



Administration Guide

FortiRecorder 7.2.8



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FortiRecorder 7.2.8 Administration Guide

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Change log

The following is a list of documentation changes. For a list of software changes, see the [FortiRecorder Release Notes](#).

Date	Change Description
2026-01-28	Initial release of the FortiRecorder 7.2.8 Administration Guide.

Key concepts

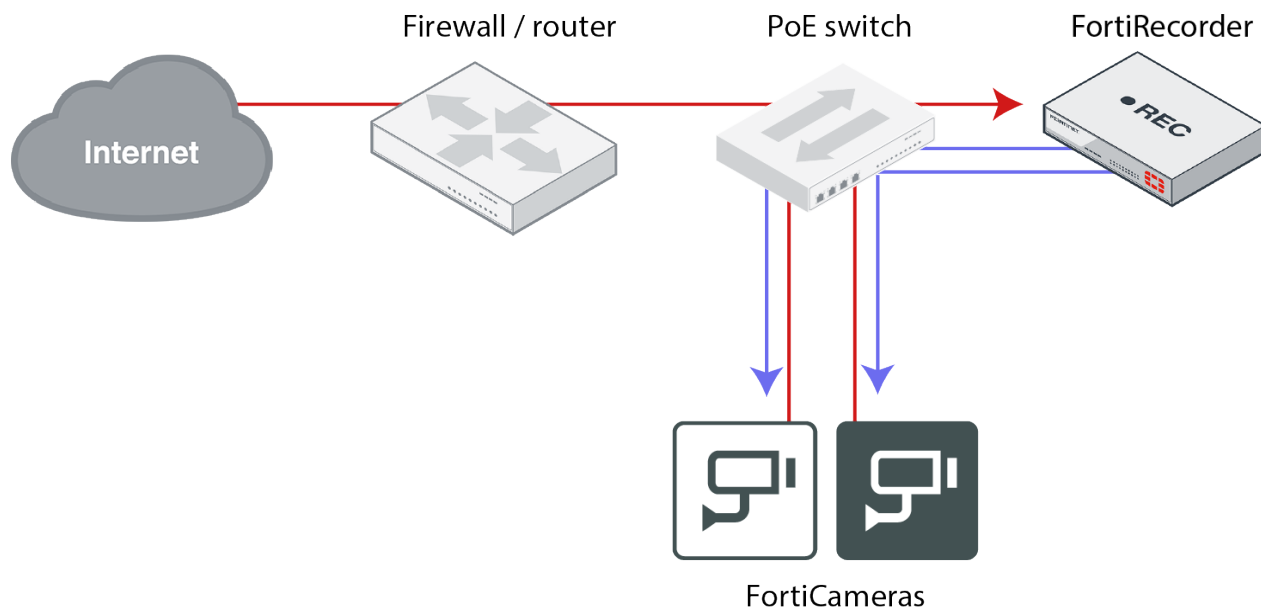
If you are new to FortiRecorder, or new to digital video surveillance systems, understanding some important ideas and words can help you quickly understand how to use your FortiRecorder.

FortiRecorder NVR

The FortiRecorder network video recorder (NVR) provides central management for:

- Configuring your cameras
- Recording your video feeds
- Viewing recordings and live video feeds

It can also be connected to access control systems (ACS) to correlate events such as when doors are opened.



Third-party camera support

FortiRecorder supports Fortinet FortiCam cameras and third-party ONVIF-compliant cameras. Some features on third-party cameras might not be fully supported, however. In that case, you can configure those features through the built-in GUI on the camera.

By default, FortiRecorder allows you to connect one third-party camera. To connect more third-party cameras, please contact Fortinet or your reseller to purchase a [license](#).

Licenses

For more capabilities, you can purchase licenses for:

- Managing more [third-party ONVIF cameras](#)
- [Face recognition AI](#)
- Connecting cameras to [FortiCamera Cloud](#), through FortiRecorder
- [Virtual machine \(VM\) support for large scale deployments](#) that can grow with your organization

When you receive your licenses, register them with [Fortinet Customer Service & Support](#), and then upload them to FortiRecorder. See [Upload licenses on page 55](#).

If you are unsure which licenses you have installed, or whether they are valid, you can use the dashboard to verify their status.

Subscription services such as FortiCare support contracts and FortiCamera Cloud are purchased separately.

Cloud mode for cameras

All FortiRecorder models, except FortiRecorder VM on AWS pay-as-you-go (PAYG), can be licensed to allow connected cameras to be managed and accessed from FortiCamera Cloud, via FortiRecorder (a [hybrid deployment](#)). Connecting through FortiRecorder is useful for camera models that are not cloud native, or when you want to store video recordings with FortiRecorder or its remote storage instead of a camera's [onboard disk](#).

To enable cloud support for a camera, use the following license SKUs:

- FRC-CLM-20 – Ability for 20 cameras to connect through FortiRecorder to FortiCamera Cloud

This license is stackable and perpetual. It does not add to the [maximum number of cameras](#) that can connect to FortiRecorder, but enables management and access of existing connected cameras by FortiCamera Cloud.

Also requires the active subscription to FortiCamera Cloud (FC1-10-FCCLD-518-02-DD) for each camera that is connected to it, and that you enable [Managed by cloud](#) on the camera.

Third-party camera licenses

FortiRecorder supports using ONVIF-compliant cameras from third-party vendors if you purchase the following SKUs and upload their licenses to FortiRecorder:

- FRC-EXC-1 for 1 third-party camera
- FRC-EXC-5 for 5 third-party cameras
- FRC-EXC-10 for 10 third-party cameras
- FRC-EXC-20 for 20 third-party cameras

These licenses are stackable and perpetual. They do not add to the [maximum number of cameras](#), but enable third-party support for existing cameras.

Trial license

Each FortiRecorder comes with one third-party channel available for free evaluation when no license is installed. You can use this in order to confirm compatibility with a specific third-party camera model.

Face recognition AI license

All FortiRecorder models except FRC-100D/G can be licensed to run [face recognition analytics](#).

It requires an active FortiGuard AI DB service SKU.

The license activates up to two analytics channels for appliances and theoretically unlimited for VM installations, although CPU load will restrict the usable number.

If the license is expired or invalid, only the last 7 days of face recognition data (face clusters, timeline, events, and activity) will be displayed.

Activation of the license requires Internet access for FortiRecorder.

After initial license verification and analytics module download the face recognition is working without Internet connection for the duration of the license.

Trial license

Each FortiRecorder (except FRC-100D/G) comes with a trial license for face recognition for one camera available. It is limited to a 7-day history, and requires Internet access to download the analytics module.

FortiRecorder-VM licenses

FortiRecorder-VM is licensed based on the number of enabled cameras and uses a stackable licensing model. The available license SKUs are:

- FRC-VM-Base – includes 10 camera licenses
- FRC-VM-10 – adds 10 cameras to the Base license
- FRC-VM-50 – adds 50 cameras to the Base license
- FRC-VM-100 – adds 100 cameras to the Base license

There are no other restrictions to the license other than the number of active cameras – i.e. there is no restriction on the number of virtual CPUs, disk space, etc.

The current maximum number of active cameras supported by FortiRecorder-VM is 1010 – i.e. you cannot currently license more than 1010 active cameras per FortiRecorder-VM installation.

Trial license

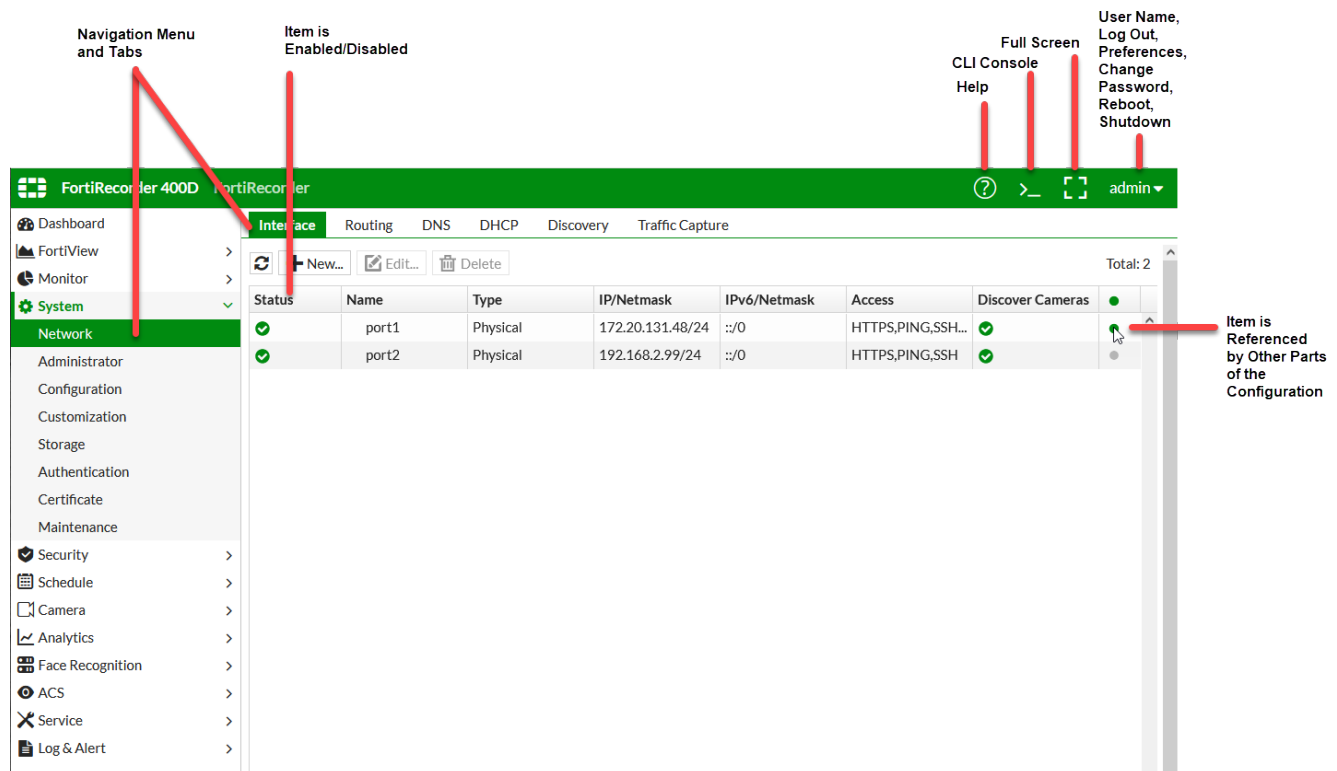
When FortiRecorder-VM is first installed, it will have a trial license. The trial license supports a maximum of 5 active cameras for 45 days. All features are available with a trial license **except** third-party camera support of more than one camera.

Evaluation license

The FRC-VM-Base SKU can be ordered as an evaluation license. The FRC-VM-Base SKU supports 10 enabled cameras. All features are available with an evaluation license **including** third-party camera support of more than one camera.

Interface overview

The GUI of FortiRecorder contains the following main areas and common controls:



Settings are often grouped into a reusable, named item called a "profile". Instead of repeatedly configuring the same settings, you configure settings once, give them a name, and then reference it by selecting it in other parts of the configuration. For example, multiple cameras often use the same settings. You can configure those settings once — in a camera profile — and then simply select that camera profile when you add each camera.

While referenced by another part of the configuration, an item cannot be deleted. If you need to trace references to it, then:

1. Use the navigation menus to go to the list of items.
2. In the item's row, click the green references dot.

A list of item names or index numbers that reference the item are displayed.

When an item is not referenced, you can either delete it ,or temporarily disable it. Disabling the item keeps it in the configuration file for later use, but it is not loaded into memory. This optimizes RAM usage, improving performance.

The Help button is context-aware. When you click it, it jumps to the part of the documentation that matches your current location in the GUI.

Quick setup

Upon the first startup, you must configure FortiRecorder.



Alternatively, to save time with larger deployments, you can use a USB key drive for zero-touch provisioning instead. For details, see [Automatic provisioning on page 19](#).

When you connect cameras locally — **directly, or on the same LAN as FortiRecorder** — then FortiRecorder can automatically discover the cameras. Automatic camera discovery supports UPnP, mDNS, and ONVIF. Basic setup can be completed in a few minutes.

Deployment patterns that can use quick setup are:

1. [Connecting cameras to FortiRecorder only](#)
2. [Connecting cameras to a DHCP server and FortiRecorder](#)

with cameras that are not cloud native (do not have "-C" in the model name).

This results in a very basic but functional configuration where you can log in and the cameras are connected to FortiRecorder as their NVR. If you want to add more administrator or user accounts, set up alerts, or want to configure more advanced system settings, also perform [More system settings on page 79](#).

Old or broken cameras can also quickly be replaced. See [Replacing cameras on page 20](#).

Don't use quick setup with complex networks (for example, if the Internet or a firewall is between cameras and FortiRecorder). Instead follow [Setup on page 22](#).

Connecting cameras to FortiRecorder only

You can use this scenario if you want a **new, dedicated network** where you install your FortiRecorder, cameras, and access control system (ACS). The built-in DHCP server on FortiRecorder is enabled to automatically give IP addresses to the devices, so you don't need a separate DHCP server or router.



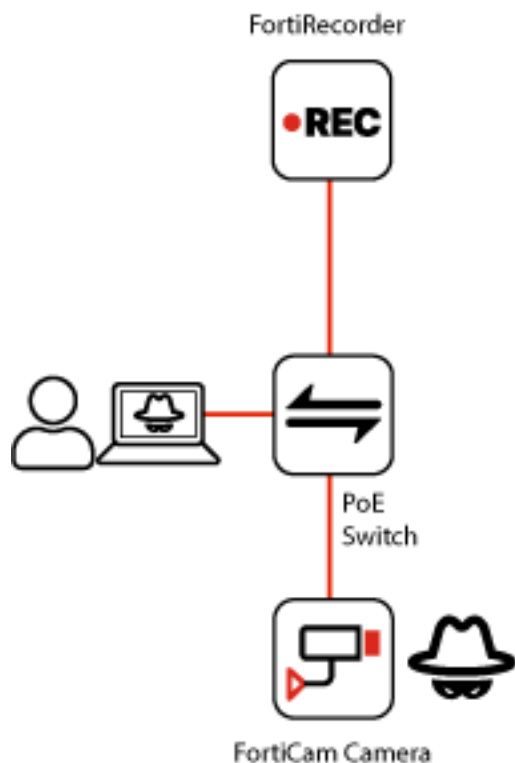
If you already have a DHCP server, do not use these instructions. Instead use [Connecting cameras to a DHCP server and FortiRecorder on page 16](#).



For best performance and security:

- **Isolate cameras and ACS devices from the building's LAN, on a separate network.** Only FortiRecorder should be able to control the cameras. Don't connect other devices — especially untrusted computers — to the surveillance network.
- **Dedicate a port on FortiRecorder for camera connections only.** Network bandwidth should be consistently available to cameras. (For example, cameras may use port2, while remote storage (NAS) is on port3, etc.)

This network topology provides both. It can also be used if you want to test a third-party camera or other device with FortiRecorder in a lab.



1. Use Ethernet network cables to connect port1 of FortiRecorder and your computer to a power-over-Ethernet (PoE) switch.
Do not plug in your cameras yet.
2. Change your computer's IP address to be 192.168.198 with subnet 255.255.255.0. Steps vary by whether you use [Apple macOS](#), [Linux](#), or [Microsoft Windows](#).
Alternatively, you can use a different IP address, but it must be on the same subnet as the default IP address of FortiRecorder port1: 192.168.10/24.
3. On your computer, open a web browser and go to:
<https://192.168.199>
Log in with the username `admin` and no password.
4. Change the password. For details, see [Setting the "admin" account password on page 33](#).
5. Configure the built-in DHCP server:
 - a. On the FortiRecorder GUI, go to *System > Network > DHCP*.
 - b. Click *New*.

c. Enable *Enable DHCP server*.

d. From *Interface*, select *port1*.

e. In the *DHCP IP Range* area, click *New*. Enter a range of IP addresses (pool) that is larger than all of the devices that you want to connect.

DHCP IP addresses must be in the same subnet as the IP address that you will give to *port1*. For example, if *port1* is 192.168.19/24, then a DHCP range for 10 cameras could be 192.168.110-192.168.119.

f. Click the *Create* button to close the dialog, and then click the *Create* button to start the DHCP server.

6. Configure port1:

a. Go to *System > Network > Interface*.

b. Select *port1*. Click *Edit*.

c. Enable *Discover cameras on this port*.

d. Click *OK*.

7. Use Ethernet network cables to connect the cameras to the switch.



If you connected the cameras too soon, before a DHCP server was available, then they are using a default IP address. The default address will not work with your network. To fix this, unplug the cameras and then plug them in again. This reboots the cameras and requests a correct IP address from the DHCP server.

8. Discover and configure the cameras:

a. Go to *Camera > Configuration > Camera*.

b. Click the *Discover* button.

After several seconds, a list of cameras appears. Newly discovered cameras are highlighted in yellow, and their *Status* column displays *Not Configured*.

Camera

Camera Group

Camera Profile

Video Profile

Firmware

+ New...

Edit...

Delete

Configure...

Assign to...

View Schedule...

Upgrade...

Reboot...

Verify

Discover

Configure View

1 / 1

Records per page: 100

Total: 66

Enabled	Camera Name	Version	Location	Address	MAC Address	Profile	Status		Cloud
☒	20A	v1.3.0.0		172.20.131.121	00:22:f4:81:b6:1f	DoContinuous	Active	☒	☐
☐	20A-2	v1.3.0.0		172.20.131.142	20:10:7a:5a:28:e4	HighResContinuous	Inactive	☒	☐
☐	cd51			172.20.131.156	d4:76:a0:09:fa:2d	HighResContinuousMotion	Inactive	☒	☐
☒	fe120b_gold	v1.0.0.0		172.20.131.109	94:f3:92:9e:ce:79	test	Active	☒	☐
☐	vb00-stereo			172.20.131.57	08:00:27:f7:49:b0	DoContinuous	Inactive	☒	☐
☐	vb00-ulaw			172.20.131.62	08:00:27:05:a8:18	DoNotRecord	Inactive	☒	☐
☐	FCM-20A-2915			172.20.131.124	20:10:7a:5a:29:15		Not Configured	☐	
☐	FCM-20A-293a			172.20.132.186	20:10:7a:5a:29:3a		Not Configured	☐	
☐	FCM-20A-b5e3			172.20.131.128	00:22:f4:81:b5:e3		Not Configured	☐	
☐	FCM-20A-b5e8			172.20.132.183	00:22:f4:81:b5:e8		Not Configured	☐	

- c. Double-click each camera to configure its settings. For details, see [Configuring cameras on page 63](#).

Repeat this step for all cameras.

9. To verify that FortiRecorder is able to receive video from the camera, go to *Monitor > Video > Video*. You should be able to see the camera's live video feed.

