.
7. Select *OK*.

Using the FortiGate CLI

To override the 802.1X settings for a virtual domain, use the following commands:

```
config switch-controller managed-switch
  edit < switch >
    config 802-1X-settings
      set local-override [ enable | *disable ]
      set reauth-period < int > // visible if override enabled
      set max-reauth-attempt < int > // visible if override enabled
      set link-down-auth < *set-unauth | no-action > // visible if override enabled
    end
  next
end
```

For a description of the options, see [Configure the 802.1X settings for a virtual domain](#).

Define an 802.1X security policy

You can define multiple 802.1X security policies.

Using the FortiGate GUI

To create an 802.1X security policy:

1. Go to *WiFi & Switch Controller > FortiSwitch Security Policies*.
2. Select *Create New*.
3. Enter a name for the new FortiSwitch security policy.

4. For the security mode, select *Port-based* or *MAC-based*.
5. Select + to select which user groups will have access.
6. Enable or disable guest VLANs on this interface to allow restricted access for some users.
7. Enter the number of seconds for authentication delay for guest VLANs. The range is 1-900 seconds.
8. Enable or disable authentication fail VLAN on this interface to allow restricted access for users who fail to access the guest VLAN.
9. Enable or disable MAC authentication bypass (MAB) on this interface.
10. Enable or disable EAP pass-through mode on this interface.
11. Enable or disable whether the session timeout for the RADIUS server will overwrite the local timeout.
12. Select OK.

Using the FortiGate CLI

To create an 802.1X security policy, use the following commands:

```
config switch-controller security-policy 802-1X
  edit "<policy.name>"
    set security-mode {802.1X | 802.1X-mac-based}
    set user-group <*group_name | Guest-group | SSO_Guest_Users>
    set mac-auth-bypass [enable | *disable]
    set eap-passthru [enable | disable]
    set guest-vlan [enable | *disable]
    set guest-vlan-id "guest-VLAN-name"
    set guest-auth-delay <integer>
    set auth-fail-vlan [enable | *disable]
    set auth-fail-vlan-id "auth-fail-VLAN-name"
    set radius-timeout-overwrite [enable | *disable]
    set policy-type 802.1X
  end
end
```

Option	Description
set security-mode	You can restrict access with 802.1X port-based authentication or with 802.1X MAC-based authentication.
set user-group	You can set a specific group name, Guest-group, or SSO_Guest_Users to have access. This setting is mandatory.
set mac-auth-bypass	You can enable or disable MAB on this interface.
set eap-passthrough	You can enable or disable EAP pass-through mode on this interface.
set guest-vlan	You can enable or disable guest VLANs on this interface to allow restricted access for some users.
set guest-vlan-id "guest-VLAN-name"	You can specify the name of the guest VLAN.
set guest-auth-delay	You can set the authentication delay for guest VLANs on this interface. The range is 1-900 seconds.
set auth-fail-vlan	You can enable or disable authentication fail VLAN on this interface to allow restricted access for users who fail to access the guest VLAN.

Option	Description
set auth-fail-vlan-id "auth-fail-VLAN-name"	You can specify the name of the authentication fail VLAN
set radius-timeout- overwrite	You can enable or disable whether the session timeout for the RADIUS server will overwrite the local timeout.
set policy-type 802.1X	You can set the policy type to the 802.1X security policy.

Apply an 802.1X security policy to a FortiSwitch port

You can apply a different 802.1X security policy to each FortiSwitch port.

Using the FortiGate GUI

To apply an 802.1X security policy to a managed FortiSwitch port:

1. Go to *WiFi & Switch Controller > FortiSwitch Ports*.
2. Select the + next to a FortiSwitch unit.
3. In the Security Policy column for a port, click + to select a security policy.
4. Select *OK* to apply the security policy to that port.

Using the FortiGate CLI

To apply an 802.1X security policy to a managed FortiSwitch port, use the following commands:

```
config switch-controller managed-switch
  edit <managed-switch>
    config ports
      edit <port>
        set port-security-policy <802.1X-policy>
      next
    end
  next
end
```

Test 802.1x authentication with monitor mode

Use the monitor mode to test your system configuration for 802.1x authentication. You can use monitor mode to test port-based authentication, MAC-based authentication, EAP pass-through mode, and MAC authentication bypass. Monitor mode is disabled by default. After you enable monitor mode, the network traffic will continue to flow, even if the users fail authentication.

To enable or disable monitor mode, use the following commands:

```
config switch-controller security-policy 802-1X
  edit "<policy_name>"
    set open-auth {enable | disable}
```

```
next
end
```

Restrict the type of frames allowed through IEEE 802.1Q ports

You can now specify whether each FortiSwitch port discards tagged 802.1Q frames or untagged 802.1Q frames or allows all frames access to the port. By default, all frames have access to each FortiSwitch port.

Use the following CLI commands:

```
config switch-controller managed-switch <SN>
  config ports
    edit <port_name>
      set discard-mode <none | all-tagged | all-untagged>
    next
  next
end
```

RADIUS accounting support

The FortiSwitch unit uses 802.1x-authenticated ports to send five types of RADIUS accounting messages to the RADIUS accounting server to support FortiGate RADIUS single sign-on:

- START—The FortiSwitch has been successfully authenticated, and the session has started.
- STOP—The FortiSwitch session has ended.
- INTERIM—Periodic messages sent based on the value set using the set acct-interim-interval command.
- ON—FortiSwitch will send this message when the switch is turned on.
- OFF—FortiSwitch will send this message when the switch is shut down.

