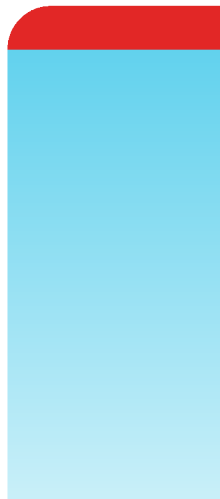


# Admin Guide

## FortiExtender (Managed) 7.2.4



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March 8, 2023

FortiExtender (Managed) 7.2.4 Admin Guide

# TABLE OF CONTENTS

|                                                                                   |           |
|-----------------------------------------------------------------------------------|-----------|
| <b>Introduction</b>                                                               | <b>5</b>  |
| <b>FortiOS and FortiExtender OS compatibility</b>                                 | <b>6</b>  |
| <b>Supported hardware models</b>                                                  | <b>7</b>  |
| <b>Before you begin</b>                                                           | <b>8</b>  |
| <b>FortiExtender and FortiGate integration</b>                                    | <b>9</b>  |
| FortiExtender monitoring enhancement                                              | 9         |
| Provision FortiExtender firmware upon authorization                               | 14        |
| FortiGate-FortiExtender zero-touch provisioning (ZTP)                             | 15        |
| Connect to FortiGate                                                              | 16        |
| Wireless WAN extension to WAN interfaces of FortiGate                             | 16        |
| Wireless extension to internal LAN interface of FortiGate                         | 17        |
| Authorize FortiExtender on FortiOS                                                | 17        |
| VLAN mode                                                                         | 18        |
| Set up FortiExtender as the WAN-extension of FortiGate using VLAN mode            | 18        |
| Enable FortiExtender Controller on FortiOS                                        | 23        |
| Support for device password and allowed protocols for FortiExtender in FortiGate. | 24        |
| FortiExtender as FortiGate LAN extension                                          | 24        |
| Introduce LAN extension mode for FortiExtender                                    | 25        |
| Using the backhaul IP when the FortiGate access controller is behind NAT          | 33        |
| Bandwidth limits on the FortiExtender Thin Edge                                   | 40        |
| IPAM in FortiExtender LAN extension mode                                          | 41        |
| FortiExtender LAN extension in public cloud FGT-VM                                | 45        |
| Allow FortiExtender to be managed and used in a non-root VDOM                     | 52        |
| Discover a FortiExtender unit                                                     | 56        |
| De-authorize FortiExtender devices                                                | 57        |
| The default FortiExtender profile                                                 | 59        |
| Allow access for FortiExtender management                                         | 62        |
| Set bandwidth limit for LAN extension                                             | 62        |
| Configure FortiExtender admin password                                            | 63        |
| Discovery response lockdown                                                       | 64        |
| Wildcard                                                                          | 65        |
| Data transportation over the LAN extension interface                              | 66        |
| LAN extension configuration in a profile                                          | 67        |
| Backhaul IP in LAN extension                                                      | 69        |
| <b>Manage dual FortiExtender devices</b>                                          | <b>71</b> |
| Active/Passive mode                                                               | 71        |
| Active/Active mode                                                                | 71        |
| Cellular as backup of Ethernet WAN                                                | 71        |
| SD-WAN                                                                            | 71        |
| Configure cellular settings                                                       | 73        |
| Create a data plan                                                                | 73        |
| Set the default SIM                                                               | 75        |
| Enable SIM-switch                                                                 | 76        |

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|                                                                           |           |
|---------------------------------------------------------------------------|-----------|
| Report to FortiGate .....                                                 | 77        |
| Capwap mode .....                                                         | 77        |
| VLAN mode .....                                                           | 78        |
| <b>CAPWAP on multiple ports for broadcast discovery .....</b>             | <b>79</b> |
| <b>Check current manage mode .....</b>                                    | <b>80</b> |
| <b>Get modem status .....</b>                                             | <b>81</b> |
| <b>Stopping data traffic on overaged LTE interface .....</b>              | <b>82</b> |
| <b>Use cases .....</b>                                                    | <b>83</b> |
| Redundant with FGT in IP Pass-through mode .....                          | 83        |
| Enable DHCP server on FortiExtender and the VRRP primary router .....     | 85        |
| Enable DHCP relay on both FortiExtender and the VRRP primary router ..... | 86        |
| FEX-201E for FortiGate HA configuration .....                             | 88        |
| Network topology .....                                                    | 89        |
| Prerequisites .....                                                       | 89        |
| Configuration procedures .....                                            | 89        |
| <b>Change Log .....</b>                                                   | <b>93</b> |

# Introduction

FortiExtender is a plug-and-play customer premises equipment (CPE) device. As a 3G/4G LTE and 5G wireless WAN extender, FortiExtender can provide a primary WAN link for retail POS, ATM, and kiosk systems, or a failover WAN link to your primary Internet connection to ensure business continuity. You can deploy it both indoors and outdoors by choosing the right model and appropriate enclosures.

FortiExtender can be deployed in standalone mode as a wireless router, managed individually or centrally from FortiExtender Cloud, or managed by FortiGate as part of the integrated Fortinet Fabric Solutions.

This *Guide* is for FortiExtender managed by FortiGate only. For information about standalone FortiExtender or FortiExtender managed by FortiExtender Cloud, refer to their respective Admin Guides.

## FortiOS and FortiExtender OS compatibility

FortiExtender (Managed) 7.2.4 supports FortiOS 6.2.x, 6.4.x, and 7.0.x. For more information about compatibility between versions of FortiOS and FortiExtender OS, see [FortiOS & FortiExtender OS Compatibility Matrix](#).

## Supported hardware models

FortiExtender OS 7.2.4 supports the following FortiExtender hardware models:

| Model                           | Market                                            |
|---------------------------------|---------------------------------------------------|
| FortiExtender 511F              | Global                                            |
| FortiExtender 311F              | Global                                            |
| FortiExtender 212F              | Global                                            |
| FortiExtender (Managed) 202F-AM | North America                                     |
| FortiExtender (Managed) 202F-EA | EMEA, Brazil, and some APAC carriers              |
| FortiExtender (Managed) 201F-AM | North America                                     |
| FortiExtender (Managed) 201F-EA | EMEA, Brazil, and some APAC carriers              |
| FortiExtender 200F              | Global                                            |
| FortiExtender 101F-EA           | EMEA, Brazil, and parts of APAC                   |
| FortiExtender 101F-AM           | North America                                     |
| FortiExtender 211E              | Global                                            |
| FortiExtender 201E              | North and South Americas, EMEA, and parts of APAC |
| FortiExtenderVehicle 211F       |                                                   |
| FortiExtenderVehicle 211F-AM    |                                                   |

For more information about FortiExtender OS and hardware compatibility, see [FortiExtender OS & Hardware Platform Compatibility Matrix](#).



All FortiExtender units come with a Bluetooth button, which is off by default. Bluetooth discovery will be active for 90 seconds after you press and hold the Bluetooth button for more than three seconds. Once connected, as an example, from the FortiExplorer app, you can access the devices via Bluetooth. As a good security practice, we strongly recommend setting your own password before deploying FortiExtender in your environment.



When running FortiExtender OS 7.2.3 on FEX-511F, be sure to use the latest firmware and use the 7.2.3 GA release to enable the n77 and b48 bands by default.

## Before you begin

Before you start to configure your FortiGate-managed FortiExtender unit, we assume:

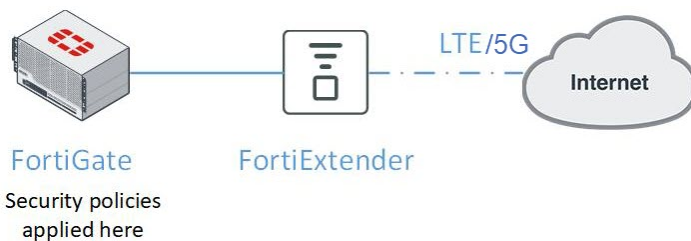
- You have completed the installation of the FortiExtender unit, as outlined in the QuickStart Guide. (**Note:** You can power the FortiExtender unit using an external power adapter or by POE when connected to the POE/PSE port of the FortiGate.)
- You have administrative access to the FortiExtender GUI or CLI.
- You have installed the FortiGate unit on your network and have administrative access to the FortiGate GUI and CLI.

# FortiExtender and FortiGate integration

FortiExtender works as an extended WAN interface in IP pass-through mode.

The following paragraphs highlight the network topology for integrating FortiExtender with FortiGate.

In this scenario, FortiGate manages FortiExtender over the Control and Provisioning of Wireless Access Points (CAPWAP) protocol in IP pass-through mode. Unlike a standalone 3G/4G/5G wireless WAN extender, the FortiExtender managed by FortiGate integrates directly into the FortiGate Connected UTM (Unified Threat Management) and is managed from the familiar FortiOS interface. This not only enables security policies to be seamlessly applied to the FortiExtender, but also provides visibility to the performance and data usage of the connection.



In this scenario, you can connect one FortiExtender to two FortiGate devices for a high availability (HA) configuration in active-passive deployment, or two FortiExtenders to two FortiGate devices in active-active deployment to provide dual active redundancy for wireless WAN access as well.

The FortiExtender and the FortiGate share the same LTE IP in WAN-extension mode. In pre-4.2.2 releases, FortiExtender does not allow access to SSH/HTTPS/HTTP/Telnet service via the LTE interface, so all the traffic to those default services goes to FortiGate. FortiExtender 4.2.2 adds local SSH/HTTPS/HTTP/Telnet service support via the LTE interface. To distinguish local services from FortiGate services, you must configure the FortiExtender to use different ports. Otherwise, all traffic to these default services will be sent to the

FortiExtender locally instead of FortiGate.

**To configure FortiExtender local SSH/HTTPS/HTTP/Telnet service support via the LTE interface:**

```
config system management
  config local-access
    set https 22443
    set ssh 2222
  end
end
```

## FortiExtender monitoring enhancement

The Managed FortiExtenders tab on the Network > FortiExtenders page has been enhanced with the following additional monitoring features:

- Profile tab on the Network > FortiExtenders page has two new charts: Status and Mode.
- Updated Status column with Online, Offline, Waiting For Authorization states.
- A new default Details column filled with the data used by the modem/SIM card when FortiExtender is in WAN-extension mode, or filled with the connected IPsec tunnel used with the FortiGate when FortiExtender is in LAN-extension mode.
- When FortiExtender is in WAN-extension mode, you can view modem information by left-clicking or hovering the mouse over the FortiExtender name to show a tooltip, and then clicking "Diagnostics and Tools".
- The "Serial #" column which used to be a default column is now optional.

### FortiExtender default page and option selection

By default, the page shows the name of each FortiExtender, but Serial number is not in default display.

The screenshot shows the FortiGate-81E-POE interface. The left sidebar lists various network settings, with 'FortiExtenders' highlighted. The main content area has tabs for 'Managed FortiExtenders', 'Profiles', and 'Data Plans'. Under 'Managed FortiExtenders', there are two donut charts: 'Status' showing 2 Online and 0 Offline, and 'Mode' showing 2 WAN extension and 0 LAN extension. Below the charts is a table of managed FortiExtenders.

| Name            | Status | Mode          | Details        |
|-----------------|--------|---------------|----------------|
| FX0015919000272 | Online | WAN extension | M1/S2 76.00 MB |
| FX004TQ21000005 | Online | WAN extension | M1/S2 75.00 MB |

You can click in the default column to view more options and add more columns, such as "Serial #".

This screenshot shows the same FortiExtenders page as the previous one, but with the 'Details' column header clicked. A dropdown menu titled 'Best Fit Columns' is open, showing a list of columns that can be added to the table. The 'Serial #' column is listed at the bottom of the menu.

| Name            | Status | Mode          | Details        |
|-----------------|--------|---------------|----------------|
| FX0015919000272 | Online | WAN extension | M1/S2 76.00 MB |
| FX004TQ21000005 | Online | WAN extension | M1/S2 75.00 MB |

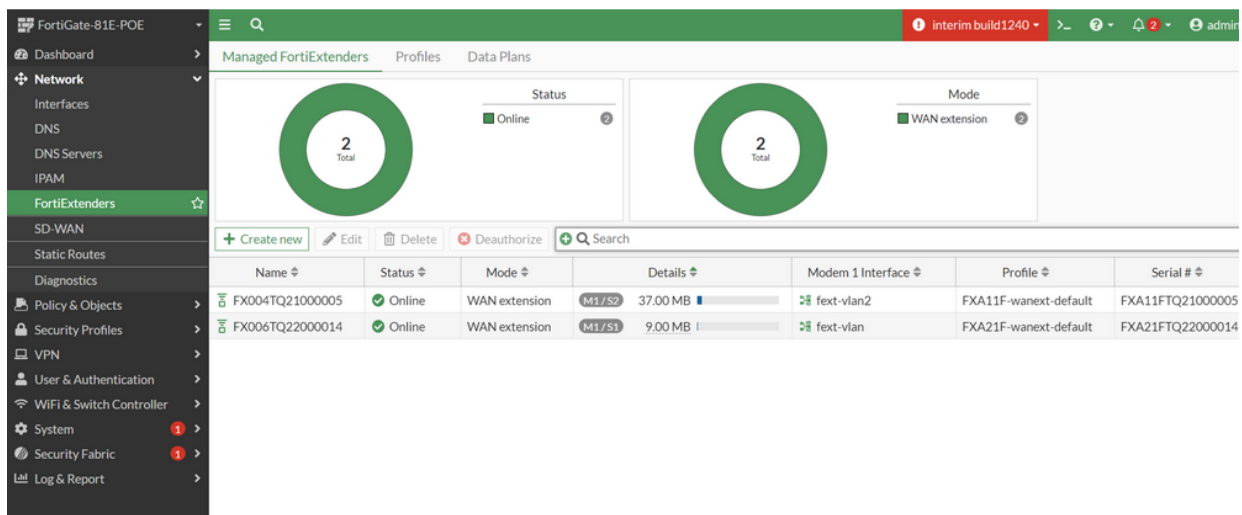
- ✓ Name
- ✓ Status
- ✓ Mode
- ✓ Details
- Modem 1 Interface
- Modem 2 Interface
- Profile
- Serial #

Buttons: Apply, Cancel

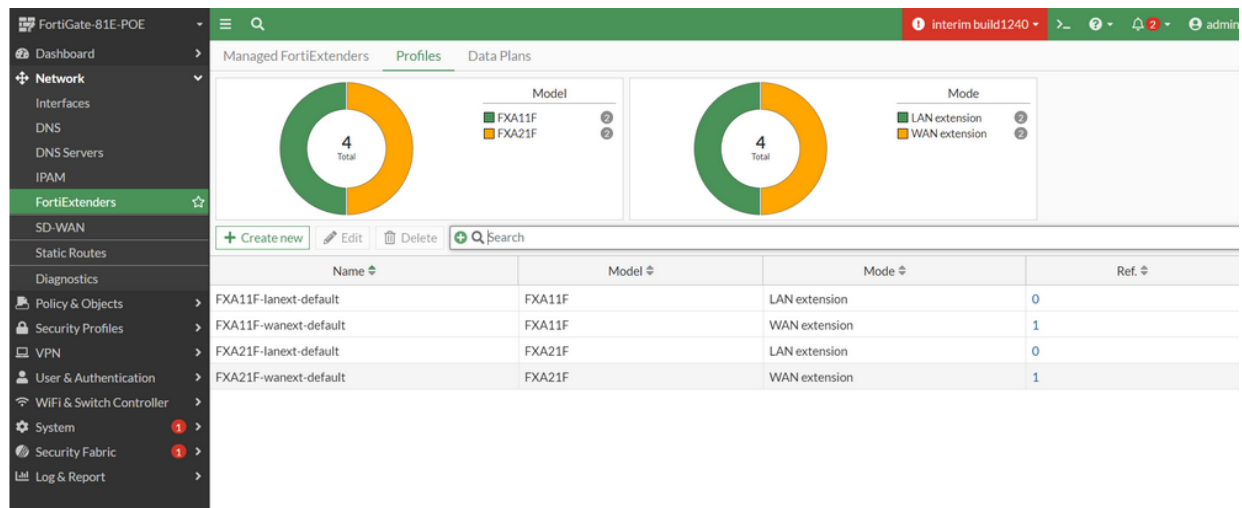
## FortiGate GUI monitoring page when FortiExtender is authorized in wan-extension mode



- The "Modem 1 Interface #" column shows the FortiGate virtual interface which is built on the FortiExtender. This is the FortiGate WAN interface which extends to the FortiExtender LTE-modem.
- The "Details" column shows the data used on Modem1 / SIM1 in FXA21FTQ22000014.



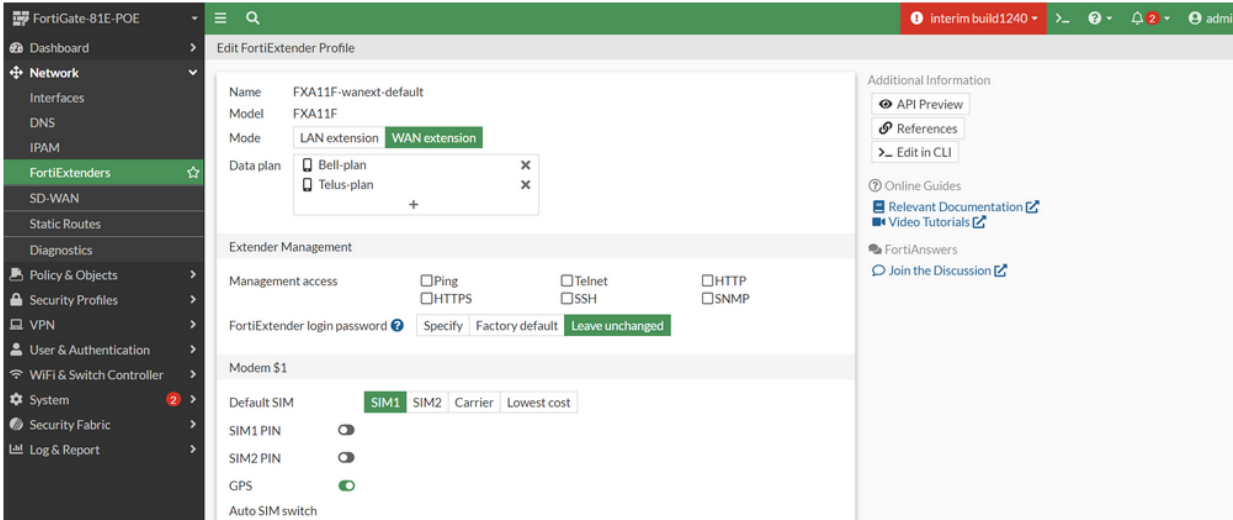
## FortiGate GUI provides the profiles used for each FortiExtender



## FortiGate GUI provides profile settings for wan-extension



- "Default SIM" defines which SIM card starts to work first.
- SIM switch can be enabled by data plan. Assuming SIM1 uses Bell card. When its usage has reached the data limit in the plan, SIM2 (using Telus card) will be engaged to for service.

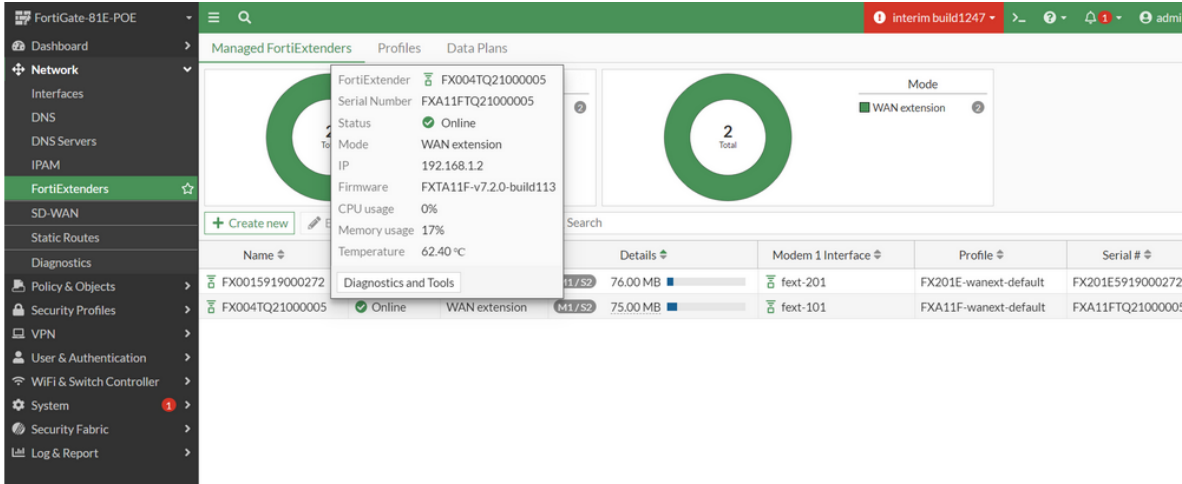


FortiGate GUI provides detailed FortiExtender diagnostics pages

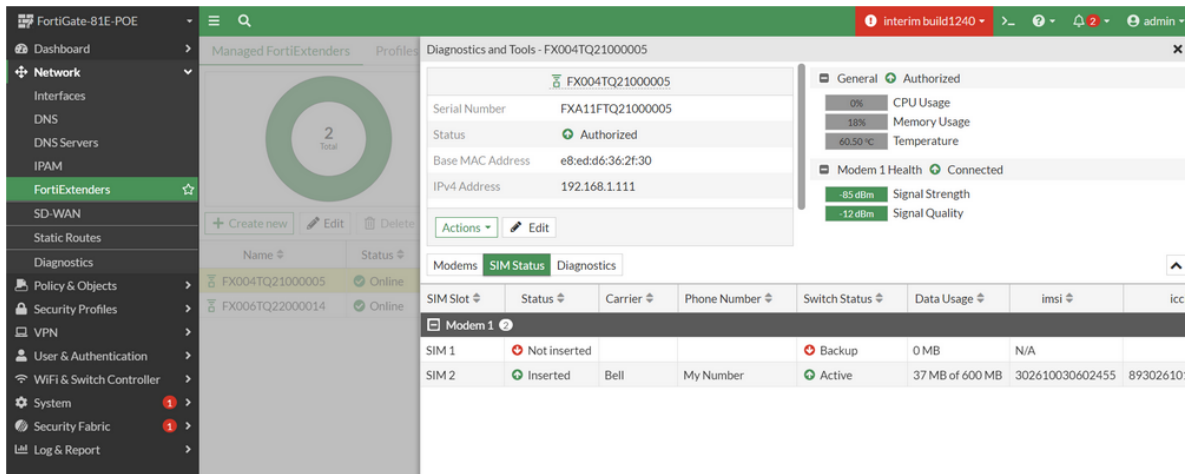


You can left-click the name of an FortiExtender or hover the mouse over the name to get the tooltip, as shown in the following image.

- 1. Click the name of an FortiExtender to get the following page.



- Click "Diagnostics and Tools" to open the Diagnostics and Tools page.