Connecting cameras to a DHCP server and FortiRecorder

You can use this scenario if you already have an **existing network with a DHCP server** where you will install your FortiRecorder, cameras, and access control system (ACS). Often the PoE switch is connected to an existing router, and an existing DHCP server gives IP addresses to devices on the subnet.

The cameras get network settings from your DHCP server, but FortiRecorder does not. Like any server, FortiRecorder uses a static IP address so that its GUI or CLI can always be reached at the same network address.

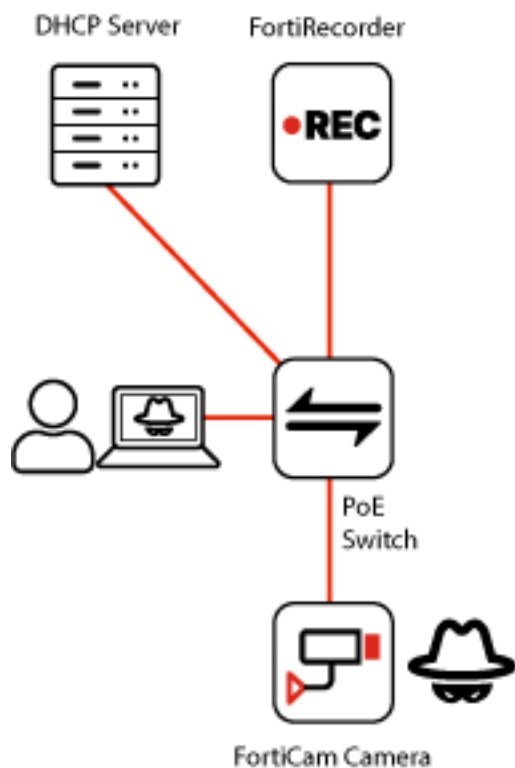
For best performance and security:



- **Isolate cameras and ACS devices from the building's LAN, on a network separate from the building's LAN.** Only FortiRecorder should be able to control the cameras. Don't connect other devices — especially untrusted computers — to the surveillance network.

If the PoE switch is connected to an existing router or firewall such as FortiGate — especially if it connects to the Internet — use policies and VPNs that only allow authorized access.

- **Dedicate a port on FortiRecorder for camera connections only.** Network bandwidth should be consistently available to cameras. (For example, cameras may use port2, while remote storage (NAS) is on port3, etc.)



1. Use Ethernet cables to connect your DHCP server (and router, if any) to your power-over-Ethernet (PoE) switch. Your DHCP server must have a range of IP addresses (pool) that is larger than all of the devices that you will connect.
2. Use Ethernet network cables to connect the cameras to the switch.



If you connected the cameras too soon, before a DHCP server was available, then they are using a default IP address. The default address will not work with your network. To fix this, unplug the cameras and then plug them in again. This reboots the cameras and requests a correct IP address from the DHCP server.

3. On your DHCP server, create a reservation for each camera so that it always gets the same IP address.



Fortinet strongly recommends to either:

- configure your cameras with a static IP address (see [Address](#)), or
- configure your DHCP server with lease reservations and then update the camera's [Address](#) with its current IP address

Without reservations, the IP address provided by the DHCP server might appear to work initially, but later, when the DHCP lease expires, the DHCP server might change the IP address of the camera. DHCP servers do not notify FortiRecorder about the camera's new dynamic IP address. FortiRecorder tries to detect IP address changes with mDNS probes, but some networks do not allow this. During this time, FortiRecorder will try to control the camera at its old IP address. This does not work. **Connections with that camera will be broken and all video from that camera could be lost during that interruption.**

4. Use Ethernet network cables to **directly** connect port1 of FortiRecorder to your computer.

Do not put your switch between them yet. FortiRecorder network settings are not configured yet.

5. Temporarily change your computer's IP address to be 192.168.198 with subnet 255.255.255.0. (If your computer has a static IP address, write it down so that you can restore the settings later.) Steps vary by whether you use [Apple macOS](#), [Linux](#), or [Microsoft Windows](#).

Alternatively, you can use a different IP address, but it must be on the same subnet as the default IP address of FortiRecorder port1: 192.168.10/24.

6. On your computer, open a web browser and go to:

<https://192.168.199>

Log in with the name admin and no password.

7. Change the password. For details, see [Setting the "admin" account password on page 33](#).

8. Configure port1:

- a. Go to *System > Network > Interface*.
- b. Select *port1*. Click *Edit*.
- c. Enable *Discover cameras on this port*.
- d. In *IP/Netmask*, enter the IP address and netmask that FortiRecorder will have on your network.



Do not use one of the range of IP addresses that the DHCP server assigns to cameras, computers, etc. (This can cause IP address conflict error messages.)

- e. Click *OK*.

9. Change your computer's IP address and subnet back to its original settings.

10. Unplug the Ethernet cable between your computer and FortiRecorder port1, and then plug them both into the switch.

11. In your web browser, go to the new IP address of FortiRecorder. Log in.

12. Discover and configure the cameras:

- a. Go to *Camera > Configuration > Camera*.
- b. Click *Discover*.

After several seconds, a list of cameras appears. Newly discovered cameras are highlighted in yellow, and their *Status* column displays *Not Configured*.

Camera

Camera Group

Camera Profile

Video Profile

Firmware

+ New...

Edit...

Delete

Configure...

Assign to...

View Schedule...

Upgrade...

Reboot...

Verify

Discover

Configure View

1

/

1

Records per page:

100

Total: 66

Enabled	Camera Name	Version	Location	Address	MAC Address	Profile	Status		Cloud
	20A	v1.3.0.0		172.20.131.121	00:22:f4:81:b6:1f	DoContinuous	Active		
	20A-2	v1.3.0.0		172.20.131.142	20:10:7a:5a:28:e4	HighResContinuous	Inactive		
	cd51			172.20.131.156	d4:76:a0:09:fa:2d	HighResContinuousMotion	Inactive		
	fe120b_gold	v1.0.0.0		172.20.131.109	94:f3:92:9e:ce:79	test	Active		
	vb00-stereo			172.20.131.57	08:00:27:f7:49:b0	DoContinuous	Inactive		
	vb00-ulaw			172.20.131.62	08:00:27:05:a8:18	DoNotRecord	Inactive		
	FCM-20A-2915			172.20.131.124	20:10:7a:5a:29:15		Not Configured		
	FCM-20A-293a			172.20.132.186	20:10:7a:5a:29:3a		Not Configured		
	FCM-20A-b5e3			172.20.131.128	00:22:f4:81:b5:e3		Not Configured		
	FCM-20A-b5e8			172.20.132.183	00:22:f4:81:b5:e8		Not Configured		

- c. Double-click each camera to adjust its settings. For details, see [Configuring cameras on page 63](#).

Repeat this step for all cameras.

13. To verify that FortiRecorder is able to receive video from the camera, go to *Monitor > Video > Video*. You should be able to see the camera's live video feed.

Automatic provisioning

Especially if you have a large deployment with many stores or branch offices, and you deploy the same camera models in the same type of network at every site, then you can save time by using zero-touch automatic installation. This provides easy, consistent configuration and firmware updates for every site where you deploy FortiRecorder.

1. On a USB drive, format the disk as FAT32.
2. Put the files that you want to use for your deployment on the disk, such as:

- [License](#) (license.txt)

- [FortiRecorder firmware](#) (image.out)

If this firmware version is already installed, FortiRecorder skips this file.

- [Camera firmware](#) (*.firmware)

- FortiRecorder configuration (frc_system.conf)

Use a plain text editor such as Notepad++ or Microsoft Visual Studio Code. Format the file using CLI syntax, the same as a configuration backup. To download a backup that you can use as an example, see [Backups on page 168](#).

If already configured, FortiRecorder skips this file.

- Site-specific FortiRecorder configuration (localconfig.csv)

Some settings vary by site: the time zone, [hostname](#) that identifies which FortiRecorder sent an alert email, and the [public network IP address or domain name for access from the Internet](#). Put them in this file so it's easier to focus on what you need to customize.

Use a plain text editor such as Notepad++ or Microsoft Visual Studio Code, or a spreadsheet application such as Microsoft Excel. Formatting is comma-separated values (CSV), with the columns shown in the following example.

```
# FortiRecorder provisioning CSV file,,,
# Hostname,Public IP address/domain name,Time zone number,Automatically adjust clock for
DST?
'''
FRC_123,192.168.1.10,15,1
```

For the time zone number column, see the options in the GUI/CLI. For example, 15 is (GMT-5:00) Eastern Standard Time.

For automatic clock adjustment for daylight savings time (DST), 0 is disabled; 1 is enabled.

If a line is blank or a comment (starts with #), FortiRecorder skips that line.

- Site-specific camera configuration (camconfig.csv)

Similarly, each site might have different cameras or recording settings. Enter the columns shown in the following example.

```
# Camera provisioning CSV file,,,,,
# Name,Type,MAC address,Username>Password,Camera profile
,,,,,
# 3rd party ONVIF cameras,,,,,
camera_1,onvif,00:02:d1:89:a1:48,root,vivo1234,HighResContinuousMotion
,,,,,
# Fortinet cameras,,,,,
md40_1,,1c:c3:16:21:34:43,,HighResContinuous
md40_2,,20:10:7a:5a:28:d1,,HighResContinuousMotion
```

For the type column, onvif is a third-party camera; leave the field empty if the camera is from Fortinet.

If a line is blank or a comment (starts with #), FortiRecorder skips that line.

- [Camera firmware](#) (image.out)

If this firmware version is already installed, FortiRecorder skips this file.

By default, provisioning is enabled with all of those files. If you don't want FortiRecorder to load all of them, then either:

- Delete the files that you don't want to use from the USB drive.
- On FortiRecorder, go to *System > Configuration > Provisioning* and disable those files.

3. Plug in the USB drive into the USB port of FortiRecorder.
4. Power on or reboot the FortiRecorder unit.
Wait for it to install the firmware and reboot.
5. Repeat the previous two steps with each FortiRecorder unit.

Replacing cameras

When a camera is old or broken, a replacement camera is often put at the same location: the same wall or ceiling, and the same video recording settings. So you may want continuity in your recording timeline, since both cameras will have provided surveillance for the same location.

Especially if you used [provisioning](#), you also may want the new camera to reuse the same IP address and DHCP reservation. This simplifies administration because every store or branch office's network remains the same.

You can replace an existing camera. The result is that, after a repair, your deployment is the same as before, and recording timelines are not split.

Currently, this feature works with Fortinet FortiCam cameras. Third party ONVIF cameras are not supported.

1. On the DHCP server, increase the pool. You need enough IP addresses to give a temporary IP address to the new camera so that FortiRecorder can connect to it, until it replaces the old camera.

If you use the build-in DHCP server on FortiRecorder, for details, see [Configuring the built-in DHCP server on page 41](#).

2. Plug in the new camera.

Similar to initial setup, the replacement camera must be able to reach the DHCP server. If the camera is on a remote network, see [Discovering cameras in remote networks on page 56](#).

3. Go to *Camera > Configuration > Camera*.
4. Click *Discover*.

Wait for the new camera to be discovered. It should appear at the end of the list. The camera's *Status* column indicates *Not Configured*.

5. Click the row to select the new camera.

The *Assign to* button becomes available.

6. Click *Assign to*.

7. In *Name*, select the name of the old or broken camera that the new camera will replace.

8. Review the remaining settings. Camera settings vary by model, so if the new camera is a different model, then you may need to adjust settings:

- a. (Optional) [Configuring video profiles on page 58](#)
- b. (Optional) [Configuring camera profiles on page 60](#)
- c. [Configuring cameras on page 63](#)

9. Click *OK*.

The new camera replaces the old or broken camera in the FortiRecorder configuration. The camera's *Status* column indicates *Active* if FortiRecorder succeeds at connecting to the new camera.

10. If you use a third-party DHCP server, then in the DHCP reservation, replace the old or broken camera's MAC address with the new camera.

You may need to reboot the camera for it to start using the new DHCP reservation, or wait for the lease to expire.

Setup

If you did not use one of the [quick setup scenarios](#) — or later want to change settings — then you can use these instructions.

When you initially install FortiRecorder, or after a configuration reset or clean install, you must perform the following **steps in order**. **Optional steps can be skipped if you want to use factory default settings.**

1. [Sizing guidelines on page 23](#)
2. [Deployment topology on page 26](#)
3. [Registering licenses and devices with Fortinet on page 30](#)
4. [Connecting to the FortiRecorder GUI on page 30 or CLI](#)
5. [Setting the "admin" account password on page 33](#)
6. Network settings, including:
 - a. [Configuring network interfaces on page 34](#)
 - b. [Configuring routing on page 38](#)
 - c. [Configuring DNS settings on page 40](#)
 - d. DHCP server settings, either:
 - [Making reservations on your DHCP server on page 41](#)
 - [Configuring the built-in DHCP server on page 41](#)
 - e. (Remote network deployments) Firewall/router settings:
 - i. [Configuring a policy on your firewall/router on page 44](#)
 - ii. [Configuring NAT/port forwarding on your firewall/router on page 45](#)
 - iii. [Configuring the public port numbers and domain name on page 46](#)
7. (Optional) [Configuring the system time on page 48](#)
8. (Optional) [Updating the firmware on page 49](#)
9. [Upload licenses on page 55](#)
10. [Plugging in the cameras on page 56](#)
 - a. (Cloud native cameras) [Moving cloud native cameras to FortiRecorder on page 56](#)
 - b. (Remote network deployments) [Discovering cameras in remote networks on page 56](#)
11. Camera settings, including:
 - a. (Optional) [Configuring video profiles on page 58](#)
 - b. (Optional) [Configuring camera profiles on page 60](#)
 - c. [Configuring cameras on page 63](#)

This results in a basic, functional configuration where you can log in and cameras are connected to FortiRecorder.

If you want to add more administrator or user accounts, set up alert email, or configure more advanced settings, continue with [More system settings on page 79](#).

Sizing guidelines

Consider the performance of all deployment components:

- FortiRecorder
- FortiCentral or a web browser for viewing video
- Cameras
- Network devices: switches, routers, firewalls, NAS for remote storage



Performance bottlenecks are usually:

- Network bandwidth to and from FortiRecorder

Separate network and a dedicated port on FortiRecorder for camera connections only are recommended.

To troubleshoot issues such as high bandwidth usage, recording gaps, or dropped (skipped) frames for each camera, go to:

- *FortiView > Camera Statistics > Bandwidth*
- *FortiView > Camera Statistics > Advanced.*
- CPU of computers with FortiCentral or web browsers

Displaying multiple video streams at the same time is CPU-intensive.

To choose appropriate hardware and settings for your FortiRecorder deployment, consider how much data can be generated for both input and output.

Input varies by:

- Scene (complex details, lighting, movement)
- Number of video streams from each camera (not just the total number of cameras)
- Video recording schedules (motion only or continuous) of each camera
- Video resolution, frame rate, bitrate mode ([constant or variable](#)) and its parameters (bitrate or image quality)
- Storage settings ([NAS or remote storage](#), [re-compression](#), and [deletion of old recordings](#))

Output varies by:

- Number of simultaneous user sessions
- Maximum number of simultaneous videos being played by users
- Video resolution, frame rate, bitrate mode ([constant or variable](#)) and its parameters (bitrate or image quality)

See also [Optimizing performance on page 164](#), or contact your Fortinet reseller.

Number of supported cameras

See [Appendix: Maximum values on page 199](#).

Bandwidth per camera

Constant (fixed) **bit rate** for video is a simple calculation of:

video resolution x frame rate x number of cameras

Variable bit rate

Depending on **resolution**, **frame rate**, and **video quality**, each camera using H.264 compression can use the following network bandwidth:

- 352 x 240 @ 30 FPS, high quality = 0.4 Mbps
- 720 x 576 @ 30 FPS, high quality = 1 Mbps
- 1280 x 720 @ 30 FPS, high quality = 2 Mbps
- 1920 x 1080 @ 30 FPS, high quality = 4 Mbps
- 1920 x 1080 @ 30 FPS, medium quality = 2.8 Mbps
- 1920 x 1080 @ 30 FPS, low quality = 2 Mbps
- 1920 x 1080 @ 10 FPS, high quality = 2.4 Mbps
- 1920 x 1080 @ 10 FPS, low quality = 1.2 Mbps

The following table can be used to estimate. Please note that these are estimates providing a high quality image under most conditions. If the scene is less complex (indoors, with little detail and not much motion) or the camera has very little noise (daylight, good **noise reduction**), then the required bit rate might be lower. If video compression is set to lower quality or capped at a defined maximum bandwidth, then the bit rate can be significantly lower, but image quality is also reduced. DNR can reduce bandwidth usage even more, especially for grainy night images, but shows less detail during motion.



Avoid using networks with less than half of the bandwidth indicated in the following table.

Bitrate table (H.264 estimate) in Mbps with high quality image (x0.7 = standard quality):

Bitrate/screen resolution	Frame rate				
	1	6	10	15	30
CIF (352 x 240 pixels)	0.16	0.2	0.24	0.3	0.4
D1 (0.4 Mbps; 720 x 576 pixels)	0.4	0.5	0.6	0.75	1
720p (1 Mbps)	0.8	1	1.2	1.5	2
SXGA (1.3 Mbps; 1280 x 1024 pixels)	1	1.25	1.5	1.9	2.5
HD (2 Mbps; 1920 x 1080 pixels)	1.6	2	2.4	3	4

Bitrate/screen resolution	Frame rate				
	1	6	10	15	30
3 Mbps	2	2.5	3	3.75	5
5 Mbps	3.2	4	4.8	6	8

Bandwidth per FortiRecorder

Recommended maximum total bandwidth usage varies by FortiRecorder model and deployment scenarios such as network attached storage (NAS), continuous recording only, or continuous recording with separate video clips for motion detection.

Model	Continuous	Continuous with NAS	Continuous with motion	Continuous with motion and NAS
FRC-100D	90 Mbps	60 Mbps	60 Mbps	60 Mbps
FRC-100G	100 Mbps	90 Mbps	80 Mbps	70 Mbps
FRC-200D gen1	90 Mbps	55 Mbps	50 Mbps	50 Mbps
FRC-200D gen2	135 Mbps	135 Mbps	130 Mbps	130 Mbps
FRC-400D	170 Mbps	160 Mbps	140 Mbps	130 Mbps
FRC-400F	200 Mbps	155 Mbps	160 Mbps	140 Mbps



These values have been determined experimentally in a lab setting and do not represent hard limits. Performance degrades gradually if enough bandwidth is not available, with symptoms such as a slow response or dropped video frames. Real world performance depends on many factors, including network and NAS type. The table above assumes a motion detection rate of 13% based on 1 detection that is 40 seconds long every 5 minutes per camera.

Storage capacity

Video retention depends on the available storage capacity and the total amount of video bandwidth from the cameras.