Use the following commands to set up RADIUS accounting so that FortiOS can send accounting messages to managed FortiSwitch units:

```
config user radius
  edit <RADIUS_server_name>
    set acct-interim-interval <seconds>
    config accounting-server
      edit <entry_ID>
        set status {enable | disable}
        set server <server_IP_address>
        set secret <secret_key>
        set port <port_number>
      next
    end
  next
end
```

RADIUS change of authorization (CoA) support

For increased security, each subnet interface that will be receiving CoA requests must be configured with the `set allowaccess radius-acct` command.

Starting in FortiSwitchOS 6.2.1, RADIUS accounting and CoA support EAP and MAB 802.1x authentication.

The FortiSwitch unit supports two types of RADIUS CoA messages:

- CoA messages to change session authorization attributes (such as data filters and the session-timeout setting) during an active session.
- Disconnect messages (DMs) to flush an existing session. For MAC-based authentication, all other sessions are unchanged, and the port stays up. For port-based authentication, only one session is deleted.

RADIUS CoA messages use the following Fortinet proprietary attribute:

```
Fortinet-Host-Port-AVPair 42 string
```

The format of the value is as follows:

Attribute	Value	Description
Fortinet-Host-Port-AVPair	action=bounce-port	The FortiSwitch unit disconnects all sessions on a port. The port goes down for 10 seconds and then up again.
Fortinet-Host-Port-AVPair	action=disable-port	The FortiSwitch unit disconnects all session on a port. The port goes down until the user resets it.
Fortinet-Host-Port-AVPair	action=reauth-port	The FortiSwitch unit forces the reauthentication of the current session.

In addition, RADIUS CoA use the session-timeout attribute:

Attribute	Value	Description
session-timeout	<session_timeout_value>	The FortiSwitch unit disconnects a session after the specified number of seconds of idleness. This value must be more than 60 seconds. NOTE: To use the session-timeout attribute, you must enable the <code>set radius-timeout-overwrite</code> command first.

The FortiSwitch unit sends the following Error-Cause codes in RADIUS CoA-NAK and Disconnect-NAK messages.

Error Cause	Error Code	Description
Unsupported Attribute	401	This error is a fatal error, which is sent if a request contains an attribute that is not supported.
NAS Identification Mismatch	403	This error is a fatal error, which is sent if one or more NAS-Identifier Attributes do not match the identity of the NAS receiving the request.
Invalid Attribute Value	407	This error is a fatal error, which is sent if a CoA-Request

Error Cause	Error Code	Description
		or Disconnect-Request message contains an attribute with an unsupported value.
Session Context Not Found	503	This error is a fatal error if the session context identified in the CoA-Request or Disconnect-Request message does not exist on the NAS.

Configuring CoA and disconnect messages

Use the following commands to enable a FortiSwitch unit to receive CoA and disconnect messages from a RADIUS server:

```
config system interface
  edit "mgmt"
    set ip <address> <netmask>
    set allowaccess <access_types>
    set type physical
  next
config user radius
  edit <RADIUS_server_name>
    set radius-coa {enable | disable}
    set radius-port <port_number>
    set secret <secret_key>
    set server <server_name_IPv4>
  end
```

Variable	Description
config system interface	
ip <address> <netmask>	Enter the interface IP address and netmask.
allowaccess <access_types>	Enter the types of management access permitted on this interface. Valid types are as follows: http https ping snmp ssh telnet radius-acct. Separate each type with a space. You must include radius-acct to receive CoA and disconnect messages.
<RADIUS_server_name>	Enter the name of the RADIUS server that will be sending CoA and disconnect messages to the FortiSwitch unit. By default, the messages use port 3799.
config user radius	
radius-coa {enable disable}	Enable or disable whether the FortiSwitch unit will accept CoA and disconnect messages. The default is disable.
radius-port <port_number>	Enter the RADIUS port number. By default, the value is 0 for FortiOS, which uses port 1812 for the FortiSwitch unit in FortiLink mode.
secret <secret_key>	Enter the shared secret key for authentication with the RADIUS server. There is no default.

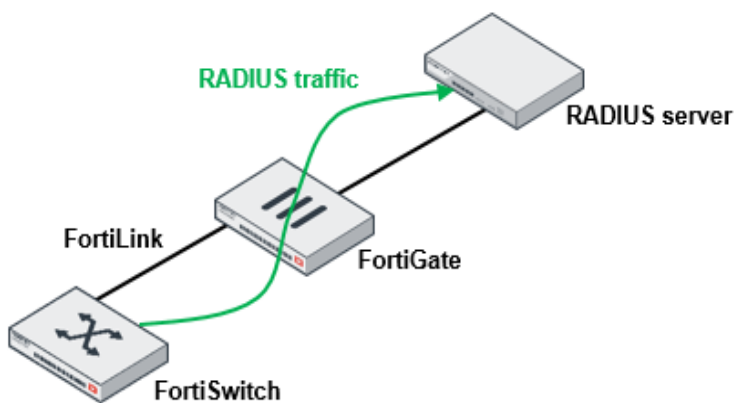
Variable	Description
server <server_name_IPv4>	Enter the domain name or IPv4 address for the RADIUS server. There is no default.

Example: RADIUS CoA

The following example uses the FortiOS CLI to enable the FortiSwitch unit to receive CoA and disconnect messages from the specified RADIUS server:

```
config switch-controller security-policy local-access
  edit default
    set internal-allowaccess ping https http ssh snmp telnet radius-acct
  next
end
config user radius
  edit "Radius-188-200"
    set radius-coa enable
    set radius-port 0
    set secret ENC
      +2NyBcp8JF3/OijWl/w5nOC++aDKQPWnlC8Ug2HKwn4RcmhqVYE+q07yI9eSDhtiIw63kR/oMBLGwFQoeZf
      OQWengI1GTb+YQo/1YJn1V3Nwp9sdkcblfyayfc9gTeqe+mFltK15IWNi7WRyiJC8sxaF9Iyr2/14hpCiVU
      MiPOU6fSsj
    set server "10.105.188.200"
  next
end
```

802.1x authentication deployment example



To control network access, you can configure 802.1x authentication from a FortiGate unit managing FortiSwitch units. A supplicant connected to a port on the switch must be authenticated by a RADIUS/Diameter server to gain access to the network.