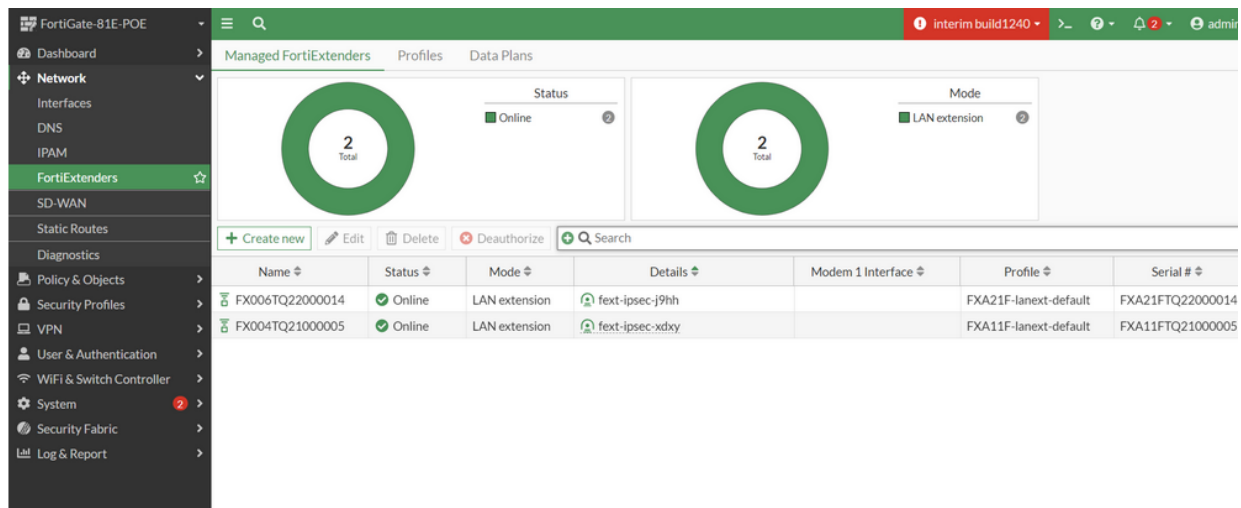
The screenshot shows the FortiGate GUI with the 'Diagnostics and Tools' page selected. The page title is 'Diagnostics and Tools - FX004TQ21000005'. The left sidebar shows the 'FortiExtenders' section under 'Network'. The main content area displays a summary of the FortiExtender's status, including its serial number (FXA11FTQ21000005), status (Authorized), base MAC address (e8:ed:d6:36:2f:30), and IPv4 address (192.168.1.111). Below this, there is a table of modems. The table has columns for SIM Slot, Status, Carrier, Phone Number, Switch Status, Data Usage, imsi, and icc. The table shows two modems: SIM 1 (Not inserted) and SIM 2 (Inserted).

| SIM Slot | Status       | Carrier | Phone Number | Switch Status | Data Usage      | imsi            | icc      |
|----------|--------------|---------|--------------|---------------|-----------------|-----------------|----------|
| SIM 1    | Not inserted |         |              | Backup        | 0 MB            | N/A             |          |
| SIM 2    | Inserted     | Bell    | My Number    | Active        | 37 MB of 600 MB | 302610030602455 | 89302610 |

## FortiGate GUI monitoring page when FortiExtender is authorized in lan-extension mode



The "Details" column shows the IPSec tunnel between FortiGate and FortiExtender.



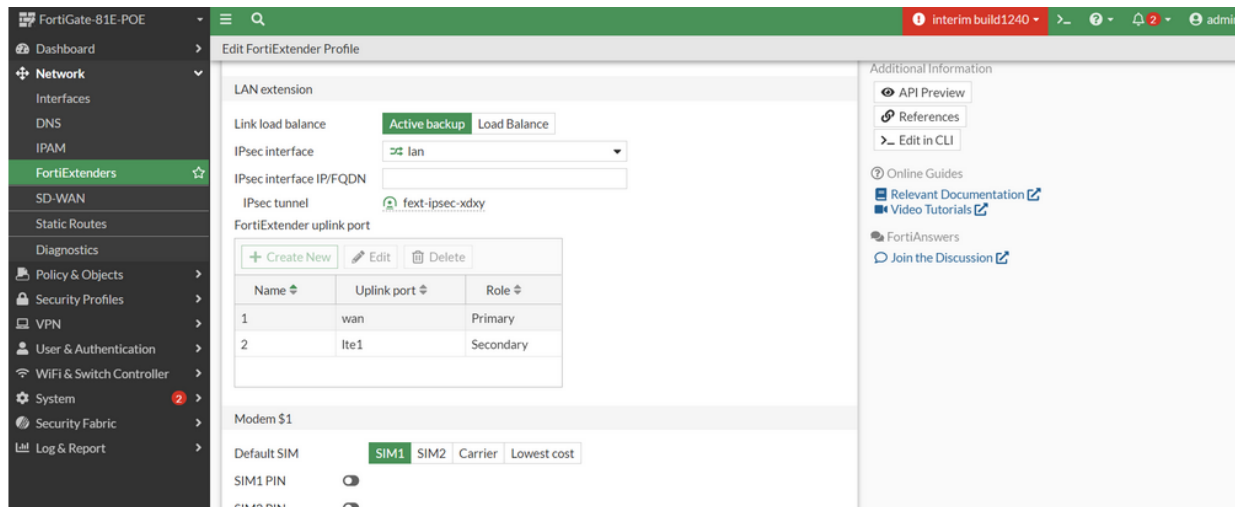
The screenshot shows the FortiGate GUI with the 'Managed FortiExtenders' page selected. The page title is 'Managed FortiExtenders'. The left sidebar shows the 'FortiExtenders' section under 'Network'. The main content area displays a summary of the FortiExtenders' status, including their names, status, mode, and details. Below this, there is a table of modems. The table has columns for Name, Status, Mode, Details, Modem 1 Interface, Profile, and Serial #. The table shows two FortiExtenders: FX006TQ22000014 and FX004TQ21000005.

| Name            | Status | Mode          | Details         | Modem 1 Interface | Profile               | Serial #         |
|-----------------|--------|---------------|-----------------|-------------------|-----------------------|------------------|
| FX006TQ22000014 | Online | LAN extension | fext-ipsec-j9hh |                   | FXA21F-lanext-default | FXA21FTQ22000014 |
| FX004TQ21000005 | Online | LAN extension | fext-ipsec-xdxy |                   | FXA11F-lanext-default | FXA11FTQ21000005 |

## FortiGate GUI provides Profile settings for lan-extension



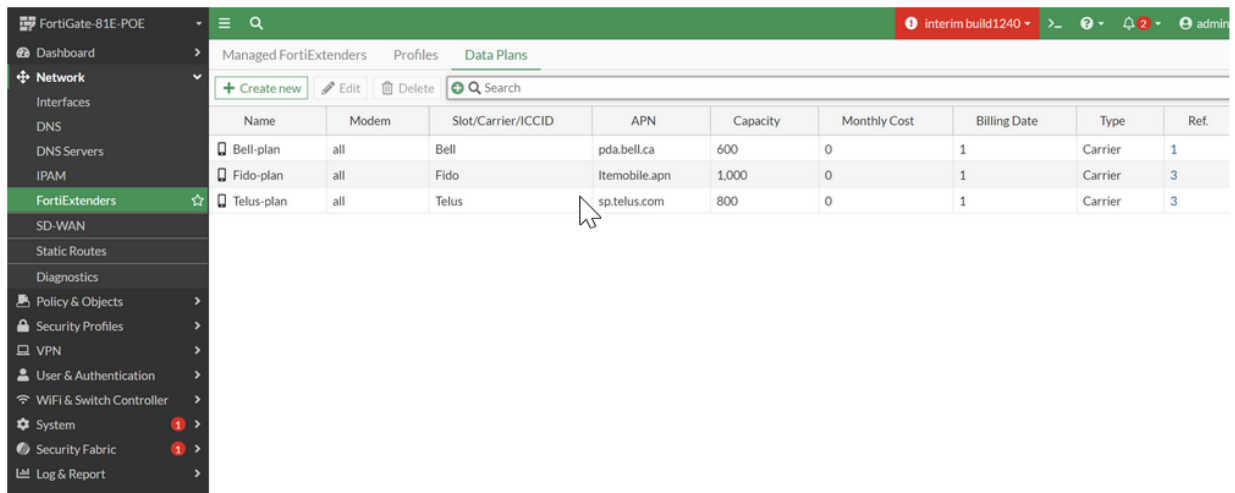
- You can set the IPsec tunnel connection between FortiExtender and FortiGate on this page.
- After multiple connections from FortiExtender (as uplink) are established, you can select load balance mode on this page.



### FortiGate GUI provides the settings for data plan



- Each data plan is associated with a carrier name. After the SIM card is active, the modem will detect the carrier and use the corresponding plan.
- Each data plan has a data limit (capacity) that can be used by the SIM card. The data limit is reset after the billing date.



## Provision FortiExtender firmware upon authorization

FortiExtender is now able to automatically perform firmware provisioning using CLI commands. This makes it possible to allow federated upgrade of an FortiExtender unit upon discovery and authorization by the FortiGate. The FortiExtender will be upgraded to the latest firmware from FortiGuard, based on the matching FortiExtender firmware version that matches each FortiOS firmware version.

1. FortiGuard has a matrix which contains following table for each FortiExtender. The matrix code is FEXV.

```
FGTVersion=7.2.1|FGTBuildNum=01247|FEXPlatform=FX201E|FEXVersion=7.2.0|FEXBuildNum=00113|ImageIdentifier=07002000FIMG1000102000
```

2. Test condition: The FortiGate has v7.2.1 b1247 and the FortiExtender has v7.0.3 b056.

```
config system global
    set fortiextender-provision-on-authorization enable
end
```

3. Once the FortiGate has authorized the FortiExtender, automatical update is enabled for one time.

```
config extension-controller extender
    edit "FX0015919000272"
        set id "FX201E5919000272"
        set authorized enable <<----- Upon user auth,
        set device-id 1
        set extension-type wan-extension
        set profile "FX201E-wanext-default"
        set override-allowaccess enable
        set allowaccess ping telnet
        set override-login-password-change enable
        config wan-extension
            set modem1-extension "fext-201"
        end
        set firmware-provision-latest once <<----- Config is automatically
            set to "once"
    next
end
```

4. Once the FortiGate starts to manage the FortiExtender and detects that the FortiExtender's build is lower than that in the matrix (v7.2.0 b0113), the FortiGate will push the image (b0113) to FortiExtender.

## FortiGate-FortiExtender zero-touch provisioning (ZTP)

FortiExtender supports FortiGate-FortiExtender zero-touch provisioning (ZTP). The FortiExtender default discovery mode is set to auto with DHCP server enabled over the LAN interface. The process is outlined stepwise as follows:

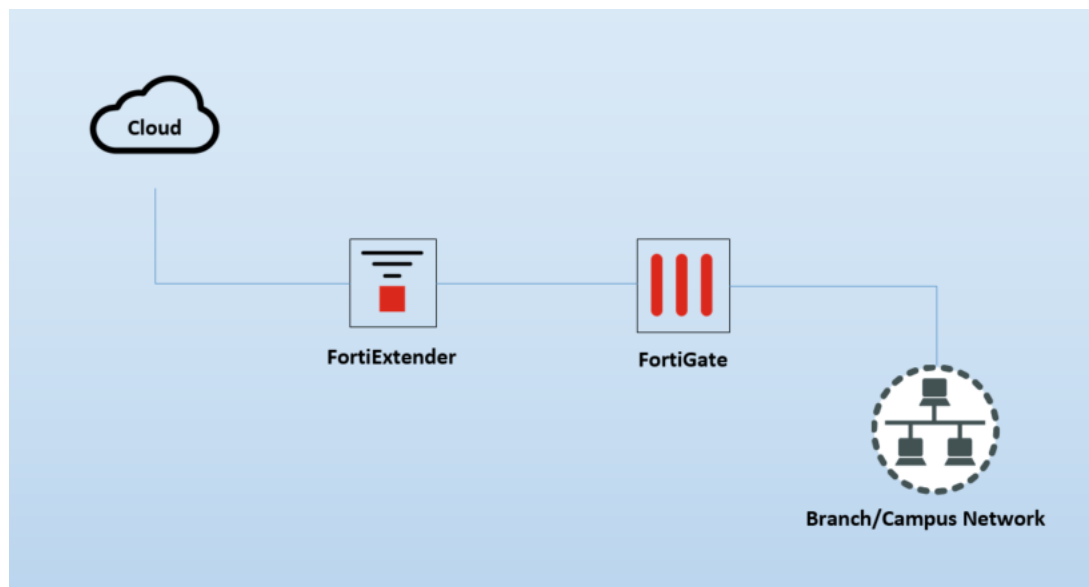
1. A SIM card without a PIN code is expected to be used for ZTP, and the default APN should be retrieved automatically at first connection.
2. Acting as a DHCP client, the FortiGate connects to the FortiExtender LAN port (1, 2, or 3) interface to obtain a private IP to reach FortiManager.
3. The FortiGate reports the discovered FortiExtender to FortiManager to authorize it (FortiExtender).
4. Once authorized, the FortiExtender switches to IP-passthrough mode and then reboots itself.
5. Upon booting up in IP-passthrough mode, the FortiExtender serves as the FortiExtender WAN interface of the FortiGate.

## Connect to FortiGate

When setting up a FortiExtender out of box with FortiExtender OS version 7.0.0 or later, you can connect the FortiExtender to a FortiGate in either of the following ways:

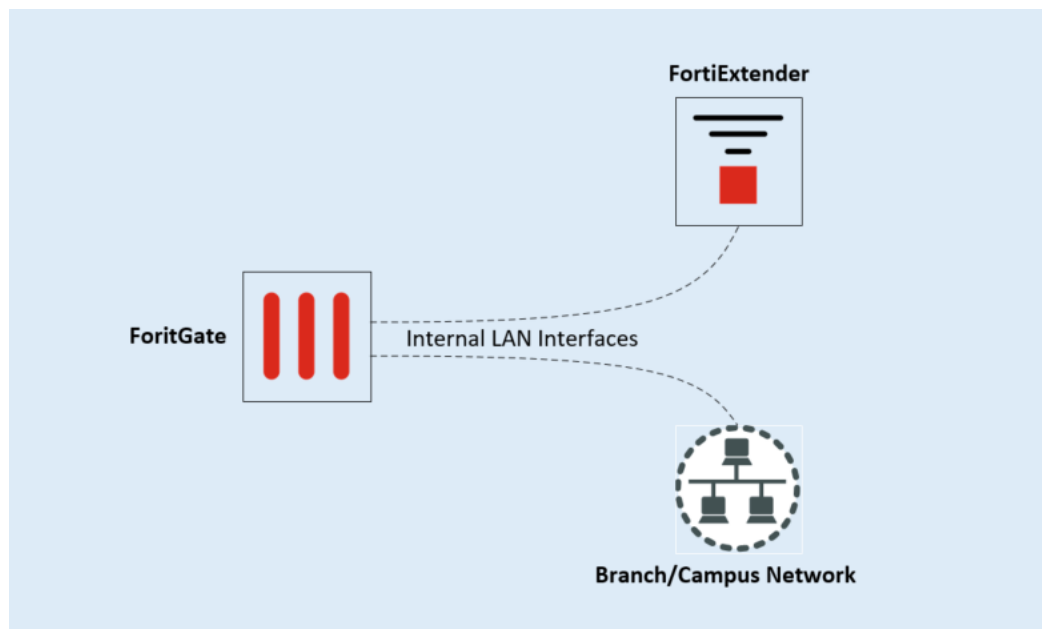
- Connect the FortiGate port (such as WAN1/WAN2) in DHCP client mode to a FortiExtender LAN port (1—3). In this option, the FortiGate interface acquires DHCP lease from the FortiExtender LAN DHCP server, and has a default gateway as the FortiExtender LAN interface IP address.
- If the FortiGate internal /LAN is running a DHCP server, connect the FortiGate to port4 of the FortiExtender, which acquires DHCP lease from the FortiGate DHCP server.

### Wireless WAN extension to WAN interfaces of FortiGate



Connect the FortiGate WAN port (e.g., WAN1 or WAN2) which is in DHCP client mode to a FortiExtender LAN port (LAN 1—3 in FortiExtender 201E/211E). In this option, the FortiGate WAN interface acquires DHCP lease from the FortiExtender LAN DHCP server, and has a default gateway as the FortiExtender LAN interface IP address, as illustrated above.

## Wireless extension to internal LAN interface of FortiGate



In some scenarios, you may want to connect the FortiExtender to an internal LAN interface of the FortiGate (to use POE power or some other means). In this case, if the FortiGate internal LAN is running a DHCP server, connect the FortiGate to port4 of the FortiExtender (FEX-201E/211E) which acquires DHCP lease from the FortiGate DHCP server, as illustrated above.

## Authorize FortiExtender on FortiOS

Once the FortiExtender is discovered, you must authorize it by associating it either with a virtual WAN interface or a VLAN interface.

To authorize the FortiExtender device in FortiOS:

1. Go to *Network > FortiExtender*, and wait for the FortiExtender device to be discovered by the FortiGate.
2. Bind the device to an interface and authorize it.

In FortiGate 5.4 and later releases, you must manually create either a virtual WAN interface of type FEX-WAN or a VLAN sub-interface, and link it to the FortiExtender as part of the authorization process, as

illustrated below.

|                                                     |                                                                                                                                                                                 |
|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Serial Number                                       | FX04DA5918009600                                                                                                                                                                |
| Status                                              | Deauthorized                                                                                   |
| Interface Name                                      |  fext-wan1  |
| <div> <div>Authorize</div> <div>Delete</div> </div> |                                                                                                                                                                                 |

Make sure that the FortiExtender and the FortiGate are connected on Layer 2 by default. If they are not connected via Layer 2 but can reach each other via Layer-3 networking, configure the FortiExtender with static discovery using the following FortiExtender CLI commands:



```
config system management fortigate
    set ac-discovery-type static
    config static-ac-addr
        edit 1
            set server 192.168.1.99
        next
        edit 2
            set server fortinet.com
        next
    end
    set discovery-intf lan port4
end
```

## VLAN mode

VLAN mode is an alternative to the default CAPWAP mode for FortiGate to FortiExtender connectivity. In the default FEX-WAN type interface, all traffic to and from the FortiGate is encapsulated in the CAPWAP data channel. In VLAN mode, traffic is sent and received on the VLAN interface. Because there is no encapsulation overhead and data traffic is processed in userspace currently, VLAN mode delivers better performance with the requirement that the VLAN interface be directly created on the port on which the FortiExtender is connected to the FortiGate.

It is important to note that in VLAN mode, the FortiExtender and the FortiGate can be connected directly to each other or through a switch. In case of a switch in between, the switch must be configured to support the configured VLANs.

## Set up FortiExtender as the WAN-extension of FortiGate using VLAN mode

Before you start, keep the following in mind:

- Ensure that the VLAN interface is created according to the actual physical interface of the connected FortiExtender.



In this sample configuration, Port 4 of the FortiExtender is directly connected to the WAN2 interface on the FortiGate.

---

## Configure the FortiGate

1. Create a WAN2 interface, setting the IP address to 192.168.2.99 with a DHCP server running on it and allowing Security Fabric connection traffic.
2. Enable 'fortiextender-vlan-mode':



- By default, VLAN mode is disabled on FortiGate, and must be explicitly enabled on the FortiGate:

```
config system global
(global)set fortiextender-vlan-mode enablevlan
(global)end
```
  - Before enabling VLAN mode, you must delete all the FortiExtender-WAN interfaces created on the device.
- 

3. Create a VLAN interface (any VLAN ID, e.g., 123) on top of the WAN2 interface, name it FEXVLAN, and

make this interface type DHCP client.

**New Interface**

Name: FEXVLAN

Alias:

Type: VLAN

VLAN protocol: 802.1Q 802.1AD

Interface: wan2

VLAN ID: 123

VRF ID: 0

Role: LAN

**Address**

Addressing mode: Manual **DHCP** Auto-managed by IPAM PPPoE

Retrieve default gateway from server: ☒

Distance: 5

Override internal DNS: ☒

Create address object matching subnet: ☒

Name: FEXVLAN address

Destination: 0.0.0.0/0.0.0.0

**Administrative Access**

IPv4: ☐ HTTPS ☐ HTTP ☐ PING ☐ SNMP

☐ FMG-Access ☐ SSH ☐ Security Fabric Connection

☐ FTM ☐ RADIUS Accounting

☐ Speed Test

**Network**

Device detection: ☒

## Configure the FortiExtender

1. Ensure that the port4 interface is connected to WAN2 to get the IP address (192.168.2.98) from the FortiGate.
2. On the FortiExtender GUI, select *Setting>Management*, and set the following:
  - Controller — FortiGate
  - Discovery Type — Static
  - Discovery Interface — port4
  - Static Access Control Address > Server —192.168.2.99

**Management Setup** [Cancel] [Save]

**Controller**

auto **fortigate** cloud local

**Fortigate**

Discovery Type

broadcast **static**

Discovery Interface: port4

Controller CTL Port: 5246

Ingress Interface: port4

**Static Access Control Address**

[Create]

| Server       | ID |
|--------------|----|
| 192.168.2.99 | 1  |

- On the FortiGate GUI, select *Network>FortiExtenders*, wait for the FortiExtender to be discovered by the FortiGate, and then authorize the FortiExtender by setting the following:
  - Mode — WAN extension
  - Modem 1 Interface — FEXVLAN

**Edit FortiExtender**

Serial number: FX511FTQ XXXXXXXX

Alias:

Mode: LAN extension **WAN extension**

Profile: FX511F-wanext-default

**Extender Profile Overrides**

Management access: ☒ Ping ☒ Telnet ☒ HTTP ☒ HTTPS ☒ SSH ☒ SNMP

FortiExtender login password:

State

Authorized: ☒

WAN extension

Modem 1 Interface: FEXVLAN

- Wait for a few moments, for the FortiExtender may need to reboot when the mode is changed from NAT to IP-passthrough (VLAN).
- After the WAN extension tunnel is set up, check its status from the FortiExtender Dashboard for the following Controller Information:

- FortiGate, with Status — Connected
  - Mode — FortiGate (ip-passthrough (VLAN))
6. Check the status of the WAN extension with the following FortiExtender CLI command:
- ```
# get extender status
```

```

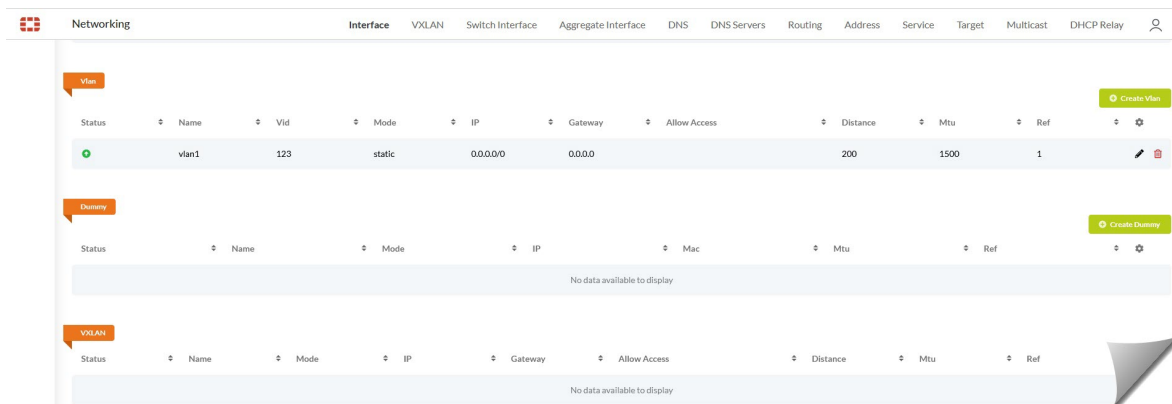
Fortinet

FX511FTQ login: Modem 1: Cellular Data Session started successfully

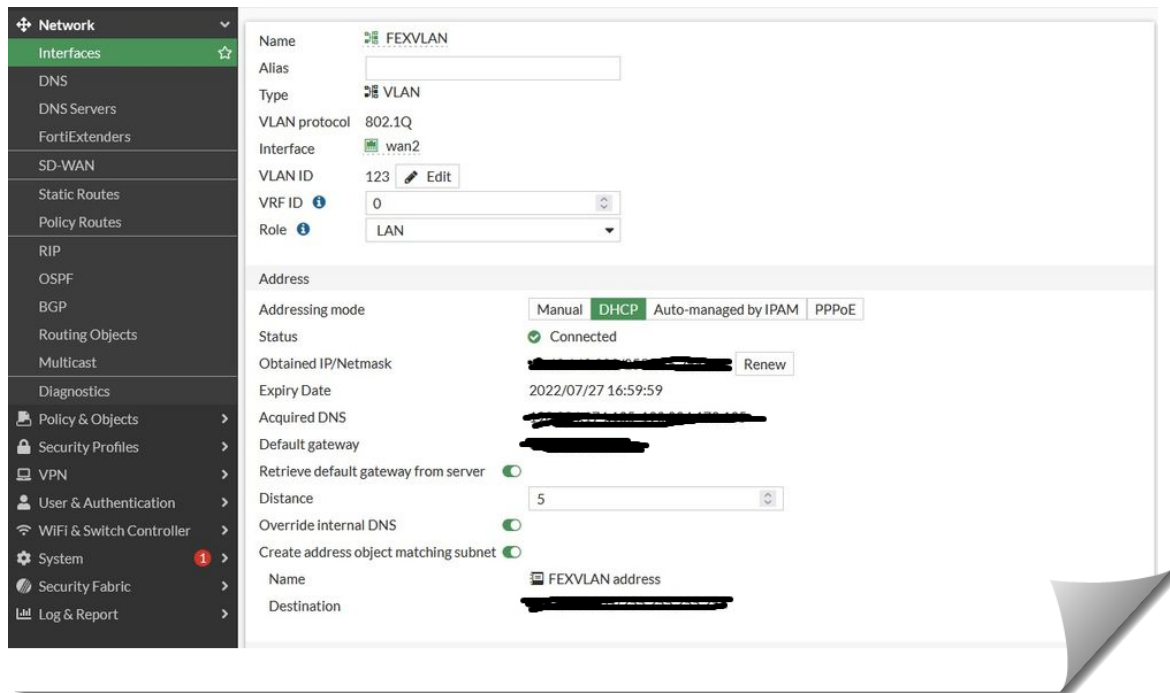
FX511FTQ login: admin
Password:
FX511FTQ # get extender status
Extender Status
  name           : FX511FTQ
  mode           : CAPWAP
  fext-addr      : 192.168.2.98
  ingress-intf   : port4
  fext-wan-addr  : 
  controller-addr : 192.168.2.99:5246,25246
  controller-name : FGT81E
  uptime        : 0 days, 0 hours, 50 minutes, 28 seconds
  management-state : CWS_RUN
  base-mac      : 94:FF:3C:0D:1A:C0
  network-mode   : ip-passthrough (vlan)
  fgt-backup-mode : backup
  discovery-type  : static
  discovery-interval : 5
  echo-interval  : 30
  report-interval : 30
  statistics-interval : 120
  mdm-fw-server  : fortixtender-firmware.forticloud.com
  ps-fw-server   : fortixtender-firmware.forticloud.com

```

The FortiGate will send the VLAN ID to the FortiExtender over CAPWAP, and the FortiExtender will then create a VLAN interface automatically with the name VLAN1 and vid 123, for example. No special configuration is needed.