The [dashboard](#) shows capacity, estimated from the last 5 minutes of bandwidth consumption. When you plan a new installation, however, bandwidth data is not yet available. **Estimate that a 1 TB hard drive stores 1 camera configured to consume 1 Mbps for approximately 100 days.** Alternatively, use the following table. After installation, use the dashboard to confirm that you have a good balance between video quality and capacity. Adjust video profiles if needed. Retention eventually should match the estimated capacity if you choose a constant (fixed) bitrate, but this may not happen if you choose variable bitrate. See also [Variable vs. constant vs. constrained bit rate video on page 167](#).

Examples: Video retention capacity

FortiRecorder 100 D with 1 TB HD, 4 cameras at 2 Mbps	FortiRecorder 200 D with 3 TB HD & 24 TB NAS, 32 cameras at 2 Mbps	FortiRecorder 400 D with 6 TB HD, 16 cameras at 1.5 Mbps
12 days	42 days	25 days

Deployment topology

Cameras and ACS devices can be deployed in networks that are:

- [Hybrid deployment with FortiCamera Cloud and FortiRecorder](#)
- [Local to FortiRecorder](#)
- [Remote from FortiRecorder](#)

or a combination of them.

Do not plug in your cameras and FortiRecorder yet. You will follow the order of steps in [Setup on page 22](#). Diagrams below are for comparison and planning purposes.

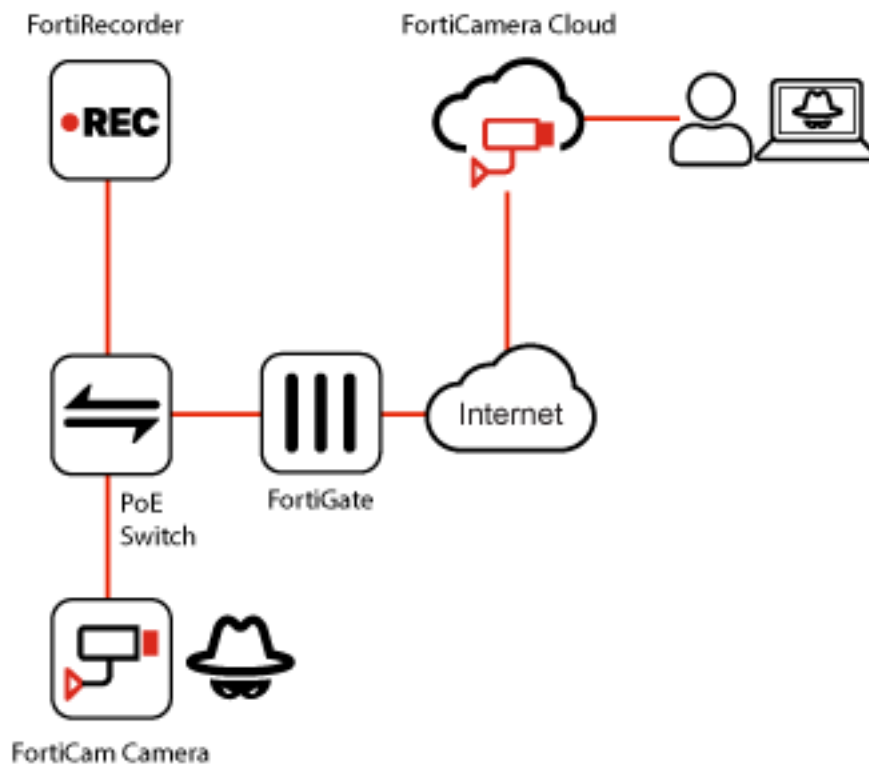
Often there is a DHCP server on the LAN already. If not, you do not need to deploy one. You can use the [built-in DHCP server](#) on FortiRecorder instead. In their factory default state, FortiCam cameras automatically get network settings from a DHCP server during initial setup. Many third-party cameras require a DHCP server, too. Some third-party cameras have a default static IP address, however; these require you to manually configure the network settings through the camera's native GUI. Later, once connected, optionally you can reconfigure cameras to use a static IP address.

For Wi-Fi cameras, you will temporarily use an Ethernet cable during setup with FortiRecorder. Later, once setup is complete, you will disconnect and move the camera to its location on the Wi-Fi network. Power is then supplied by a PoE injector, not a physical connection through a PoE switch.

For external storage, [Chromecast integration](#), and/or larger, more complex networks, you may need more network connections than the diagrams show, although the designs are similar.

For FortiRecorder-VM, cloud or hypervisor settings must be configured **before you start FortiRecorder-VM**. See the [FortiRecorder-VM Install Guide](#) or cloud deployment guides.

Hybrid deployment with FortiCamera Cloud and FortiRecorder



[FortiCamera Cloud](#) can be used together with FortiRecorder. Live video and most camera settings can be used via FortiCamera Cloud while FortiRecorder provides video storage and is used to configure remaining camera settings, if any. For details, see [Managed by cloud](#).

The network topology is a mix of on-premise and cloud networks.

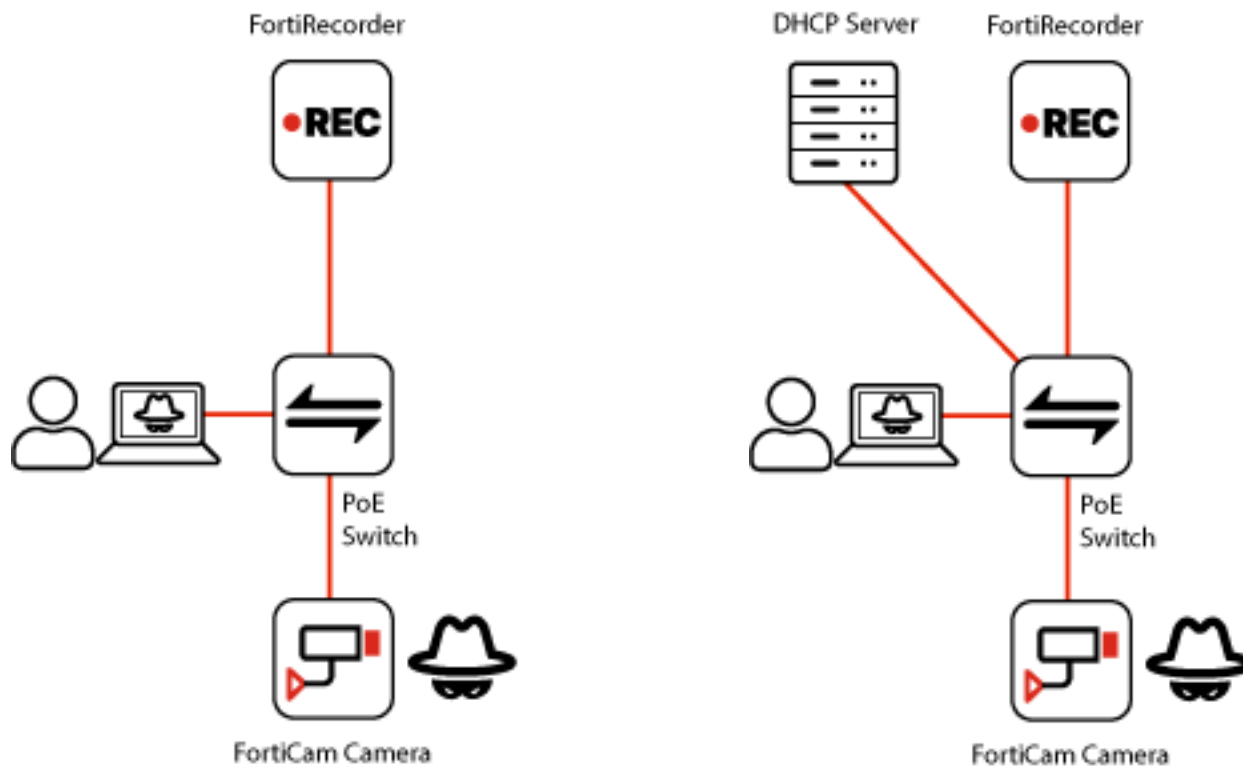
This architecture scales well if your organization is adding small locations quickly. Each location can start with a cloud native FortiCam model connected to FortiCamera Cloud, and then [later add FortiRecorder](#) when more cameras need local storage, or for advanced features.

Topology is similar to [remote networks](#), but once setup is complete, an administrator or operator usually logs in through FortiCamera Cloud — not FortiRecorder.



Cloud native FortiCam cameras (with "-C" or "-CA" in the model name) do not require a cloud-only or hybrid network. Instead, you can deploy those cameras with an on-premise FortiRecorder in your private network (local or remote).

Local to FortiRecorder

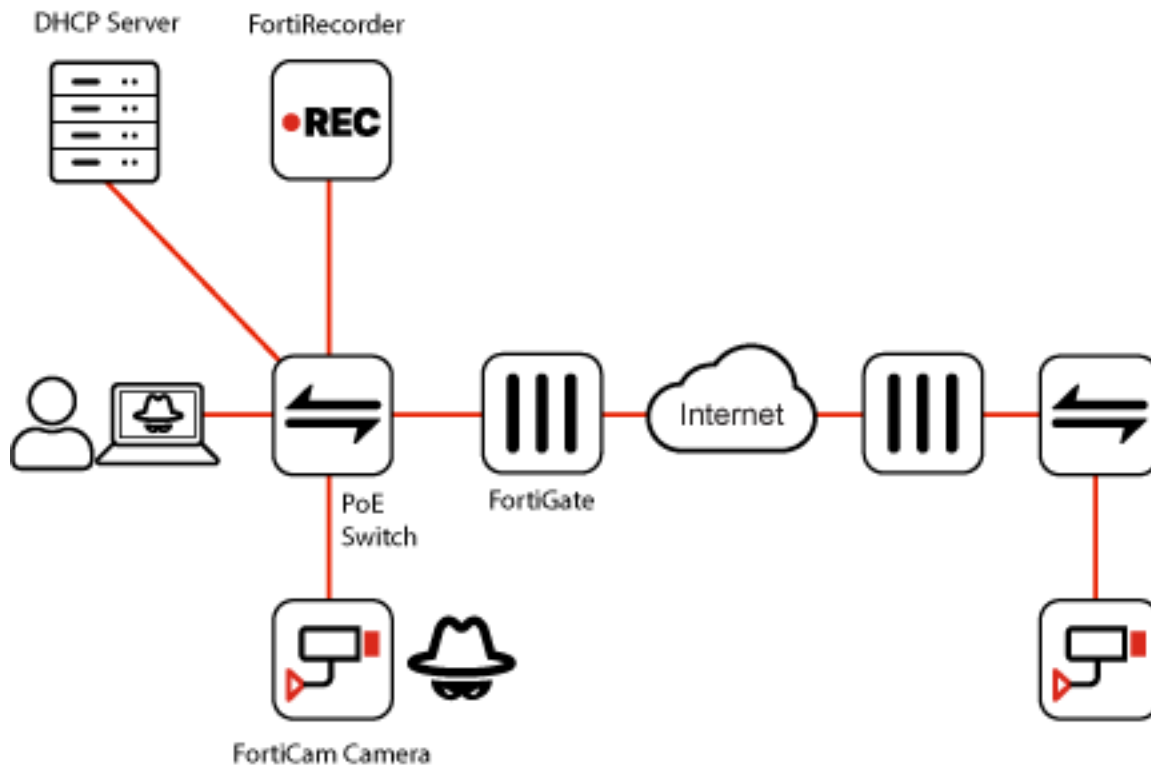


In a simple local deployment, cameras are installed on the same local network as FortiRecorder, with either:

1. No router or firewall between them
2. Router or firewall between them, but they do **no network address translation (NAT)/port forwarding** (for example, a FortiGate operating in transparent mode, or LANs joined via VPN)

Often the switch is connected to a router, and devices connect through it to the Internet. However, this is not required unless you use camera or FortiRecorder features that require an Internet connection. See also [Appendix: Port numbers on page 196](#).

Remote from FortiRecorder



Remote camera deployment is when there is a firewall or router — perhaps many internal networks, or the Internet — between FortiRecorder and the cameras, ACS, and/or administrators and operators. Branch offices often use this design. Devices in your deployment will connect through either:

- secure tunnel (VPN)
- [network address translation \(NAT\)](#) and/or [port forwarding](#)

on the router or firewall.

If you require remote access while you are out of the office, you can also use these to connect through the Internet to FortiRecorder.



Surveillance video and other sensitive information must be protected so that it cannot be intercepted or changed by unauthorized persons.

To strengthen security:

- **Use a VPN — not NAT/port forwarding.** For larger networks, VPN tunnels can be simpler than configuring NAT/port forwarding for many devices, too.
- Require authentication. Each person or service should have a separate login for audit purposes.
- Use a firewall to defend against hacking attempts.

Registering licenses and devices with Fortinet

When you register a device with Fortinet, also apply any associated feature licenses and service subscriptions.

1. Go to:

<https://support.fortinet.com>

and log in as the owner.

Other accounts may not have the required permissions.

2. Register your cameras and FortiRecorder with Fortinet.

For details, see [FortiCloud Asset Management documentation](#).

3. Register the feature licenses and (if any) FortiCamera Cloud service entitlement license.

The FortiCamera Cloud service entitlement license can be used only by registered cameras in the same FortiCare account.

For hybrid deployments, cameras will not use the service license directly. Instead, cameras will be licensed through FortiRecorder, and FortiRecorder will connect with the service.

FortiCamera Cloud service subscriptions are not permanently bound to a specific camera. You can [replace cameras or transfer the subscription](#) to another camera if needed.

4. (Hybrid deployments only) Apply the [feature license for hybrid deployment](#) to the FortiRecorder serial number.

Connecting to the FortiRecorder GUI

To configure the FortiRecorder appliance, you must connect to its management GUI or CLI console.

During [initial installation](#), you can connect to the GUI using its factory default settings.

Default settings for connecting to the GUI

Network Interface	port1
URL	https://192.168.1.99/
Administrator Account	admin
Password	

Requirements

- a computer with an RJ-45 Ethernet network port
- a crossover Ethernet cable
- a web browser

HTML5 is supported. For details and a list of supported web browsers, see the [Release Notes](#).



To allow areas in the GUI to properly display, Fortinet recommends that you set your monitor to a screen resolution of at least 1280 x 1024 pixels.

To connect to the GUI

1. On your management computer, configure the Ethernet port with the static IP address 192.168.1.2 with a netmask of 255.255.255.0.
2. Using the Ethernet cable, connect your computer's Ethernet port to the FortiRecorder appliance's port1.
3. Start your browser and go to:
<https://192.168.1.99/>

Remember to include the "s" in "https://". By default, only HTTPS access to the GUI is enabled.

4. In the *Name* field, enter admin and then click *Login*.

(There is no default password for the admin account.)

Login credentials entered are encrypted before they are sent to the FortiRecorder appliance. The GUI appears if the login is successful.

Connecting to the FortiRecorder CLI

For [initial installation](#), you can connect to the CLI from your management computer, either:

- **Through the network** — Connect your computer either directly (a peer connection) or through any network attached to one of the FortiRecorder unit's network ports.
- **Locally** — Connect your computer directly to the FortiRecorder unit's serial console port.

Local serial console connection is required if:

- [Restoring the firmware](#). This utilizes a boot interrupt. Network access to the CLI is not available until **after** the boot process has completed, and therefore local serial access to the CLI is the only method that you can use.
- Installing your FortiRecorder unit for the first time, **only** if don't want to reconfigure your computer's network settings for a peer connection. (In its factory default settings, during initial setup, FortiRecorder is not yet configured to connect to your network. Peer connection is the only method that you can use until you configure the network interfaces.)

[Command syntax](#) for FortiRecorder is similar to other Fortinet products.

CLI connection via SSH

By default, SSH and HTTPS administrative access are enabled so that you can connect to the CLI during initial setup.

After initial setup, if you will connect using Telnet client, then enable [SSH](#) or [Telnet](#) on the network interface. If you will connect using the *Dashboard* > *Console* in the GUI, then enable [HTTPS](#) administrative access.

Requirements

- a computer with an Ethernet port
- a crossover Ethernet cable
- an SSH client, such as [PuTTY](#)



The following procedure uses PuTTY. Steps may vary with other SSH clients.

To connect to the CLI using an SSH connection

1. On your management computer, configure the Ethernet port with the static IP address 192.168.12 and a netmask of 255.255.255.0.
2. Using the Ethernet cable, connect your computer's Ethernet port to the FortiRecorder unit's port1.
3. Verify that the FortiRecorder unit is powered on.
4. On your management computer, start PuTTY.
5. In *Host Name (or IP Address)*, type 192.168.1.99.
6. In *Port*, type 22.
7. From *Connection type*, select *SSH*.
8. Click *Open*.

The SSH client connects to the FortiRecorder unit. The SSH client might display a warning if this is the first time you are connecting to the FortiRecorder unit and its SSH key is not yet recognized by your SSH client, or if you have previously connected to the FortiRecorder unit but it used a different IP address or SSH key. If your management computer is directly connected to the FortiRecorder unit with no network hosts between them, this is normal.

Click *Yes* to verify the fingerprint and accept the FortiRecorder unit's SSH key. You will not be able to log in until you have accepted the key.

The CLI displays a login prompt.

9. Type *admin* and press *Enter* twice. (In its factory default state, there is no password for this account.)

CLI connection via local serial console

Requirements

- a computer with a serial communications (COM) port
- the RJ-45-to-DB-9 serial or null modem cable included in your FortiRecorder package
- terminal emulation software, such as [PuTTY](#)



The following procedure describes connection using PuTTY. Steps may vary with other terminal emulators or terminal servers.

To connect to the CLI using a local serial connection

1. Using the console cable, connect the FortiRecorder unit's console port to the serial communications (COM) port on your management computer.
2. On your management computer, start PuTTY.
3. In the *Category* tree on the left, go to *Connection > Serial* and configure the following:

Serial line to connect to	COM1(or, if your computer has multiple serial ports, the name of the connected serial port)
Speed (baud)	9600
Data bits	8
Stop bits	1
Parity	None
Flow control	None

4. In the Category tree on the left, go to *Session* (**not** the sub-node, *Logging*) and from *Connection type*, select *Serial*.
5. Click *Open*.
6. Press the Enter key to initiate a connection.
The login prompt appears.
7. Type admin and press Enter twice. (In the factory default state, there is no password for this account.)

Setting the "admin" account password

In its factory default configuration, FortiRecorder has one user account, named `admin`. This account has administrator permissions that grant full rights to the FortiRecorder appliance's settings and features—including to reset the password for other administrators. Its name and permissions cannot be changed.

In factory default configuration, for initial connection during setup, `admin` has no password.



Set a strong password for the account named `admin` when you log in for the first time. Change the password regularly. If you don't, unauthorized persons could log into FortiRecorder and compromise security.

If multiple people will use FortiRecorder, configure separate accounts for each person later, once setup is complete. See [Configuring user and administrator accounts on page 79](#).

To change the "admin" administrator password

1. Log in to the `admin` administrator account.
2. Go to *System > Administrator > Administrator*.
3. Double-click the row for `admin`, or select it and then click the *Edit* button.
4. Click *Change Password* and enter the new password.
5. Log out.