To use the RADIUS server for authentication, you must configure the server before configuring the users or user groups on the FortiSwitch unit. You also need a firewall policy on the FortiGate unit to allow traffic from the FortiSwitch unit to the RADIUS server.

To create a firewall policy to allow the FortiSwitch unit to reach the RADIUS server:

```
config firewall policy
  edit 1
    set name "fortilink-to-radius"
    set srcintf "fortilink"
    set dstintf "accounting-server"
    set action accept
    set service "ALL"
    set nat enable
  end
```

To create a group for users who will be authenticated by 802.1x:

```
config user radius
  edit "dot1x-radius"
    set server "192.168.174.10"
    set secret ENC ***
    set radius-port 1812
    config accounting-server
      edit 1
        set status enable
        set server "192.168.174.10"
        set secret ENC ***
        set port 1813
      next
    end
  next
end

config user group
  edit "radius users"
    set member "dot1x-radius"
  next
end
```

To create an 802.1X security policy:

You can create an 802.1X security policy using the FortiGate GUI by going to *WiFi & Switch Controller > FortiSwitch Security Policies* and selecting *Create New*.

```
config switch-controller security-policy 802-1X
  edit "802-1X-policy-default"
    set security-mode 802.1X-mac-based
    set user-group "dot1x-local"
    set mac-auth-bypass enable
    set eap-passthru enable
    set guest-vlan enable
    set guest-vlan-id "guest-VLAN"
    set auth-fail-vlan enable
    set auth-fail-vlan-id "auth-fail-VLAN"
    set radius-timeout-overwrite disable
  next
end
```


To configure the global 802.1X settings:

```
config switch-controller 802-1X-settings
  set link-down-auth no-action
  set reauth-period 90
  set max-reauth-attempt 4
end
```

To apply an 802.1X security policy to a managed FortiSwitch port:

You can apply an 802.1X security policy to a managed FortiSwitch port using the FortiGate GUI by going to *WiFi & Switch Controller > FortiSwitch Ports*.

```
config switch-controller managed-switch
  edit S548DN4K16000360
    config ports
      edit "port1"
        set dhcp-snooping trusted
        set dhcp-snoop-option82-trust enable
        set port-security-policy "802-1X-policydefault"
      next
    end
```

Detailed deployment notes

- Using more than one security group (with the `set security-groups` command) per security profile is not supported.
- CoA and single sign-on are supported only by the CLI in this release.
- RADIUS CoA is supported in standalone mode. In addition, RADIUS CoA is supported in FortiLink mode when NAT is disabled in the firewall policy (`set nat disable` under the `config firewall policy` command), and the interfaces on the link between the FortiGate unit and FortiSwitch unit are assigned routable addresses other than 169.254.1.x.
- The FortiSwitch unit supports using FortiAuthenticator, FortiConnect, Microsoft Network Policy Server (NPS), Aruba ClearPass, and Cisco Identity Services Engine (ISE) as the RADIUS server for CoA and RSSO.
- Each RADIUS CoA server can support only one accounting manager in this release.
- RADIUS accounting/CoA/VLAN-by-name features are supported only with `eap-passthru enable`.
- Fortinet recommends a unique secret key for each accounting server.
- For CoA to correctly function with FortiAuthenticator or FortiConnect, you must include the User-Name attribute (you can optionally include the Framed-IP-Address attribute) or the User-Name and Calling-Station-ID attributes in the CoA request.
- To obtain a valid Framed-IP-Address attribute value, you need to manually configure DHCP snooping in the 802.1x-authenticated ports of your VLAN network for both port and MAC modes.
- Port-based basic statistics for RADIUS accounting messages are supported in the Accounting Stop request.
- By default, the accounting server is disabled. You must enable the accounting server with the `set status enable` command.
- The default port for FortiAuthenticator single sign-on is 1813 for the FortiSwitch unit.
- In MAC-based authentication, the maximum number of client MAC addresses is 20. Each model has its own maximum limit.

- Static MAC addresses and sticky MAC addresses are mechanisms for manual/local authorization; 802.1x is a mechanism for protocol-based authorization. Do not mix them.
- Fortinet recommends an 802.1x setup rate of 5 to 10 sessions per second.
- Starting in FortiSwitch 6.2.0, when 802.1x authentication is configured, the EAP pass-through mode (`set eap-passthru`) is enabled by default.
- For information about the RADIUS attributes supported by FortiSwitchOS, refer to the “Supported attributes for RADIUS CoA and RSSO” appendix in the *FortiSwitchOS Administration Guide—Standalone Mode*.

Additional capabilities

This chapter covers the following topics:

- [Execute custom FortiSwitch scripts on page 131](#)
- [View and upgrade the FortiSwitch firmware version on page 132](#)
- [FortiSwitch log settings on page 133](#)
- [FortiSwitch per-port device visibility on page 134](#)
- [FortiGate CLI support for FortiSwitch features \(on non-FortiLink ports\) on page 135](#)
- [Synchronizing the FortiGate unit with the managed FortiSwitch units on page 139](#)
- [Replacing a managed FortiSwitch unit on page 139](#)

Execute custom FortiSwitch scripts

From the FortiGate unit, you can execute a custom script on a managed FortiSwitch unit. The custom script contains generic FortiSwitch commands.

NOTE: FortiOS 5.6.0 introduces additional capabilities related to the managed FortiSwitch unit.