Now when the FortiExtender modem is connected to the internet, the FortiGate VLAN interface, i.e., FEXVLAN, will get the same IP address as the one of the FortiExtender LTE interface.



On the FortiGate, after configuring the correct firewall policy, the client behind the FortiGate can go to the internet via the FEXVLAN interface. This will ensure that the VLANs are separated for data traffic from control traffic.

## Enable FortiExtender Controller on FortiOS

After connecting your FortiExtender LAN port to the FortiGate, do the following:

1. Enable the FortiExtender Controller on the FortiGate.
 

```
config system global
    set fortiextender enable
end
```
2. Make sure that your FortiGate enables FortiExtender Controller.  
The FortiExtender-related GUI is enabled by default.
3. Enable the CAPWAP access to use the FortiGate interface to which the FortiExtender is connected.
 

```
config system interface
    edit lan
        append allowaccess fabric
    next
end
```



The "append allowaccess fabric" command is introduced in FOS 6.2.3, and applies to FortiGate devices running FOS 6.2.3 and later. If you are connecting your FortiExtender to a pre-FortiOS 6.2.3 FortiGate device, you MUST use "append allowaccess capwap" instead.



Be sure to keep the following in mind:

- If FortiLink is enabled, the FortiExtender must be connected to the FortiGate through FortiLink.
- If FortiLink is enabled and the FortiExtender is not part of FortiLink, the discovery type on the FortiExtender must be static.

## Support for device password and allowed protocols for FortiExtender in FortiGate.

This feature enables you to configure FortiExtender admin password from FortiGate. You can also configure allowaccess of the ingress interface from the FortiGate so that the FortiGate can manage the FortiExtender based on the protocol specified in allowaccess.

For FortiExtenders configured as WAN extension in FortiGate, the ingress interface is the one specified in "ingress-intf" under "config system management fortigate". In the following example, the allowaccess of the "lan" interface will be changed as the configuration from the FortiGate. The value of "ingress-intf" will be automatically filled by the system when the FortiExtender is managed by the FortiGate. It cannot be edited or unset.

```
FX201E5919000027 # config system management fortigate
FX201E5919000027 (fortigate) # show
config system management fortigate
  set ac-discovery-type broadcast
  set ac-ctl-port 5246
  set ac-data-port 25246
  set discovery-intf lan
  set ingress-intf lan <=== The value cannot be edited and unset
end
```

For a FortiExtender configured as LAN extension of a FortiGate, the ingress interface is "le-switch", whose allowaccess will be changed as the configuration from the FortiGate. In the following example, the "le-switch" is a predefined switch interface which will be automatically generated by the system when the FortiExtender is managed by the FortiGate. The entry "le-switch" under "config system switch-interface" is read-only and cannot be edited or deleted.

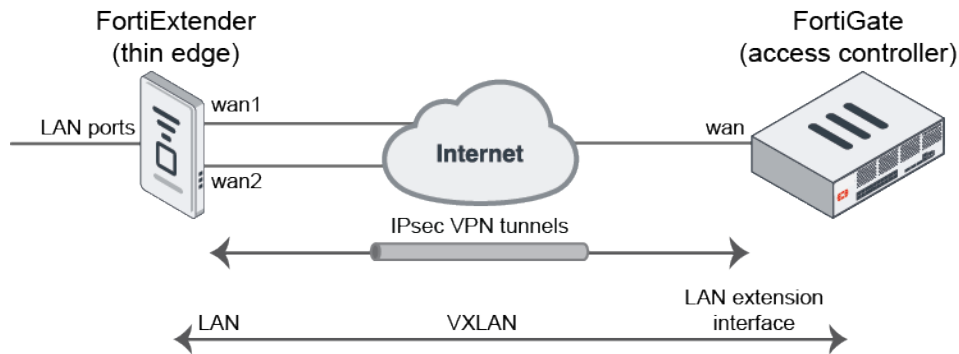
```
config system switch-interface
  edit le-switch <=== The entry cannot be edited or deleted
    set members le-agg-link lan
    set stp disable
  next
end
```

## FortiExtender as FortiGate LAN extension

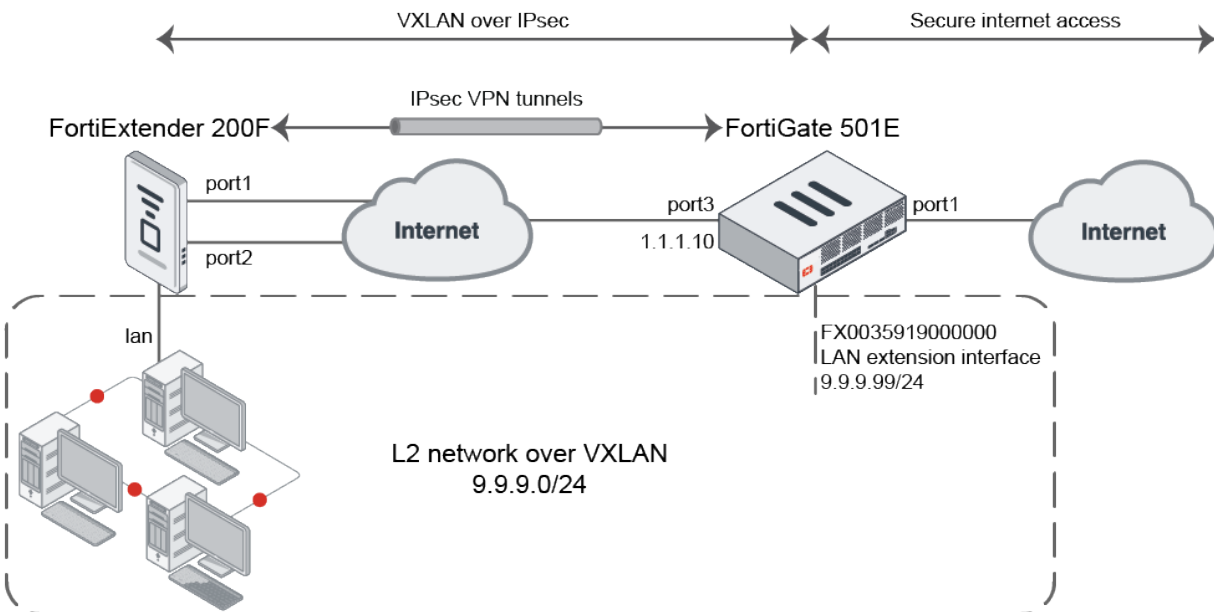
This section discusses how to configure FortiExtender as the LAN extension interface of FortiGate.

## Introduce LAN extension mode for FortiExtender

LAN extension is a new configuration mode on the FortiGate that allows the FortiExtender to provide remote thin edge connectivity back to the FortiGate over a backhaul connection. The FortiExtender deployed at a remote location will discover the FortiGate access controller (AC) and form an IPsec tunnel (or multiple tunnels when multiple links exist on the FortiExtender) back to the FortiGate. A VXLAN is established over the IPsec tunnels to create an L2 network between the FortiGate and the network behind the remote FortiExtender.



In the following example, the FortiGate 501E is the FortiExtender AC that provides secure internet access to the remote network behind the FortiExtender 200F thin edge. The FortiGate 501E has two WAN connections: one is used as an inbound backhaul connection and the other for outbound internet access. The FortiExtender 200F has two wired WAN/uplink ports connected to the internet. Once the FortiExtender discovers the FortiGate AC and is authorized by the FortiGate, the FortiGate pushes an extender profile to the FortiExtender. From the profile, the extender uses the configurations to form two IPsec tunnels back to the FortiGate. Additional VXLAN aggregate interfaces are automatically configured to create an L2 network between the FortiExtender LAN port and a virtual LAN extension interface on the FortiGate. Clients behind the FortiExtender can now connect to the internet through the FortiGate that secures the internet connection.



## Authorizing the devices

### To discover and authorize the FortiExtender in the GUI:

- On the FortiGate, enable the Security Fabric connection on port3 to allow the FortiExtender to connect over CAPWAP:
  - Go to *Network > Interfaces* and edit port3.
  - In the *Administrative Access* section, select *PING* and *Security Fabric Connection*.
  - Click *OK*.
- On the FortiExtender, connect to the CLI via SSH and set the AC server address to the FortiGate:

```
config system management
  set discovery-type fortigate
  config fortigate
    set ac-discovery-type static
    config static-ac-addr
      edit 1
        set server 1.1.1.10
      next
    end
  set ac-ctl-port 5246
  set ac-data-port 25246
  set discovery-intf port1 port2
  set ingress-intf
end
end
```

Once the FortiExtender's discovery packet reaches port3 on the FortiGate, the FortiExtender will appear under *Network > FortiExtenders* as unauthorized.

| Managed FortiExtenders                                                                                                                   |                  |              |               |
|------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------------|---------------|
| Profiles                                                                                                                                 |                  |              |               |
| Data Plans                                                                                                                               |                  |              |               |
| <a href="#">+ Create New</a> <a href="#">Edit</a> <a href="#">Delete</a> <a href="#">Deauthorize</a> <input type="text" value="Search"/> |                  |              |               |
| Name                                                                                                                                     | Serial Number    | Status       | Mode          |
| FX0035919000000                                                                                                                          | FX200F5919000000 | Unauthorized | LAN extension |

The FortiGate automatically creates a VPN profile for this FortiExtender, which appears on the *VPN > IPsec Tunnels* page.

| <a href="#">+ Create New</a> <a href="#">Edit</a> <a href="#">Delete</a> <input type="text" value="Search"/> |                   |          |      |
|--------------------------------------------------------------------------------------------------------------|-------------------|----------|------|
| Tunnel                                                                                                       | Interface Binding | Status   | Ref. |
| Custom 1                                                                                                     |                   |          |      |
| fxext-ipsec-ksKS                                                                                             | port3             | Inactive | 3    |

The FortiGate also creates an extender profile for that model of FortiExtender, which appears on the *Network > FortiExtenders > Profiles* tab.

| Managed FortiExtenders                                                                                       |        |               |      |
|--------------------------------------------------------------------------------------------------------------|--------|---------------|------|
| Profiles                                                                                                     |        |               |      |
| Data Plans                                                                                                   |        |               |      |
| <a href="#">+ Create New</a> <a href="#">Edit</a> <a href="#">Delete</a> <input type="text" value="Search"/> |        |               |      |
| Name                                                                                                         | Model  | Mode          | Ref. |
| FX200F-lanext-default                                                                                        | FX200F | LAN extension | 1    |

The FortiExtender profile is configured based on the FortiExtender model. It automatically selects *Load Balance* (as the *Link load balance* setting), the IPsec interface, and the pre-configured tunnel.

**Edit FortiExtender Profile**

Name: FX200F-lanext-default  
Model: FX200F  
Mode: LAN extension

**LAN extension**

Link load balance: Active backup Load Balance

IPsec interface: port3

IPsec interface IP/FQDN:

IPsec tunnel: text-ipsec-ksKS

FortiExtender uplink port

| Name | Uplink port | Weight |
|------|-------------|--------|
| 1    | port1       | 1      |
| 2    | port2       | 1      |

**Additional Information**

[API Preview](#)  
[References](#)  
[Edit in CLI](#)

[Documentation](#)  
[Online Help](#)  
[Video Tutorials](#)

### 3. Authorize the FortiExtender:

- Go to **Network > FortiExtenders**, select the **Managed FortiExtenders** tab, and edit the discovered FortiExtender.
- In the **Status** section, enable **Authorized**.

**Edit FortiExtender**

Serial number: FX200F5919000000  
Alias:   
Mode: LAN extension  
Profile: FX200F-lanext-default

**State**

Authorized: ☒

**FortiGate**

**FortiGate-501E**

**Additional Information**

[API Preview](#)  
[Edit in CLI](#)

[Documentation](#)  
[Online Help](#)  
[Video Tutorials](#)

OK Cancel

- Click **OK**. The device now displays as authorized.

| Managed FortiExtenders                                                                                                    |                  |            |               |
|---------------------------------------------------------------------------------------------------------------------------|------------------|------------|---------------|
| Profiles Data Plans                                                                                                       |                  |            |               |
| <a href="#">+ Create New</a> <a href="#">Edit</a> <a href="#">Delete</a> <a href="#">Deauthorize</a> <input type="text"/> |                  |            |               |
| Name                                                                                                                      | Serial Number    | Status     | Mode          |
| FX0035919000000                                                                                                           | FX200F5919000000 | Authorized | LAN extension |

### To discover and authorize the FortiExtender in the CLI:

- On the FortiGate, enable the Security Fabric connection on port3 to allow the FortiExtender to connect over CAPWAP:

```
config system interface
  edit "port3"
    set vdom "root"
```

```
        set ip 1.1.1.10 255.255.255.0
        set allowaccess ping fabric
    next
end
```

2. On the FortiExtender, connect to the CLI via SSH and set the AC server address to the FortiGate:

```
config system management
    set discovery-type fortigate
    config fortigate
        set ac-discovery-type static
        config static-ac-addr
            edit 1
                set server 1.1.1.10
            next
        end
        set ac-ctl-port 5246
        set ac-data-port 25246
        set discovery-intf port1 port2
        set ingress-intf
    end
end
```

3. The FortiGate discovers the FortiExtender and some basic configurations are automatically initialized in FortiOS:

```
config extender-controller extender
    edit "FX0035919000000"
        set id "FX200F5919000000"
        set device-id 0
        set extension-type lan-extension
        set profile "FX200F-lanext-default"
    next
end
```

4. An IPsec tunnel is automatically created for the detected FortiExtender:

```
config vpn ipsec phase1-interface
    edit "fext-ipsec-ksKS"
        set type dynamic
        set interface "port3"
        set ike-version 2
        set peertype one
        set net-device disable
        set proposal aes128-sha256 aes256-sha256 aes128-sha1 aes256-sha1
        set localid "localid-5bzuqs54dGni2TT0x2NePg0HexHW2piQ44aZ4NiGe8SVxxBnFuiqZqo"
        set dpd on-idle
        set comments "[FX200F-lanext-default] Do NOT edit. Automatically generated by extender controller."
        set peerid "peerid-svxVy5bZbPxZdfoIQBNA7YrkSKBA9Ui1vZsvYcVrgp1Uy0aFMCVZzGzh"
        set psksecret ENC <secret>
        set dpd-retryinterval 60
    next
end
config vpn ipsec phase2-interface
    edit "fext-ipsec-ksKS"
```

```
        set phase1name "fext-ipsec-ksKS"
        set proposal aes128-sha1 aes256-sha1 aes128-sha256 aes256-sha256 aes128gcm
aes256gcm chacha20poly1305
        set comments "[FX200F-lanext-default] Do NOT edit. Automatically generated
by extender controller."
    next
end
```

**5. A FortiExtender profile is created for the model of the detected FortiExtender:**

```
config extender-controller extender-profile
    edit "FX200F-lanext-default"
        set id 0
        set model FX200F
        set extension lan-extension
        config lan-extension
            set link-loadbalance loadbalance
            set ipsec-tunnel "fext-ipsec-ksKS"
            set backhaul-interface "port3"
            config backhaul
                edit "1"
                    set port port1
                next
                edit "2"
                    set port port2
                next
            end
        end
    end
```

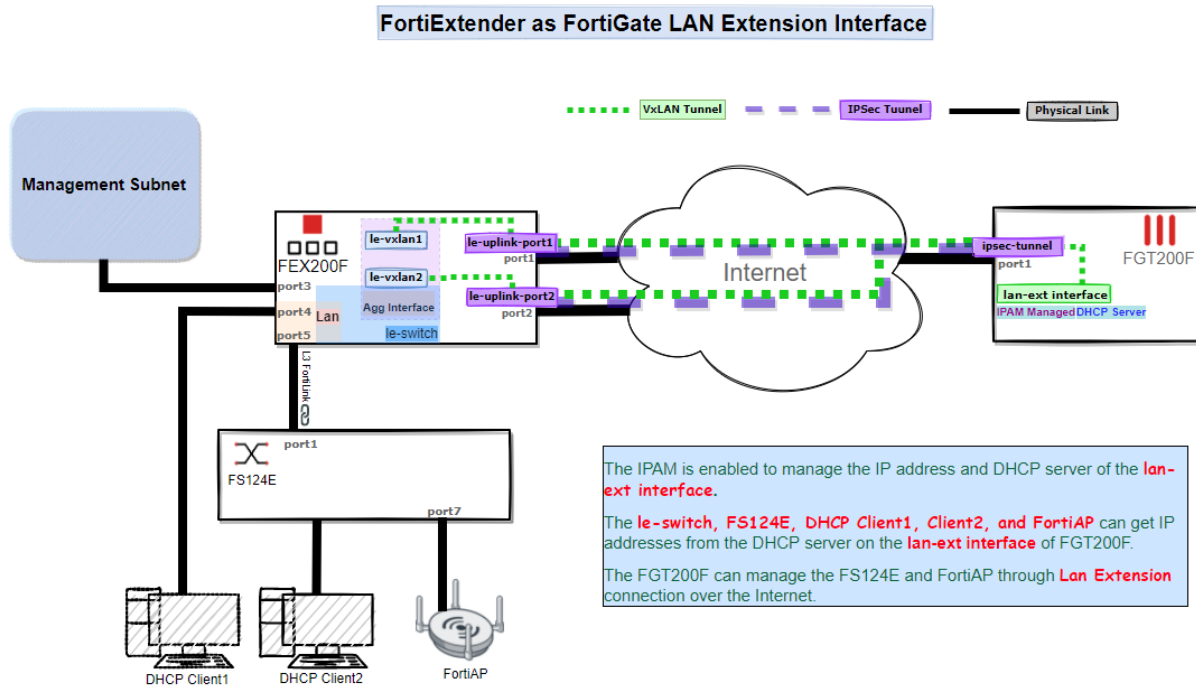
**6. Authorize the FortiExtender:**

```
config extender-controller extender
    edit "FX0035919000000"
        set authorized enable
    next
end
```

## Backhaul tunnel and VXLAN auto-deployment

Once the FortiExtender is authorized, the FortiGate immediately pushes the IPsec tunnel configuration to the extender. This forces the FortiExtender to establish the tunnel and form the VXLAN mechanism.

In the following diagram, the VXLANs are built on the IPsec tunnels between the FortiExtender and the FortiGate. The two VXLAN interfaces are aggregated to provide load balancing and redundancy. A softswitch is also used to combine the aggregate interface with the local LAN ports, which allows the LAN ports to be part of the VXLAN. This ultimately combines the local LAN ports with the virtual LAN extension interface on the FortiGate AC.



### Underlying configurations that are automatically configured:

1. The FortiExtender receives the IPsec configurations from the FortiGate and creates the corresponding tunnels for each uplink:

```
config vpn ipsec phase1-interface
    edit le-uplink-port1
        set ike-version 2
        set keylife 86400
        set proposal aes128-sha256 aes256-sha256 3des-sha256 aes128-sha1 aes256-sha1 3des-sha1
        set dhgrp 14 5
        set interface port1
        set type static
        set remote-gw 1.1.1.10
        set authmethod psk
        set psksecret *****
        set localid peerid-
svxVy5bZbPxZdfoIQBNA7YrksKBA9UilvZsvYcVrgp1Uy0aFMCVZzGzh
        set peerid localid-5bzuqs54dGni2TT0x2NePg0HexHW2piQ44aZ4NiGe8SVxxBnFuiqZqo
        set add-gw-route enable
        set dev-id-notification disable
    next
    edit le-uplink-port2
        set ike-version 2
        set keylife 86400
        set proposal aes128-sha256 aes256-sha256 3des-sha256 aes128-sha1 aes256-sha1 3des-sha1
        set dhgrp 14 5
        set interface port2
        set type static
```

```
        set remote-gw 1.1.1.10
        set authmethod psk
        set psksecret *****
        set localid peerid-
svxVy5bZbPxZdfoIQBNA7YrkSKBA9Ui1vZsvYcVrgp1Uy0aFMCVZzGzh
        set peerid localid-5bzuqs54dGni2TT0x2NePg0HexHW2piQ44aZ4NiGe8SVxxBnFuiqZqo
        set add-gw-route enable
        set dev-id-notification disable
    next
end
```

**2. VXLAN interfaces are formed over each tunnel:**

```
config system vxlan
    edit le-vxlan-port1
        set vni 0
        set remote-ip 10.252.0.1
        set local-ip 10.252.0.2
        set dstport 9999
    next
    edit le-vxlan-port2
        set vni 0
        set remote-ip 10.252.0.1
        set local-ip 10.252.0.3
        set dstport 9999
    next
end
```

**3. An aggregate interface is configured to load balance between the two VXLAN interfaces:**

```
config system aggregate-interface
    edit le-agg-link
        set mode loadbalance
        set mapping-timeout 60
        config members
            edit le-vxlan-port1
                set interface le-vxlan-port1
                set weight 1
                set health-check-event le-agg-port1
                set health-check-fail-cnt 5
                set health-check-recovery-cnt 5
            next
            edit le-vxlan-port2
                set interface le-vxlan-port2
                set weight 1
                set health-check-event le-agg-port2
                set health-check-fail-cnt 5
                set health-check-recovery-cnt 5
            next
        end
    next
end
```

**4. The softswitch bridges the aggregate interface and the local LAN to connect the LAN to the VXLAN bridged L2 network, which spans across to the FortiGate LAN extension interface:**

```
config system switch-interface
    edit le-switch
```

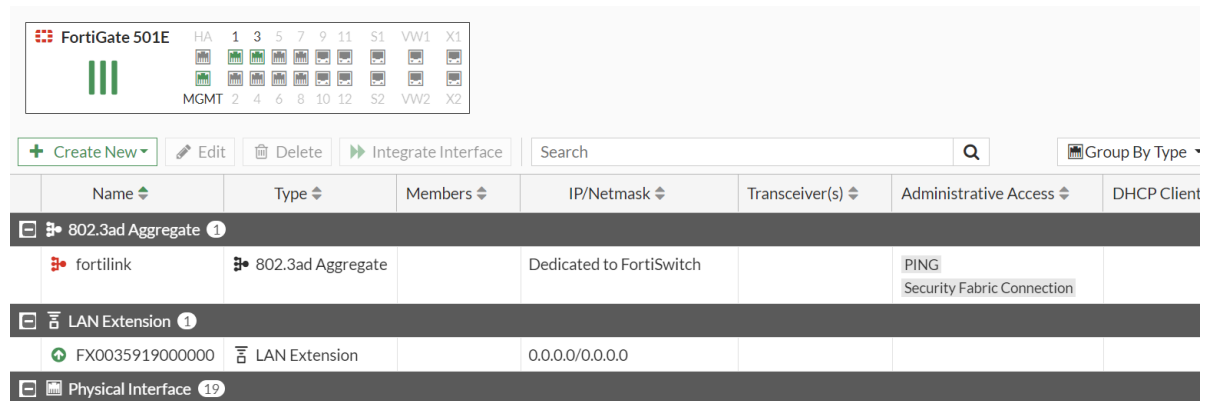
```

        set members le-agg-link lan
        set stp disable
    next
end

```

## Configuring the LAN extension and firewall policy

Once the IPsec tunnel is set up and the VXLAN is created over the IPsec tunnel, the new LAN extension interface appears on the FortiGate.