The new password takes effect the next time that you log in.

Configuring network settings and routers/firewalls

To connect with FortiRecorder, cameras, and other devices, you must configure network settings.

If you need to troubleshoot networking issues, see [Connectivity issues on page 175](#).

Configuring network interfaces

Each of the FortiRecorder appliance's physical network adapter ports (or, for FortiRecorder-VM, vNICs) correspond to a logical network interface. By default, the network interfaces have these IP addresses and netmasks:

Network Interface*	Default IP Address	Netmask
port1	192.168.1.99	255.255.255.0
port2	192.168.2.99	255.255.255.0
port3	192.168.3.99	255.255.255.0
port4	192.168.4.99	255.255.255.0
*The number of network interfaces varies by model.		

If these IP addresses and subnets are not compatible with the design of your unique network, then you must configure them before you plug in port1, etc.

At least one network interface (usually port1) must be connected and configured so that you can connect to the FortiRecorder GUI and CLI.



Best practice is to connect cameras and other services (GUI/CLI, external file storage, etc.) on different network interfaces. For example, you could connect:

- port1 for administrator access
- port2 for cameras and ACS devices
- port3 for external file storage
- port4 for Internet access (time synchronization, FortiCamera Mobile, etc.)

Isolate cameras and ACS devices from the Internet, or use a VPN, so that only FortiRecorder can control them. Live video streams may be lower quality or have choppy motion if cameras do not have constantly available bandwidth. A dedicated network connection only for cameras has many advantages:

- better security by preventing unauthorized access to cameras and video surveillance
- consistent quality of service for live video streams
- simpler bandwidth management

To configure a network interface's IP address

1. Log in to the admin administrator account.
2. Go to *System > Network > Interface*.
3. Double-click the row to select the physical network interface that you want to modify.
4. Expand the *Addressing Mode* section, and then select either:

Setting Name	Description
Manual	Manually assign an IP address and subnet mask to this network interface. Enter the IP address and netmask in <i>IP/Netmask</i>. IPv4 and IPv6 subnet masks should be provided in CIDR format. (For example, enter /24, not 255.255.255.0.) The IP address must be on the same subnet as the network to which the interface connects. Two network interfaces cannot have IP addresses on the same subnet.
DHCP	Automatically retrieve network settings from a DHCP server. Enable <i>Connect to server</i> to retrieve a DHCP lease when you save this configuration. If you want to also retrieve DNS and default route (gateway) settings, also enable <i>Retrieve default gateway and DNS from server</i>.  If an interface uses DHCP, and there are cameras connected to the interface, then you must configure an IP address reservation on the DHCP server so that the IP address will not change. FortiRecorder needs an IP address that does not change so that cameras can communicate with it reliably.  <i>Retrieve default gateway and DNS from server</i> will overwrite the existing DNS and default route, if any.

5. Expand the *Advanced Setting* section, and then configure the following settings:

Setting Name	Description
Discover cameras on this port	Enable to send multicast camera discovery traffic from this network interface. You can also discover cameras on other subnets. See Discovering cameras in remote networks on page 56.
Access	Enable the types of administrative access that you want to permit to this interface.  Enable administrative access only on network interfaces connected to trusted private networks or directly to your management computer. If possible, enable only secure administrative access protocols such as HTTPS or SSH. Failure to restrict administrative access could compromise the security of your FortiRecorder appliance. For more information on restricting access of administrative connections, see Configuring user and administrator accounts on page 79.

Setting Name	Description
Access: HTTPS	Enable to allow secure HTTPS connections to the GUI and/or REST API through this network interface. To configure the listening port number, see Configuring the public port numbers and domain name on page 46 . To upload a certificate, see Replacing the default certificate for the GUI on page 112 . To allow accounts to use the GUI and/or REST API, see Access mode on page 81 .
Access: PING	Enable to allow: - ICMP type 8 (ECHO_REQUEST) or type 30 - UDP ports 33434 to 33534 for ping and traceroute to be received on this network interface. When it receives an ECHO_REQUEST, FortiRecorder will reply with ICMP type 0 (ECHO_RESPONSE).  Disabling PING only prevents FortiRecorder from receiving ICMP type 8 (ECHO_REQUEST) or type 30 and traceroute-related UDP. It does not disable FortiRecorder CLI commands such as <code>execute ping</code> or <code>execute traceroute</code> that send such traffic.
Access: HTTP	Enable to allow HTTP connections to the GUI through this network interface. To configure the listening port number, see Configuring the public port numbers and domain name on page 46.  HTTP connections are not secure, and can be intercepted by a third party. If possible, enable this option only for network interfaces connected to a trusted private network, or directly to your management computer. Failure to restrict administrative access through this protocol could compromise the security of your FortiRecorder appliance.
Access: SSH	Enable to allow SSH connections to the CLI through this network interface.
Access: SNMP	Enable to allow SNMP queries to this network interface, if queries have been configured and the sender is a configured SNMP manager. To configure the listening port number and configure queries and traps, see Configuring SNMP traps and queries on page 100 .
Access: TELNET	Enable to allow Telnet connections to the CLI through this network interface.  Telnet connections are not secure, and can be intercepted by a third party. If possible, enable this option only for network interfaces connected to a trusted private network, or directly to your management computer. Failure to restrict administrative access through this protocol could compromise the security of your FortiRecorder appliance.

Setting Name	Description
Access: FRC-Central	Enable to allow access from FortiCentral installations and the FortiCamera Mobile app. See also the FortiCentral User Guide .
Access: RTSP	Enable to allow live video streams from cameras. See also the FortiRecorder REST API Reference and Configuring video sharing on page 155 .
MTU	Enable to change the maximum transmission unit (MTU) value, then enter the maximum packet or Ethernet frame size in bytes. If network devices between the FortiRecorder unit and its traffic destinations require smaller or larger units of traffic, packets may require additional processing at each node in the network to fragment or defragment the units, resulting in reduced network performance. Adjusting the MTU to match your network can improve network performance. The default value is 1500 bytes. The MTU size must be between 576 and 1500 bytes. For example, RFC 2516 prescribes a value of 1492 for PPPoE. This option is available only for network interfaces that are directly associated with a physical link.
Administrative Status	Select either: <i>Up</i> — Enable (that is, bring up) the network interface so that it can send and receive traffic. <i>Down</i> — Disable (that is, bring down) the network interface so that it cannot send or receive traffic.

6. Click *OK*.

If you were connected to the GUI through this network interface, you are now disconnected from it.

7. To access the GUI again, in your web browser, modify the URL to match the new IP address of the network interface. For details, see [Connecting to the FortiRecorder GUI on page 30](#).

Creating FortiRecorder logical interfaces

If you have a more complex network, then in addition to the physical network interfaces, you can create a logical interfaces on FortiRecorder. Go to *System > Network > Interface* and click *New*.

VLAN subinterfaces

A virtual LAN (VLAN) subinterface, also called a VLAN, is a virtual interface on a physical interface. The subinterface allows routing of VLAN tagged packets using that physical interface, but it is separate from any other traffic on the physical interface.

Virtual LANs (VLANs) use ID tags to logically separate devices on a network into smaller broadcast domains. These smaller domains forward packets only to devices that are part of that VLAN domain. This reduces traffic and increases network security.

One example of an application of VLANs is a company's accounting department. Accounting computers may be located at both main and branch offices. However, accounting computers need to communicate with each other frequently and require increased security. VLANs allow the accounting network traffic to be sent only to accounting computers and to connect accounting computers in different locations as if they were on the same physical subnet.

Redundant interfaces

On a FortiRecorder, you can combine two or more physical interfaces to provide link redundancy. This feature allows you to connect to two or more switches to provide connectivity in the event one physical interface or the equipment on that interface fails.

In a redundant interface, traffic is only going over one interface at any time. This differs from an aggregated interface where traffic is going over all interfaces for increased bandwidth. This difference means redundant interfaces can have more robust configurations with fewer possible points of failure.

A physical interface is available to be in a redundant interface if it is:

- a physical interface, not a VLAN interface
- not already part of a redundant interface
- has no defined IP address and is not configured for DHCP
- does not have any VLAN sub-interfaces

When a physical interface is included in a redundant interface, it is not listed on *System > Network > Interface*. You cannot configure the interface anymore.

Aggregate interfaces

An aggregate interface is a logical interface which uses the Link Aggregation Control Protocol (LACP) (802.3ad) and combines several interfaces to increase throughput. It also provides redundancy in case one interface in the aggregation is down.

Loopback interfaces

A loopback interface is a logical interface that is always up (no physical link dependency) and the attached subnet is always present in the routing table.

The loopback IP address does not depend on one specific external port, and is therefore possible to access it through several physical or VLAN interfaces. In the current release, you can only add one loopback interface on the FortiRecorder.

The loopback interface is useful when you use an OSI Layer 2 load balancer in front of several FortiRecorder devices. In this case, you can set the FortiRecorder loopback interface's IP address the same as the load balancer's IP address and thus the FortiRecorder unit can pick up the traffic forwarded to it from the load balancer.

Configuring routing

If one or more routers is between FortiRecorder and the Internet, your cameras, etc., then you must specify which is the default route ("gateway" router) that network traffic from FortiRecorder uses to reach other parts of your network.



If you used *DHCP* and *Retrieve default gateway and DNS from server* when configuring your network interfaces, skip this step — the default route was configured automatically.



For small networks with only a few devices, often you will only need to configure one route: a default route that forwards packets to your router that is the gateway to the Internet.

If you have redundant gateway routers (for example, dual Internet/WAN links), or a larger network with multiple routers (each of which should receive packets destined for a different subset of IP addresses), then you might need to configure multiple static routes.

1. Log in to the admin administrator account.
Other accounts might not have the permissions required to change this setting.
2. Go to *System > Network > Routing*.
3. Click *New*.
4. Configure the following settings:

Setting Name	Description
Destination IP/netmask	Type the destination IP address and network mask of packets that will be subject to this static route, separated by a slash (/). The value 0.0.0.0/0 results in a default route, which matches all packets.
Interface	Select the port number from the dropdown list.
Gateway	Type the IP address of the next-hop router where the FortiRecorder appliance will forward packets subject to this static route. This router must know how to route packets to the destination IP addresses that you have specified in <i>Destination IP/netmask</i> , or forward packets to another router with this information. For a direct Internet connection, this will be the router that forwards traffic towards the Internet, and could belong to your ISP.
	 The gateway IP address must be in the same subnet as a network interface's IP address. Failure to do so will cause FortiRecorder to delete all static routes, including the default gateway.

5. Click *OK*.
6. If you are moving FortiRecorder to connect through a different router in your network, then re-connect it at the [intended location](#) now. (Connections through the previous gateway will fail until you do this.)
The FortiRecorder appliance should now be reachable to networks indicated by the mask.
7. To verify connectivity, from a computer on the route's network destination, attempt to ping one of the network interfaces of FortiRecorder that should be reachable from that location. If the connectivity test fails, you can use the CLI commands to determine if a complete route exists from the FortiRecorder to the host:

```
execute ping <destination_ipv4>
```

 and to determine the point of connectivity failure:

```
execute traceroute <destination_ipv4>
```

 See also [Examining routing on page 177](#).

Configuring DNS settings

FortiRecorder appliances require connectivity to DNS servers for DNS lookups. The appliance will query the DNS servers whenever it needs to resolve a domain name into an IP address.

To configure DNS settings



If you will use the settings DHCP and Retrieve default gateway and DNS from server when you configure your network interfaces, skip this — DNS is configured automatically.

1. Log in to the admin administrator account.
Other accounts might not have permissions necessary to change this setting.
2. Go to *System > Network > DNS*.
3. Enter the IP addresses of a primary and secondary DNS server.
Your Internet service provider (ISP) might provide IP addresses of DNS servers, or you might want to use the IP addresses of your own DNS servers.



Incorrect DNS settings or unreliable DNS connectivity can cause issues with other features, including the NTP system time. For improved performance, use DNS servers on your local network.

4. Click *Apply*.
5. To verify your DNS settings, in the CLI, enter the following commands:

```
execute traceroute www.fortinet.com
```



DNS tests may not succeed if you have not yet configured routes. See also [Configuring routing on page 38](#).

6. If the DNS query for the domain name succeeds, you should see results that indicate that the host name resolved into an IP address, and the route from FortiRecorder to that IP address:

```
traceroute to www.fortinet.com (192.0.43.10), 30 hops max, 60 byte packets
 1  172.20.130.2 (172.20.130.2)  0.426 ms  0.238 ms  0.374 ms
 2  static-209-87-254-221.storm.ca (209.87.254.221)  2.223 ms  2.491 ms  2.552 ms
 3  core-g0-0-1105.storm.ca (209.87.239.161)  3.079 ms  3.334 ms  3.357 ms
 ...
16  43-10.any.icann.org (192.0.43.10)  57.243 ms  57.146 ms  57.001 ms
```

If the DNS query fails, you will see an error message such as:

```
www.fortinet.com: Temporary failure in name resolution
Cannot handle "host" cmdline arg `www.fortinet.com' on position 1 (argc 3)
```

Verify your DNS server IP address, routing, and that your firewalls or routers do not block or proxy UDP port 53.

Making reservations on your DHCP server

If your cameras get their network settings from a third-party DHCP server, then reserve the range of IP addresses that the cameras will use so that other devices cannot take them. Bind each IP address to a specific camera's MAC address. For details, see the documentation for your DHCP server.



DHCP IP address reservations have important benefits:

- Avoid changes to each camera's IP address. This disrupts live video streams, recordings, and FortiRecorder connections with the camera until you update [Address](#) and the router NAT or firewall policy to match the camera's new IP address. **Connections with that camera will be broken and all video from that camera could be lost during that interruption.**
- Prevent each camera's IP address from being re-assigned to another device when the current DHCP lease expires.
- Mimic a static IP address, yet still provide the benefit that IP addresses are still centrally managed on your DHCP server.

FortiRecorder attempts to keep track of any DHCP-related IP address changes automatically by periodically sending mDNS probes. However this usually requires that the camera is on the same subnet as FortiRecorder. If cameras are on [remote networks](#), and multicast does not reach, then this does not work; DHCP reservations are required.



Reserved leases cannot prevent misconfigured computers from using the same IP address, causing an IP address conflict, and breaking the connection of FortiRecorder with the camera. See [Resolving IP address conflicts on page 183](#).

Configuring the built-in DHCP server

If you do not have a DHCP server on your network, FortiRecorder has a built-in DHCP server and can assign IP addresses to your cameras and other devices. Configure the DHCP server on the interface that the cameras connect to, and then configure the cameras to use DHCP to get their network settings. See also [Configuring cameras on page 63](#).

To configure the DHCP server on FortiRecorder via the GUI

1. Go to *System > Network > DHCP*.
2. Click *New*.
3. Select the check box for *Enable DHCP server*.
4. Configure the following settings:

Setting Name	Description
Interface	Select the name of the network interface where this DHCP server will listen for requests from DHCP clients.
Gateway	Type the IP address that DHCP clients will use as their next-hop router.

Setting Name	Description
	On smaller networks, this is usually the same router that FortiRecorder uses. It could be your office's router, or cable/DSL modem.
DNS options	Select either: • <i>Default</i> — Leave DHCP clients' DNS settings at their default values. • <i>Specify</i> — Configure DHCP clients with the DNS servers that you specify in <i>DNS server 1</i> and <i>DNS server 2</i>.
DNS server 1	Type the IP address of a DNS server that DHCP clients can use to resolve domain names. For performance reasons, if you have one, it is preferable to use a DNS server on your local network. This setting is available only if <i>DNS options</i> is set to <i>Specify</i> .
DNS server 2	Type the IP address of an alternative DNS server that DHCP clients can use to resolve domain names. For performance reasons, if you have one, it is preferable to use a DNS server on your local network. This setting is available only if <i>DNS options</i> is set to <i>Specify</i> .
Domain	Optional. Type the domain name, if any, that DHCP clients will use when resolving host names on the local domain.
Netmask	Type the subnet mask that DHCP clients will use in conjunction with the IP address that is assigned by the DHCP server on FortiRecorder.
Lease time (Seconds)	Type the maximum amount of time that the DHCP client can use the IP address assigned to it by the server. When the lease expires, the DHCP client must either request a new IP address from the DHCP server or renew its existing lease. Otherwise, the DHCP server may try to assign it to the next DHCP client that requests an IP. The default is 604800 seconds (7 days). If you have more or almost as many DHCP clients (cameras) as the number of IP addresses available to give to DHCP clients, you can decrease the lease. This will free up IP addresses from inactive clients so that IP addresses are available to give to clients that are currently in need of IP addresses. Keep in mind, however, that if the DHCP server is attached to your overall network rather than directly to cameras, this will slightly increase traffic volume and slightly decrease performance.
Conflicted IP timeout (Seconds)	Type the maximum amount of time that the DHCP server will wait for an ICMP ECHO (ping) response from an IP before it determines that it is not used, and therefore safe to allocate to a DHCP client that is requesting an IP address. The default is 1800 seconds (3 minutes).

Setting Name	Description
	To ensure that the DHCP server does not cause IP address conflicts with misconfigured computers that are accidentally using the pool of IP addresses used for DHCP, when a client request a new DHCP lease, the built-in DHCP server will ping an unused IP address in the pool first. If the ping test is successful, then a misconfigured computer is currently using that IP, and allocating it also to the DHCP client would cause an IP address conflict. To prevent this, the DHCP server will temporarily abandon that IP (mark it as used by a static host) and look for an other, available IP to give to the DHCP client. (It will not try abandoned IP addresses again until the pool is exhausted.) However, before the DHCP server can determine if the ping test is successful, the it must first wait to see if there is any reply. This slows down the search for an available IP address, and in rare cases, could cause a significant delay before the DHCP client receives its assigned IP address and other network settings. If your network is smaller or typically has low latency to ping replies, you can safely decrease this setting's value to improve DHCP speed and performance. In most cases, 3 seconds is enough. See also Resolving IP address conflicts on page 183.
DHCP IP Range	To configure the DHCP lease pool — the range of IP addresses that the DHCP server can assign to its clients — click <i>New</i> and configure the first and last IP address in the range. To avoid DHCP pool exhaustion that can occur in some cases, the pool should be slightly larger than the total number of clients. If you need to exclude some IP addresses from this range (for example, printers permanently occupy static IP addresses in the middle of the range), also configure <i>DHCP Excluded Range</i>.  The built-in DHCP server can provide IP addresses to the computers on your network too, not just to cameras.
DHCP Excluded Range	To configure IP addresses that should be omitted from the DHCP pool and never given to DHCP clients (such if there are printers with manually assigned static IP addresses in the middle of your DHCP range), click <i>New</i>.
Reserved IP Address	To bind specific device to a specific DHCP IP address lease, ensuring that the DHCP server will not assign it to another DHCP client, click <i>New</i> and enter the device's MAC address.