Create a custom script

Use the following syntax to create a custom script from the FortiGate unit:

```
config switch-controller custom-command
  edit <cmd-name>
    set command "<FortiSwitch_command>"
  end
```

NOTE: You need to use %0a to indicate a return.

For example, use the custom script to set the STP max-age parameter on a managed FortiSwitch unit:

```
config switch-controller custom-command
  edit "stp-age-10"
    set command "config switch stp setting %0a set max-age 10 %0a end %0a"
  end
```

Execute a custom script once

After you have created a custom script, you can manually execute it on any managed FortiSwitch unit. Because the custom script is not bound to any switch, the FortiSwitch unit might reset some parameters when it is restarted.

Use the following syntax on the FortiGate unit to execute the custom script once on a specified managed FortiSwitch unit:

```
execute switch-controller custom-command <cmd-name> <target-switch>
```

For example, you can execute the `stp-age-10` script on the specified managed FortiSwitch unit:

```
execute switch-controller custom-command stp-age-10 S124DP3X15000118
```

Bind a custom script to a managed switch

If you want the custom script to be part of the managed switch's configuration, the custom script must be bound to the managed switch. If any of the commands in the custom script are locally controlled by a switch, the commands might be overwritten locally.

Use the following syntax to bind a custom script to a managed switch:

```
config switch-controller managed-switch
  edit "<managed_switch_ID>"
    config custom-command
      edit <custom_script_entry>
        set command-name "<name_of_custom_script>"
      next
    end
  next
end
```

For example:

```
config switch-controller managed-switch
  edit "S524DF4K15000024"
    config custom-command
      edit 1
        set command-name "stp-age-10"
      next
    end
  next
end
```

View and upgrade the FortiSwitch firmware version

You can view the current firmware version of a FortiSwitch unit and upgrade the FortiSwitch unit to a new firmware version. The FortiGate unit will suggest an upgrade when a new version is available in FortiGuard.

Using the FortiGate web interface

To view the FortiSwitch firmware version:

1. Go to *WiFi & Switch Controller > Managed FortiSwitch*.
2. In the main panel, select the FortiSwitch faceplate and click **Edit**.
3. In the *Edit Managed FortiSwitch* panel, the *Firmware* section displays the current build on the FortiSwitch.

To upgrade the firmware on multiple FortiSwitch units at the same time:

1. Go to *WiFi & Switch Controller > Managed FortiSwitch*.
2. Select the faceplates of the FortiSwitch units that you want to upgrade.
3. Click *Upgrade*. The *Upgrade FortiSwitches* page opens.

4. Select *FortiGuard* or select *Upload* and then select the firmware file to upload. If you select *FortiGuard*, all FortiSwitch units that can be upgraded are upgraded. If you select *Upload*, only one firmware image can be used at a time for upgrading.
5. Select *Upgrade*.

Using the CLI

Use the following command to stage a firmware image on all FortiSwitch units:

```
diagnose switch-controller switch-software stage all <image id>
```

Use the following command to upgrade the firmware image on one FortiSwitch unit:

```
diagnose switch-controller switch-software upgrade <switch id> <image id>
```

Use the following CLI commands to enable the use of HTTPS to download firmware to managed FortiSwitch units:

```
config switch-controller global
  set https-image-push enable
end
```

From your FortiGate CLI, you can upgrade the firmware of all of the managed FortiSwitch units of the same model using a single `execute` command. The command includes the name of a firmware image file and all of the managed FortiSwitch units compatible with that firmware image file are upgraded. For example:

```
execute switch-controller switch-software stage all <firmware-image-file>
```

You can also use the following command to restart all of the managed FortiSwitch units after a 2-minute delay.

```
execute switch-controller switch-action restart delay all
```

FortiSwitch log settings

You can export the logs of managed FortiSwitch units to the FortiGate unit or send FortiSwitch logs to a remote Syslog server.

Exporting logs to FortiGate

You can enable and disable whether the managed FortiSwitch units export their logs to the FortiGate unit. The setting is global, and the default setting is enabled. Starting in FortiOS 5.6.3, more details are included in the exported FortiSwitch logs.

To allow a level of filtering, the FortiGate unit sets the user field to “fortiswitch-syslog” for each entry.

Use the following CLI command syntax:

```
config switch-controller switch-log
  set status {*enable | disable}
  set severity {emergency | alert | critical | error | warning | notification | *information |
  debug}
end
```

You can override the global log settings for a FortiSwitch unit, using the following commands:

```
config switch-controller managed-switch
  edit <switch-id>
```

```
config switch-log
  set local-override enable
```

At this point, you can configure the log settings that apply to this specific switch.

Sending logs to a remote Syslog server

Instead of exporting FortiSwitch logs to a FortiGate unit, you can send FortiSwitch logs to one or two remote Syslog servers. After enabling this option, you can select the severity of log messages to send, whether to use comma-separated values (CSVs), and the type of remote Syslog facility. By default, FortiSwitch logs are sent to port 514 of the remote Syslog server.