### To configure the LAN extension interface and firewall policy:

1. Edit the LAN extension interface:
  - a. Go to **Network > Interfaces** and edit the LAN extension interface.
  - b. Configure the *IP/Netmask* (9.9.9.99/255.255.255.0). Other devices on the remote LAN network will configure this as their gateway.
  - c. Optionally, enable *DHCP Server* to assign IPs to the remote devices using DHCP.
  - d. Click **OK**.
2. Configure the firewall policy to allow traffic from the LAN extension interface to the WAN (port1):
  - a. Go to **Policy & Objects > Firewall Policy** and click **Create New**.
  - b. Enter the following:

|                           |                 |
|---------------------------|-----------------|
| <b>Incoming Interface</b> | FX0035919000000 |
| <b>Outgoing Interface</b> | port1           |
| <b>Source</b>             | all             |
| <b>Destination</b>        | all             |
| <b>Schedule</b>           | always          |
| <b>Service</b>            | ALL             |
| <b>Action</b>             | ACCEPT          |
| <b>NAT</b>                | Enable (NAT)    |

- c. Configure the other settings as needed, such as security profiles.

d. Click OK.

This policy allows the remote LAN clients to access the internet through the backhaul channel. Clients in the remote LAN behind the FortiExtender will now be able to receive an IP over DHCP and reach the internet securely through the FortiGate.

## Using the backhaul IP when the FortiGate access controller is behind NAT

When the FortiGate LAN extension controller is behind a NAT device, remote thin edge FortiExtenders must connect to the FortiGate through a backhaul address. This is an address on the upstream NAT device that forwards traffic to the FortiGate. It can be configured as an IP or FQDN in the FortiGate extender profile.

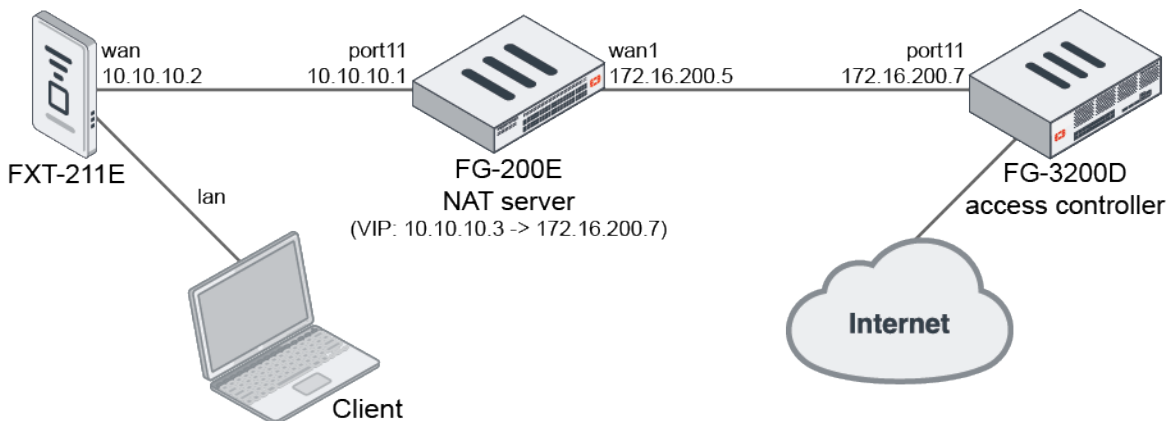
When the default IKE port 500 is inaccessible, you can configure a custom IKE port on the FortiExtender and the FortiGate.

This topic contains four configuration examples:

- [Configuring an IP as a backhaul address in the FortiGate extender profile](#)
- [Configuring an FQDN as a backhaul address in the FortiGate extender profile](#)
- [Configuring the IKE port on FortiExtender when NAT traversal is enabled in the FortiGate IPsec tunnel settings](#)
- [Configuring the IKE port on FortiExtender when NAT traversal is disabled in the FortiGate IPsec tunnel settings](#)

## Examples

The following topology is used for the first three examples and assumes that the FortiExtender has already been discovered (see [Introduce LAN extension mode for FortiExtender on page 25](#) for more information).



## Configuring an IP as a backhaul address in the FortiGate extender profile

To configure an IP as a backhaul address in the GUI:

1. Edit the LAN extension profile:
  - a. Go to *Network > FortiExtenders*, select the *Profiles* tab, and edit the default LAN extension profile (*FX211E-lanext-default*).

- b. In the *LAN extension* section, set the *IPsec interface IP/FQDN* to *10.10.10.3*.

**Edit FortiExtender Profile**

Name: FX211E-lanext-default  
 Model: FX211E  
 Mode: LAN extension  
 Data plan: +

**LAN extension**

Link load balance: **Active backup** Load Balance  
 IPsec Interface: port1  
 IPsec interface IP/FQDN: 10.10.10.3  
 IPsec tunnel: fext-ipsec-bwyt

**FortiExtender uplink port**

| Name | Uplink port | Role      |
|------|-------------|-----------|
| 1    | wan         | Primary   |
| 2    | lte1        | Secondary |

**Modem 1**

Default SIM: **SIM1** SIM2 Carrier Lowest cost  
 SIM1 PIN: ☒  
 SIM2 PIN: ☐  
 GPS: ☒  
 Auto SIM switch: ☐  
 By disconnecting: ☐  
 By signal: ☐

OK Cancel

- c. Click **OK**.

2. Authorize the FortiExtender:

- Go to *Network > FortiExtenders*, select the *Managed FortiExtenders* tab, and edit the discovered FortiExtender.
- In the *Status* section, enable *Authorized*.
- Click **OK**.

In FortiExtender, the *VPN Tunnels* page displays the IPsec tunnel *le-uplink-wan* as up. The *Remote Gateway* is set to *10.10.10.3*.

**VPN Tunnels**

| Name           | Status | Local      | Remote Gateway | In Bytes | Out Bytes | Up Seconds |
|----------------|--------|------------|----------------|----------|-----------|------------|
| le-uplink-wan  | up     | 10.10.10.2 | 10.10.10.3     | 588      | 4334      | 38         |
| le-uplink-lte1 | down   | 0.0.0.0    | 10.10.10.3     | 0        | 0         | 0          |

**To configure an IP as a backhaul address in the CLI:**

1. Configure the backhaul IP address:

```
config extender-controller extender-profile
edit "FX211E-lanext-default"
set id 1
set model FX211E
```

```

        set extension lan-extension
    config cellular
        config sms-notification
        end
        config modem1
        end
    end
    config lan-extension
        set ipsec-tunnel "fext-ipsec-bwyt"
        set backhaul-interface "port1"
        set backhaul-ip "10.10.10.3"
        config backhaul
            edit "1"
                set port wan
                set role primary
            next
            edit "2"
                set port ltel
                set role secondary
            next
        end
    end
next
end

```

## 2. Verify the configuration in FortiExtender:

```

config vpn ipsec phase1-interface
    edit le-uplink-wan
        set ike-version 2
        set keylife 86400
        set proposal aes128-sha256 aes256-sha256 3des-sha256 aes128-sha1 aes256-
sha1 3des-sha1
        set dhgrp 14 5
        set interface wan
        set type static
        set remote-gw 10.10.10.3
        set authmethod psk
        set psksecret *****
        set localid peerid-
SIbiT5AnbTo2tk0pZttfxzh1CFihu9tP7EBsKniCpRTeXnb4mUi6MmXX
        set peerid localid-33rR5UQbwq705X95TyKfQ0h7GtDbMfAjX4jz6Vsm0Au8gibcCsZk09t
        set add-gw-route enable
        set dev-id-notification disable
    next
end

```

## Configuring an FQDN as a backhaul address in the FortiGate extender profile

### To configure an FQDN as a backhaul address in the GUI:

1. Edit the LAN extension profile:
  - a. Go to *Network > FortiExtenders*, select the *Profiles* tab, and edit the default LAN extension profile (*FX211E-lanext-default*).

- b. In the *LAN extension* section, set the *IPsec interface IP/FQDN* to *fgt3200d.qatest.com*.

**Edit FortiExtender Profile**

Name: FX211E-lanext-default  
 Model: FX211E  
 Mode: LAN extension  
 Data plan: +

**LAN extension**

Link load balance: **Active backup** Load Balance  
 IPsec Interface: port1  
 IPsec interface IP/FQDN: fgt3200d.qatest.com  
 IPsec tunnel: fext-ipsec-bwyt

**FortiExtender uplink port**

| Name | Uplink port | Role      |
|------|-------------|-----------|
| 1    | wan         | Primary   |
| 2    | lte1        | Secondary |

**Modem 1**

Default SIM: **SIM1** SIM2 Carrier Lowest cost  
 SIM1 PIN: ☒  
 SIM2 PIN: ☐  
 GPS: ☒  
 Auto SIM switch: ☐  
 By disconnecting: ☐  
 By signal: ☐

OK Cancel

- c. Click **OK**.

2. Authorize the FortiExtender:

- Go to *Network > FortiExtenders*, select the *Managed FortiExtenders* tab, and edit the discovered FortiExtender.
- In the *Status* section, enable *Authorized*.
- Click **OK**.

In FortiExtender, the *VPN Tunnels* page displays the IPsec tunnel *le-uplink-wan* as up. The *Remote Gateway* is set to *fgt3200d.qatest.com*.

**VPN Tunnels**

| Name           | Status | Local      | Remote Gateway      | In Bytes | Out Bytes | Up Seconds |
|----------------|--------|------------|---------------------|----------|-----------|------------|
| le-uplink-wan  | up     | 10.10.10.2 | fgt3200d.qatest.com | 906      | 4070      | 36         |
| le-uplink-lte1 | down   | 0.0.0.0    | fgt3200d.qatest.com | 0        | 0         | 0          |

**To configure an FQDN as a backhaul address in the CLI:**

1. Configure the backhaul IP address:

```
config extender-controller extender-profile
  edit "FX211E-lanext-default"
    set id 1
    set model FX211E
```

```

        set extension lan-extension
    config cellular
        config sms-notification
        end
        config modem1
        end
    end
    config lan-extension
        set ipsec-tunnel "fext-ipsec-bwyt"
        set backhaul-interface "port1"
        set backhaul-ip "fgt3200d.qatest.com"
    config backhaul
        edit "1"
            set port wan
            set role primary
        next
        edit "2"
            set port ltel
            set role secondary
        next
    end
end
next
end

```

## 2. Verify the configuration in FortiExtender:

```

config vpn ipsec phase1-interface
    edit le-uplink-wan
        set ike-version 2
        set keylife 86400
        set proposal aes128-sha256 aes256-sha256 3des-sha256 aes128-sha1 aes256-
sha1 3des-sha1
        set dhgrp 14 5
        set interface wan
        set type ddns
        set remotegw-ddns fgt3200d.qatest.com
        set authmethod psk
        set psksecret *****
        set localid peerid-
SIbiT5AnbTo2tk0pZttfxzh1CFihu9tP7EBsKniCpRTeXnb4mUi6MmXX
        set peerid localid-33rR5UQbwq705X95TyKfQ0h7GtDbMfAjX4jz6Vsm0Au8gibcCsZk09t
        set add-gw-route enable
        set dev-id-notification disable
    next
end

```

## Configuring the IKE port on the FortiExtender when NAT traversal is enabled in the FortiGate IPsec tunnel settings

To configure the IKE port on FortiExtender when NAT traversal is enabled:

1. Set the IKE port on the FortiGate:

```
config system settings
    set ike-port 6000
end
```

**2. Set the IKE port on the FortiExtender:**

```
config system settings
    set ike-port 6000
end
```

**3. Start a packet capture on the FG-200E's port11 with the filter set to UDP protocol and port 4500 or 6000.**

**4. Terminate the IPsec VPN tunnel in FortiExtender:**

```
~ # swanctl -t -i le-uplink-wan
[IKE] deleting IKE_SA le-uplink-wan[5] between 10.10.10.2[peerid-SIbiT5AnbTo2tk0pZttfxzh1CFihu9tP7EBsKniCpRtEXnb4mUi6MmXX]...10.10.10.3[localid-33rR5UQbwq705X95TyKfQOh7GtDbMfAjX4jz6Vsm0Au8gibcCsZkO9t]
[IKE] sending DELETE for IKE_SA le-uplink-wan[5]
[ENC] generating INFORMATIONAL request 2 [ D ]
[NET] sending packet: from 10.10.10.2[4500] to 10.10.10.3[6000] (80 bytes)
[NET] received packet: from 10.10.10.3[6000] to 10.10.10.2[4500] (80 bytes)
[ENC] parsed INFORMATIONAL response 2 [ ]
[IKE] IKE_SA deleted
terminate completed successfully
```

**5. Verify the packet capture on the FG-200E. During the tunnel setup, the first packet from the FortiExtender has the source port set to 6000, but it changes to 4500. This is because FortiExtender only supports Port 4500 when NAT traversal is enabled:**

```
# diagnose sniffer packet port11 'udp and port 4500 or port 6000' 4
interfaces=[port11]
filters=[udp and port 4500 or port 6000]
...
24.064847 port11 -- 10.10.10.2.6000 -> 10.10.10.3.6000: udp 936
24.065929 port11 -- 10.10.10.3.6000 -> 10.10.10.2.6000: udp 428

24.119178 port11 -- 10.10.10.2.4500 -> 10.10.10.3.6000: udp 612
24.120272 port11 -- 10.10.10.3.6000 -> 10.10.10.2.4500: udp 276
```

**6. Verify the IPsec tunnel status on the FortiExtender to confirm that Port 4500 is used:**

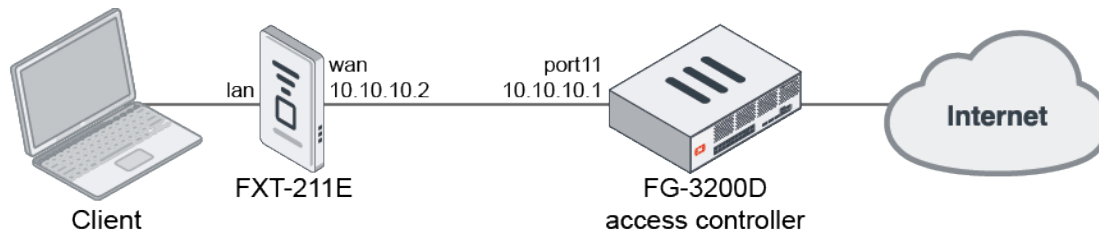
```
~ # swanctl -l
le-uplink-wan: #3, ESTABLISHED, IKEv2, 1fbb2997d6a5afc7_i* 5d500758882339f4_r
  local 'peerid-SIbiT5AnbTo2tk0pZttfxzh1CFihu9tP7EBsKniCpRtEXnb4mUi6MmXX' @
  10.10.10.2[4500]
  remote 'localid-33rR5UQbwq705X95TyKfQOh7GtDbMfAjX4jz6Vsm0Au8gibcCsZkO9t' @
  10.10.10.3[6000]
  AES_CBC-128/HMAC_SHA2_256_128/PRF_HMAC_SHA2_256/MODP_2048
  established 90s ago, rekeying in 85289s
le-uplink-wan: #3, reqid 3, INSTALLED, TUNNEL-in-UDP, ESP:AES_CBC-128/HMAC_SHA1_
96
  installed 90s ago, rekeying in 38952s, expires in 47430s
  in c3406a5a (0x00000005), 1512 bytes, 18 packets, 2s ago
  out 7d17257c (0x00000005), 8000 bytes, 52 packets, 2s ago
  local 10.252.8.2/32
  remote 10.252.8.1/32
```



NAT traversal has the default value enabled in the FortiGate IPsec tunnel settings, and it is not recommended to change any IPsec tunnel configurations even if there is a NAT server between the FortiExtender and the FortiGate access controller. The IPsec tunnel always uses Port 4500 for NAT traversal.

### Configuring the IKE port on FortiExtender when NAT traversal is disabled in the FortiGate IPsec tunnel settings

NAT traversal is enabled by default in the FortiGate IPsec tunnel setting and it cannot be changed in the GUI. If NAT traversal is disabled, the IPsec tunnel can use a custom IKE port (port 6300 in this example).



#### To configure the IKE port on FortiExtender when NAT traversal is disabled:

1. Set the IKE port on the FortiGate:

```
config system settings
    set ike-port 6300
end
```

2. Set the IKE port on the FortiExtender:

```
config system settings
    set ike-port 6300
end
```

3. Verify the IPsec tunnel status on the FortiExtender to confirm that port 6300 is used:

```
~ # swanctl -l
le-uplink-wan: #2, ESTABLISHED, IKEv2, 14a9fe5800b9d0b9_i* 9dd465f634ed9abd_r
    local 'peerid-aRuaScJBVVJ1DWKrrKcY8VcHF8Vg6cgLQkpEtdzDRpRTVvapxdeeJoiO' @
    10.10.10.2[6300]
    remote 'localid-dCcVF2kc5PWVuKbNvWEoBlm332ik5dz1jtRqxfaxxiH4G7y5wLDAPcN' @
    10.10.10.1[6300]
    AES_CBC-128/HMAC_SHA2_256_128/PRF_HMAC_SHA2_256/MODP_2048
    established 3606s ago, rekeying in 82066s
le-uplink-wan: #1, reqid 1, INSTALLED, TUNNEL, ESP:AES_CBC-128/HMAC_SHA1_96
    installed 3606s ago, rekeying in 37205s, expires in 43914s
    in c3ae8beb (0x00000003), 60564 bytes, 721 packets, 1s ago
    out d0d92a63 (0x00000003), 343410 bytes, 2365 packets, 1s ago
    local 10.252.8.2/32
    remote 10.252.8.1/32
```

## Bandwidth limits on the FortiExtender Thin Edge

The FortiGate LAN extension controller can push a bandwidth limit to the FortiExtender Thin Edge. The limit is enforced on the FortiExtender using traffic shaping.

### To configure a bandwidth limit:

1. On the FortiGate, create a LAN extension profile with bandwidth control enabled and a bandwidth limit configured (in Mbps):

```
config extender-controller extender-profile
  edit "FX200F-lanext-default"
    set model FX200F
    set extension lan-extension
    set enforce-bandwidth enable
    set bandwidth-limit 20
  next
end
```

2. Add a FortiExtender in LAN extension mode and apply the profile to it:

```
config extender-controller extender
  edit "FX0035919000000"
    set id "FX200F5919000000"
    set authorized enable
    set extension-type lan-extension

    set profile "FX200F-lanext-default"
  next
end
```

3. On the FortiExtender, confirm that the bandwidth configuration has been pushed to it:

```
config firewall shaper
  config traffic-shaper
    edit le-traffic-shaper
      set max-bandwidth 20
      set bandwidth-unit mbps
    next
  end
end
config firewall shaping-policy
  edit le-shaping-policy
    set status enable
    set dstintf le-agg-link
    set traffic-shaper le-traffic-shaper
  next
end
```

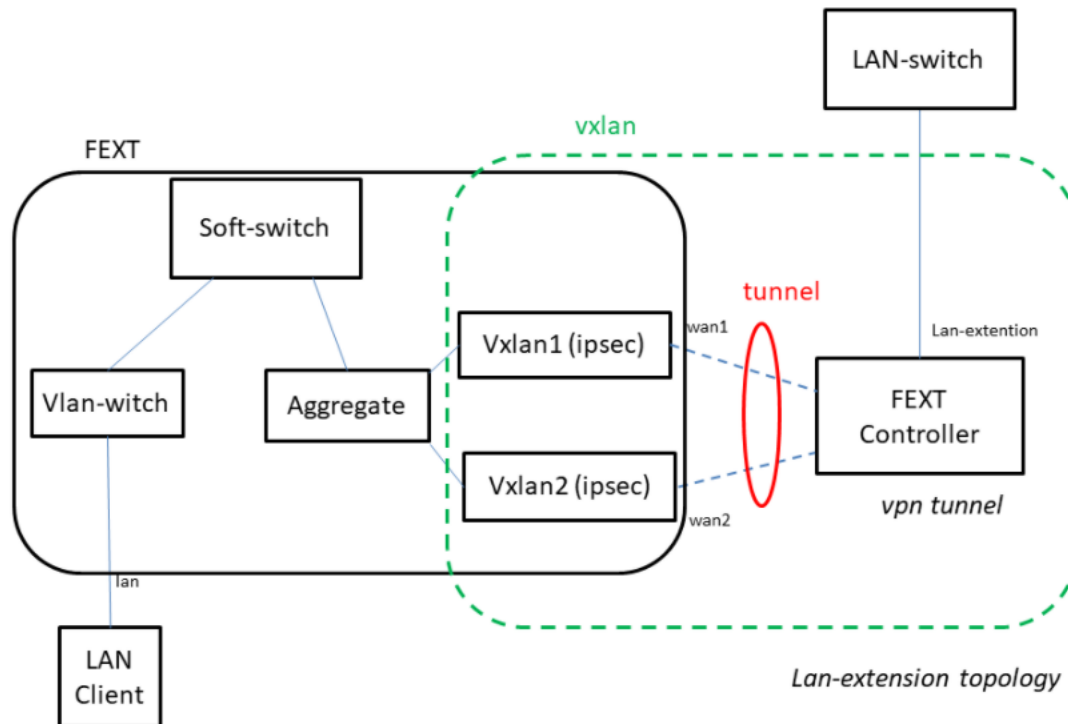
If bandwidth enforcement is disabled on the FortiGate, the configuration that was pushed to the FortiExtender will be removed.

## IPAM in FortiExtender LAN extension mode

After authorizing the FortiExtender in LAN-extension mode, the FortiExtender controller generates a new lan-extension interface.

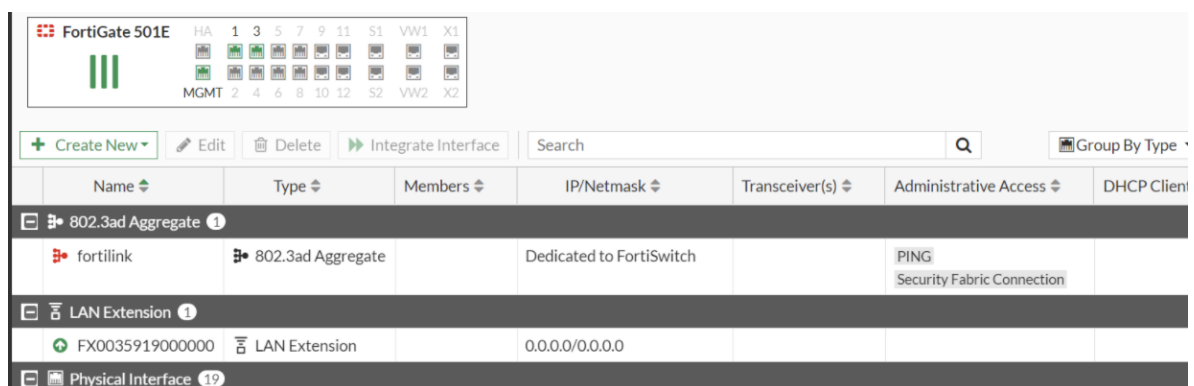
The LAN client connecting to the FortiExtender LAN interface will get DHCP allocation from the lan-extension interface. It can then reach the Internet via the firewall policy in the FortiExtender controller.

### Topology



### To configure IPAM in the FortiExtender lan-extension interface in the GUI:

1. On the FortiGate device, go to *Interfaces*. You will see that the LAN extension interface has already been created in the FortiExtender controller.



2. In the *LAN Extension* section, highlight the lan-extension interface (FX0035919000000), and select *Edit*.
3. For *Addressing mode*, select *Auto-managed by IPAM > Enable IPAM*.

4. For *IPAM Settings > Status*, select *Enable* and then *OK*. The IP pool now is selected for FX0035919000000.



The subnet configured above is for a standalone device.

If the FortiGate is a Security Fabric Downstream device, the subnet in the pool will be sent from the Security Fabric Root device.

The IP and DHCP server on FX0035919000000 will be set accordingly.

The client will get DHCP allocation from FX0035919000000.



The client is a FortiGate-61F whose wan1 connects the lan-interface on the FortiExtender.