Setting Name	Description
	DHCP IP address reservations have important benefits: • Avoid changes to each camera's IP address. This disrupts live video streams, recordings, and FortiRecorder connections with the camera until you update Address and the router NAT or firewall policy to match the camera's new IP address. Connections with that camera will be broken and all video from that camera could be lost during that interruption. • Prevent each camera's IP address from being re-assigned to another device when the current DHCP lease expires. • Mimic a static IP address, yet still provide the benefit that IP addresses are still centrally managed on your DHCP server. FortiRecorder attempts to keep track of any DHCP-related IP address changes automatically by periodically sending mDNS probes. However this usually requires that the camera is on the same subnet as FortiRecorder. If cameras are on remote networks, and multicast does not reach, then this does not work; DHCP reservations are required.
	Reserved leases cannot prevent misconfigured computers from using the same IP address, causing an IP address conflict, and breaking the connection of FortiRecorder with the camera. See Resolving IP address conflicts on page 183.

5. Click *Create*.

As cameras join the network, they appear on *Monitor > DHCP > DHCP*.

Configuring a policy on your firewall/router

If your deployment:

- includes a [remote network](#), and
- either or both:
 - VPN is used to connect the local and remote networks
 - automatic discovery will be used to [find cameras on different subnets](#), or detect when they change IP address

then on your office's FortiGate, third-party firewall, or Internet router, you must configure a policy to allow traffic between those networks.

Hybrid network deployments may also improve performance if video streams can open a more direct path between users and FortiRecorder, instead of being relayed indirectly through FortiCamera Cloud or NAT on your router or firewall.

For details, see [Appendix: Port numbers on page 196](#) and the [FortiGate Administration Guide](#) or other documentation for your firewall/router.

Configuring NAT/port forwarding on your firewall/router

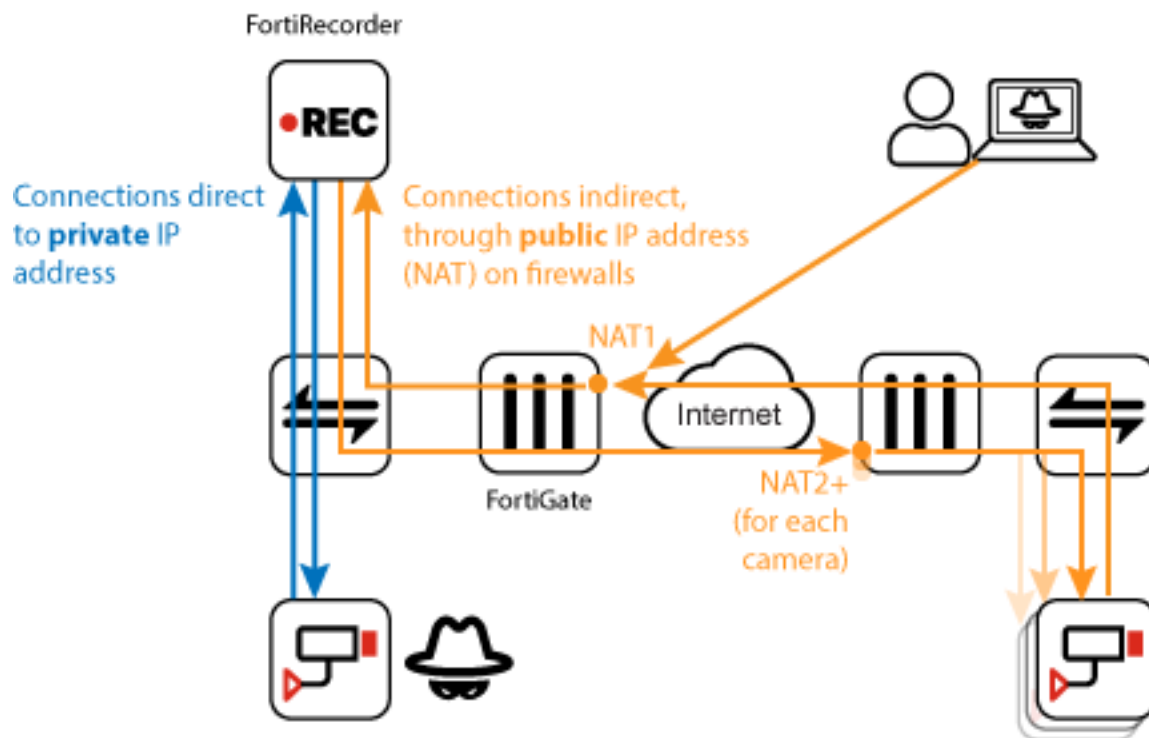
If your deployment:

- includes a [remote network](#), and
- VPN is **not** used to connect the local and remote networks

then on your office's FortiGate, third-party firewall, or Internet router, you must configure either or both:

- NAT
- port forwarding

to accept and forward incoming connections from an external/**public** IP address on the firewall/router to the internal/**private** IP address of FortiRecorder.



For each NAT/port forward, the IP address that receives connections is either the:

- IP address on the office WAN or Internet router
- IP address of the external interface on a firewall

Similarly, communications in the opposite direction — from FortiRecorder to cameras etc. — also require NAT and/or port forwarding. If you have multiple remote devices, then configure one for each device that needs to receive connections from FortiRecorder.



If you are not sure what your network's Internet address is, while connected to your office network, you can use an online utility such as:

<https://ping.eu/>

Port numbers on the external IP address can be either be forwarded from the same as the listening port numbers as FortiRecorder, or translated from a different port number.

On FortiGate, NAT and port forwarding are done by a virtual IP (VIP) address. For example, if port2 is attached to the Internet, then you configure a VIP on port2 to forward connections to the internal IP address and port numbers of FortiRecorder. For details, see [Appendix: Port numbers on page 196](#) and the [FortiGate Administration Guide](#) or other documentation for your firewall/router.



NAT and port forwarding are usually required for remote networks that use IPv4, but **not** IPv6. If you only use IPv6, you may be able to skip this step.

Once you have configured NAT and/or port forwarding on your firewall/router, you must configure FortiRecorder and your remote devices to use it. Continue with [Configuring the public port numbers and domain name on page 46](#). Later, you will also configure NAT and/or port forwarding ([Address mode](#)) for each remote camera.

Configuring the public port numbers and domain name

If you configured a [NAT/port forward address on your firewall/router](#), then you must configure FortiRecorder to use it. FortiRecorder uses the external-facing address and port number in features such as notifications. For example, notification email about motion detection contains a hyperlink with the [Public Access Host name](#) and [Access Ports Service](#) (Public port number), like this:

`https://nvr.example.com:1443/admin/AdminLogin.html?nid=123...`

Due to this, when you are out of the office, you can click the link regardless of where you are on the Internet, and be able to watch the motion detection clip on FortiRecorder.

Miscellaneous settings (for example, password strength and idle timeout for local administrator accounts) are also available on this page of the GUI.

1. On FortiRecorder, go to *System > Configuration > Options*.
2. Configure the following settings:

Setting Name	Description
Idle timeout	Enter the amount of time that a user may be inactive before the FortiRecorder unit automatically logs out the user.

Setting Name	Description
	 For better security, use a low idle timeout value.
Login disclaimer	Enter text that you want to prompt the user to agree, such as an IT policy or legal disclaimer, then also configure when to display it: • Display pre-login banner • Display post-login banner
Display pre-login banner	Enable to display the text in Login disclaimer before the login dialog.
Display post-login banner	Enable to display the text in Login disclaimer after the login dialog, but before the GUI menu or CLI command prompt appears.
Password Policy	Enable to require strong passwords, as configured in Minimum password length and Password must contain. If any password does not meet the requirements, FortiRecorder requires that user to change the password during the next login.
	 Set a strong password policy, especially for administrator accounts. If you don't, unauthorized persons could log into FortiRecorder and compromise security. Short, simple, and easily-guessed passwords are a security risk.
	 Password policy settings only apply to accounts that are local (defined on FortiRecorder). See also Configuring remote authentication on page 85.
Minimum password length	Enter the minimum number of characters that a password must contain. The default value is 8.
Password must contain	Select which types of characters are required to ensure password complexity: • <i>Uppercase letter</i> • <i>Lowercase letter</i> • <i>Number (0-9)</i> • <i>Non alphanumeric character</i>: Any character that is not a letter of the US-ASCII alphabet nor a number, such as: é ! ~ @ # %
Allow empty password	Enable to ignore Minimum password length and Password must contain and allow empty passwords.

Setting Name	Description
	Empty passwords effectively disable authentication, and are a security risk. Only enable this setting if: - FortiRecorder is on an isolated network (not accessible from the Internet or office LAN) - access is physically restricted to authorized persons If you don't, unknown and unauthorized persons could log into FortiRecorder and compromise security.
Public Access Host name	If you configured NAT on a firewall/router (see Configuring NAT/port forwarding on your firewall/router on page 45), then type either an: - IP address - fully qualified domain name (FQDN), such as <code>nvr.example.com</code>, that Internet DNS servers can resolve into the above IP address Devices on remote networks or the public Internet will connect through this address on the firewall/router for communications to the FortiRecorder. This hostname may be different than the one in Host name.
Access Ports Service	For each network service (HTTPS etc.), configure: <i>Local</i>: Type the listening port number on FortiRecorder. Devices on the internal/private network connect directly to this port number. <i>Public</i>: If you configured port forwarding on a firewall/router (see Configuring NAT/port forwarding on your firewall/router on page 45), then type the external/public port number on your firewall/router that forwards communications to the FortiRecorder port number in <i>Local</i>. Devices on remote networks or the public Internet will connect through this public port number on the firewall/router to reach the FortiRecorder. If you do not use port forwarding, then keep <i>Public</i> the same as <i>Local</i>. By default, each service (protocol) on FortiRecorder uses IANA standard port numbers. See also Appendix: Port numbers on page 196.
	 The <i>FortiCentral</i> port number is used by both FortiCentral and FortiCamera Mobile app.
FortiRecorderTag	Enter a tag that you can use on FortiCentral to group or filter devices. Separate multiple tags with commas.

3. Click *Apply*.

Configuring the system time

For many features to work, including video timestamps, [scheduled recording](#), [logging](#), and [SSL/TLS-dependent features](#), the FortiRecorder system time must be accurate. Once setup is complete and cameras have been

connected, FortiRecorder synchronizes the clocks of cameras with its own in order to keep them in agreement.

You can either manually set the FortiRecorder system time or configure the FortiRecorder appliance to automatically keep its system time correct by synchronizing with a Network Time Protocol (NTP) server.



NTP is recommended to achieve better time accuracy. Adjust your firewall, if any, to allow these connections. See also [Appendix: Port numbers on page 196](#).

To configure the system time

1. Go to *System > Configuration > Time*.
2. Either manually set the date and time, or select to synchronize with NTP server.
3. Click *Apply*.

If you manually configured the time, or if you enabled NTP and the NTP query for the current time succeeds, the new clock time should appear in *System time*. (If the query reply is slow, you may need to wait a couple of seconds, then click *Refresh* to update the display in *System time*.)

Updating the firmware

The FortiRecorder appliance is shipped with the latest operating system (firmware); however, if a new version has been released since your appliance was received, install the latest firmware before continuing the installation of your FortiRecorder.

[Camera firmware](#) can be updated later, after you have connected your cameras to the appliance.

Fortinet periodically releases FortiRecorder firmware updates to include enhancements and address issues. After you register your FortiRecorder appliance, FortiRecorder firmware is available for download from [Fortinet Support](#).

New firmware can introduce new features which you must configure for the first time.

New firmware can also change which FortiCam camera models are supported. For planning purposes, when you upgrade the FortiRecorder firmware, if it detects that any of your cameras have reached their end-of-support (EOS) date, a [log message](#) and [camera status](#) notifies you. Warnings will also appear in the [audit](#). EOS cameras will be disabled and not supported by the next major or minor version (patches not affected). Replace those cameras before your next FortiRecorder firmware upgrade.

For late-breaking information specific to the firmware release version, see the [FortiRecorder Release Notes](#).



In addition to major releases that contain new features, Fortinet releases patch releases that resolve specific issues without containing new features and/or changes to existing features. It is recommended to download and install patch releases as soon as they are available.

Before you can download firmware updates for your FortiRecorder appliance, you must first register your FortiRecorder appliance with Fortinet Technical Support. For details, go to <https://support.fortinet.com/> or contact Fortinet Technical Support.

Installing firmware

You can use either the GUI, the CLI, or USB drive (see [Automatic provisioning on page 19](#)) to upgrade or downgrade the FortiRecorder appliance's operating system.

Firmware changes are either:

- an update to a newer version
- a reversion to an earlier version

To determine if you are updating or reverting the firmware, go to *Dashboard > Status* and in the *System Information* widget, see the *Firmware Version* row. (Alternatively, in the CLI, enter the command `get system status`.)

For example, if your current firmware version is:

FortiRecorder-400D v7.0.2, build069, 2023.08.02

changing to

FortiRecorder-400D v7.0.1, build066, 2023.06.28

an earlier version number (7.0.1), build number (66), and date (2023.06.28 means June 28, 2023), indicates that you are reverting.



Back up your configuration before beginning this procedure. Reverting to an earlier firmware version could reset settings that are not compatible with the new firmware. See [Backups on page 168](#).



If you are installing a firmware version that requires a different size of system partition, you may be required to format the boot device before installing the firmware by re-imaging the boot device. Consult the Release Notes. In that case, do not install the firmware using this procedure.

To install firmware using the GUI

1. Download the firmware file from the Fortinet Technical Support web site:
<https://support.fortinet.com/>
2. On the FortiRecorder appliance, log into the GUI as the admin administrator.
3. Go to *Dashboard > Status*.
4. In the *System Information* widget, in the *Firmware version* row, select *Update*.
The *Choose Firmware* dialog appears.
5. Click *Browse* to locate and select the firmware file that you want to install, then click *OK*.
6. Click *OK*.

Your management computer uploads the firmware image to the FortiRecorder appliance. The FortiRecorder appliance installs the firmware and restarts. The time required varies by the size of the file and the speed of your network connection, and by the amount of time that the specific model requires to reboot. Over a LAN connection, it should only take a couple minutes until the appliance becomes available again.



If you are downgrading the firmware to a previous version, and the settings are not fully backwards compatible, the FortiRecorder appliance may either remove incompatible settings, or use the feature's default values for that version of the firmware. You may need to reconfigure some settings. See also [Restoring a previous configuration on page 169](#).

7. Clear the cache of your web browser and restart it to ensure that it reloads the GUI and correctly displays all interface changes. For details, see your browser's documentation.
8. To verify that the firmware was successfully installed, log in to the GUI and go to *Dashboard > Status*. In the *System Information* widget, the *Firmware version* row indicates the currently installed firmware version.
9. If you want to install alternate firmware on the secondary partition, follow [Installing alternative firmware on page 52](#).
10. Continue with [Setting the "admin" account password on page 33](#).

To install firmware using the CLI

1. Download the firmware file from the Fortinet Technical Support web site:
<https://support.fortinet.com/>
2. Copy the new firmware image file to the root directory of the TFTP server.
3. Connect your management computer to the FortiRecorder console port using a RJ-45-to-DB-9 serial cable or a null-modem cable.
4. Connect port1 of the FortiRecorder appliance directly or to the same subnet as a TFTP server.
5. Initiate a connection from your management computer to the CLI of the FortiRecorder appliance, and log in as the administrator named `admin`.
6. Start your TFTP server. (If you do not have one, you can temporarily install and run one such as `tftpd` (Windows, macOS, or Linux) on your management computer.



Because TFTP is not secure, and because it does not support authentication and could allow anyone to have read and write access, you should only run it on trusted administrator-only networks, never on computers directly connected to the Internet. If possible, immediately disable TFTP when you are done.

7. Verify that the TFTP server is currently running, and that the FortiRecorder appliance can reach the TFTP server.
To use the FortiRecorder CLI to verify connectivity, enter the following command:
`execute ping 192.168.1.168`
where `192.168.1.168` is the IP address of the TFTP server.
8. Enter the following command to download the firmware image from the TFTP server to the FortiRecorder appliance:
`execute restore image tftp <name_str> <tftp_ipv4>`
where:
 - `<name_str>` is the name of the firmware image file
 - `<tftp_ipv4>` is the IP address of the TFTP server
 For example, if the firmware image file name is `image.out` and the IP address of the TFTP server is `192.168.1.168`, enter:
`execute restore image tftp image.out 192.168.1.168`
One of the following message appears:

- This operation will replace the current firmware version!

Do you want to continue? (y/n)

- Get image from tftp server OK.

Check image OK.

This operation will downgrade the current firmware version!

Do you want to continue? (y/n)

9. Press Y.

The FortiRecorder appliance downloads the firmware image file from the TFTP server. The FortiRecorder appliance installs the firmware and restarts. The time required varies by the size of the file and the speed of your network connection.



If you are downgrading the firmware to a previous version, the FortiRecorder appliance reverts the configuration to default values for that version of the firmware. You will need to reconfigure the FortiRecorder appliance or restore the configuration file from a backup. For details, see [Connecting to the FortiRecorder GUI on page 30](#) and, if you want to restore the configuration, [Restoring a previous configuration on page 169](#).

10. To verify that the firmware was successfully installed, log in to the CLI and type:

```
get system status
```

The firmware version number is displayed.

11. If you want to install alternate firmware on the secondary partition, follow [Installing alternative firmware on page 52](#).
12. Continue with [Setting the "admin" account password on page 33](#).

Installing alternative firmware

You can install alternate firmware which can be loaded from its separate partition if the primary firmware fails. This can be accomplished via the GUI or CLI.

To install alternate firmware via the CLI

1. Download the firmware file from the Fortinet Technical Support web site:
<https://support.fortinet.com/>
2. Copy the new firmware image file to the root directory of the TFTP server.
3. Connect your management computer to the FortiRecorder console port using a RJ-45-to-DB-9 serial cable or a null-modem cable.
4. Connect port1 of the FortiRecorder appliance directly or to the same subnet as a TFTP server.
5. Initiate a connection from your management computer to the CLI of the FortiRecorder appliance, and log in as the admin administrator.

For details, see [Connecting to the FortiRecorder CLI on page 31](#).

6. Start your TFTP server. (If you do not have one, you can temporarily install and run one such as tftpd (Windows, macOS, or Linux) on your management computer.)



Because TFTP is not secure, and because it does not support authentication and could allow anyone to have read and write access, you should only run it on trusted administrator-only networks, never on computers directly connected to the Internet. If possible, immediately turn off tftpd off when you are done.

7. Verify that the TFTP server is currently running, and that the FortiRecorder appliance can reach the TFTP server. To use the FortiRecorder CLI to verify connectivity, enter the following command:

```
execute ping 192.168.1.168
```

where 192.168.1.168 is the IP address of the TFTP server.