Use the following CLI command syntax to configure the default syslogd and syslogd2 settings:

```
config switch-controller remote-log
  edit {syslogd | syslogd2}
    set status {enable | *disable}
    set server <IPv4_address_of_remote_syslog_server>
    set port <remote_syslog_server_listening_port>
    set severity {emergency | alert | critical | error | warning | notification |
      *information | debug}
    set csv {enable | *disable}
    set facility {kernel | user | mail | daemon | auth | syslog | lpr | news | uucp | cron |
      authpriv | ftp | ntp | audit | alert | clock | local0 | local1 | local2 | local3 |
      local4 | local5 | local6 | *local7}
  next
end
```

You can override the default syslogd and syslogd2 settings for a specific FortiSwitch unit, using the following commands:

```
config switch-controller managed-switch
  edit <FortiSwitch_serial_number>
    config remote-log
      edit {edit syslogd | syslogd2}
        set status {enable | *disable}
        set server <IPv4_address_of_remote_syslog_server>
        set port <remote_syslog_server_listening_port>
        set severity {emergency | alert | critical | error | warning | notification |
          *information | debug}
        set csv {enable | *disable}
        set facility {kernel | user | mail | daemon | auth | syslog | lpr | news | uucp |
          cron | authpriv | ftp | ntp | audit | alert | clock | local0 | local1 | local2
          | local3 | local4 | local5 | local6 | *local7}
      next
    end
  next
end
```

FortiSwitch per-port device visibility

In the FortiGate GUI, *User & Device > Device List* displays a list of devices attached to the FortiSwitch ports. For each device, the table displays the IP address of the device and the interface (FortiSwitch name and port).

From the CLI, the following command displays information about the host devices:

```
diagnose switch-controller mac-cache show <switch-id>
```

FortiGate CLI support for FortiSwitch features (on non-FortiLink ports)

You can configure the following FortiSwitch features from the FortiGate CLI.

Configuring a link aggregation group (LAG)

You can configure a link aggregation group (LAG) for non-FortiLink ports on a FortiSwitch. You cannot configure ports from different FortiSwitch units in one LAG.

```
config switch-controller managed-switch
  edit <switch-id>
    config ports
      edit <trunk name>
        set type trunk
        set mode {static | lacp} Link Aggregation mode
        set bundle (enable | disable)
        set min-bundle <int>
        set max-bundle <int>
        set members < port1 port2 ...>
      next
    end
  end
end
```

Configuring storm control

Storm control uses the data rate (packets/sec, default 500) of the link to measure traffic activity, preventing traffic on a LAN from being disrupted by a broadcast, multicast, or unicast storm on a port.

When the data rate exceeds the configured threshold, storm control drops excess traffic. You can configure the types of traffic to drop: broadcast, unknown unicast, or multicast.

The storm control settings are global to all of the non-FortiLink ports on the managed switches. Use the following CLI commands to configure storm control:

```
config switch-controller storm-control
  set rate <rate>
  set unknown-unicast (enable | disable)
  set unknown-multicast (enable | disable)
  set broadcast (enable | disable)
end
```

You can override the global storm control settings for a FortiSwitch using the following commands:

```
config switch-controller managed-switch
  edit <switch-id>
    config storm-control
```

```
set local-override enable
```

At this point, you can configure the storm control settings that apply to this specific switch.

Displaying, resetting, and restoring port statistics

For the following commands, if the managed FortiSwitch unit is not specified, the command is applied to all ports of all managed FortiSwitch units.

To display port statistics of a managed FortiSwitch unit:

```
diagnose switch-controller switch-info port-stats <managed FortiSwitch device ID> <port_name>
```

For example:

```
FG100D3G15817028 (global) # diagnose switch-controller switch-info port-stats S524DF4K15000024
    port8
Vdom: dmgmt-vdom
Vdom: root
Vdom: root
```

```
S524DF4K15000024:
Port(port8) is Admin up, line protocol is down
Interface Type is Serial Gigabit Media Independent Interface(SGMII/SerDes)
Address is 08:5B:0E:F1:95:ED, loopback is not set
MTU 9216 bytes, Encapsulation IEEE 802.3/Ethernet-II
half-duplex, 0 Mb/s, link type is auto
input : 0 bytes, 0 packets, 0 errors, 0 drops, 0 oversizes
0 unicasts, 0 multicasts, 0 broadcasts, 0 unknowns
output : 0 bytes, 0 packets, 0 errors, 0 drops, 0 oversizes
0 unicasts, 0 multicasts, 0 broadcasts
0 fragments, 0 undersizes, 0 collisions, 0 jabbers
```

```
Vdom: vdom-1
```

To reset the port statistics counters of a managed FortiSwitch unit:

```
diagnose switch-controller trigger reset-hardware-counters <managed FortiSwitch device ID>
    <port_name>
```

For example:

```
FG100D3G15817028 (global) # diagnose switch-controller trigger reset-hardware-counters
    S524DF4K15000024 1,3,port6-7
```

NOTE: This command is provided for debugging; accuracy is not guaranteed when the counters are reset. Resetting the counters might have a negative effect on monitoring tools, such as SNMP and FortiGate. The statistics gathered during the time when the counters are reset might be discarded.

To restore the port statistics counters of a managed FortiSwitch unit:

```
diagnose switch-controller trigger restore-hardware-counters <managed FortiSwitch device ID>
    <port_name>
```


For example:

```
FG100D3G15817028 (global) # diagnose switch-controller trigger restore-hardware-counters
S524DF4K15000024 port10-port11,internal
```

Configuring QoS with managed FortiSwitch units

Quality of Service (QoS) provides the ability to set particular priorities for different applications, users, or data flows.

NOTE: The FortiGate unit does not support QoS for hard or soft switch ports.

The FortiSwitch unit supports the following QoS configuration capabilities:

- Mapping the IEEE 802.1p and Layer 3 QoS values (Differentiated Services and IP Precedence) to an outbound QoS queue number.
- Providing eight egress queues on each port.
- Policing the maximum data rate of egress traffic on the interface.

To configure the QoS for managed FortiSwitch units:

1. Configure a Dot1p map.

A Dot1p map defines a mapping between IEEE 802.1p class of service (CoS) values (from incoming packets on a trusted interface) and the egress queue values. Values that are not explicitly included in the map will follow the default mapping, which maps each priority (0-7) to queue 0. If an incoming packet contains no CoS value, the switch assigns a CoS value of zero.