**Edit Interface**

Name: wan1

Alias:

Type: Physical Interface

Role: WAN

Estimated bandwidth: 0 kbps Upstream, 0 kbps Downstream

**Address**

Addressing mode: Manual **DHCP** PPPoE

Status: ☒ Connected

Obtained IP/Netmask: 172.31.0.2/255.255.255.0 [Renew](#)

Expiry Date: 2022/01/14 15:54:08

Acquired DNS: 96.45.45.45 96.45.46.46

Default gateway: 172.31.0.1

Retrieve default gateway from server: ☐

Distance: 5

Override internal DNS: ☐

**FortiGate**

FGT61FTK19006594

Status: ☒ Up

MAC address: 04:d5:90:7a:50:a8

Speed Test

[Execute speed test](#)

**Additional Information**

[API Preview](#)

[References](#)

[Edit in CLI](#)

**Documentation**

[Online Help](#)

[Video Tutorials](#)

## To configure IPAM in the FortiExtender lan-extension interface in the CLI:

Originally, the lan-extension interface has the following options after the FortiExtender is authorized:

```
config system interface
    edit "FX0035919000000"
        set vdom "root"
        set type lan-extension
        set role lan
        set snmp-index 27
        config ipv6
            set ip6-send-adv enable
            set ip6-other-flag enable
        end
        set interface "fext-ipsec-wiUx"
    next
end
```

After IPAM is set as the addressing mode for FX0035919000000 in the GUI, the following steps are created in the CLI:

```
config system ipam
    set status enable
end

config system interface
    edit "FX0035919000000"
        set vdom "root"
        set ip 172.31.0.1 255.255.255.0
        set type lan-extension
        set role lan
        set snmp-index 27
        set ip-managed-by-fortiipam enable
        config ipv6
            set ip6-send-adv enable
            set ip6-other-flag enable
        end
    end
end
```

```
        end
        set interface "fext-ipsec-wiUx"
    next
end

config system dhcp server
    edit 3
        set dns-service default
        set default-gateway 172.31.0.1
        set netmask 255.255.255.0
        set interface "FX0035919000000"
        config ip-range
            edit 1
                set start-ip 172.31.0.1
                set end-ip 172.31.0.254
            next
        end
        set dhcp-settings-from-fortiipam enable
        config exclude-range
            edit 1
                set start-ip 172.31.0.1
                set end-ip 172.31.0.1
            next
        end
    next
end
```

## FortiExtender LAN extension in public cloud FGT-VM

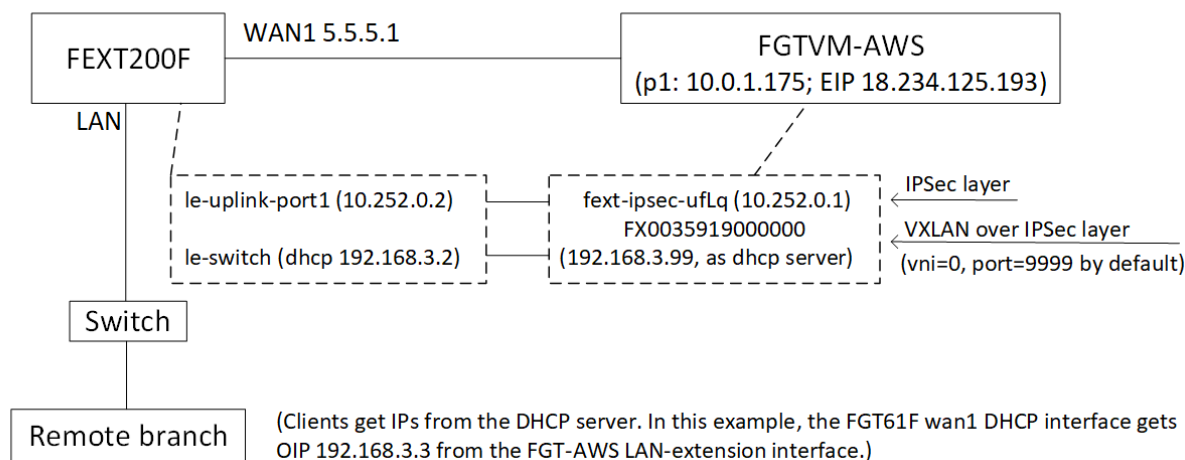
The FortiExtender LAN extension feature allows a FortiGate to extend its LAN functionality to a remote FortiExtender. In this enhancement, the FortiExtender LAN extension is added to the FGT-VM running on Public Clouds.

### Topology in demo configuration:

Before LAN extension



After LAN extension



Note:

In this demo, the FEXT200F LAN interface includes port4 and port5, which are members of the le-switch. After the FEXT and the FGTVM connect successfully, the FGTVM is able to extend LAN to the remote branch on the FEXT LAN interface via VXLAN.

## GUI

The LAN-extension interface is up on the FGT-AWS.

| FortiGate VM64-AWS                                                                                            |                    |         |                            |                                    |              |                          |      |   |
|---------------------------------------------------------------------------------------------------------------|--------------------|---------|----------------------------|------------------------------------|--------------|--------------------------|------|---|
| <div> <div>1 3 5 7 9 11 13 15 17 19 21 23</div> <div>2 4 6 8 10 12 14 16 18 20 22 24</div> </div>             |                    |         |                            |                                    |              |                          |      |   |
| <div> <div>Create New Edit Delete Integrate Interface</div> <div>Search</div> <div>Group By Type</div> </div> |                    |         |                            |                                    |              |                          |      |   |
| Name                                                                                                          | Type               | Members | IP/Netmask                 | Administrative Access              | DHCP Clients | DHCP Ranges              | Ref. |   |
| 802.3ad Aggregate                                                                                             |                    |         |                            |                                    |              |                          |      |   |
| fortilink                                                                                                     | 802.3ad Aggregate  |         | Dedicated to FortiSwitch   | PING<br>Security Fabric Connection |              | 10.255.1.2-10.255.1.254  | 2    |   |
| LAN Extension                                                                                                 |                    |         |                            |                                    |              |                          |      |   |
| FX0035919000000                                                                                               | LAN Extension      |         | 192.168.3.99/255.255.255.0 | PING<br>HTTPS<br>SSH<br>SNMP       | 2            | 192.168.3.2-192.168.3.98 | 1    |   |
| Physical Interface                                                                                            |                    |         |                            |                                    |              |                          |      |   |
| port1                                                                                                         | Physical Interface |         | 10.0.1.175/255.255.255.0   | PING<br>HTTPS<br>SSH<br>HTTP       |              |                          |      | 3 |
| fgt-ipsec-v3JH                                                                                                | Tunnel Interface   |         | 10.252.0.1/255.255.255.255 | PING                               |              |                          |      | 4 |
| Tunnel Interface                                                                                              |                    |         |                            |                                    |              |                          |      |   |
| NAT Interface (naf.root)                                                                                      | Tunnel Interface   |         | 0.0.0.0/0.0.0.0            |                                    |              |                          |      | 0 |

The FGT-AWS LAN-extension interface is able to act as a DHCP server over VXLAN, and remote branch computers (In this demo, it's an FGT61F) behind the FortiExtender are able to get IP addresses from the DHCP server on the FGT-AWS LAN-extension interface.

| FortiGate VM64-AWS                                                                                            |                    |         |                            |                                    |              |                          |      |   |
|---------------------------------------------------------------------------------------------------------------|--------------------|---------|----------------------------|------------------------------------|--------------|--------------------------|------|---|
| <div> <div>1 3 5 7 9 11 13 15 17 19 21 23</div> <div>2 4 6 8 10 12 14 16 18 20 22 24</div> </div>             |                    |         |                            |                                    |              |                          |      |   |
| <div> <div>Create New Edit Delete Integrate Interface</div> <div>Search</div> <div>Group By Type</div> </div> |                    |         |                            |                                    |              |                          |      |   |
| Name                                                                                                          | Type               | Members | IP/Netmask                 | Administrative Access              | DHCP Clients | DHCP Ranges              | Ref. |   |
| 802.3ad Aggregate                                                                                             |                    |         |                            |                                    |              |                          |      |   |
| fortilink                                                                                                     | 802.3ad Aggregate  |         | Dedicated to FortiSwitch   | PING<br>Security Fabric Connection |              | 10.255.1.2-10.255.1.254  | 2    |   |
| LAN Extension                                                                                                 |                    |         |                            |                                    |              |                          |      |   |
| FX0035919000000                                                                                               | LAN Extension      |         | 192.168.3.99/255.255.255.0 | PING<br>HTTPS<br>SSH<br>SNMP       | 2            | 192.168.3.2-192.168.3.98 | 1    |   |
| Physical Interface                                                                                            |                    |         |                            |                                    |              |                          |      |   |
| port1                                                                                                         | Physical Interface |         | 10.0.1.175/255.255.255.0   | PING<br>HTTPS<br>SSH<br>HTTP       |              |                          |      | 3 |
| fgt-ipsec-v3JH                                                                                                | Tunnel Interface   |         | 10.252.0.1/255.255.255.255 | PING                               |              |                          |      | 4 |
| Tunnel Interface                                                                                              |                    |         |                            |                                    |              |                          |      |   |
| NAT Interface (naf.root)                                                                                      | Tunnel Interface   |         | 0.0.0.0/0.0.0.0            |                                    |              |                          |      | 0 |

| DHCP Clients for FX0035919000000                                     |             |                 |            |                   |              |                                                   |
|----------------------------------------------------------------------|-------------|-----------------|------------|-------------------|--------------|---------------------------------------------------|
| <div> <div>Refresh Revoke Reservation</div> <div>Search</div> </div> |             |                 |            |                   |              |                                                   |
| Device                                                               | IP          | Interface       | Status     | MAC               | Reserved     | Host Information                                  |
| FX200F5919000000                                                     | 192.168.3.2 | FX0035919000000 | Leased out | e8:1c:ba:c4:4e:b8 | Not Reserved | VCI: FortiExtender-200F<br>Hostname: FX200F591900 |
| FGT61FTK19006594                                                     | 192.168.3.3 | FX0035919000000 | Leased out | 04:d5:90:7a:50:a8 | Not Reserved | VCI: FortiGate-61F<br>Hostname: FGT61FTK1900      |

## CLI

### Step 1: Configure the FortiExtender:

```
FX200F5919000000 # config system interface
FX200F5919000000 (interface) # edit port1
FX200F5919000000 (port1) # set mode static
FX200F5919000000 (port1) <M> # set ip 5.5.5.1/24
FX200F5919000000 (port1) <M> # set gateway 5.5.5.99
FX200F5919000000 (port1) <M> # end

FX200F5919000000 # execute ping 18.234.125.193
PING 18.234.125.193 (18.234.125.193): 56 data bytes
64 bytes from 18.234.125.193: seq=0 ttl=233 time=68.132 ms
```

```
FX200F5919000000 # config system management
FX200F5919000000 (management) # set discovery-type fortigate
Changing "discovery-type" may affect networking mode and virtual-wire-pair
configuration, resulting in system reboot!
Do you want to continue? (y/n)y

FX200F5919000000 (management) <M> # config fortigate
FX200F5919000000 (fortigate) # set ac-discovery-type static
FX200F5919000000 (fortigate) <M> # config static-ac-addr
FX200F5919000000 (static-ac-addr) # edit 1
FX200F5919000000 (1) <M> # set server 18.234.125.193
FX200F5919000000 (1) <M> # next
FX200F5919000000 (static-ac-addr) # end
FX200F5919000000 (fortigate) <M> # set discovery-intf port1
FX200F5919000000 (fortigate) <M> # end
FX200F5919000000 (management) <M> # end

config system switch-interface
    edit le-switch
        set members le-agg-link lan
        set stp disable
    next
end
edit lan
    set type lan-switch
    set status up
    set mode static
    set ip
    set gateway
    set mtu-override enable
    set mtu 1500
    set distance 50
    set vrrp-virtual-mac enable
    config vrrp
        set status disable
    end
    set allowaccess http https ssh ping telnet
next
config system lan-switch
    config ports
        edit port4
        next
        edit port5
        next
    end
end
```

**Step 2: Configure the FGT-AWS:**

```
FGT-AWS-EXT # show system global
config system global
    set fortiextender enable
    set hostname "FGT-AWS-EXT"
end
config system interface
    edit "port1"
```

```

        set allowaccess ping https ssh http fgfm fabric
    next
end
config extender-controller extender <=====This table is automatically added
after FGT detects the FEXT over "fabric" protocol on the port1
    edit "FX0035919000000"
        set id "FX200F5919000000"
        set device-id 0
        set extension-type lan-extension
        set profile "FX200F-lanext-default"
    next
end
config extender-controller extender-profile
    edit "FX200F-lanext-default"
        set id 0
        set model FX200F
        set extension lan-extension
        config lan-extension
            set ipsec-tunnel "fext-ipsec-ufLq"
            set backhaul-interface "port1"
            set backhaul-ip "18.234.125.193"
            config backhaul
                edit "1"
                    set port port1
                    set role primary
                next
            end
        end
    next
end
config extender-controller extender
    edit "FX0035919000000"
        set authorized enable
    next
end

```

**Step 3: The FGT-AWS and the FEXT connect automatically over IPSec. There is no need to configure it manually, but you must ensure that IPSec works:**

```

FGT-AWS-EXT # sh vpn ipsec phase1-interface
config vpn ipsec phase1-interface
    edit "fext-ipsec-v3JH"
        set type dynamic
        set interface "port1"
        set ike-version 2
        set peertype one
        set net-device disable
        set proposal aes128-sha256 aes256-sha256 aes128-sha1 aes256-sha1
        set localid "localid-
760sv1bSXj2wrUASEluwcryLKilXEUImlh1v1FehZ2u971qHDPukCjFh"
        set dpd on-idle
        set comments "[FX200F-lanext-default] Do NOT edit. Automatically
generated by extender controller."
        set peerid "peerid-
4GyQg3yg01w5ye7oaPQNQlQs9fM8qyXReabC3lBsOPeZGSdiqfJp8tj1l"
        set psksecret ENC

```

```

IyjGZpuZykJBmtOL4cfEoQQ/yNM4N1kDXvB/TBq6dXlzeXymkw8cyoizM2a8SeyWao2sGnLCkqqkHIttruVfy7
jy10dMp6AzaFlnxP6f9k8hTEBKxqUOS3+ccvSLFWvM7ouuaWgA6Hdu4StWsBVMc85tBFe+H6PTnVpRFaRCYQE
OyatuM9tcWQXCilsuv66HlAYvGlv==
        set dpd-retryinterval 60
    next
end

FGT-AWS-EXT # diagnose vpn tunnel list
list all ipsec tunnel in vd 0
-----
name=fext-ipsec-v3JH_0 ver=2 serial=3 10.0.1.175:4500-
>204.101.161.19:64916 tun_id=204.101.161.19 tun_id6=::10.0.0.3 dst_mtu=9001 dpd-
link=on weight=1
    bound_if=3 lgwy=static/1 tun=intf/0 mode=dial_inst/3 encap=none/9088
options[2380]=rgwy-chg rport-chg frag-rfc run_state=0 accept_traffic=1 overlay_id=0
parent=fext-ipsec-v3JH index=0
proxyid_num=1 child_num=0 refcnt=8 ilast=0 olast=0 ad=/0
stat: rxp=6334 txp=710 rxb=1190272 txb=62655
dpd: mode=on-idle on=1 idle=60000ms retry=3 count=0 seqno=0
natt: mode=keepalive draft=0 interval=10 remote_port=64916
proxyid=fext-ipsec-v3JH proto=0 sa=1 ref=4 serial=1 add-route
    src: 0:10.252.0.1-10.252.0.1:0
    dst: 0:10.252.0.2-10.252.0.2:0
    SA: ref=3 options=682 type=00 soft=0 mtu=8926 expire=40316/0B
replaywin=2048
    seqno=2c7 esn=0 replaywin_lastseq=000018be itn=0 qat=0 hash_
search_len=1
    life: type=01 bytes=0/0 timeout=43189/43200
    dec: spi=07c1e02b esp=aes key=16 b0e867d4cb6b4ebc6778ea7dff3819db
        ah=sha1 key=20 70e681e26a5bdcaa60e16f32d714b4ee74073306
    enc: spi=c6e96e0d esp=aes key=16 139e01770682b809d24702bb9c446e8f
        ah=sha1 key=20 89ffb4be3b6b9db9145be6f0d37ee49d01940a2f
    dec:pkts/bytes=6334/764822, enc:pkts/bytes=710/115536
-----
name=fext-ipsec-v3JH ver=2 serial=1 10.0.1.175:0->0.0.0.0:0 tun_
id=10.0.0.1 tun_id6=::10.0.0.1 dst_mtu=0 dpd-link=on weight=1
    bound_if=3 lgwy=static/1 tun=intf/0 mode=dialup/2 encap=none/512 options
[0200]=frag-rfc accept_traffic=1 overlay_id=0
proxyid_num=0 child_num=1 refcnt=3 ilast=2907 olast=2907 ad=/0
stat: rxp=6336 txp=712 rxb=1190592 txb=62823
dpd: mode=on-idle on=0 idle=60000ms retry=3 count=0 seqno=0
natt: mode=none draft=0 interval=0 remote_port=0
run_tally=0

```

**Step 4: Ensure that VXLAN over IPSec is set up automatically between the FGT cloud VM and the FortiExtender. (There is no need to configure it manually.)**

```

FGT-AWS-EXT # diagnose sys vxlan fdb list FX0035919000000
mac=00:00:00:00:00:00 state=0x0082 remote_ip=10.252.0.2 port=9999 vni=0
ifindex=9
mac=e8:1c:ba:c4:4e:b8 state=0x0002 remote_ip=10.252.0.2 port=9999 vni=0
ifindex=9
mac=04:d5:90:7a:50:a8 state=0x0002 remote_ip=10.252.0.2 port=9999 vni=0
ifindex=9

total fdb num: 3

```

**Step 5: Set the IP address for the FGT-AWS LAN-extension interface, and ensure that the FGT-AWS LAN-extension interface is able to act as DHCP server over VXLAN:**

```
FGT-AWS-EXT # show system dhcp server 100
```

```
config system dhcp server
  edit 100
    set default-gateway 192.168.3.99
    set netmask 255.255.255.0
    set interface "FX0035919000000"
    config ip-range
      edit 1
        set start-ip 192.168.3.2
        set end-ip 192.168.3.98
      next
    end
  next
end

config system interface
  edit "FX0035919000000"
    set vdom "root"
    set ip 192.168.3.99 255.255.255.0
    set allowaccess ping https ssh snmp http telnet
    set type lan-extension
    set role lan
    set snmp-index 7
    set interface "fext-ipsec-v3JH"
  next
end
```

```
***** FEXT le-switch interface is able to get the ip (192.168.3.2) from FGT-AWS vxlan
interface dhcp server
FX200F5919000000 # get system interface
== [ le-switch ]
name: le-switch      status: online/up/link up      type: switch      mac:
e8:1c:ba:c4:4e:b8   mode: dhcp      ip: 192.168.3.2/24      mtu: 1500
                    gateway: 192.168.3.99
```

\*\*\*\*\* Remote branch PC behind FEXT lan interface is able to get the ip from FGT-AWS vxlan interface dhcp server.

In this demo, a FGT61F acts as a PC behind FEXT, this FGT61 wan1 interface is the same switch as FEXT lan interface port4.

Set FGT61 wan1 interface as dhcp client, it can get ip address (in this demo it's 192.168.3.3) from FGT-AWS lan-extension interface.

```
FGT61FTK19006594 # show system interface wan1
config system interface
  edit "wan1"
    set vdom "root"
    set mode dhcp
    set allowaccess ping https ssh snmp
    set type physical
    set role wan
    set snmp-index 1
```

```
next
end
```

```
FGT61FTK19006594 # diag hardware deviceinfo nic wan1
Current_HWaddr      04:d5:90:7a:50:a8
Permanent_HWaddr    04:d5:90:7a:50:a8
```

**Step 6: Ensure that the FGT-AWS is able to access the remote branch behind the FortiExtender via VXLAN:**

```
FGT-AWS-EXT # exec ping 192.168.3.3
PING 192.168.3.3 (192.168.3.3): 56 data bytes
64 bytes from 192.168.3.3: icmp_seq=0 ttl=255 time=68.9 ms
64 bytes from 192.168.3.3: icmp_seq=1 ttl=255 time=68.6 ms

FGT-AWS-EXT # diag ip arp list
index=13 ifname=FX0035919000000 192.168.3.3 04:d5:90:7a:50:a8 state=00000008 use=362
confirm=362 update=429 ref=3
```

## Allow FortiExtender to be managed and used in a non-root VDOM

This feature allows FortiExtender to be managed and used in a non-root VDOM.

### GUI operating procedures

1. The FortiExtender appears in the Network section in each VDOM.

2. The FortiExtender can be discovered in the VDOM.



The VDOM must get an interface (lan2) with Security Fabric Connection and a DHCP server. Then the FortiExtender can be discovered when connecting to lan2 port11.

| Managed FortiExtenders                                                                                                      |                  |              |               |
|-----------------------------------------------------------------------------------------------------------------------------|------------------|--------------|---------------|
| Profiles Data Plans                                                                                                         |                  |              |               |
| <a href="#">+ Create new</a> <a href="#">Edit</a> <a href="#">Delete</a> <a href="#">Deauthorize</a> <a href="#">Search</a> |                  |              |               |
| Name                                                                                                                        | Serial Number    | Status       | Mode          |
| FX004TQ21000005                                                                                                             | FXA11FTQ21000005 | Unauthorized | WAN extension |

3. After it is authorized, the FortiExtender can provide an interface to the VDOM.



The FortiExtender can be authorized to bond a FortiExtender type interface to the LTE modem.

**Edit FortiExtender**

Serial number: FXA11FTQ21000005

Alias:

Mode: LAN extension WAN extension

Profile: FXA11F-wanext-default

**Extender Profile Overrides**

Management access: ☐

FortiExtender login password:

**State**

Authorized: ☒

WAN extension

Modem 1 Interface:

Interface:  Port Speed: Auto-Negotiation

Type:  Role: WAN

OK Cancel

**FortiGate**

FortiGate-81E-POE

Connection status: Offline

**Additional Information**

API Preview

Edit in CLI

**Documentation**

Online Help

Video Tutorials



The FortiExtender is connected to the FortiGate after authorization.

**Edit FortiExtender**

Serial number: FXA11FTQ21000005

Alias:

Mode: LAN extension WAN extension

Profile: FXA11F-wanext-default

**Extender Profile Overrides**

Management access: ☐

FortiExtender login password:

**State**

Authorized: ☒

Firmware: FXTA11F-v7.0.2-build622

WAN extension

Modem 1 Interface:

**FortiGate**

FortiGate-81E-POE

Model: FortiExtender-A11F

Connection status: Connected

IP address: 192.168.4.2

CPU Usage: 0%

Memory Usage: 14%

Modem 1: Quectel

Modem 1 Network: Fido LTE

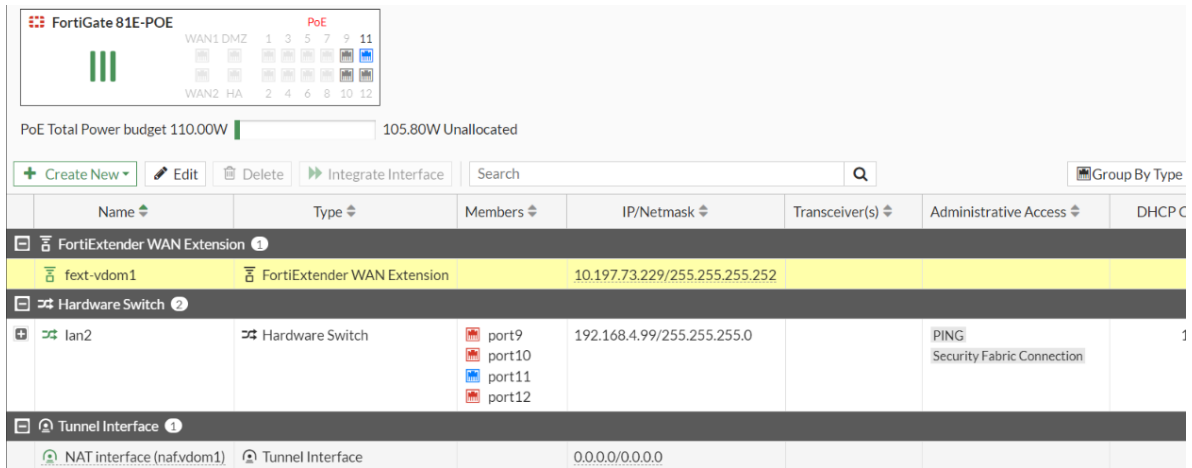
Modem 1 Data Usage: 0 MB

**Additional Information**

Diagnostics and Tools



The FortiGate gets the IP and gateway for the FortiExtender type interface in the VDOM.