8. Enter the following command to restart the FortiRecorder appliance:

```
execute reboot
```

9. As the FortiRecorder appliances starts, a series of system startup messages appear.

```
Press any key to display configuration menu.....
```

10. Immediately press a key to interrupt the system startup.



You have only 3 seconds to press a key. If you do not press a key soon enough, the FortiRecorder appliance reboots and you must log in and repeat the execute reboot command.

If you successfully interrupt the startup process, the following messages appears:

```
[G]: Get firmware image from TFTP server.
```

```
[F]: Format boot device.
```

```
[B]: Boot with backup firmware and set as default.
```

```
[Q]: Quit menu and continue to boot with default firmware.
```

```
[H]: Display this list of options.
```

```
Enter G,F,B,Q,or H:
```

```
Please connect TFTP server to Ethernet port "1".
```

11. Press G to get the firmware image from the TFTP server.

The following message appears:

```
Enter TFTP server address [192.168.1.168]:
```

12. Type the IP address of the TFTP server and press Enter.

The following message appears:

```
Enter local address [192.168.1.188]:
```

13. Type a temporary IP address that can be used by the FortiRecorder appliance to connect to the TFTP server. The following message appears:

```
Enter firmware image file name [image.out]:
```

14. Type the firmware image file name and press Enter. The FortiRecorder appliance downloads the firmware image file from the TFTP server and displays a message similar to the following:

```
Save as Default firmware/Backup firmware/Run image without saving:[D/B/R]?
```

15. Press B. The FortiRecorder appliance saves the backup firmware image and restarts. When the FortiRecorder appliance reboots, it is running the primary firmware.

Booting from the alternate partition

Each appliance can have up to two firmware versions installed. Each firmware version is stored in a separate disk partition.

To boot into alternative firmware through the local console CLI

1. Install firmware onto the alternate partition (see [Installing alternative firmware on page 52](#)).
2. Connect your management computer to the FortiRecorder console port using a RJ-45-to-DB-9 serial cable or a null-modem cable.
3. Initiate a connection from your management computer to the CLI of the FortiRecorder appliance, and log in as the admin administrator.
4. Enter the following command to restart the FortiRecorder appliance:
`execute reboot`
5. As the FortiRecorder appliances starts, a series of system startup messages appear.

```
Press any key to display configuration menu.....
```

Immediately press a key to interrupt the system startup.



You have only 3 seconds to press a key. If you do not press a key soon enough, the FortiRecorder appliance reboots and you must log in and repeat the `execute reboot` command.

If you successfully interrupt the startup process, the following messages appears:

```
[G]: Get firmware image from TFTP server.
```

```
[F]: Format boot device.
```

```
[B]: Boot with backup firmware and set as default.
```

[Q]: Quit menu and continue to boot with default firmware.

[H]: Display this list of options.

Enter G,F,B,Q,or H:

Please connect TFTP server to Ethernet port "1".

6. Press B to reboot and use the backup firmware.

Upgrading or downgrading camera firmware

Once the FortiRecorder is connected to your cameras, you can upgrade and downgrade the camera firmware through the FortiRecorder GUI.



Fortinet does not recommend downgrading firmware. Downgrading firmware could result in a loss of configuration information. If possible, back up the configuration before you downgrade.

To upgrade or downgrade a camera's firmware

1. Download the firmware file from the Fortinet Technical Support web site:
<https://support.fortinet.com/>
2. Go to *Camera > Configuration > Firmware*.
3. Click the *Upload* button and select the camera firmware file.
After the firmware is successfully uploaded, the *Availability* column changes from *Fortinet support* to *Local*.
4. Go to *Camera > Configuration > Camera*.
5. Click the row to select one or more cameras that you want to upgrade or downgrade, and then click *Upgrade*.
6. From the available firmware list, select the firmware version you want to upgrade to and click *OK*.
The camera installs the new firmware. During this time, the camera cannot record video if it was *scheduled*, so there is a gap in the recorded video.

Upload licenses

If you have purchased [licenses](#), then to FortiRecorder to unlock those features.

1. Go to *Dashboard > Status*.
2. In the *License Information* widget, click *Update*. Find and upload the license file.
FortiRecorder validates the license and updates the license status on the dashboard. If you uploaded a face recognition AI license, validation requires an Internet connection (airgapped networks not supported). See also [Appendix: Port numbers on page 196](#).
3. Repeat the previous step if you need to upload more licenses.

Plugging in the cameras

Use Ethernet network cables to connect the cameras to the same switch as FortiRecorder, as shown in [Deployment topology on page 26](#).



If you connected the cameras too soon, before a DHCP server was available, then they are using a default IP address. The default address will not work with your network. To fix this, unplug the cameras and then plug them in again. This reboots the cameras and requests a correct IP address from the DHCP server.

If you cannot plug cameras into the same switch (for example, if you later add cameras at a branch office), see [Discovering cameras in remote networks on page 56](#).

Moving cloud native cameras to FortiRecorder

Cloud native FortiCam cameras, such as FortiCam FB85-CA or CD55-C, have "-C" in the model number.

When you plug in cloud native FortiCam cameras, by default, they try to connect to FortiCamera Cloud first — not FortiRecorder.

New cameras that have not been claimed by an owner in FortiCamera Cloud do not have an associated organization yet. Once the camera is put in an organization's inventory and deployed to a site, however, only that organization's administrators can configure the camera. Other organizations and FortiRecorder appliances cannot authenticate to manage the camera anymore.

So if you want to re-deploy a cloud native camera onto FortiRecorder, you must:

1. Log into FortiCamera Cloud as the owner.
2. [Un-claim the camera](#), removing it from the organization.

If the camera is not currently in a hybrid deployment, then un-claiming should also send a factory reset signal to the camera. If the camera is not online when this occurs, then you may need to manually press the factory reset button on the camera in order to remove old settings that had previously been received from the cloud. (Locations of the reset button vary. See the QuickStart Guide for your camera model.)

3. Unplug the camera.
4. Plug in the camera.

Continue with the usual setup with FortiRecorder.

If the camera will use a [hybrid network](#) approach with *both* FortiRecorder and FortiCamera cloud together, then later you will also enable [Managed by cloud](#).

Discovering cameras in remote networks

During initial setup, FortiRecorder automatically discovers cameras that are connected to the **same subnet**. You don't need to manually run a discovery scan if you only have local cameras.

If you add cameras on a [remote network](#) or **different subnet** of the local network, then you can also add those cameras to FortiRecorder. Either:

- Go to *Camera > Configuration > Camera* and click *New* to manually add a camera.
- Use a discovery scan (automatic or manual) to find new cameras, or detect when they [change IP address](#).

To discover cameras in remote networks

1. Verify that a DHCP server is available on the remote network.
2. Plug in cameras at the remote network, as shown in [Remote from FortiRecorder on page 29](#).
Automatic discovery might find the cameras now if the setup on your router or firewall [allows automatic discovery \(UPnP, mDNS, or ONVIF\)](#). Otherwise continue to the next step to trigger a manual discovery scan.
3. Go to *System > Network > Discovery*.
4. Click *Enable*.
5. Click *New*.
6. Enter a subnet.
You can use either an IP address range or classless (CIDR) format.
For example, you might enter 172.20.1.100-172.20.1.200, or 172.20.1.0/24.
7. Click *Apply*.
8. Go to *Camera > Configuration*.
9. Click *Discover*.

FortiRecorder starts to scan for cameras. Discovered cameras appear on *Camera > Configuration > Camera*. Time required varies by the size of the IP address range, and how quickly cameras respond.

If remote cameras do not appear, verify that FortiRecorder can [reach the remote network](#).

Configuring cameras

Camera configuration includes configuration of the cameras themselves, but also related settings such as video recording and storage settings.

About recording types

When you configure a camera profile, you can select the [Recording type](#). Results vary by your selection in that setting, but also by other settings. **CPU usage and disk space usage are increased by some combinations of settings.**

If *Continuous* is enabled

A video clip is recorded. Duration and disk space usage varies by the schedule and video profile.

If also:

- *Motion detection/Metadata/etc.* (recordings triggered by detection) are enabled
- *Use continuous recordings if available* is selected for [Storage Options](#) of detection recordings
- detection events occur during a scheduled continuous recording

then FortiRecorder simply puts markers in the continuous recording on the timeline. No additional copy of the video clip files are made for the detections.



CPU and disk space usage decrease if you select *Use continuous recordings if available*.

If *Continuous* is disabled

If *Motion detection* or others are enabled, then the [Use temporary stream](#) option appears, which determines whether a video clip is recorded or not. Select either:

- **Yes:** FortiRecorder initiates a video stream with the camera. Each time motion or another detection occurs, FortiRecorder stores that part of the stream and a little before it as a motion detection video clip. Duration is about 40 seconds each occurrence.
- **If required:** Varies by camera model. Depending on what the camera model supports, either:
 - Cameras record and send a motion detection video clip to FortiRecorder.
 - FortiRecorder initiates a video stream and stores any part with motion detection, same as the Yes option.
- **No:** Varies by camera model. Depending on what the camera model supports, either:
 - Cameras record and send a motion detection video clip to FortiRecorder.
 - FortiRecorder does not record. Instead, it only puts markers in the timeline.



Do not select *No* if you require a motion detection video clip or preview image. Depending on the camera model, CPU and disk space usage may decrease if you select *No*. To monitor the effect on video retention and storage capacity, see [Using the dashboard on page 120](#).

Configuring video profiles

Video profiles define the video quality that you want cameras to use when they record or stream live video to FortiRecorder. If you want to use a factory default profile (for example, high-resolution), then you can skip this step during initial setup. Otherwise you can configure profiles with your custom settings.

Video profiles are used in camera profiles. For details, see [Configuring camera profiles on page 60](#).



Better video quality consumes more network bandwidth and more disk space. If you need to retain video for a long time, or have a slow network, then you might need to reduce the video quality until you reach acceptable network performance or disk usage.

To configure a video profile

1. Go to *Camera > Configuration > Video Profile*.
2. Click *New*.
3. Configure the following settings:

Setting Name	Description
Name	Type a name (such as <code>live-stream1</code>) that can be referenced by other parts of the configuration. Do not use spaces or special characters. The maximum length is 35 characters.
Codec	Select the video compression format, such as H.264 AVC or H.265 HEVC.
Resolution	Select the amount of detail (the number of pixels) in the image. from the drop-down menu. Lower resolutions have less detail but are faster to transmit. Higher resolutions produce a clearer image but require more bandwidth. A higher resolution is preferable if the camera is recording a large space, such as a parking lot, where small details like faces and license plates could be important.  High resolution can significantly reduce performance and increase network bandwidth and disk space usage.
Frames per second	Type the number of frames per second (FPS). Conventional video is 24 frames per second.  More frames per second may be useful if you need to record very fast motion, but increasing FPS will also increase disk space usage and CPU usage.
Group of pictures	Select from the drop-down menu the duration of a group of pictures (GOP) sequence. A GOP sequence is the interval between frames that contain the full image. Longer intervals save bandwidth, but slightly delay the start of live video streams.
Bitrate mode	Select the bit rate: Variable — Automatically adjust the stream to the minimum bit rate required by the current video frames while maintaining video quality. Bitrate is less when there is less motion. This setting increases image noise. Tip: You can monitor how the bitrate is affecting storage capacity. See Using the dashboard on page 120 and Variable vs. constant vs. constrained bit rate video on page 167. Fixed — Manually specify a constant bit rate in <i>Bit rate</i>. This guarantees calculated video retention time and bandwidth but might reduce image quality if, for example, if there is a sudden burst of motion, like rain or flashing lights. Constrained — Automatically adjusts the stream to reduce the bitrate usage while recording less motion, and increasing bitrate while recording more motion. Unlike <i>Variable</i>, however, you can set the maximum bitrate that the camera uses.

Setting Name	Description
Max bitrate	Enter the maximum bitrate that the camera can stream. Lower bitrates use less bandwidth by sacrificing image quality. This setting is only available when <i>Bitrate mode</i> is <i>Constrained</i> .
Quality	Select the degree of compression. Greater compression reduces required network bandwidth but causes greater CPU usage .
Audio	Enable or disable audio.

4. Click *Create*.

Configuring camera profiles

Camera profiles define which video profile to use, video storage options, and recording schedules (either continuous or motion detection) for the cameras that use the profile. If you want to use a factory default profile (for example, DoContinuous), then you can skip this step during initial setup. Otherwise you can configure profiles with your custom settings.

Camera profiles are used by cameras. For details, see [Configuring cameras on page 63](#).

To configure camera profiles

1. Go to *Camera > Configuration > Camera Profile*.
2. Click *New*.
3. Expand the sections such as *Video*, and then configure the following settings:

Setting Name	Description
Name	Enter a name (such as camera-settings1) that can be referenced by other parts of the configuration. Do not use spaces or special characters. The maximum length is 35 characters.
Video	
Add schedule	Select the schedule that defines when to use low or high quality video. See also Configuring a schedule on page 141 .
Recording stream profile	Select the video profile that defines the quality of the recorded video . See also Configuring video profiles on page 58 .
Viewing stream profile	Select the video profile that defines the quality of the video when viewing live video .

Setting Name	Description
	Better video quality will use more bandwidth and disk space.  If video seems slow or choppy when you view live streams from multiple cameras at the same time, then you can select a lower quality or lower bandwidth profile for the cameras in <i>Viewing stream profile</i>. This reduces CPU usage on FortiCentral or the web browser.
Recording	
Add schedule	Select the schedule that defines when to use specific Recording type or Store on settings. See also Configuring a schedule on page 141. For example, you could instruct the camera to start recording for motion detection during the day and PIR detection at night.
Recording type	Select which triggers cause the camera to begin recording: • <i>Continuous</i>: Scheduled times. See also Configuring a schedule on page 141. • <i>Motion detection</i>: Movement detected by the camera lens. If <i>Motion detection</i> is selected, and <i>Continuous</i> is not selected, then the <i>Use temporary stream</i> setting appears. For details, see About recording types on page 57. • <i>Metadata</i>: Movement detected by built-in AI on some camera models such as the FortiCam FD55-CA, FB85-CA, FD51, FE120B, and FE120B-CA that can detect specific categories such as people or vehicles and record that metadata. This metadata is required by FortiCentral heatmaps and charts. • <i>Digital input</i>: Devices connected to the camera's digital input wire. This option only takes effect if the camera supports DIDO. • <i>Audio detection</i>: Microphone on the camera detected sound. • <i>PIR detection</i>: Infrared sensor on the camera detected people, animals, or other objects that produce heat energy. • <i>Tamper detection</i>: Tamper sensor on the camera. Supported recording types vary by camera model. For many types, you may be able to define the matching or sensor sensitivity level for each camera. See Configuring cameras on page 63.  Recording type results vary by combination with other settings. CPU usage and disk space usage are increased by some settings. See About recording types on page 57.
Store on	Select where to store the recording: • <i>FortiRecorder</i>: Store your recorded video on the FortiRecorder or its remote storage. See also Configuring external storage on page 94.

Setting Name	Description
	SD card: Store your recorded video on the camera's SD card (also called "edge recording"). See also Enable storage on camera SD card and Edge Download. Recording types vary by camera model.
Edge Download	
Add schedule	Select the schedule that defines when to use specific Continuous recordings or Detection recordings settings. See also Configuring a schedule on page 141 .
Continuous recordings	Enable to download scheduled video recordings from the camera's SD card to FortiRecorder local or remote storage. This setting applies only if Recording type is <i>Continuous</i>.
Detection recordings	Enable to download motion detection video recordings from the camera's SD card to FortiRecorder local or remote storage. This setting applies only if Recording type is <i>Motion detection</i>.
Storage Options	
Continuous recordings	Select the storage strategy for scheduled recordings, either: Keep until overwritten: Retain video until all available disk space, both local and remote, is almost full. Then the oldest video will be overwritten. Delete: Remove video when it exceeds the specified maximum age, or if the disk is full. Move: Move video to external storage when it exceeds the specified maximum age, or if the disk is full. In the <i>After n</i> options that appear, select the age threshold that will cause FortiRecorder to move the video clips to external storage. This option applies only if you have configured remote storage. Recordings are stored on the hard disk as multiple video files. The oldest part of the recording is deleted or moved first. If remote storage is configured, video is first stored on the local disk, then transferred to remote storage when the local disk needs space for newer video. When the remote disk is full too, the video will finally be deleted from it.
Detection recordings	Select the storage strategy for recordings triggered when Recording type is <i>Motion detection</i> etc. Options are the same as Continuous recordings, except that you can also select: Use continuous recordings if available: Marks the time ranges of motion detection inside of continuous recordings on the timeline instead of storing them as separate copies of the video files (sometimes also called "zero penalty" because the NVR system resources are not spent on copies).

Setting Name	Description
	 Selecting <i>Use continuous recordings if available</i> reduces CPU load, but does not allow continuous recordings to be deleted, and FortiRecorder only keeps the section of video that was marked by motion detection for an amount of time that varies by, for example, whether or not the live video stream is currently being used. See also About recording types on page 57.
Compression Options	
Continuous recordings	Select whether or not FortiRecorder reduces the disk space usage of continuous recordings by removing P-frames. If you select <i>Compress</i>, then also configure the maximum amount of time to keep the files uncompressed. Files whose start time is older than the specified time will be compressed.
	 Selecting <i>Compress</i> can reduce video frame rate. It can also increase CPU and disk space usage.

4. Click *Create*.

Configuring cameras

Most settings for local cameras are automatically retrieved during discovery, so usually, you are not required to configure them. However, you might need to configure camera settings if:

- You want to adjust camera settings.
- You add a camera on a [remote network](#), and did not use [remote camera discovery](#).
- You want to configure a new camera **before** you connect it to FortiRecorder.
- You want to replace an old or broken camera.
- The *Status* column indicates *Not Configured*.

Features vary by camera vendor and model. Therefore many settings only appear after you configure [Model](#) or FortiRecorder discovers the camera, so that it knows which options are supported. If a setting is not visible, then the setting is not supported by that model.



If FortiRecorder is in a [hybrid deployment with FortiCamera Cloud](#), then many camera settings described in this section must be configured on FortiCamera Cloud — **not** FortiRecorder. For details, see [Managed by cloud](#).

If you have many cameras, it may be useful to filter the list of cameras to focus on specific [statuses](#), vendors, models, firmware version, FortiCamera Cloud mode, or locations. To do this, from the *Configure View* drop-down list, select

Show and Hide Columns and then enable or disable each column. If you want the filter to persist for every time that you view the list of cameras, then from the *Configure View* drop-down list, select *Save View*.