NOTE: Do not enable trust for both Dot1p and DSCP at the same time on the same interface. If you do want to trust both Dot1p and IP-DSCP, the FortiSwitch uses the latter value (DSCP) to determine the queue. The switch will use the Dot1p value and mapping only if the packet contains no DSCP value.

```
config switch-controller qos dot1p-map
  edit <Dot1p map name>
    set description <text>
    set priority-0 <queue number>
    set priority-1 <queue number>
    set priority-2 <queue number>
    set priority-3 <queue number>
    set priority-4 <queue number>
    set priority-5 <queue number>
    set priority-6 <queue number>
    set priority-7 <queue number>
  next
end
```

2. Configure a DSCP map. A DSCP map defines a mapping between IP precedence or DSCP values and the egress queue values. For IP precedence, you have the following choices:

- network-control—Network control
- internetwork-control—Internetwork control
- critic-ecp—Critic and emergency call processing (ECP)
- flashoverride—Flash override
- flash—Flash
- immediate—Immediate

- priority—Priority
- routine—Routine

```
config switch-controller qos ip-dscp-map
edit <DSCP map name>
set description <text>
configure map <map_name>
edit <entry name>
set cos-queue <COS queue number>
set diffserv {CS0 | CS1 | AF11 | AF12 | AF13 | CS2 | AF21 | AF22 | AF23 | CS3 |
AF31 | AF32 | AF33 | CS4 | AF41 | AF42 | AF43 | CS5 | EF | CS6 | CS7}
set ip-precedence {network-control | internetwork-control | critic-ecp |
flashoverride | flash | immediate | priority | routine}
set value <DSCP raw value>
next
end
end
```

3. Configure the egress QoS policy. In a QoS policy, you set the scheduling mode for the policy and configure one or more CoS queues. Each egress port supports eight queues, and three scheduling modes are available:

- With strict scheduling, the queues are served in descending order (of queue number), so higher number queues receive higher priority.
- In simple round-robin mode, the scheduler visits each backlogged queue, servicing a single packet from each queue before moving on to the next one.
- In weighted round-robin mode, each of the eight egress queues is assigned a weight value ranging from 0 to 63.

```
config switch-controller qos queue-policy
edit <QoS egress policy name>
set schedule {strict | round-robin | weighted}
config cos-queue
edit [queue-<number>]
set description <text>
set min-rate <rate in kbps>
set max-rate <rate in kbps>
set drop-policy {taildrop | random-early-detection}
set weight <weight value>
next
end
next
end
```

4. Configure the overall policy that will be applied to the switch ports.

```
config switch-controller qos qos-policy
edit <QoS egress policy name>
set default-cos <default CoS value 0-7>
set trust-dot1p-map <Dot1p map name>
set trust-ip-dscp-map <DSCP map name>
set queue-policy <queue policy name>
next
end
```

5. Configure each switch port.

```
config switch-controller managed-switch
edit <switch-id>
config ports
edit <port>
set qos-policy <CoS policy>
next
end
```

```

    next
end

```

6. Check the QoS statistics on each switch port.

```
diagnose switch-controller switch-info qos-stats <FortiSwitch_serial_number> <port_name>
```

Synchronizing the FortiGate unit with the managed FortiSwitch units

You can synchronize the FortiGate unit with the managed FortiSwitch units to check for synchronization errors on each managed FortiSwitch unit.

Use the following command to synchronize the full configuration of a FortiGate unit with a managed FortiSwitch unit:

```
diagnose switch-controller trigger config-sync <FortiSwitch_serial_number>
```

Replacing a managed FortiSwitch unit

If a managed FortiSwitch unit fails, you can replace it with another FortiSwitch unit that is managed by the same FortiGate unit. The replacement FortiSwitch unit will inherit the configuration of the FortiSwitch unit that it replaces. The failed FortiSwitch unit is no longer managed by a FortiGate unit or discovered by FortiLink.

NOTE:

- Both FortiSwitch units must be of the same model.
- The replacement FortiSwitch unit must be discovered by FortiLink but not authorized.
- If the replacement FortiSwitch unit is one of an MCLAG pair, you need to manually reconfigure the MCLAG-ICL trunk.
- After replacing the failed FortiSwitch unit, the automatically created trunk name does not change. If you want different trunk name, you need to delete the trunk. The new trunk is created automatically with an updated name. At the end of this section is a detailed procedure for renaming the MCLAG-ICL trunk.
- If the replaced managed FortiSwitch unit is part of an MCLAG, only the ICL should be connected to the new switch to avoid any traffic loops. The other interfaces should be connected only to the switch that is fully managed the FortiGate unit with the correct configuration.
- The best way to replace a MCLAG FortiSwitch unit in FortiLink:
 - a. Back up the configuration of the failed FortiSwitch unit.
 - b. Restore the configuration to the replaced Fortiswitch unit while it is offline.
 - c. Enter the `replace-device` command in FortiOS.
 - d. Physically replace the failed FortiSwitch unit.

To replace a managed FortiSwitch unit:

1. Unplug the failed FortiSwitch unit.
2. Plug in the replacement FortiSwitch unit.
3. Upgrade the firmware of the replacement FortiSwitch unit to the same version as the firmware on the failed FortiSwitch unit. See [View and upgrade the FortiSwitch firmware version on page 132](#).
4. Reset the replacement FortiSwitch unit to factory default settings with the `execute factoryreset` command.