PoE Total Power budget 110.00W 105.80W Unallocated

[+ Create New](#)
[Edit](#)
[Delete](#)
[Integrate Interface](#)

[Group By Type](#)

| Name                                 | Type                        | Members                                                                | IP/Netmask                    | Transceiver(s) | Administrative Access                                 | DHCP |
|--------------------------------------|-----------------------------|------------------------------------------------------------------------|-------------------------------|----------------|-------------------------------------------------------|------|
| <b>FortiExtender WAN Extension 1</b> |                             |                                                                        |                               |                |                                                       |      |
| text-vdom1                           | FortiExtender WAN Extension |                                                                        | 10.197.73.229/255.255.255.252 |                |                                                       |      |
| <b>Hardware Switch 2</b>             |                             |                                                                        |                               |                |                                                       |      |
| lan2                                 | Hardware Switch             | <div>port9</div> <div>port10</div> <div>port11</div> <div>port12</div> | 192.168.4.99/255.255.255.0    |                | <div>PING</div> <div>Security Fabric Connection</div> | 1    |
| <b>Tunnel Interface 1</b>            |                             |                                                                        |                               |                |                                                       |      |
| NAT interface (nafvdom1)             | Tunnel Interface            |                                                                        | 0.0.0.0/0.0.0.0               |                |                                                       |      |

#### 4. A FortiExtender profile and data plan can be set up per VDOM.

Edit FortiExtender Profile

Name: FXA11F-wanext-default

Model: FXA11F

Mode: WAN extension

Data plan: [+](#)

**Extender Management**

Management access: ☒ Ping ☒ Telnet ☐ HTTP ☐ HTTPS ☐ SSH ☐ SNMP

FortiExtender login password: [Specify](#) [Factory default](#) [Leave unchanged](#)

**Modem \$1**

Default SIM: [SIM1](#) [SIM2](#) [Carrier](#) [Lowest cost](#)

SIM1 PIN: ☐

SIM2 PIN: ☐

GPS: ☒

Auto SIM switch: ☐

By disconnecting: ☐

**Additional Information**

[API Preview](#)

[References](#)

[Edit in CLI](#)

**Documentation**

[Online Help](#)

[Video Tutorials](#)

| Managed FortiExtenders Profiles Data Plans                                                    |       |                    |               |          |              |              |         |      |
|-----------------------------------------------------------------------------------------------|-------|--------------------|---------------|----------|--------------|--------------|---------|------|
| <a href="#">+ Create new</a> <a href="#">Edit</a> <a href="#">Delete</a> <input type="text"/> |       |                    |               |          |              |              |         |      |
| Name                                                                                          | Modem | Slot/Carrier/ICCID | APN           | Capacity | Monthly Cost | Billing Date | Type    | Ref. |
| Bell-v1                                                                                       | all   | Bell               | pda.bell.ca   | 500      | 0            | 1            | Carrier | 0    |
| Rogers-v1                                                                                     | all   | Rogers             | Itemobile.apn | 200      | 0            | 1            | Carrier | 0    |

## CLI operating procedures

### 1. Set up the interface to discover FortiExtender in the VDOM.

```
config system interface
edit "lan2"
set vdom "vdom1"
set ip 192.168.4.99 255.255.255.0
set allowaccess ping fabric
```

```

        set type hard-switch
        set snmp-index 32
    next
end

```

## 2. Create a FortiExtender type interface in the VDOM.

```

config system interface
    edit "fext-vdom1"
        set vdom "vdom1"
        set mode dhcp
        set type fext-wan
        set role wan
        set snmp-index 34
    next
end

```

## 3. Authorize the discovered FortiExtender and bond the FortiExtender type interface.

```

config extender-controller extender
    edit "FX004TQ21000005"
        set id "FXA11FTQ21000005"
        set authorized enable
        set device-id 1
        set extension-type wan-extension
        set profile "FXA11F-wanext-default"
        config wan-extension
            set modem1-extension "fext-vdom1"
        end
    next
end

```

## 4. Check the IP and gateway from the FortiExtender interface.

```

FortiGate-81E-POE (vdom1) # get system interface | grep fext-vdom1
== [ fext-vdom1 ]
name: fext-vdom1   mode: dhcp   ip: 10.197.73.229 255.255.255.252   status: up
netbios-forward: disable   type: fext-wan   netflow-sampler: disable   sflow-
sampler: disable   src-check: enable   explicit-web-proxy: disable   explicit-
ftp-proxy: disable   proxy-captive-portal: disable   mtu-override: disable
drop-overlapped-fragment: disable   drop-fragment: disable

```

```

FortiGate-81E-POE (vdom1) # get router info routing-table all
Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP
       O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       V - BGP VPNv4
       * - candidate default

```

```

Routing table for VRF=0
S*    0.0.0.0/0 [5/0] via 10.197.73.230, fext-vdom1, [1/0]
C     10.197.73.228/30 is directly connected, fext-vdom1
C     192.168.4.0/24 is directly connected, lan2

```

**5. Modify the FortiExtender profile.**

```
config extender-controller extender-profile
  edit "FXA11F-wanext-default"
    set id 4
    set model FXA11F
    set allowaccess ping telnet
    config cellular
      config sms-notification
      end
      config modem1
      end
    end
  next
end
```

**6. Create a FortiExtender data plan.**

```
config extender-controller dataplan
  edit "Rogers-v1"
    set type carrier
    set carrier "Rogers"
    set apn "ltemobile.apn"
    set capacity 200
  next
end
```

## Discover a FortiExtender unit

For a FortiGate acting as the access controller (AC) to discover a FortiExtender unit, the FortiGate must be able to reach the FortiExtender. There are two ways in which a FortiExtender with the factory default configuration can be discovered by a FortiGate:

- Broadcast
- Static IP

### Broadcast

The FortiExtender can be discovered when sending broadcast traffic in its local subnet. In this case, the FortiGate and the FortiExtender must be in the same subnet. The interfaces specified in "discovery-intf" configured on the FortiExtender should include the interface that can reach out to the FortiGate, as shown in the example below:

```
config system management fortigate
  set ac-discovery-type broadcast
  set discovery-intf lan port4
end
```

### Static

The FortiExtender sends discover requests to a preconfigured IP address on the FortiGate. You can specify multiple FortiGates in IPv4-address or FQDN format. The FortiExtender will choose one that it can reach and connect. You can specify up to 16 FortiGate entries in the configuration. See the following example:

```

config system management fortigate
    set ac-discovery-type static
    config static-ac-addr
    edit 1
        set server 192.168.1.99
    next
    edit 2
        set server fortinet.com
    next
end
set discovery-intf lan port4
end

```

For the FortiGate, you must ensure that the interface used for discovery should have allowaccess with "fabric", as shown in the example below:

```

config system interface
    edit "lan"
        set vdom "root"
        set ip 192.168.1.99 255.255.255.0
        set allowaccess ping https ssh fgfm fabric << fabric should be one option
            in allowaccess
        set type hard-switch
        set stp enable
        set role lan
        set snmp-index 21
    next
end

```

## De-authorize FortiExtender devices

FortiExtenders discovered by the FortiGate configured as a controller used to show up on the FortiGate GUI as pending authorization, causing confusion in certain situations. This enhancement enables you to disable a discovered FortiExtender device on a FortiGate configured as a FortiExtender controller from the GUI or the CLI.

### GUI

1. Locate the FortiExtender in "Unauthorized" status.

The screenshot shows the FortiGate GUI interface for managing FortiExtenders. The left sidebar contains a navigation menu with options like Dashboard, Network, DNS, IPAM, FortiExtenders (highlighted), SD-WAN, Static Routes, Diagnostics, Policy & Objects, Security Profiles, VPN, User & Authentication, WiFi & Switch Controller, System, Security Fabric, and Log & Report. The main content area is titled 'Managed FortiExtenders' and includes tabs for Profiles and Data Plans. It features two donut charts: 'Status' showing 1 Unauthorized device and 'Mode' showing 1 WAN extension device. Below the charts is a table with the following data:

| Name           | Status       | Mode          | Details |
|----------------|--------------|---------------|---------|
| FX013592100036 | Unauthorized | WAN extension |         |

2. Select the FortiExtender and click "Edit". Note: The original status is "Deauthorized"

The screenshot shows the 'Edit FortiExtender' configuration page in FortiGate. The left sidebar shows the 'Network' menu with 'FortiExtenders' selected. The main panel displays the configuration for a FortiExtender with serial number FX511F5921000036. The status is 'Deauthorized'. The mode is 'WAN extension'. The FortiGate is 'FortiGate-81E-POE'. The 'Extender Profile Overrides' section shows 'Management access' with 'Ping', 'Telnet', and 'SSH' checked. The 'FortiExtender login password' is set to 'Specify'. The 'Status' section has buttons for 'Authorize', 'Deauthorize', and 'Reject'. The 'OK' button is highlighted.

3. Set the status to "Reject", and click OK.

The screenshot shows the 'Edit FortiExtender' configuration page in FortiGate. The left sidebar shows the 'Network' menu with 'FortiExtenders' selected. The main panel displays the configuration for a FortiExtender with serial number FX511F5921000036. The status is 'Reject'. The mode is 'WAN extension'. The FortiGate is 'FortiGate-81E-POE'. The 'Extender Profile Overrides' section shows 'Management access' with 'Ping', 'Telnet', and 'SSH' checked. The 'FortiExtender login password' is set to 'Specify'. The 'Status' section has buttons for 'Authorize', 'Deauthorize', and 'Reject'. The 'OK' button is highlighted.

The following image shows the status of the FortiExtender after it is being rejected.

The screenshot shows the 'Managed FortiExtenders' status page in FortiGate. The left sidebar shows the 'Network' menu with 'FortiExtenders' selected. The main panel displays a summary of the FortiExtenders. The 'Status' section shows '1 Total' and 'Rejected'. The 'Mode' section shows '1 Total' and 'WAN extension'. Below the summary is a table with one entry:

| Name            | Status   | Mode          | Details |
|-----------------|----------|---------------|---------|
| FX0135921000036 | Rejected | WAN extension |         |

## CLI

When the FortiExtender is in "discovered" state.

```
config extension-controller extender
  edit "FX0135921000036"
    set id "FX511F5921000036"
    set authorized discovered
```

You can change it to "disable" state. It will be shown as "Reject" in the GUI.

```
config extension-controller extender
  edit "FX0135921000036"
    set id "FX511F5921000036"
    set authorized disable
```

## The default FortiExtender profile

In some circumstances, a default profile (or 2 default profiles) will be automatically generated.

The profile or profiles are generated based on the FortiExtender model. For FortiExtender models without LTE/5G modems, such as FortiExtender 200F, FortiGate will generate a LAN extension profile as follows:

```
config extender-controller extender-profile
  edit "FX200F-lanext-default"
    set id 0
    set model FX200F
    set extension lan-extension
    config lan-extension
      set link-loadbalance loadbalance
      set ipsec-tunnel "fext-ipsec-WrXw"
      set backhaul-interface "port2"
      config backhaul
        edit "1"
          set port port1
        next
        edit "2"
          set port port2
        next
      end
    end
  next
end
```

In this default FortiExtender 200F profile, there are two default backhaul ports: port1 and port2. It indicates that the FortiExtender 200F will use its port1 and port2 for the uplinks connected to the FortiGate. The underlying data transportation will be VLAN over IPsec, which is transparent to users.

These two ports will be linked as an aggregated interface in the FortiExtender and you can specify load-balance mode on it. More detailed LAN extension configuration is covered in [LAN extension configuration in a profile on page 67](#).

For FortiExtender models with LTE/5G modems, two default profiles will be generated: one for WAN extension and the other for LAN extension.

For WAN extension, the default profile with default values for FortiExtender 201E is as follows:



The following example is for illustration only.

---

```
config extender-controller extender-profile
  edit "FX201E-wanext-default"
    set id 2
    config cellular
      config sms-notification
      end
      config modem1
      end
    end
  next
end

# get FX201E-wanext-default (default value will be shown below)
name : FX201E-wanext-default
id : 2
model : FX201E
extension : wan-extension
allowaccess :
login-password-change: no
cellular:
  dataplan :
  controller-report:
    status : disable
  sms-notification:
    status : disable
  modem1:
    redundant-mode : disable
    conn-status : 0
    default-sim : sim1
    gps : enable
    sim1-pin : disable
    sim2-pin : disable
    auto-switch:
      disconnect : disable
      signal : disable
      dataplan : disable
      switch-back :
      switch-back-time : 00:01
      switch-back-timer : 86400
```

For the LAN extension, the default profile for the FortiExtender 201E generated on the FortiGate would look as follows. For details of LAN extension configuration, go to [LAN extension configuration in a profile on page 67](#).

```
config extender-controller extender-profile
  edit "FX201E-lanext-default"
    set id 3
    set extension lan-extension
    config cellular
      config sms-notification
      end
      config modem1
      end
    end
  config lan-extension
    set ipsec-tunnel "fext-ipsec-ut4Z"
    set backhaul-interface "lan"
    config backhaul
```

```
        edit "1"
            set port wan
            set role primary
        next
        edit "2"
            set port ltel
            set role secondary
        next
    end
end
next
end
```

```
# get FX201E-wanext-default (default value will be shown below)
name : FX201E-lanext-default
id : 3
model : FX201E
extension : lan-extension
allowaccess :
login-password-change: no
enforce-bandwidth : disable
cellular:
    dataplan :
    controller-report:
        status : disable
    sms-notification:
        status : disable
    modem1:
        redundant-mode : disable
        conn-status : 0
        default-sim : sim1
        gps : enable
        sim1-pin : disable
        sim2-pin : disable
        auto-switch:
            disconnect : disable
            signal : disable
            dataplan : disable
            switch-back :
            switch-back-time : 00:01
            switch-back-timer : 86400
lan-extension:
    link-loadbalance : activebackup
    ipsec-tunnel : fext-ipsec-ut4Z
    backhaul-interface : lan
    backhaul-ip :
    backhaul:
        == [ 1 ]
        name: 1
        == [ 2 ]
        name: 2
```



After upgrading to 7.0.2 or later from 3.2, the default behavior is "unset allowaccess" to prevent direct management of the FortiExtender by anything other than the FortiGate. If you want to exert some direct control over the device, you can change the default behavior using the following CLI commands:

```
config extender-controller extender-profile
  edit "FX211E-wanext-default"
    set allowaccess ping https
    set login-password-change no
  end
```

## Allowaccess for FortiExtender management

The allowaccess configuration controls the types of traffic that the FortiExtender uplink interface is allowed to send to the FortiGate. There are six options that you can configure as needed:

- Ping
- Telnet
- HTTP
- HTTPS
- SSH
- SNMP

```
config extender-controller extender-profile
  edit "FX201E-lanext-default"
    set allowaccess ping telnet http https ssh snmp
  next
end
```

Each FortiExtender associated with this profile has the same allowaccess settings specified in the profile. However, it can also be overridden per device. For example, the following FortiExtender will use the allowaccess specified in the extender entry instead of the one specified in the profile, "FX201E-lanext-default".

```
config extender-controller extender
  edit "FX0015919000027"
    set id "FX201E5919000027"
    set authorized enable
    set extension-type lan-extension
    set override-allowaccess enable
    set allowaccess ping telnet
    set profile "FX201E-lanext-default"
  next
end
```

## Set bandwidth limit for LAN extension

Just like allowaccess and login password, the bandwidth limit for the LAN extension can be configured in a profile, and can also be overridden in an extender entry.

```
config extender-controller extender-profile
  edit "FX200F-lanext-default"
```

```

set model FX200F
set extension lan-extension
set enforce-bandwidth [enable|disable]
set bandwidth-limit 1000 // only shown when enforce-bandwidth is enable
config lan-extension
...
end
end
config extender-controller extender
edit "FX0015919000027"
    set id "FX201E5919000027"
    set authorized enable
    set extension-type lan-extension
    set override-enforce-bandwidth [enable|disable] // override the profile
setting
    set enforce-bandwidth [enable|disable]
    set bandwidth-limit 1003 // only shown when enforce-bandwidth is enable
    set profile "FX201E-lanext-default"
next
end

```

| Parameter                             | Description                                                                                             |
|---------------------------------------|---------------------------------------------------------------------------------------------------------|
| enforce-bandwidth<br>[enable disable] | Enable/Disable the enforcement of bandwidth limit on the LAN extension interface.                       |
| bandwidth-limit<br><integer>          | Set the FortiExtender LAN extension interface bandwidth limit in Mbps. The range is from 1 to 16776000. |

Once it is configured, the FortiExtender will have the "shaper" configuration as shown in the example below, and it can have bandwidth limit with the configuration. The terms "le-traffic-shaper" and "le-shaping-policy" are predefined, and will be created in the FortiExtender.

```

config firewall shaper traffic-shaper
edit le-traffic-shaper
    set max-bandwidth 1024 // set bandwidth-unit mbps
next
end
config firewall shaping-policy
edit le-shaping-policy
    set status enable
    set dstintf le-agg-link
    set traffic-shaper le-traffic-shaper
next
end

```

## Configure FortiExtender admin password

You can configure the admin login password of a FortiExtender via the FortiGate console. Similar to allowaccess, it can be configured in a profile and also can be overridden in an extender entry.

```

config extender-controller extender
edit "FX201E0123456789"
    set override-login-password-change [enable|diabile]
    set login-password-change [yes|default|no]

```

```

        set login-password <string>
    next
end
config extender-controller extender-profile
    edit "FX201E-default"
        set login-password-change [yes|default|no]
        set login-password <string>
    next
end

```

| Parameter                                                                        | Description                                                                                                                                                                                                                                                                                                                                               |
|----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>set login-password-change</code><br><code>[yes default no]</code>          | Use one of the following options: <ul style="list-style-type: none"> <li><code>yes</code> — Change the administrator login password of the FortiExtender.</li> <li><code>default</code> — Keep the managed administrator login password set to the factory default.</li> <li><code>no</code> — Do not change the administrator login password.</li> </ul> |
| <code>set override-login-password-change</code><br><code>[enable disable]</code> | Enter either of the following: <ul style="list-style-type: none"> <li><code>enable</code> — Override the administrator login password setting in the profile.</li> <li><code>disable</code> — Use the administrator login password setting in the profile.</li> </ul>                                                                                     |
| <code>set login-password</code><br><code>&lt;string&gt;</code>                   | Set the administrator login password of the managed FortiExtender.                                                                                                                                                                                                                                                                                        |



In earlier releases of FortiOS, there is a "set login-password" command in the extender entry, but there are no "login-password-change" and "override-login-password-change" attributes. If you have configured your administrator login password in an earlier version of FortiOS, the "login-password-change" attribute will be set to "yes" and your login-password will remain the same as before after upgrade.

## Discovery response lockdown

By default, FortiGate automatically generate a FortiExtender entry if a newly added FortiExtender discovers it, that is to say when the FortiExtender is sending a discovery request.

In order to prevent rogue devices from detecting or scanning the FortiGate, you can enable "fortiextender-discovery-lockdown" to ensure that the discovery response is sent to a pre-authorized device only.

Once enabled, the FortiGate will not automatically generate an extender entry when a newly discovered FortiExtender joins the network. Instead, it will only accept discovery request from a pre-authorized extender entry. By default, "fortiextender-discovery-lockdown" is disabled. You can enable it using the following command:

```

config system global
    set fortixtender-discovery-lockdown enable
end

```

## Wildcard

In some cases, you may not know the ID (i.e., serial number) of a FortiExtender, but still intend to pre-create an extender entry in the FortiGate for easy deployment. You can use the wildcard \* (asterisk) in the "id" attribute when manually creating an extender entry.

The rule for using wildcard is to have a 6-digit model name followed by 10 \* (asterisks).

Below are the 6-digit model names of FortiExtender devices:

- FX201E
- FX211E
- FX200F
- FXA11F
- FXE11F
- FXA21F
- FXE21F
- FXA22F
- FXE22F
- FX212F
- FX311F
- FX312F
- FX511F
- FVG21F
- FVA21F
- FVG22F
- FVA22F
- FX04DA

Take FX200F for example. You can configure as follows:

```
config extender-controller extender
  edit <entry> << any entry name you like (less than 15 characters)
    set id FX200F*****
    set extension lan-extension
    set profile "FX200F-lanext-default"
  next
end
```

You can also pre-authorize the entry as well, as shown below:

```
config extender-controller extender
  edit <entry>
    set authorized enable
    set id FX200F*****
    set extension lan-extension
    set profile "FX200F-lanext-default"
  next
end
```

Whenever a new FX200F joins (assuming its serial number is FX200F5919000001), the FortiGate will select the extender entry and replace the "id" with its serial number. If there are more than two wildcard entries with the same model, it will choose the one that has "set authorized" enabled because of its higher priority.

```
config extender-controller extender
  edit entry1
    set id FX201E*****
    set extension lan-extension
    set profile "FX201E-lanext-default"
  next
  edit entry2
    set authorized enable
    set id FX200F5919000001
    set extension lan-extension
    set profile "FX201E-lanext-default"
  next
end
```

## Data transportation over the LAN extension interface

FortiGate automatically generates a "lan-extension" interface for each FortiExtender that it has authorized. The name of the interface is the same as the FortiExtender entry name.

```
config extender-controller extender
  edit "FX00159190000027"
    set id "FX201E59190000027"
    set authorized enable
    set device-id 1
    set extension-type lan-extension
    set override-allowaccess enable
    set profile "FX201E-lanext-default"
  next
end
config system interface
  edit "FX00159190000027"
    set vdom "root"
    set type lan-extension
    set role lan
    set snmp-index 26
    set interface "fext-ipsec-ut4Z"
  next
end
```

This interface is the virtual interface that abstracts all the details of the underlying transportation tunneling protocol. You can view the interface as a LAN interface in the FortiGate. Unlike a real LAN interface, this "lan-extension" interface will connect the FortiExtender across the internet.

It is transparent to users to provide a reliable, secure interface. For example, you can configure the "ip" of this interface and enable DHCP server on it.

```
config system interface
  edit "FX00159190000027"
    set vdom "root"
    set ip 192.168.3.99 255.255.255.0
    set allowaccess ping https ssh snmp http telnet
    set type lan-extension
    set role lan
    set snmp-index 26
    set interface "fext-ipsec-ut4Z"
  next
```

```
end
config system dhcp server
  edit 3
    set default-gateway 192.168.3.99
    set netmask 255.255.255.0
    set interface "FX0015919000027"
    config ip-range
      edit 1
        set start-ip 192.168.3.2
        set end-ip 192.168.3.98
      next
    end
  next
end
```

An appropriate firewall policy can be used to forward traffic out of the FortiGate's WAN interface. Suppose that "wan1" is the WAN interface of the FortiGate, you can configure it as follows. You can also apply a more strict firewall policy based on your need.

```
config firewall policy
  edit 1
    set name "LAN-EXT"
    set uuid 8b7c21e4-221e-51ec-0a0d-34e7b478557b
    set srcintf "FX0015919000027"
    set dstintf "wan1"
    set action accept
    set srcaddr "all"
    set dstaddr "all"
    set schedule "always"
    set service "ALL"
    set nat enable
  next
end
```

On the FortiExtender side, the "lan" interface will be mapped to the "lan-extension" interface on the FortiGate. You can have computers directly connected to any of the LAN ports on the FortiExtender, or have a switch between the LAN and the computers. The computers will get IPs from the DHCP server configured in "lan-extension" interface and can forward traffic out through the FortiGate based on the firewall policy.