To configure cameras

1. Go to *Camera > Configuration > Camera*.
2. Either:
 - double-click the row of a discovered camera, or
 - click *New* (to configure a camera that is not yet discovered yet)
3. Configure the following settings:

Setting Name	Description
Enable	Select this toggle to enable the FortiRecorder unit to communicate with this camera.  If a camera is disabled while you change its settings, or when it would normally be scheduled to begin continuous or motion detection recording, then FortiRecorder will not connect to the camera. This can break communications between them: if you reconfigure the camera's IP address while the camera is disabled, your FortiRecorder may later attempt to communicate with the camera at the new IP address or gateway, but the camera will still be using the old address or gateway. It can also cause cameras to become out-of-sync, because they will not receive time setting changes while disabled. To fix this, disable the camera definition, revert the settings, enable the camera definition again, then apply your changes while the camera definition is enabled.
Name	Type a name (such as front-door1) that can be referenced by other parts of the configuration. Do not use spaces or special characters. Maximum length is 35 characters.
Location	Optional. Type a description of the camera's physical location that can be used if the camera is hidden, in case it is forgotten or lost.
Tag	Enter a tag that you can use on FortiCentral to group or filter devices. Separate multiple tags with commas.

Setting Name	Description
Vendor	The vendor company and camera model. If you are configuring a discovered camera , this and other camera information was automatically retrieved. You do not need to configure it. To refresh the information, you can click <i>Camera detail</i> .
Model	If you are adding a new camera before it is connected or discovered, then you must configure these and other settings manually. For Fortinet FortiCam cameras, you must specify the models; for third-party cameras, you must specify the camera's login credentials (user name and password) so that FortiRecorder can connect to it.
Address mode	Select how the camera is connected to FortiRecorder in your deployment topology: • <i>Wired</i>: On the same (local) network or directly attached, through a Ethernet cable. • <i>Wireless</i>: On the same network, through Wi-Fi. This setting is not available on all camera models. • <i>VIP</i>: On a different (remote) network, through NAT and/or port forwarding, such as through the Internet or your office's WAN. To specify this connection, you must configure Address, (HTTPS) Port, and (RTSP) Port.
Address	If Address mode is <i>VIP</i> , then type either an: • IP address • fully qualified domain name (FQDN), such as <code>camera.example.com</code>, that Internet DNS servers can resolve into the above IP address that FortiRecorder will connect through for communications to the camera. This setting is available only when Address mode is <i>VIP</i> . See also Configuring NAT/port forwarding on your firewall/router on page 45 .
(HTTPS) Port	Enter the port number of configuration communications to the camera. If the VIP/NAT on the router or firewall does not do port forwarding or port translation, then keep this setting at its default value, 443. This setting is available only when Address mode is <i>VIP</i> .
(RTSP) Port	Enter the port number of video streaming commands (RTSP) to the camera, such as when beginning a continuous recording schedule. If the VIP/NAT on the router or firewall does not do port forwarding/translation, keep this setting at its default value, 554. This setting is available only when Address mode is <i>VIP</i> .
Transport type	Select the transport layer protocol for video streaming from the camera to FortiRecorder. By default, RTSP communications between the camera and FortiRecorder are transported over UDP. If your router or firewall requires it, you can instead use TCP, HTTP tunneling, or HTTPS (secure/encrypted) tunneling.

Setting Name	Description
Profile	Either click <i>New</i> or select the camera profile that indicates the recording schedule, video quality, and other settings that this camera will use. See Configuring camera profiles on page 60 .
Managed by cloud	Enable if this camera will be managed in a hybrid deployment with FortiCamera Cloud. You will configure many camera settings via FortiCamera Cloud — not FortiRecorder, except: • local network connection settings, including transport protocol between the camera and FortiRecorder • management via third-party ONVIF GUI or FortiRecorder • smart DNR settings • audio input settings • power frequency settings • status (enable/disable the camera, which disconnects it from FortiCamera Cloud) Cameras will also stream video through FortiRecorder to FortiCamera Cloud. If this is the first time that you are logging into FortiCamera Cloud, continue with the first login to FortiCamera Cloud. Otherwise continue with setup of organizations, sites, or cameras. To remove the camera from a hybrid deployment: 1. On FortiCamera Cloud, unclaim the camera. 2. On FortiRecorder, disable Managed by cloud. The camera should now be managed only by FortiRecorder, not FortiCamera Cloud.

4. If the camera supports Wi-Fi, and you want it to connect to FortiRecorder through a wireless router, expand the *Wifi* section and configure the following settings:

Setting Name	Description
Enable	Enable Wi-Fi on the camera. When enabled, these indicators appear: • <i>Status</i> • <i>Signal strength</i>
SSID	Enter the SSID of the Wi-Fi access point (AP) that the camera will connect to.
Security	Select the type of Wi-Fi encryption: • <i>None</i> • <i>WPA personal</i> • <i>WPA2 personal</i> • <i>WPA enterprise</i> • <i>WPA2 enterprise</i> When you select an encryption type, its related settings appear, such as: • <i>WPA encryption</i> (TKIP or AES) • <i>WPA username</i>

Setting Name	Description
	WPA password or WPA passphrase
	 To strengthen security, select WPA2 enterprise or personal. For details, see your FortiAP/FortiWifi or third-party product documentation.

5. Expand the *Network* section.

Click the *Wired* tab if the camera will use an Ethernet connection to the network; click the *Wireless* tab if the camera will use Wi-Fi.

Configure the following settings:

Setting Name	Description
Address mode	Select either: <i>DHCP</i> — Use a DHCP server to dynamically configure the camera's IP address and other network settings. See also Making reservations on your DHCP server on page 41 and Configuring the built-in DHCP server on page 41. <i>Static</i> — Manually configure the camera with a static private network IP address that you specify in Address. It will no longer use DHCP.
	Fortinet strongly recommends to either: - configure your cameras with a static IP address, or - configure your DHCP server with lease reservations (see also Making reservations on your DHCP server on page 41). Without reservations, the IP address provided by the DHCP server might appear to work initially, but later, when the DHCP lease expires, the DHCP server might change the IP address of the camera. DHCP servers do not notify FortiRecorder about the camera's new dynamic IP address. During this time, FortiRecorder will try to control the camera at its old IP address. This does not work. Connections with that camera will be broken and all video from that camera could be lost during that interruption. To fix this, create IP address reservations on your DHCP server and then update the camera's Address with its current IP address.
Address	Enter the IP address of the camera. This setting is available only if Address mode is <i>Static</i>.
Netmask	Enter the subnet mask of the camera. IPv4 and IPv6 subnet masks should be provided in dotted quad format. (For example, enter 255.255.255.0, not /24). This setting is available only if Address mode is <i>Static</i>.

Setting Name	Description
Gateway	Type the IP address of the next-hop router that will forward packets from the camera to destinations on other subnets, such as FortiRecorder or FortiCamera Cloud. For a direct Internet connection, this will be the router that forwards traffic towards the Internet, and could belong to your ISP. This setting is available only if <i>Address mode</i> is <i>Static</i> .
DNS1	Enter the IP address of a primary DNS server. This setting is available only if <i>Address mode</i> is <i>Static</i> .
DNS2	Enter the IP address of a secondary DNS server. This setting is available only if <i>Address mode</i> is <i>Static</i> .

6. Expand the following sections (available features vary by camera model) and configure their settings:

- [Management](#)
- [Light or Infrared](#)
- [Video](#)
- [Audio](#)
- [Pan / Tilt / Zoom / Focus](#)
- [Privacy Mask](#)
- [Detection](#)
- [Miscellaneous](#)
- [SD Card](#)
- [Scheduled Setting](#)

7. Click *Apply* and then *OK*.

If you selected the *Enabled* toggle, FortiRecorder now connects to the camera and configures it. While the dialog is still open, a progress indicator such as (*Configuring ... 12%*) appears under the preview image; otherwise the progress indicator appears in the *Status* column of the list of cameras.

After the camera receives the settings, in order to control the camera according to your selected schedules, FortiRecorder will periodically connect to the camera again. It will also keep video recordings sent by that camera from its IP address.

8. If you changed the *Address mode* setting or the *Wifi* and *Network* sections, now disconnect the temporary Ethernet connection between the discovered camera and FortiRecorder that you used during initial setup. Move the camera to the intended location on the Ethernet or Wi-Fi network.

9. To confirm that FortiRecorder can receive video from the camera at its new IP address, go to *Monitor > Video > Video*. (See [Viewing live video on page 128](#).)

If you cannot view the live video feed from that camera, verify that:

- Other video software has not taken the RTSP file type association. (Installing other video software later is a common cause of changes to media file type associations.)
- A route exists to the camera's new IP address and, if applicable, its external NAT/virtual IP address. To confirm, go to *Dashboard > Console* and enter the command:

```
execute ping <camera_ipv4>
```

 where <camera_ipv4> is the camera's IP address or external NAT/virtual IP address. If you receive messages such as *Timeout...*, to locate the point of failure on the network, enter the command:

```
execute traceroute <camera_ipv4>
```

- Firewalls and routers, if any, allow both RTSP and RTCP components of the RTP streaming video protocol between FortiRecorder and the camera and between your computer and FortiRecorder.
 - Web proxies or firewalls, if any, support streaming video
- If you did not discover the camera but instead manually configured FortiRecorder with the camera's IP address, confirm that the camera is actually located at that address

Management

If the camera is an ONVIF-compliant third-party camera, then the *Management* section appears. Expand it. For each category of the camera's settings (for example, *Video/Audio settings*), either:

- *Enable*: Use FortiRecorder to configure these settings.
- *Disable*: Use the third-party camera's native GUI to configure these settings.

Light or Infrared

If the camera supports infrared recording or LED lighting, expand the *Light or Infrared* section. Configure the following settings:

Setting Name	Description
Mode	At night or in the dark, some camera models can use infrared light to record a black-and-white image. This mode also removes a daylight filter for more sensitivity. Select either: • <i>off</i> — Disable. • <i>auto</i> — Automatically enable infrared mode at the darkness threshold.
LED	Infrared LEDs can help the camera to see in the darkness. Select either: • <i>off</i> — Disable. Select this option if the camera is behind a window (glass reflects light, which can effectively blind the camera), or if enough ambient lighting is always available and therefore the infrared LED is not required. • <i>auto</i> — Automatically activate the infrared LED at the darkness threshold.
Enable threshold	Enter the light level that specifies when infrared mode and infrared LEDs can automatically activate.
Disable threshold	Enter the light level that specifies when infrared mode and infrared LEDs can automatically deactivate.
Threshold time	Enter the amount of time in seconds after the threshold is reached that the camera waits to automatically activate or deactivate infrared mode. Wait time helps to avoid accidentally frequently enabling or disabling infrared mode. This can occur if the camera is near a blinking light (for example, passing cars, flashing advertisement signs, water reflections, tree shade, or holiday decorations).
Current light level	Displays the light level that the camera currently detects (red line), compared with the enable (orange line) and disable threshold (blue line).
Refresh	Click to refresh <i>Current light level</i> .

Video

Expand the *Video* section. Configure the following settings:

Setting Name	Description
Orientation	Select the relative position of the camera: • <i>Normal</i> — Regular viewing angle and position. • <i>Vertical Flip</i> — The camera is positioned on a ceiling and the preview image appears upside down. • <i>Horizontal Flip</i> — The camera is positioned viewing a mirror or on a ceiling and the preview image appears reversed left to right. • <i>Rotate 90/180/270</i> — The camera is in a hallway or corridor. The image is in portrait format.
Video display	If the camera has a fisheye lens, select how to display video from the camera: • <i>Fisheye</i> — Use the raw, circle-shaped image. This option is suitable if de-warping is done on FortiCentral instead of FortiRecorder. • <i>Panorama</i> — De-warp the image into a rectangle-shaped, 360- or 180-degree panorama.  Due to distortion and cropping during fisheye dewarping, some movement that is not visible in panorama format could still trigger motion detection alarms. See Monitor Window on page 74.
Mount	Select the mount type of the camera, either: • <i>Ceiling</i> • <i>Table</i> • <i>Wall</i>
Video aspect	Select the video resolution. Options vary by camera model, but can be: • <i>SD</i> • <i>HD</i>
Overlay mode	Select which to display on the video image: • <i>Name</i> (camera name) • <i>Date & Time</i> • <i>Timezone</i>
Date format	If Overlay mode has <i>Date & Time</i> enabled, then select the order of the day (DD), month (MM), and year (YYYY) numbers in the timestamp overlay.
Brightness	Adjust the tonal range of an image. Low brightness increases the area of shadows; high brightness expands the area of highlights. Brightness adjustment is applied to video before encoding.
Contrast	Adjust the contrast to increase the separation between dark and light areas of the image, making shadows darker and highlights brighter.

Setting Name	Description
Saturation	Adjust to increase the separation between colors. Low saturation resembles a grayscale image.
Sharpness	Adjust to increase or decrease the edge contrast of the image. Too much sharpness creates grainy borders around the contours of the image.
DIS	Enable or disable digital image stabilization (DIS). For cameras that are mounted on an unstable surface, image stabilization reduces image shaking from various external sources, such as wind.
DNR	Select the type of digital noise reduction (DNR). Options vary by camera model, but can be: • <i>Off</i> • <i>2dnr</i> • <i>3dnr</i> This feature smooths the image and suppresses small noise that causes image graininess in low lighting.
DNR level	If you enabled <i>DNR</i> , then select how might DNR to apply.
Smart DNR	Select either <i>On</i> or <i>Off</i>. Smart DNR saves bandwidth by focusing on the moving parts of a camera's feed. It is only available on FortiCam-FD50 and FB50 models.
Exposure mode	Select whether to automatically optimize the exposure for the camera location. Options vary by camera model, but can be: • <i>Indoor</i> • <i>Outdoor</i> • <i>Manual</i>
Max gain	If <i>Exposure mode</i> is <i>Manual</i>, select the amount of exposure gain: • <i>Off</i> • <i>1</i> • <i>2</i> • <i>3</i> Exposure is the amount of light which reaches your camera sensor. It determines how light, dark, and color saturated your image appears. Gain can amplify the light from a fast exposure so that lighting appears more normal. If the gain is too much, however, then the image is grainy and noisy.
Max exposure time	If <i>Exposure mode</i> is <i>Manual</i>, select the shutter speed, such as <i>1/4</i> or <i>1/10000</i>. If the shutter speed is too slow, the image is blurry and overexposed (bright). If the shutter speed is too fast, then the image is underexposed and dark.
Digital WDR	Select whether or not to apply WDR digitally, and how many exposures to merge. Options vary by model, but can be: • <i>Off</i> • <i>On</i>

Setting Name	Description
	• 1 • 2 • 3 If the camera model supports wide dynamic range (WDR), enable it if there is intense backlight in the camera view. WDR balances images that have high contrast between light and dark, such as a person standing in front of a window during the day. The camera takes two images with different exposure (one optimized for the extreme light, and the other for the extreme dark) and merges them into one image.
Shutter WDR	Select whether or not to apply WDR, and how many exposures to merge. Options vary by model, but can be: • <i>Off</i> • <i>On</i> • <i>Auto</i> • 1 • 2
Power frequency	Select the AC frequency of the power line (main) in hertz (Hz). AC frequency varies by geographic region. Select the frequency that matches the region where the camera is located.
Media profile	Select which ONVIF media profile on the camera to use. Options vary by camera model. This option is only available on third-party ONVIF compatible cameras.

Audio

Expand the *Audio* section. Configure the following settings:

Setting Name	Description
Input level Output level	Adjust to change the strength of both the input and output level of the audio signal.
Codec	Select the audio codec.
Bitrate	Enter the amount of information to record in bits per second (bps).
Sample rate	Enter the number of times per second to measure sound in hertz (Hz). Greater bitrate and sample rate increases file size and disk usage, but gives better quality audio.

Pan / Tilt / Zoom / Focus

Expand the *Pan / Tilt / Zoom / Focus* (PTZ) section. Configure the following settings:

Setting Name	Description
Auto focus (Full or Semi)	Automatic focus improves the sharpness of the image with minimal input from the user.
Manual focus	Adjust the focus of the camera manually and determine how fast the focus should change, and then click the + and - buttons.
Zoom	Select the optical zoom value.
Digital zoom	Once the maximum optical zoom is reached, digital zoom allows the camera to view a larger image of the subject closer by digitally zooming.
	 Unlike optical zoom, increased digital zoom cannot record better detail. It only increases the size of details that are seen with optical zoom. If you need better detail, and optical zoom is at its maximum, put the camera closer to the details that you need to record.

Privacy Mask

Expand the *Privacy Mask* section. If you want to omit an area of the image from recording (for example, for privacy reasons, perhaps you want to mask the area where an employee sits), then click the plus sign beside *Mask Window* and adjust the rectangle size. To add another mask, click the plus sign again.

Fisheye lens cameras such as the FortiCam FE120B can also be viewed in a [panorama format](#), with dewarping applied. For accuracy and simplicity, when you draw a privacy mask or motion detection area, the snapshot will still be in the original fisheye format. This is because when the camera dewarps video into panorama format, the snapshot image, privacy mask, and motion detection area are also distorted to compensate for the fisheye lens, and would not be rectangles anymore.

Snapshot images are from the live video stream, not the recording stream.

Detection

Expand the *Detection* section.

All FortiCam cameras can detect motion. Motion and [other detections](#) can be used to trigger video clip recordings. Some cameras record these clips and then send them to FortiRecorder. In this case, the length and time frame varies by the camera and settings. The advantage to motion detection is that the camera only records when motion is detected. Other cameras stream continuously to FortiRecorder, and only notify it about the motion detection event. Then FortiRecorder either copies a video clip from part of the video stream and saves it, or simply marks the section of the continuous recording with the time range when motion was detected. These detections ("alarms") can be used to [trigger notification emails and text messages](#).

Some camera models can also use other inputs to trigger events and video clip recording: audio noise, tamper detection, passive infrared sensors, and more.



To detect slower movement, distant objects, or smaller objects, either:

- reduce the motion detection area ([Monitor Window](#)) so that most of it senses change when an object moves
- increase [Sensitivity](#) (or [Audio Sensitivity](#) etc.)
- reduce [Window <number> Item Size](#)
- increase [Zoom](#) or put the camera closer to moving objects so that they are more of the field of view

To reduce accidental detections of background noise, distant traffic, or small objects, do the opposite.

Configure the following settings:

Setting Name	Description
Monitor Window	Click the + (plus) button to add a rectangle to the video. The rectangle defines the area of the video that can trigger motion detection. Drag its edges and corners if you want to trigger motion detection using only a part of the video. For example, you may want to ignore street traffic and only detect when people and vehicles enter your property. Fisheye lens cameras such as the FortiCam FE120B can also be viewed in a panorama format, with dewarping applied. For accuracy and simplicity, when you draw a privacy mask or motion detection area, the snapshot will still be in the original fisheye format. This is because when the camera dewarps video into panorama format, the snapshot image, privacy mask, and motion detection area are also distorted to compensate for the fisheye lens, and would not be rectangles anymore.  Due to distortion and cropping during fisheye dewarping, some movement that is not visible in panorama format could still trigger motion detection alarms. Snapshot images are from the live video stream, not the recording stream.
Sensitivity	Specify how sensitive, in percentage, motion detection is to pixels that change between video frames. This threshold distinguishes between a moving object and the still background.
Window <number> Item Size	Specify the minimum size of objects, in percentage of changed pixels in the motion detection area (Monitor Window), that will trigger motion detection. You can also enable or disable <i>Person</i> and <i>Vehicle</i> for each area.
Audio Sensitivity	Specify the audio sensitivity level that will trigger a detection.
PIR Sensitivity	Adjust the sensitivity of the electronic sensor that measures passive infrared (PIR) light to detect motion.
Person Sensitivity	Optional. Individually adjust the sensitivity of matching for detecting people. This affects visual search results if the camera is in a hybrid deployment with FortiCamera Cloud.