5. Check the serial number of the replacement FortiSwitch unit.
6. From the FortiGate unit, go to *WiFi & Switch Controller > Managed FortiSwitch*.
7. Select the faceplate of the failed FortiSwitch unit.
8. Select *Deauthorize*.
9. Connect the replacement FortiSwitch unit to the FortiGate unit that was managing the failed FortiSwitch unit.
NOTE: If the replaced managed FortiSwitch unit is part of an MCLAG, only the ICL should be connected to the new switch to avoid any traffic loops. The other interfaces should be connected only to the switch that is fully managed the FortiGate unit with the correct configuration.
10. If the failed FortiSwitch unit was part of a VDOM, enter the following commands:

```
config vdom
  edit <VDOM_name>
    execute replace-device fortiswitch <failed_FortiSwitch_serial_number> <replacement_
      FortiSwitch_serial_number>
```

For example:

```
config vdom
  edit vdom_new
    execute replace-device fortiswitch S124DN3W16002025 S124DN3W16002026
```

If the failed FortiSwitch unit was not part of a VDOM, enter the following command:

```
execute replace-device fortiswitch <failed_FortiSwitch_serial_number> <replacement_
  FortiSwitch_serial_number>
```

An error is returned if the replacement FortiSwitch unit is authorized.

11. Authorize the replaced managed FortiSwitch unit.
12. Connect the rest of the cables required for the uplinks and downlinks for the MCLAG FortiSwitch units.

To rename the MCLAG-ICL trunk:

After replacing the failed FortiSwitch unit, the automatically created trunk name does not change. If you want different trunk name, you need to delete the trunk. The new trunk is created automatically with an updated name.

Changing the name of the MCLAG-ICL trunk must be done on both the FortiGate unit and the MCLAG-ICL switches. You need a maintenance window for the change.

1. Shut down the FortiLink interface on the FortiGate unit.
 - a. On the FortiGate unit, execute the `show system interface` command. For example:

```
FG3K2D3Z17800156 # show system interface root-lag
config system interface
  edit "root-lag"
  set vdom "root"
  set fortilink enable
  set ip 10.105.60.254 255.255.255.0
  set allowaccess ping capwap
  set type aggregate
  set member "port45" "port48"
config managed-device
```

- b. Write down the member port information. In this example, port45 and port48 are the member ports.

- c. Shut down the member ports with the `config system interface`, edit `<member-port#>`, set `status down`, and end commands. For example:

```
FG3K2D3Z17800156 # config system interface
FG3K2D3Z17800156 (interface) # edit port48
FG3K2D3Z17800156 (port48) # set status down
FG3K2D3Z17800156 (port48) # next // repeat for each member port
FG3K2D3Z17800156 (interface) # edit port45
FG3K2D3Z17800156 (port45) # set status down
FG3K2D3Z17800156 (port45) # end
```

- d. Verify that FortiLink is down with the `exec switch-controller get-conn-status` command. For example:

```
FG3K2D3Z17800156 # exec switch-controller get-conn-status
Managed-devices in current vdom root:
  STACK-NAME: FortiSwitch-Stack-root-lag
  SWITCH-ID VERSION STATUS ADDRESS JOIN-TIME NAME
  FS1D483Z17000282 v6.0.0 Authorized/Down 0.0.0.0 N/A icl-sw2
  FS1D483Z17000348 v6.0.0 Authorized/Down 0.0.0.0 N/A icl-sw1
```

2. Rename the MLAG-ICL trunk name on both MLAG-ICL switches.

- a. Execute the `show switch trunk` command on both MLAG-ICL switches. Locate the ICL trunk that includes the `set mclag-icl enable` command in its configuration and write down the member ports and configuration information. For example:

```
icl-sw1 # show switch trunk
config switch trunk
...
edit "D483Z17000282-0"
set mode lacp-active
set auto-isl 1
set mclag-icl enable // look for this line
set members "port27" "port28" // note the member ports
next
end
```

- b. Note the output of the `show switch interface <MLAG-ICL-trunk-name>`, `diagnose switch mclag icl`, and `diagnose switch trunk summary <MLAG-ICL-trunk-name>` commands. For example:

```
icl-sw1 # show switch interface D483Z17000282-0
config switch interface
edit "D483Z17000282-0"
set native-vlan 4094
set allowed-vlans 1,100,2001-2060,4093
set dhcp-snooping trusted
set stp-state disabled
set edge-port disabled
set igmps-flood-reports enable
set igmps-flood-traffic enable
```

```
set snmp-index 57
next
end
```

```
icl-sw1 # diag switch mclag icl
D483Z17000282-0
icl-ports 27-28
egress-block-ports 3-4,7-12,47-48
interface-mac 70:4c:a5:86:6d:e5
lacp-serial-number FS1D483Z17000348
peer-mac 70:4c:a5:49:50:53
peer-serial-number FS1D483Z17000282
Local uptime 0 days 1h:49m:24s
Peer uptime 0 days 1h:49m:17s
MCLAG-STP-mac 70:4c:a5:49:50:52
keepalive interval 1
keepalive timeout 60
```

Counters

```
received keepalive packets 4852
transmitted keepalive packets 5293
received keepalive drop packets 20
receive keepalive miss 1
```

```
icl-sw1 # diagnose switch trunk sum D483Z17000282-0
Trunk Name Mode PSC MAC Status Up Time
```

```
D483Z17000282-0 lacp-active(auto-isl,mclag-icl) src-dst-ip 70:4C:A5:86:6E:00
up(2/2) 0 days,0 hours,16 mins,4 secs
```

- c. Shut down the ICL member ports using the config switch physical-port, edit <member port#>, set status down, next, and end commands. For example:**

```
icl-sw1 # config switch physical-port
icl-sw1 (physical-port) # edit port27
icl-sw1 (port27) # set status down
icl-sw1 (port27) # n // repeat for each ICL member port
icl-sw1 (physical-port) # edit port28
icl-sw1 (port28) # set status down
icl-sw1 (port28) # next
icl-sw1 (physical-port) # end
```