## LAN extension configuration in a profile

The following example shows the "lan-extension" configuration in a default LAN extension profile.

```
FortiGate (extender-profile) # get FX200F-lanext-default
name : FX200F-lanext-default
id : 4
model : FX200F
extension : lan-extension
allowaccess :
login-password-change: no
enforce-bandwidth : enable
bandwidth-limit : 200
lan-extension:
link-loadbalance : loadbalance
ipsec-tunnel : fext-ipsec-rthk
```

```

backhaul-interface : lan
backhaul-ip :
backhaul:
== [ 1 ]
name: 1
== [ 2 ]
name: 2

```

| Parameter                                      | Description                                                                                                                                                                                                                                                                                      |
|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| name                                           | The profile name                                                                                                                                                                                                                                                                                 |
| id                                             | The profile ID (for system internal record)                                                                                                                                                                                                                                                      |
| model                                          | The FortiExtender model for the profile                                                                                                                                                                                                                                                          |
| extension [lan-extension   wan-extension]      | The extension type for the profile                                                                                                                                                                                                                                                               |
| alloweaccess [telnet http https snmp ping ssh] | The multi-option setting for the lan-extension switch interface of the FortiExtender. For more details, see <a href="#">Allowaccess for FortiExtender management on page 62</a> .                                                                                                                |
| login-password-change [yes no default]         | The setting of the admin password of the FortiExtender. For more details, see <a href="#">Configure FortiExtender admin password on page 63</a>                                                                                                                                                  |
| enforce-bandwidth [enable disable]             | Enable or disable enforcement of bandwidth limit.<br><b>Note:</b> "enforce-bandwidth", which is disabled by default, is used to limit the egress bandwidth used to send traffic from the FortiExtender. For more details, see <a href="#">Set bandwidth limit for LAN extension on page 62</a> . |
| bandwidth-limit                                | Specify the bandwidth limit.                                                                                                                                                                                                                                                                     |
| link-loadbalance [activebackup   loadbalance]  | Two ports are configured for the FortiExtender for load-balancing. For <code>activebackup</code> mode, you can configure "role" (primary or secondary) on the two backhaul ports. For <code>loadbalance</code> mode, you can configure "weight" on each backhaul port.                           |
| ipsec-tunnel                                   | This is the IPsec tunnel interface that will be used in underlying data transportation. It provide secure connection between the FortiExtender and the FortiGate. This entry will be auto-generated.                                                                                             |
| backhaul-interface                             | This is the egress interface for data transportation between the FortiGate and the other FortiExtenders using this profile. The default will be automatically filled with the interface that is used to manage the FortiExtender. You can configure it based on your network topology.           |
| backhaul-ip                                    | This is used for the FortiGate behind a NAT device (or DNAT, LoadBalancer, etc.). The "backhaul-ip" is the external IP of the NAT device. For details, see <a href="#">Backhaul IP in LAN extension on page 69</a> .                                                                             |

The following is an example of a backhaul configuration:

```
FortiGate (backhaul) # edit 1
FortiGate (1) # get
name : 1
port : port1
weight : 1
```

If link-loadbalance is configured as "activebackup", the following will be shown:

```
name : 1
port : port1
role : primary
```

| Parameter                  | Description                                                                         |
|----------------------------|-------------------------------------------------------------------------------------|
| name                       | The name of the backhaul entry.                                                     |
| port                       | The port on the FortiExtender that sends traffic to the FortiGate in LAN extension. |
| weight                     | Enter the weight if the link-loadbalance is configured as "loadbalance".            |
| role [primary   secondary] | Specify whether the port is primary or secondary.                                   |

## Backhaul IP in LAN extension

There is one optional `backhaul-ip` configuration in FortiGate to be used in the case that FortiGate is behind a NAT. The `backhaul-ip` is the external IP used in this NAT device. Both the FortiExtender and the FortiGate need to be aware of this `backhaul-ip`. On the FortiExtender, it needs to specify in its discovery static IP.

On the FortiExtender

```
config system management fortigate
set ac-discovery-type static
config static-ac-addr
edit 1
set server <backhaul-ip>
next
end
end
```

On the FortiGate:

```
config extender-controller extender-profile
edit "FX200F-lanext-default"
config lan-extension
set backhaul-ip <backhaul-ip>
end
next
end
```



The NAT device needs to have port mapping/forwarding configuration, which is beyond the scope of this document.

---

# Manage dual FortiExtender devices

## Active/Passive mode

By default, each FortiGate device can support up to two FortiExtender devices at a time. The first FortiExtender linked interface can be configured to have a lower distance than the second FortiExtender linked interface.

## Active/Active mode

To have access to active internet sessions on both FortiExtender devices simultaneously, authorize both FortiExtender devices and configure the distance, priority, and firewall policies accordingly.

## Cellular as backup of Ethernet WAN

In this redundant mode of operation, the FortiExtender daemon running on the FortiGate monitors a given WAN link on the FortiGate, and brings up the FortiExtender's cellular internet access when the WAN link is down and brings down the FortiExtender cellular internet when the WAN link comes up. For example:

```
config extender-controller extender
  edit <FEX SN>
    set authorized enable
    config modem1
      set ifname <fext-wan interface>
      set redundant-mode enable
      set redundant-intf <wan interface, ie wan1>
    end
  next
end
```

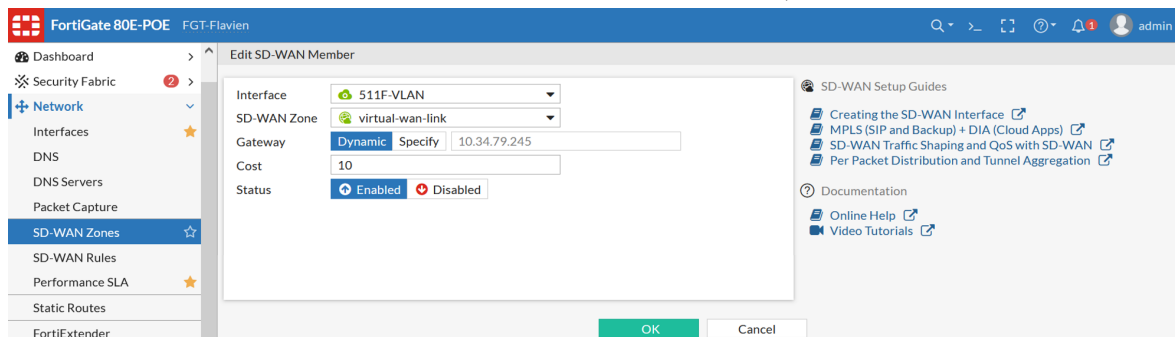
In this mode of operation, the FortiExtender interface comes up if the WAN interface goes down and goes down if the WAN interface comes up.

## SD-WAN

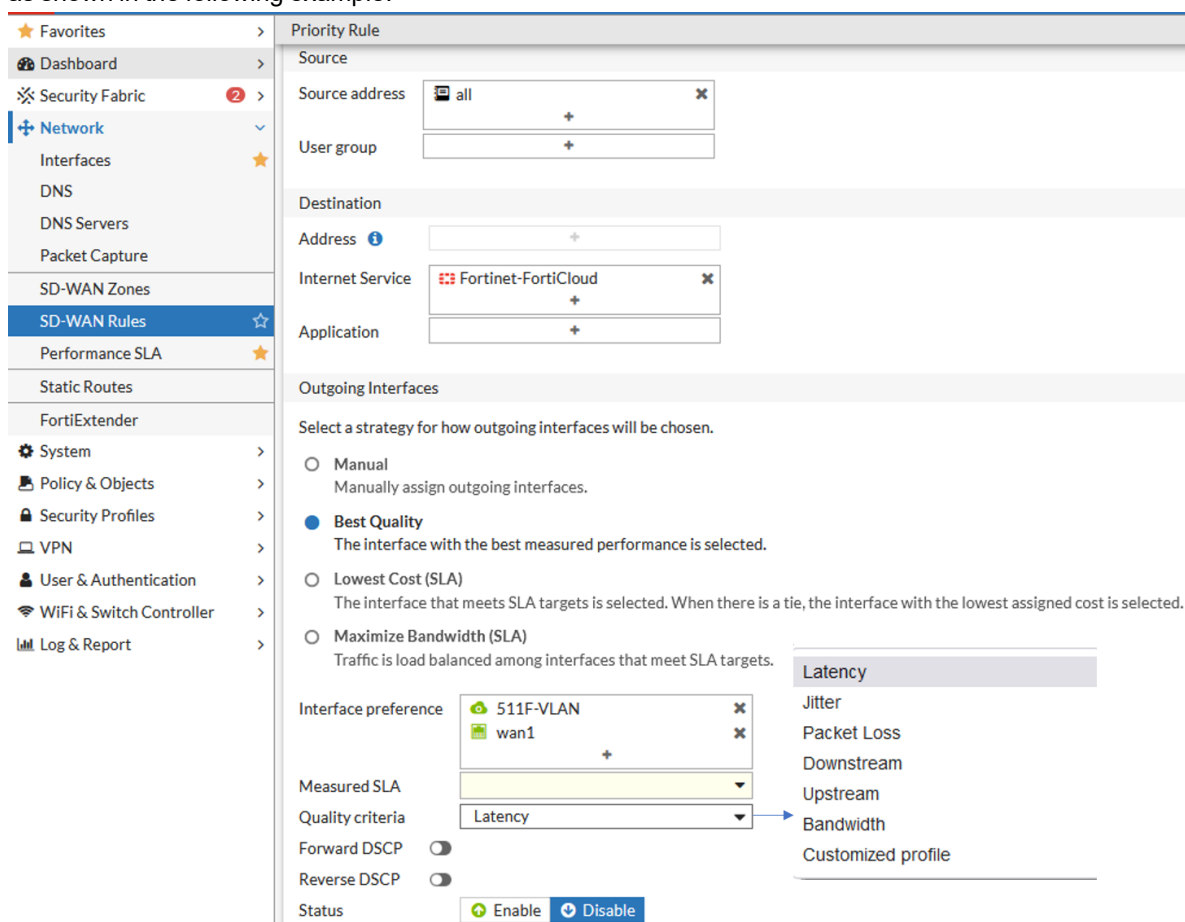
FortiOS recognizes and uses FortiExtender as a valid interface within an SD-WAN interface zone. Using SD-WAN, FortiGate becomes a WAN path controller and supports diverse connectivity methods. With FortiExtender, 3G/4G/5G can be used as the primary connection, a backup interface, or a load-balanced WAN access method with Application-Aware WAN path control selection. It provides high availability and QoS for business-critical applications by using the best effort access for low-priority applications through low-cost links and backup service through associations with a FortiExtender link. This enables aggregation of multiple interfaces into a single SD-WAN interface using a single policy.

**To accomplish this:**

1. Add the FortiExtender interface as a member of the SD-WAN interface, as illustrated below.



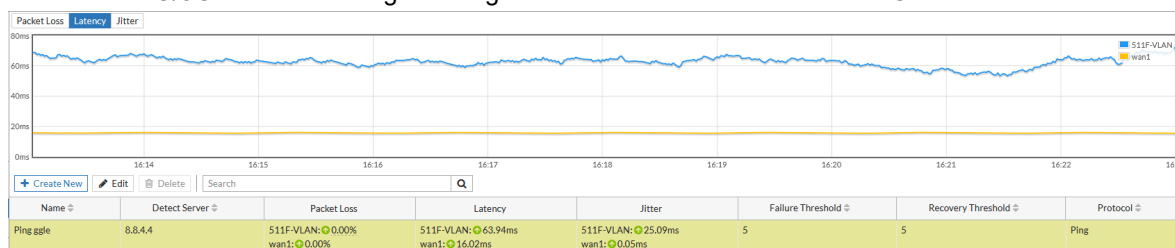
2. Define the priority rule, for instance, with the Best Quality strategy based on the Latency or Jitter criterion as shown in the following example.



3. Order or combine your policies as illustrated below.

| ID       | Name                 | Source | Destination                                                                          | Criteria  | Members           | Hit Count | Last Used           |
|----------|----------------------|--------|--------------------------------------------------------------------------------------|-----------|-------------------|-----------|---------------------|
| IPv4     |                      |        |                                                                                      |           |                   |           |                     |
| 6        | nPerfFree5G          | all    | FreeParisNPerf                                                                       |           | 511F-VLAN         | 387       | Wednesday           |
| 7        | Citrix-Fiber         | all    | Citrix.CDN<br>Citrix.Services<br>Citrix.Services_Podio<br>GoToMeeting<br>GoToWebinar |           | wan1              | 1,014     | 10 minutes ago      |
| 5        | Test5G               |        | Deezer<br>Salesforce<br>Schwab                                                       |           | 511F-VLAN<br>wan1 | 2,039     | 26 minutes ago      |
| 3        | FortiCloudVia5G      | all    | Fortinet-FortiCloud                                                                  |           | 511F-VLAN<br>wan1 |           |                     |
| 2        | AlarmVia5G           | Alarme | all                                                                                  |           | 511F-VLAN         |           |                     |
| 4        | fcld_eu_ping_5G_only |        | FortiCloud_EU                                                                        |           | 511F-VLAN         |           |                     |
| 1        | LowestCost           | all    | all                                                                                  | SLA       | 511F-VLAN<br>wan1 | 1,754,895 | 2021/08/04 16:18:40 |
| Implicit |                      |        |                                                                                      |           |                   |           |                     |
|          | sd-wan               | all    | all                                                                                  | Source IP | any               |           |                     |

#### 4. Monitor the 4G/5G link health using the integrated Performance SLA tool in FortiGate.



## Configure cellular settings

Configuration of the cellular settings involves the following tasks:

- [Create a data plan on page 73](#)
- [Set the default SIM on page 75](#)
- [Enable SIM-switch on page 76](#)
- [Report to FortiGate on page 77](#)
- [Capwap mode on page 77](#)
- [VLAN mode on page 78](#)

## Create a data plan

You can configure a data plan on the FortiGate with the following parameters:

```
config extender-controller dataplan
edit Verizon
set modem modem1
set type by-carrier
set carrier Verizon
set apn WE01.VZWSTATIC
set auth NONE
set user
```

```

    set pwd
    set pdn ipv4-only
    set signal-threshold 0
    set signal-period 0
    set capacity 0
    set monthly-fee 0
    set billing-date 0
    set overage disable
    set preferred-subnet 32
    set private-network disable
next
end

```



When "private network" is enabled, FortiExtender allows the flow of non-NATed IP traffic on to an LTE interface. Otherwise, it does not.

| Parameter        | Description                                                                                                                                                                                                                                                                                                                                                         |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| modem            | Choose "modem1", "modem2", or "all".                                                                                                                                                                                                                                                                                                                                |
| type             | Choose the way for the modem to select the SIM card: <ul style="list-style-type: none"> <li>carrier— Assign by SIM carrier.</li> <li>slot— Assign to SIM slot 1 or 2.</li> <li>iccid— Assign to a specific SIM by its serial number (18 to 22 digits).</li> <li>generic— Compatible with any SIM. Assigned if no other data plan matches the chosen SIM.</li> </ul> |
| iccid            | The serial number of the SIM, mandatory for "set type by-iccid".                                                                                                                                                                                                                                                                                                    |
| carrier          | The SIM card carrier, mandatory for "set type by-carrier".                                                                                                                                                                                                                                                                                                          |
| slot             | The SIM card slot, mandatory for "set type by-slot"                                                                                                                                                                                                                                                                                                                 |
| apn              | The APN of the SIM card.                                                                                                                                                                                                                                                                                                                                            |
| auth-type        | The Authorization mode.                                                                                                                                                                                                                                                                                                                                             |
| username         | The username.                                                                                                                                                                                                                                                                                                                                                       |
| password         | The password.                                                                                                                                                                                                                                                                                                                                                       |
| pdn              | The Packet Data Network (PDN) IP address family.                                                                                                                                                                                                                                                                                                                    |
| signal-threshold | The signal-strength threshold beyond which SIM switch will occur.<br><b>Note:</b> Enter an integer value from <50> to <100> (default = <100>).                                                                                                                                                                                                                      |
| signal-period    | The length of time (from 600 to 18000 seconds) for SIM switch to occur when signal strength remains below the set signal threshold for more than half of the set period.                                                                                                                                                                                            |
| capacity         | The data capacity per month (from 0 to 102400000 MB).                                                                                                                                                                                                                                                                                                               |
| monthly-fee      | The monthly fee for the data plan (from 0 to 1000000).                                                                                                                                                                                                                                                                                                              |
| billing-date     | The billing date of the month.                                                                                                                                                                                                                                                                                                                                      |

| Parameter        | Description                                      |
|------------------|--------------------------------------------------|
| preferred-subnet | DHCP subnet.                                     |
| private-network  | (Enable/disable) blocking all non-NATed traffic. |

## Set the default SIM

When installing two SIM cards in one modem, you can set the default SIM to use.

You can set the default SIM by

- [Set the default SIM by preferred carrier on page 75](#)
- [Set the default SIM by low cost on page 75](#)
- [Set the default SIM by SIM slot on page 75](#)

### Set the default SIM by preferred carrier

Use this option to set the default SIM if you have SIM cards from different carriers.

```
config extender-controller extender
  edit <FEX_SN>
    set authorized enable
    config modem1
      set ifname <fext-wan>
      set default-sim carrier
      set preferred-carrier <carrier name>
    end
  next
end
```

### Set the default SIM by low cost

This option applies when you need to choose the low-cost SIM over a more expensive one.

You must configure two entries under “config lte plan” for the two SIM cards separately. The system will calculate the cost based on the “set capacity” and “monthly-fee”.

```
config extender-controller extender
  edit <FEX SN>
    set authorized enable
    config modem1
      set ifname <fext-wan>
      set default-sim cost
    end
  next
end
```

### Set the default SIM by SIM slot

The default SIM is sim1. You can change it to sim2 using the following commands:

```

config extender-controller extender
    edit <FEX SN>
        set authorized enable
        config modem1
            set ifname <fext-wan>
            set default-sim sim1|2
        end
    next
end

```

## Enable SIM-switch

```

config extender-controller extender
    edit <FEX SN>
        set authorized enable
        config modem1
            set ifname <fext-wan>
            config auto-switch
                set by-disconnect enable
                set by-signal disable
                set by-data-plan disable
                set disconnect-threshold 1
                set disconnect-period 600
                set switch-back by time by-timer set switch-back-by-time 00:01
                set switch-back-by-timer 3600
            end
        end
    next
end

```



SIM-switching can be configured by data plan, disconnect settings, signal strength, coupled with switch back by time or by timer. All these options are under the “Auto switch” setting.

| Parameter            | Description                                                                                                                   |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------|
| by-disconnect        | The SIM card switches when the active card gets disconnected according to the 'disconnect-threshold' and 'disconnect-period'. |
| by-signal            | The SIM card switches when the signal strength gets weaker than the signal-threshold.                                         |
| by-data-plan         | The SIM card switches when 'capacity' is overrun and 'overage' is enabled.                                                    |
| disconnect-threshold | The number (1 —100) of disconnects for SIM switch to take place.                                                              |
| disconnect-period    | The evaluation period (600 — 18000) in seconds for SIM switch.                                                                |
| switch-back          | Enables switching back to the preferred SIM card.                                                                             |
| switch-back-by-time  | Switches over to the preferred SIM /carrier at a specified (UTC) time (HH:MM).                                                |

| Parameter            | Description                                                                                 |
|----------------------|---------------------------------------------------------------------------------------------|
| switch-back-by-timer | Switches over to the preferred SIM/carrier after a given time (3600-2147483647) in seconds. |

## Report to FortiGate

```
config extender-controller extender
  edit <FEX SN>
    set authorized enable
    config controller-report
      set status [enable|disable]
      set interval 300
      set signal-threshold 10
    end
  next
end
```

| Parameter        | Description                                                                                                                                |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| status           | Enable or disable periodic controller report.                                                                                              |
| interval         | The interval at which to notify the FortiGate (once every 30 to 86,400 seconds; the default is 300).                                       |
| signal-threshold | The signal strength threshold (10 — 50 dBm). The FortiExtender notifies the FortiGate once the RSSI change has exceeded the set threshold. |

## Capwap mode

In CAPWAP IP pass-through mode, the FortiExtender is managed by a FortiGate, and traffic is forwarded via the CAPWAP tunnel between the FortiGate and the FortiExtender. Refer to FortiGate documentation on how to manage a FortiExtender on a FortiGate. Once a FortiExtender is managed by a FortiGate, the following configurations will be synced from the FortiGate and generated automatically.

### Configurations On FortiExtender

The `ingress-intf` in system management setting is set automatically, and cannot be edited.

```
config system management fortigate
  set ingress-intf lan
end
```

### Capwap interface

The `capwap` interface is created automatically, and cannot be edited or removed.

```
config system interface
  edit capwap1
    set type capwap
    set rid 1
  next
end
```

## Virtual wire pair

Configurations of the virtual wire pair are created automatically. They cannot be edited or removed. These configurations specify the mapping of the LTE interfaces and the `capwap` interfaces. For example, 'set ltel-mapping capwap1' means the traffic from the `capwap1` interface will be sent out by the `lte1` interface.

```
config system virtual-wire-pair
    set ltel-mapping capwap1
end
```

## VLAN mode

CAPWAP mode does not perform as well as expected on low-end FortiGate devices, so VLAN mode has been introduced to improve performance. A FortiExtender in VLAN mode is also managed by a FortiGate in the same way as it is in CAPWAP mode, but it uses VLAN to forward traffic between the FortiGate and itself.

### Configurations on FortiExtender

The VLAN interface is created automatically on the FortiExtender, and cannot be edited or removed.

```
config system interface
    edit vlan1
        set type vlan
        set vid 100
        set ingress-intf lan
    next
end
```

## Virtual Wire Pair

Just like CAPWAP mode, Virtual Wire Pair Configurations of the virtual wire pair are created automatically, and cannot be edited or removed. These configurations specify the mapping of the LTE interfaces and the VLAN interfaces.

```
config system virtual-wire-pair
    set ltel-mapping vlan1
end
```

## CAPWAP on multiple ports for broadcast discovery

Starting from Version 4.2.1, FortiExtender is able to discover FortiGate on multiple interfaces. It achieves this by sending discovery messages on multiple ports (port1, port2, port3, and port4), one at a time, until it has successfully connected with a FortiGate.

```
config system management fortigate
    set ac-discovery-type broadcast
    set ac-ctl-port 5246
    set ac-data-port 25246
    set discovery-intf lan port4
    set ingress-intf
end
```

By default, FortiExtender starts the discovery process with the LAN ports (port1 through port3) first. If it fails to establish a connection after several attempts, it will move on to port4. If it fails on port4, it will go back to the LAN ports and start the process all over again.

A LAN interface has a static IP of 192.168.200.99 and a DHCP server IP of 192.168.200.110 — 192.168.200.210. We recommend connecting to the WAN port on FortiGate for ZTP.

The port4 interface is set for DHCP mode, and must be connected to the internal port on the FortiGate to obtain an IP address for the CAPWAP tunnel, which is the same as in previous versions.

## Check current manage mode

You can configure and manage your FortiExtender from FortiGate or FortiExtender Cloud. If you are not sure "who" is your FortiExtender's controller, use the following command to find out:

```
FX511F5921000053 # get extender status
Extender Status
  name           : FX511F5921000053
  mode           : CLOUD
  fext-addr      : 192.168.237.1
  fext-wan-addr  : 25.75.193.57
  controller-addr : fortiextender-dispatch.forticloud.com:443
  deployed       : true
  account-id     : 343849
  uptime         : 5 days, 17 hours, 2 minutes, 45 seconds
  management-state : CWWS_RUN
  base-mac       : E8:ED:D6:03:D2:58
  network-mode   : ip-passthrough
  fgt-backup-mode : backup
  discovery-type  : cloud
  discovery-interval : 5
  echo-interval  : 30
  report-interval : 30
  statistics-interval : 120
  mdm-fw-server  : fortiextender-firmware.forticloud.com
  os-fw-server   : fortiextender-firmware.forticloud.com
```

## Get modem status

You can use the following command to get your modem status:

```
FX201E5919002499 # get modem status
```

Modem status:

```
modem           : Modem1
usb_path        : 2-1.2 (sdk 0)
vender         : Sierra Wireless, Incorporated
product        : Sierra Wireless, Incorporated
model          : EM7455
SIM slot       : SIM1
revision       : SWI9X30C_02.32.11.00 r8042 CARMD-EV-FRMWR2 2019/05/15
21:52:20
imei           : 359073065340568
iccid          : 8933270100000296108
imsi           : 208270100029610
pin status     : enable
pin code       : 0000
carrier        : 436627|coriolis|EU
APN            : N/A
service        : LTE
sim pin (sim1) : 3 attempts left
sim puk (sim1) : 10 attempts left
rssi (dBm)     : -68
signal_strength : 64
ca state       : ACTIVE
cell ID        : 00A25703
band           : B7
band width     : 20
sinr (dB )     : 7.4
rsrp (dBm)     : -99
rsrq (dB )     : -13.1
plan_name      : coriolis100G
connect_status : CONN_STATE_CONNECTED
reconnect count : 0
smart sim switch : disabled
up time (sec)  : 26670
clock (UTC)    : 20/05/27,20:08:33+08
temperature    : 60
activation_status : N/A
roaming_status : N/A
Latitude       : 37.376281
Longitude      : -122.010817
```

## Stopping data traffic on overaged LTE interface

When an LTE interface has breached its data usage limit, FortiExtender will stop forwarding outgoing traffic (except for management traffic) to that interface. The following types of traffic are affected:

- NATed traffic
- VPN data traffic on IPsec Tunnel based on the overaged LTE interface
- IP-passthrough traffic

## Use cases

This section discusses some typical use cases to deploy FortiExtender.