- d. Delete the original MCLAG-ICL trunk name on the switch using the config switch trunk, delete <mclag-icl-trunk-name>, and end commands. For example:**

```
icl-sw1 # config switch trunk
icl-sw1 (trunk) # delete D483Z17000282-0
```

- e. Use the show switch trunk command to verify that the trunk is deleted.**

- f. Create a new trunk for the MCLAG ICL using the the original ICL trunk configuration collected in step 2b and the `set auto-isl 0` command in the configuration. For example:

```
icl-sw1 # config switch trunk

icl-sw1 (trunk) # edit MCLAG-ICL
new entry 'MCLAG-ICL' added
icl-sw1 (MCLAG-ICL) #set mode lacp-active
icl-sw1 (MCLAG-ICL) #set members "port27" "port28"
icl-sw1 (MCLAG-ICL) #set mclag-icl enable
icl-sw1 (MCLAG-ICL) # end
```

- g. Use the `show switch trunk` command to check the trunk configuration.
- h. Start the trunk member ports by using the `config switch physical-port`, `edit <member port#>`, `set status up`, `next`, and `end` commands. For example:

```
icl-sw1 # config switch physical-port
icl-sw1 (physical-port) # edit port27
icl-sw1 (port27) # set status up
icl-sw1 (port27) # next // repeat for each trunk member port
icl-sw1 (physical-port) # edit port28
icl-sw1 (port28) # set status up
icl-sw1 (port28) # end
```

NOTE: Follow steps 2a through 2h on both switches.

3. Set up the FortiLink interface on the FortiGate unit. Enter the `config system interface`, `edit <interface-member-port>`, `set status up`, `next`, and `end` commands. For example:

```
FG3K2D3Z17800156 # config system interface
FG3K2D3Z17800156 (interface) # edit port45
FG3K2D3Z17800156 (port45) # set status up
FG3K2D3Z17800156 (port45) # next // repeat on all member ports
FG3K2D3Z17800156 (interface) # edit port48
FG3K2D3Z17800156 (port48) # set status up
FG3K2D3Z17800156 (port48) # next
FG3K2D3Z17800156 (interface) # end
```

4. Check the configuration and status on both MCLAG-ICL switches

- a. Enter the `show switch trunk`, `diagnose switch mclag icl`, and `diagnose switch trunk summary <new-trunk-name>` commands. For example:

```
icl-sw1 # show switch trunk
config switch trunk
<snip>
edit "MCLAG-ICL"
set mode lacp-active
set mclag-icl enable
set members "port27" "port28"
next
end

icl-sw1 # show switch interface MCLAG-ICL
```

```
config switch interface
edit "MCLAG-ICL"
set native-vlan 4094
set allowed-vlans 1,100,2001-2060,4093
set dhcp-snooping trusted
set stp-state disabled
set igmps-flood-reports enable
set igmps-flood-traffic enable
set snmp-index 56
next
end
```

```
icl-sw1 # diagnose switch mclag icl
MCLAG-ICL
icl-ports 27-28
egress-block-ports 3-4,7-12,47-48
interface-mac 70:4c:a5:86:6d:e5
lACP-serial-number FS1D483Z17000348
peer-mac 70:4c:a5:49:50:5
peer-serial-number FS1D483Z17000282
Local uptime 0 days 2h:11m:13s
Peer uptime 0 days 2h:11m: 7s
MCLAG-STP-mac 70:4c:a5:49:50:52
keepalive interval 1
keepalive timeout 60
```

```
Counters
received keepalive packets 5838
transmitted keepalive packets 6279
received keepalive drop packets 27
receive keepalive miss 1
```

```
icl-sw1 # diagnose switch trunk summary MCLAG-ICL
```

```
Trunk Name Mode PSC MAC Status Up Time
```

```
MCLAG-ICL lacp-active(auto-isl,mclag-icl) src-dst-ip 70:4C:A5:86:6E:00 up
(2/2) 0 days,1 hours,4 mins,57 secs
```

- b.** Compare the command results in step 4a with the command results in step 2b.

Troubleshooting

If the FortiGate unit does not establish the FortiLink connection with the FortiSwitch unit, perform the following troubleshooting checks.

Check the FortiGate configuration

To use the FortiGate GUI to check the FortiLink interface configuration:

1. In *Network > Interfaces*, double-click the interface used for FortiLink.
2. Ensure that *Dedicated to FortiSwitch* is set for this interface.

To use the FortiGate CLI to verify that you have configured the DHCP and NTP settings correctly:

1. Verify that the NTP server is enabled and that the FortiLink interface has been added to the list:
`show system ntp`
2. Ensure that the DHCP server on the FortiLink interface is configured correctly:
`show system dhcp`

Check the FortiSwitch configuration

To use FortiSwitch CLI commands to check the FortiSwitch configuration:

1. Verify that the switch system time matches the time on the FortiGate:
`get system status`
2. Verify that FortiGate has sent an IP address to the FortiSwitch (anticipate an IP address in the range 169.254.x.x):
`get system interface`
3. Verify that you can ping the FortiGate IP address:
`execute ping x.x.x.x`

To use FortiGate CLI commands to check the FortiSwitch configuration:

1. Verify that the connections from the FortiGate to the FortiSwitch units are up:
`execute switch-controller get-conn-status`
2. Verify that ports for a specific FortiSwitch stack are connected to the correct locations:
`execute switch-controller get-physical-conn standard <FortiSwitch-Stack-ID>`
3. Verify that all the ports for a specific FortiSwitch are up:
`execute switch-controller get-conn-status <FortiSwitch-device-ID>`

Check FortiSwitch connections

Use the following CLI command for detailed diagnostic information on the managed FortiSwitch connections:

```
execute switch-controller diagnose-connection <FortiSwitch_serial_number>
```

If the FortiSwitch serial number is omitted, only the FortiLink configuration is checked.



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