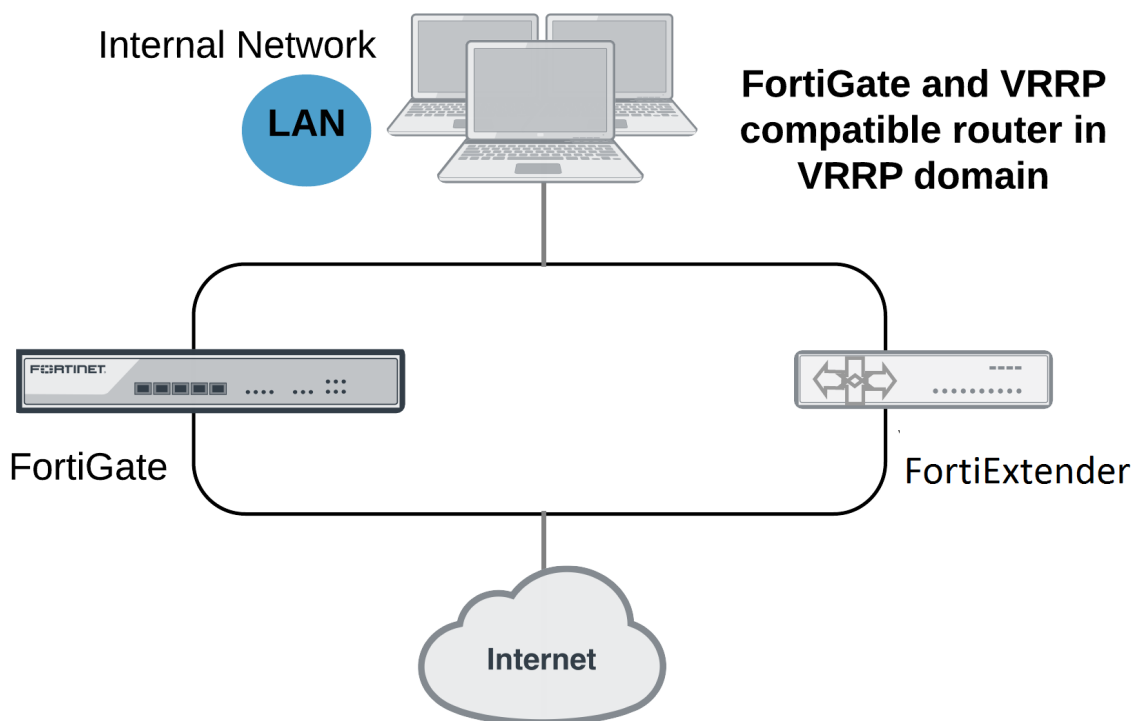
- [Redundant with FGT in IP Pass-through mode on page 83](#)
- [FEX-201E for FortiGate HA configuration on page 88](#)

### Redundant with FGT in IP Pass-through mode

A Virtual Router Redundancy Protocol (VRRP) configuration can be used as a high-availability (HA) solution to ensure network connectivity in the event of a failing FortiGate router. With VRRP enabled on FortiExtender, all traffic will transparently fail over to FortiExtender when the FortiGate on your network fails. When the failed FortiGate is restored, it will take over the processing of traffic for the network.

For more information about VRRP, see [RFC 3768](#).

**Use Case 1: FortiExtender in VRRP mode while being managed from FortiGate.**



#### General configuration procedures

1. The FortiExtender LAN interface consists of multiple ports by default. Be sure to separate out an individual port from the LAN-switch for VRRP purposes. (Refer to "Step 3: Verify the port settings on FortiExtender" in [FEX-201E for FortiGate HA configuration on page 88](#).)

2. Continue managing FortiExtender from FortiGate over the LAN interface (NOT the VRRP interface).
3. Configure the VRRP gateway IP on the newly separated individual port on the FortiExtender and the corresponding VRRP port on the FortiGate.
4. Set the VRRP priority of the FortiExtender VRRP interface to a value lower than that of the FortiGate VRRP interface.
5. Create a firewall policy on the FortiExtender to forward traffic from the newly created VRRP interface to the LTE internet. See [Configure firewall policies](#).
6. Ensure the VRRP ports on the FortiExtender and the FortiGate are connected by verifying that the FortiExtender is in backup mode and the FortiGate is in primary mode by running command 'get router info vrrp'.

In normal operations, all traffic to the internet passes through the primary VRRP interface of the FortiGate. The primary VRRP router, which is the FortiGate, sends VRRP advertisement messages to the backup router, i.e., the FortiExtender. The backup FortiExtender will not attempt to become a primary router while receiving these messages. If the primary router fails, the backup FortiExtender becomes the new primary router after a brief delay, during which the new primary router, i.e., FortiExtender sends gratuitous ARP packets to the network to map the default route GW IP address of the network to the MAC address of the new primary router. All packets sent to the default router are now being sent to the new primary router, i.e., FortiExtender. Upon switchover, the network will not continue to benefit from FortiOS security features until the FortiGate is back online.

#### To enable VRRP on the interface attached to the LAN port on the FortiGate:

```
config system interface
  edit <port num>
    set vdom "root"
    set ip <ip> <subnet mask>
    set allowaccess ping
    set vrrp-virtual-mac enable
    config vrrp
      edit <vrrp id>
        set vrip <vrrp IP>
        set priority <priority>
      next
    end
  next
end
```

#### To enable VRRP on the FortiExtender:

```
config system management
  set discovery-type fortigate
  config fortigate-backup
    set vrrp-interface <vrrp interface i.e por1>
    set status enable
  end
end
config system interface wan vrrp
  set status enable
  set version 2 <only 2 is supported currently>
  set ip <IP of virtual router>
  set id <vrrp id>
  set priority <priority>
  set adv-interval <advertisement interval in seconds>
  set start-time <initialization timer for backup router, typically 1>
```

```
set preempt <enable | disable> (preempting primary typically disable)
end
```



The VRRP interfaces on the FortiGate and the FortiExtender must be individual ports, and must not be part of a LAN switch with static IP address configurations. Devices reliant on the internet from the FortiGate or the FortiExtender must also have a static IP configured.

---

### To display the status of virtual router on FortiExtender:

```
get router info vrrp
```

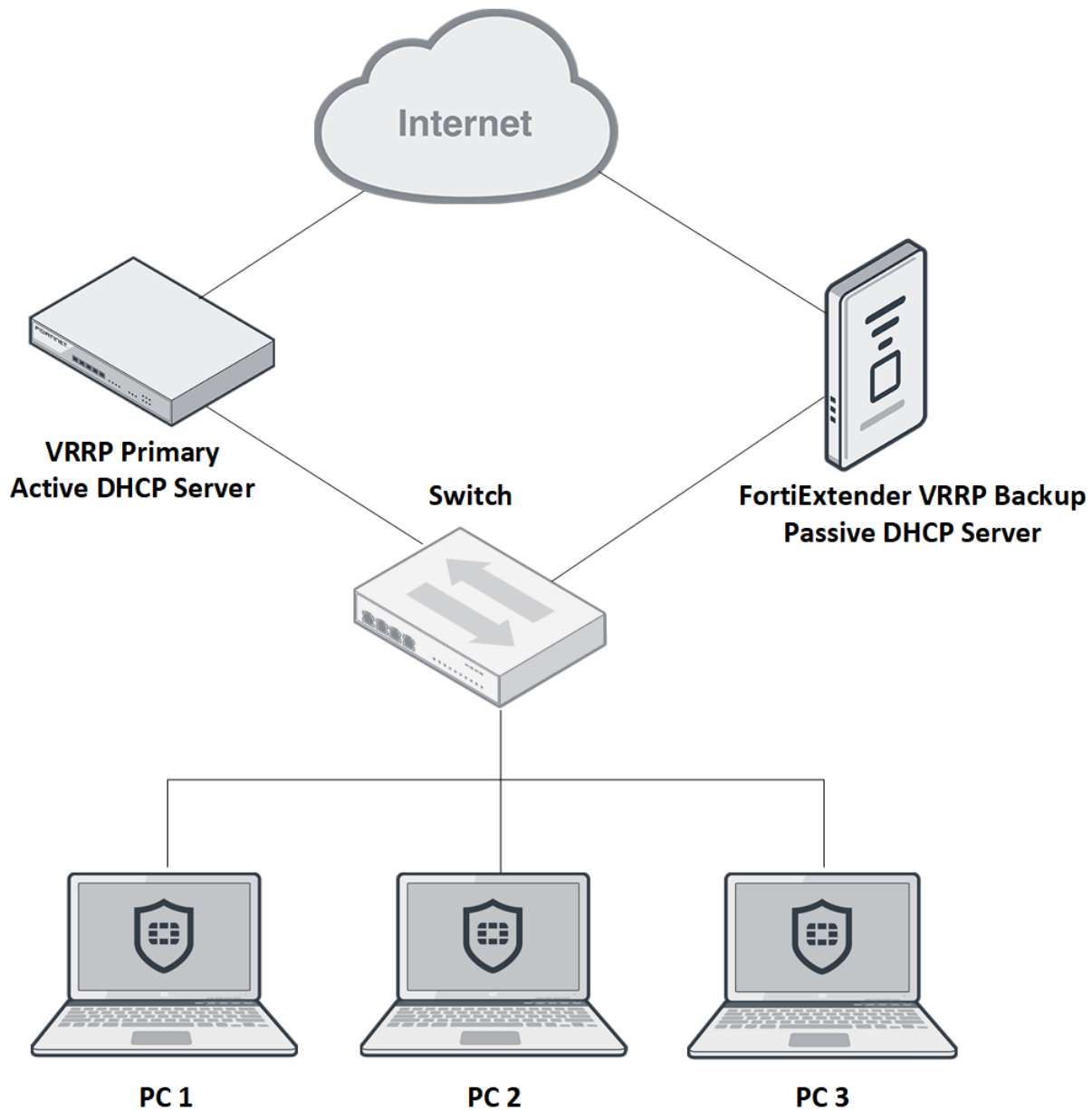
## Enable DHCP server on FortiExtender and the VRRP primary router

To ensure uninterrupted presence of a DHCP server when one of the VRRP-capable routers is down, you must ensure IP address availability all the time. Typically, both the VRRP primary and the backup routers are configured with DHCP servers with reserved IP addresses to their corresponding MAC addresses.

The FortiExtender configured in VRRP backup mode will not launch the replicated copy of the DHCP server until and unless the VRRP primary router goes down; The FortiExtender will also terminate the DHCP server when the VRRP primary router comes back up. This ability ensures that the hosts in the VRRP domain always get the same IP address, irrespective of which VRRP router is in operation, without causing any IP address conflict.

For information on DHCP server configuration, see [Configure DHCP server](#).

## DHCP server enabled on FortiExtender and VRRP primary router



## Enable DHCP relay on both FortiExtender and the VRRP primary router

You must guarantee IP address availability to ensure access to the DHCP server at any time. The hosts must be able to access a DHCP server locally or remotely on an uninterrupted basis. In the event that the DHCP server is not present locally, a DHCP relay agent service is needed to receive DHCP requests from DHCP hosts and forwards the requests to the remote DHCP server, receive responses from the server, and cater to the needs of DHCP clients. In this configuration, the FortiExtender which acts in VRRP backup mode will be running a DHCP relay agent on a VRRP interface; the VRRP primary router is also running a DHCP relay agent on the respective

VRRP interface. This ability ensures that the hosts in the VRRP domain always get the same IP address, irrespective of which VRRP router is in operation, without causing any IP address conflict because the requests are catered to by the same remote DHCP server.

For information on DHCP relay configuration, see [Configure DHCP relay](#).

## DHCP relay

FortiExtender supports DHCP relay agent which enables it to fetch DHCP leases from a remote server. It has to be configured per interface. See the following example:

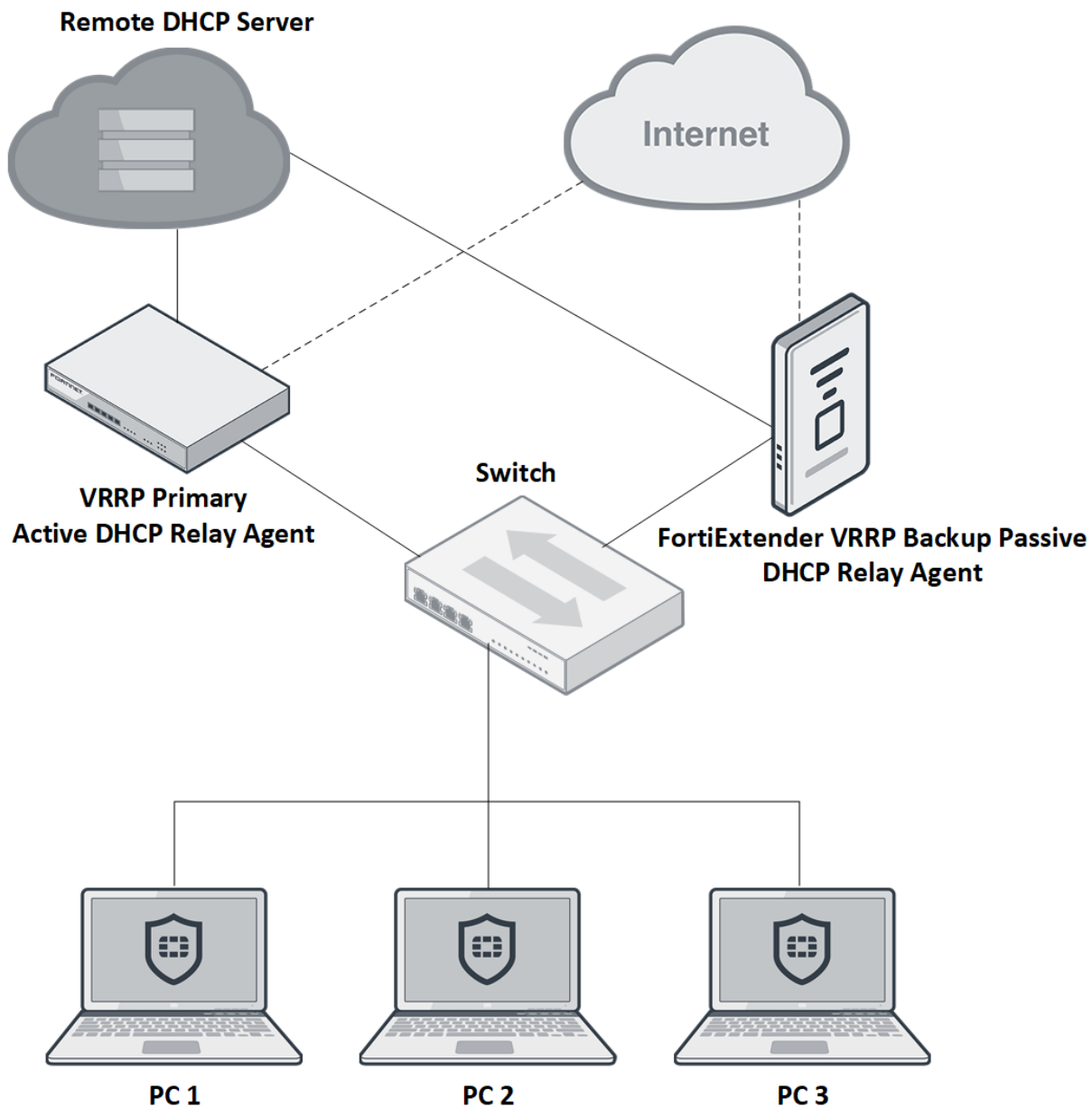
```
config system dhcprelay
edit 1
set status enable
set client-interfaces <vrrp interface name on which relay agent services are
    offered>
set server-interface <interface name through which DHCP server can be reachable>
set server-ip <remote dhcp server IP>
end
```



The DHCP relay and DHCP server services can be run on any VRRP interface, which could be either a separate port or a VLAN interface.

---

## DHCP relay enabled on FortiExtender and VRRP primary router

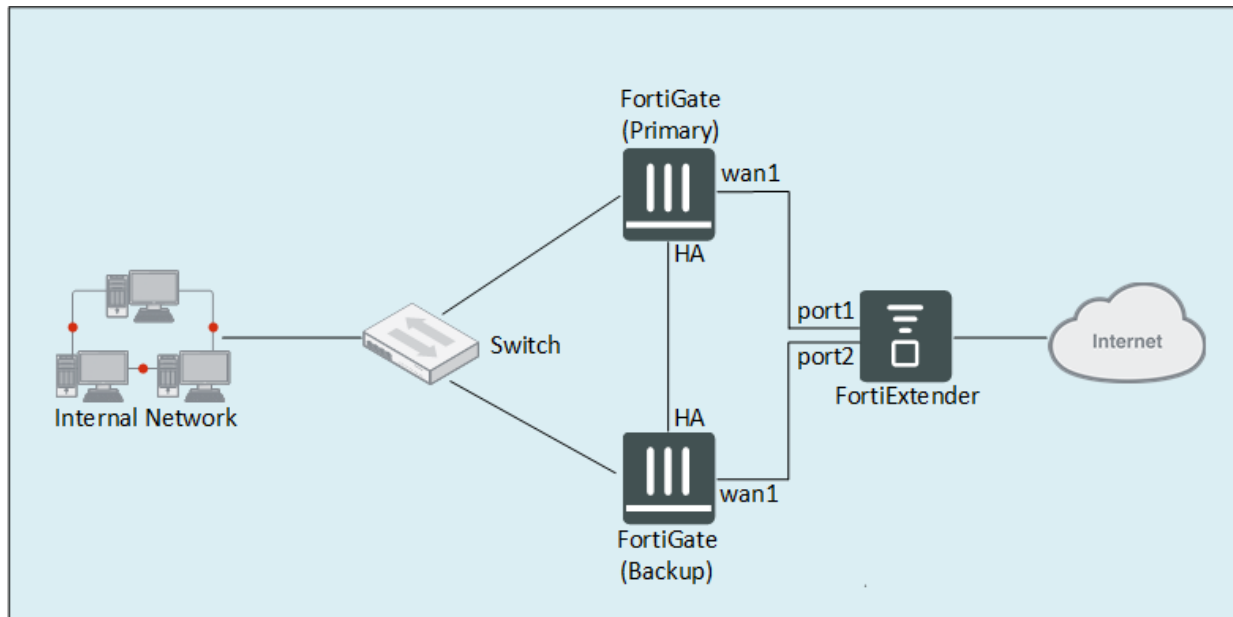


## FEX-201E for FortiGate HA configuration

This use case discusses how to use a FortiExtender 201E to support two FortiGate devices in HA configuration to ensure uninterrupted network connectivity and business continuity. It provides step-by-step instructions on how to configure the FortiGate HA cluster from the FortiGate GUI. It also provides the FortiExtender

CLI commands to verify the port configuration of FortiExtender 201E as a WAN switch to support the FortiGate HA configuration.

## Network topology



## Prerequisites

- The FortiExtender 201E device must be physically networked with the two FortiGate devices, with its port1 connected to wan1 on the primary FortiGate and port2 connected to wan1 on the backup FortiGate, as illustrated in the Network topology.
- The two FortiGate devices must be physically connected via the HA port on both of them, as illustrated in the Network topology.
- The two FortiGate devices must be running the same version of FOS.



The FortiGate devices used in this sample configuration are both running FOS 6.2.1.

## Configuration procedures

This configuration involves the following major steps:

## Step 1: Configure the primary FortiGate

1. Log in to the GUI of the primary FortiGate device.
2. From the menu, go to *Dashboard > Status*.  
The **Status** page opens.
3. Locate the *System Information* widget, click the *Hostname*, and (from the drop-down menu) select the *Configure settings in System>Settings* link.  
The **System Settings** page opens.
4. Change the *Hostname* to something that identifies the FortiGate as the primary device, and click *Apply*.
5. Then, select *System>HA*, click the top part of the page to highlight it, and click *Edit*.  
The **High Availability** page opens.



The **Edit** button will not be available until the top part of the Status page is highlighted.

---

6. Make the following required entries and/or selections:
  - a. Change *Mode* to *Active-Passive*.
  - b. Set *Device Priority* to a value greater than the one set on the backup FortiGate.
  - c. Specify the *Group name*.
  - d. Set the *Password*.
  - e. Select two *Heartbeat interfaces* (one at a time) by doing the following:
    - i. Click **+** (plus sign), and (from the pop-up list of interfaces) select *ha*.
    - ii. Set *Heartbeat Interface Priority* to 50.
    - iii. Click **OK**.
    - iv. Click **+** (plus sign) again, and (from the pop-up list of interfaces) select **wan1**.
    - v. Set **Heartbeat Interface Priority** to 50.
    - vi. Click **OK**.

## Step 2: Configure the backup FortiGate

1. Log in to the GUI of the backup FortiGate device.
2. From the menu, go to **Dashboard > Status**.  
The **Status** page opens.
3. Locate the **System Information** widget, click the **Hostname**, and (from the drop-down menu) select the **Configure settings in System > Settings** link.  
The **System Settings** page opens.
4. Change the **Host name** to something that identifies the FortiGate as the backup device, and click **Apply**.
5. Then, select **System > HA**, click the top part of the page to highlight it, and click **Edit**.  
The **High Availability** page opens.



The **Edit** button will not be available until the top part of the Status page is highlighted.

---

6. Make the following required entries and/or selections:
  - a. Change **Mode** to **Active-Passive**.
  - b. Set the **Device Priority** value smaller than the one set for the primary FortiGate.
  - c. Set the **Group name** to be the same as the one set on the primary FortiGate.
  - d. Set the **Password** to be the same as the one set on the primary FortiGate.
  - e. Select two **Heartbeat interfaces** (one at a time) by doing the following:
    - i. Click **+** (plus sign), and (from the pop-up list of interfaces) select **ha**.
    - ii. Set **Heartbeat Interface Priority** to 50.
    - iii. Click **OK**.
    - iv. Click **+** (plus sign) again, and (from the pop-up list of interfaces) select **wan1**.
    - v. Set **Heartbeat Interface Priority** to 50.
    - vi. Click **OK**.



- Ensure that the Device Priority value on the primary FortiGate is higher than the one for the backup FortiGate.
- Ensure that two heartbeat interfaces are selected and the Heartbeat Interface Priority are both set to 50 on both.

### Step 3: Verify the port settings on FortiExtender

1. Ensure that Port 1 on the back of the FortiExtender is connected to the WAN1 port on the primary FortiGate. Refer to the Network topology.
2. Ensure that Port 2 on the back of the FortiExtender is connected to the WAN1 port on the backup FortiGate. Refer to the Network topology.
3. Run the following commands to verify and ensure that the physical Ports 1 and 2 are aggregated in the LAN switch port.

```

FX211E5919000011 # config system interface
FX211E5919000011 (interface) # edit lan
FX211E5919000011 (lan) # show
edit lan
    set type lan-switch
    set status up
    set mode dhcp
    set mtu 1500
    set vrrp-virtual-mac enable
    config vrrp
        set status disable
    end
    set allowaccess http https ssh ping telnet
next

FX211E5919000011 # config system lan-switch
FX211E5919000011 (lan-switch) # show
config system lan-switch
    config ports
        edit port1
        next
        edit port2
        next

```

```
edit port3
next
edit port4
next
end
end
```



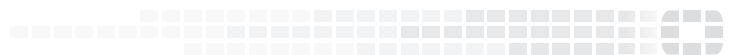
- 
- VLAN mode is best suited for high availability purposes because it delivers better throughput.
  - The "show" commands above yield the default settings of FortiExtender 201E as a LAN switch, which can be used out of the box to support FortiGate HA configurations. We recommend using these settings without change unless you are confident in your ability to configure custom settings of your own. If you prefer to configure your own LAN switch, be sure to use the aforementioned commands to double-check its configuration before putting FortiExtender to work.
-

## Change Log

| Date          | Change Description                                                                                                                                                                                                |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| March 8, 2023 | Migrated <a href="#">De-authorize FortiExtender devices on page 57</a> from the FortiOS New Features (7.2.4).                                                                                                     |
| 01/18/2023    | Initial release.<br>Migrated <a href="#">FortiExtender monitoring enhancement on page 9</a> and <a href="#">Provision FortiExtender firmware upon authorization on page 14</a> from FortiOS New Features (7.2.1). |



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