Setting Name	Description
Vehicle Sensitivity	Optional. Individually adjust the sensitivity of matching for detecting vehicles. This affects visual search results if the camera is in a hybrid deployment with FortiCamera Cloud.
Tamper Sensitivity	Specify the tamper sensitivity level that will trigger a detection.
Digital input Digital output	Enter the voltage pattern or <i>Open/Closed</i> state from DIDO connectors or ONVIF digital inputs that will trigger a detection alarm. For details, see Using DIDO terminal connectors on FortiCam MB13 cameras on page 76 .
Pre-Alarm (sec)	Specify the amount of time in seconds that the camera must continuously sense an event in order to trigger a detection. Motion detection video clips include video from this amount of time before the event.
Post-Alarm (sec)	Specify the minimum amount of time in seconds that must elapse after detection before another detection can occur (a cool-down period). Motion detection video clips include video from this amount of time after the event.

Miscellaneous

Expand the *Miscellaneous* section. Configure the following settings:

Setting Name	Description
Privacy button	Some camera models such as FortiCam MB13 have a privacy button on it. If enabled, you can press the privacy button on the camera to pause and resume video and audio monitoring. To enable the functionality of the privacy button on the camera, select <i>Privacy button</i>. To disable the functionality of the privacy button on the camera, clear the Privacy button checkbox.
Status LEDs	Most cameras have LED indicators (for details, see the LED description section in the camera's QuickStart Guide). If you want to avoid showing whether the camera is on or off, you can use this setting to disable the LEDs.
Move home	For camera models that support pan, tilt, and zoom (PTZ) controls, you can specify when the camera should stop PTZ and reset its aim to the home position.

SD Card

Expand the *SD Card* section. Configure the following settings:

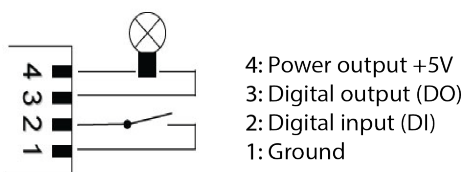
Setting Name	Description
Enable storage on camera SD card	Enable or disable the recording to the camera's internal SD card ("edge recording"). If the disk is full, the oldest recordings are overwritten. See also Store on .
Network failure	Enable or disable the camera's ability to detect network connection failure by periodically pinging FortiRecorder. If the network connection is disrupted, the camera will begin recording to the SD card. This is only supported by some camera models, such as FortiCam FE120B.
Format	Click this button to format the SD card on the camera. This is only supported by some camera models, such as FortiCam FE120B.
 Back up all required files before you format the disk. Formatting the disk will delete all files stored on it. The files cannot be recovered.	

Scheduled Setting

Expand the *Scheduled Setting* section. Optionally, you can specify different camera settings, such as brightness, contrast, and DNR level, that the camera will use as different times. To do this, click *New* to select a schedule and specify which settings.

Using DIDO terminal connectors on FortiCam MB13 cameras

FortiCam MB13 (FCM-MB13) cameras have digital input and output (DIDO) terminal connectors. You can configure the digital input to trigger the camera to record a video clip. Optionally, you can also connect other devices to the digital output, such as a relay to turn on or turn off another device.



- 4: Power output +5V
- 3: Digital output
- 2: Digital input
- 1: Ground

To configure DIDO on FortiCam MB13 cameras

1. Go to *Camera > Configuration > Camera*, select the MB13 camera from the camera list and select *Edit*.
2. Expand the *Detection* section.
3. Configure the digital input and output settings.

The digital input can be configured to trigger when the signal is:

- *LOW* (ground)
- *HIGH* (+5V)
- *Rising* (transitioning from *LOW* to *HIGH*)
- *Falling* (transitioning from *HIGH* to *LOW*)

If it is not connected, the camera will see the digital input as *HIGH*.

The digital output can be configured to be either grounded or open when triggered. When not triggered, it will be in the opposite state.

For example, if opening a door causes a sensor switch to open, then the switch could be wired between DI and ground. DI will be grounded (*LOW*) while the door is closed and *HIGH* when the door opens. DI could then be configured to trigger on the rising edge. When the door opens, DO would be triggered and a video clip will also be recorded.

Triggering on the rising or falling edge can be useful if the DI might be held in the triggered state for a long time. In the example above, if DI trigger was *HIGH* and the door was left open for a long time, then the camera would trigger repeatedly.

4. Go to *Camera > Configuration > Camera Profile*. When you create a camera profile that uses a recording schedule, enable *Digital input*.

About camera statuses

On *Camera > Configuration > Camera*, the list of detected cameras includes a configuration summary and status information about each camera. The *Status* column has the following indications.

Status	Description
Active	The camera is configured and recently has successfully connected with FortiRecorder. To upgrade the camera's firmware, click the row to select the camera, then click <i>Upgrade</i>. See also Upgrading or downgrading camera firmware on page 55.  If a camera model is older and its end-of-support (EOS) date is soon, then when you upgrade FortiRecorder, the next firmware version may not support it anymore. An (EOS) mark indicates these models so that you can plan to replace them.
Inactive	The camera is configured, but FortiRecorder has not connected with the camera for some time, and its network connection status is unknown. The camera may be offline because it is shut down, disabled, or does not have a continuous recording schedule and has not recently been triggered to record by, for example, motion detection. To test the network connection, click the row to select the camera, then click <i>Verify</i>. To examine the recording schedule, click the row to select the camera, then click <i>View Schedule</i>. To examine motion detection settings, click the row to select the camera, then click <i>Edit</i>.

Status	Description
Configuring(30%)	A new configuration is being sent from FortiRecorder to the camera, and the progress indicator updates until done. The status should normally return to <i>Active</i> once the configuration update is complete.
DHCP Issue	The camera is configured, but it is configured to get its IP address from a DHCP server, and there is a problem with DHCP. See also Unauthorized DHCP clients or DHCP pool exhaustion on page 181 .
Duplicate IP	The camera is configured with the same IP address as another device on the network, and therefore network connections fail, including connections with FortiRecorder. To fix this problem, you can reset the camera to its factory default settings and then repeat setup to give it a unique IP address, and reconnect it to FortiRecorder. Alternatively, if the other device is not configured correctly or DHCP servers have an overlapping IP address range, you can fix that configuration instead. See also Resolving IP address conflicts on page 183.
Need FortiRecorder Update	The camera is newer and not supported by this older FortiRecorder version. To fix this problem, upgrade FortiRecorder. See Updating the firmware on page 49 .
Recording Issue	The camera should be recording according to its schedule , but FortiRecorder has detected that it is not.
Not Configured	The camera has been discovered, but not yet configured. To configure the camera, click the row to select the camera, then click <i>Configure</i>. See also Configuring cameras on page 63. Alternatively, if this camera is replacing an old or broken camera, instead see Replacing cameras on page 20.

More system settings

After completing basic [initial setup](#), optionally, you can add more administrator or user accounts.

For more complex deployments, many settings for features such as network file storage, email notifications, and single sign-on (SSO) integration can also be configured.

Grouping cameras

After you have [configured the cameras](#), you can group them by physical location, model, etc. Groups can be referenced in other parts of the configuration.

To configure camera groups

1. Go to *Camera > Configuration > Camera Group*.
2. Click *New*.
3. Enter the name for the group.
4. Select the cameras you want to add to the group and then click the right arrow button (>>).
5. Click *Create*.
6. To use the camera group, select it in another part of the configuration, such as device access controls (see [Configuring device access control on page 84](#)).

Configuring user and administrator accounts

In its factory default configuration, FortiRecorder has one user account, named *admin*. However most deployments require more logins for other system administrators and users such as security guards.

Best practice is to create a separate user account for each person, and follow the principle of least privilege: only grant administrator-level access if the person's role requires it. This reduces the risk of accidents and malicious insiders. For example, IT personnel need logins with administrator permissions to do their job, but finance personnel usually do not. As a result, you would assign different profiles to those users. You must also deactivate a user account if that person leaves the organization, and create new accounts for new employees. Best practice is for larger organizations to do this centrally with a remote authentication server such as FortiAuthenticator, Microsoft Active Directory, or Red Hat Identity Management, instead of individually on each server, each FortiRecorder, etc. This saves time and gives consistent access control and password management.

User accounts on FortiRecorder have privileges that are determined by their assigned profile.

To configure an administrator or user account

1. Go to *System > Administrator > Administrator*.
2. Click *New*.
3. Expand the *Preference* section.
Configure the following settings:

Setting Name	Description
Username	Type a unique name for the account, such as <code>jdoe</code>, that can be referenced in other parts of the configuration. Do not use spaces or special characters. The maximum length is 35 characters.  This is the entire user name that the person must enter when logging in to the CLI or GUI. Depending on Authentication, your external authentication server may require that you enter both the user name and the domain part, such as <code>guard@example.com</code>.
Trusted hosts	Type the IP address and netmask from which the account is allowed to log in to the FortiRecorder appliance. You can specify up to 10 trusted network areas. Each area can be a single computer, a whole subnet, or a mixture. To allow login attempts from any IP address, enter: <code>0.0.0.0/0</code> To allow logins only from one specific computer, enter its IP address and a 32-bit netmask, such as: <code>172.168.1.50/32</code>  If you configure trusted hosts, do so for all accounts. Failure to do so means that all accounts are still exposed to the risk of brute force login attacks. This is because if you leave even one account unrestricted (allow connections from <code>0.0.0.0/0</code>), the FortiRecorder appliance must allow login attempts on all network interfaces where remote administrative protocols are enabled, and wait until after a login attempt has been received in order to check that user name's trusted hosts list.  For improved security, for each administrator, restrict their trusted host address to one IP addresses: the computer that they will use to log on. If you allow login from the Internet, set a longer and more complex <i>Password</i>, and enable only secure administrative access protocols (HTTPS and SSH) to minimize the security risk. For information on administrative access protocols, see Configuring network interfaces on page 34.
Admin profile	Select a profile that matches the permissions that you want the user to have. Either click the <i>New</i> button to create a new profile, or select an existing profile from the dropdown menu. For more information, see Configuring administrator profiles on page 82.

Setting Name	Description
Access mode	Select the FortiRecorder access methods that this account is allowed to use: • <i>GUI</i> — Web browser connections via HTTP or HTTPS. • <i>CLI</i> — Command line connections via SSH or Telnet. • <i>REST API</i> — REST API requests via HTTP or HTTPS. See the REST API Reference. Also select which network interfaces can receive these connections. See Configuring network interfaces on page 34.
Access control	Select a profile that matches the camera permissions that you want the user to have. Either click the <i>New</i> button to create a new profile, or select an existing profile from the dropdown list. See also Configuring device access control on page 84. This field is available only if <i>Admin profile</i> is not <i>SuperAdminProfile</i>. (Root administrator accounts have full privileges.)
Authentication	Select an authentication type: • <i>Local</i> — Authenticate using an account whose name, password, and other settings are stored locally, in your FortiRecorder appliance's configuration. • <i>RADIUS</i> — Authenticate by querying the remote RADIUS server that stores the account's name and password. Also configure <i>RADIUS profile</i> and <i>Check permission attribute on RADIUS server</i>. See Configuring RADIUS authentication on page 85. • <i>RADIUS+Local</i> — Authenticate either by querying the remote RADIUS server that stores the account's name and password, or by querying the accounts stored locally, in the FortiRecorder appliance's configuration. Also configure <i>RADIUS profile</i> and <i>Check permission attribute on RADIUS server</i>. • <i>LDAP</i> — Authenticate by querying a remote LDAP server that stores the account's name and password. See Configuring LDAP authentication on page 86. • <i>Single Sign On</i> — Authenticate by querying a SAML SSO IdP server such as FortiAuthenticator or Ping Identity. See Configuring single sign-on (SSO) authentication on page 89.
Password and Confirm password	Enter a password for the account. This field is available only when <i>Authentication</i> is <i>Local</i> or <i>RADIUS + Local</i>. To require strong passwords, see Configuring the public port numbers and domain name on page 46.
Preference	
Display name	Enter a display name for the recipient, such as FortiRecorder admin.
Email address	Enter the person's email address or an email alias, such as all-admins@example.com, that will receive snapshot notifications, if any, sent by FortiRecorder.

Setting Name	Description
Theme	Select this administrator account's preference for the initial GUI color scheme or click <i>Use Current</i> to choose the theme currently in effect for your own GUI session. See also Customizing the theme on page 111 . The administrator may switch the theme at any time after he or she logs in by clicking <i>Next Theme</i> in the top right corner.
Notification	Select one of the notification methods: • <i>Email</i> • <i>SMS</i> • <i>Mobile app</i> (FortiCamera Mobile) This setting appears only if <i>Admin profile</i> is <i>SuperAdminProfile</i> .
Devices	FortiCamera Mobile app installations that are associated with this account.
SMS Provider Number	Select a text messaging service provider and then enter the user's mobile phone number. See also Configuring text message settings for notifications on page 98 .
QR code	When the user's account is created, FortiRecorder uses your specified email server (see Configuring email settings for notifications on page 96) to send them a QR code with an invitation to log in. The person can use the FortiRecorder Mobile app to scan the QR code. If they did not receive the email and you need to assist them, you can click either: • <i>Click to get</i>: Open the QR code image in a new browser tab or window so that you can copy or download it. • <i>Send to email</i>: Resend the QR code to the address in Email address.

Configuring administrator profiles

Profiles act as access controls that grant permissions to each user for accessing specific FortiRecorder features.

For example, you might create a profile for administrators that grants access to all functions, and a profile for security guards that only grants access to view and operate the cameras.

To configure an administrator profile

1. Go to *System > Administrator > Admin Profile*.
2. Click *New*.
3. Enter a profile name.
4. Select the access privileges. Profiles can have read-only, read-write, or no access rights to the following categories:

Access Control	Description of scope
System access	System login and network settings of FortiRecorder: • <i>Dashboard > Console</i>

Access Control	Description of scope
	• <i>Monitor > Security > Blocked IP</i> • <i>System > Network</i> except traffic capture • <i>System > Administrator</i> • <i>System > Configuration > Options</i> • <i>System > Authentication</i> • <i>System > Certificate</i> • <i>Security</i>
System status	• <i>Dashboard > Status</i>, except for the <i>Camera Status</i> and <i>Face Recognition Information</i> widgets
System configuration	Miscellaneous system settings and statuses, such as: • <i>FortiView > Sessions</i> • <i>Monitor > Log</i> • <i>Monitor > DHCP Status</i> • <i>System > Network > Traffic Capture</i> • <i>System > Configuration</i> except <i>System > Configuration > Options</i> • <i>System > Customization</i> • <i>System > Storage</i> • <i>Schedule</i> • <i>Log & Alert</i>
System maintenance	• <i>System > Maintenance</i> • <i>Dashboard > Status</i> (only widgets with license file uploads, configuration backups, and FortiRecorder firmware upgrades)
Camera configuration	• <i>Monitor > Event</i>, including log messages from ACS devices • <i>Camera > Configuration</i>, including camera firmware upgrades
Camera status	• <i>Dashboard > Status</i> (only the <i>Camera Status</i> widget, which shows the connection and recording status) • <i>FortiView > Camera Statistics</i> (bandwidth usage, transmission errors, and more; see Monitoring camera statistics on page 122)
Camera live view	• <i>Monitor > Video</i> Live video stream of selected cameras. <i>Read-Write</i> allows annotation of the video. See also Viewing live video on page 128.
Video playback	• <i>Monitor > Event > Event</i> • <i>Monitor > Event > Event List</i> Playing the previously recorded video of selected cameras, and viewing ACS events on the video timeline. <i>Read-Write</i> allows downloads of recordings. See also Viewing previously recorded video on page 129.
Camera analytics	• <i>Monitor > Face Recognition</i> • <i>Analytics</i> • <i>Face Recognition</i> See also Face recognition on page 145 and Analytics on page 143.

Access Control	Description of scope
Camera notifications	• <i>Monitor > Camera Notifications</i> • <i>Camera > Notification</i> See also Configuring notification triggers on page 105.
Camera services	• <i>Service</i> See also Configuring video services on page 155.
Camera ACS service	• <i>Monitor > ACS</i> • <i>ACS</i> See also Integrating with an ACS on page 153.

5. Click *Create*.
6. To use the profile, select it when configuring a user account. For details, see [Configuring user and administrator accounts on page 79](#).

Configuring device access control

Access control determines permissions for when and which camera groups the users are allowed to access.

To configure access control

1. Go to *System > Administrator > Access Control*.
2. Click *New*.
3. Configure the following settings:

Setting Name	Description
Name	Type a unique name for the device access control rule.
Camera Group List	To include cameras in the policy, select their name and then click the >> (right arrow) button to move them into the column on the right. See also Grouping cameras on page 79 .
Access	Click <i>New</i> to add a new policy to the rule, or double-click an existing rule to edit it. Then enter: • <i>Name</i>: Select the name of an existing schedule, or click the + (plus) button to add a new schedule. See also Configuring a schedule on page 141. • <i>Access type</i>: Select either <i>Allow</i> or <i>Deny</i>. If the user tries to access the camera when the schedule denies it, then an error message displays: Access not permitted at this time.

4. To use the profile, select it when configuring a user account. For details, see [Configuring user and administrator accounts on page 79](#).

Configuring remote authentication

To authenticate users and administrators, FortiRecorder can connect with FortiAuthenticator or a remote authentication server such as Microsoft Active Directory, Red Hat Identity Management, or Ping Identity, via LDAP, RADIUS, or SAML SSO.

Configuring RADIUS authentication

If your users must log in to a RADIUS server, then configure a RADIUS profile that defines how FortiRecorder sends authentication queries to the RADIUS server.

To configure a RADIUS query

1. Go to *System > Authentication > RADIUS*.
2. Click *New*.
3. Configure the following settings:

Setting Name	Description
Profile name	Enter a unique name (such as RADIUS-query1) that can be referenced by other parts of the configuration. Do not use spaces or special characters. The maximum length is 35 characters.
Server name/IP	Enter the fully qualified domain name (FQDN) or IP address of the RADIUS server that will be queried when an account referencing this profile attempts to authenticate.
Server port	Enter the port number on which the authentication server listens for queries. The IANA standard port number for RADIUS is 1812.
Transport protocol	Select which authentication method is used by the RADIUS server: • <i>Default Authentication Scheme</i>: Negotiate automatically by preferring password authentication, Microsoft challenge handshake V2, and then challenge handshake, in that order. • <i>Password Authentication</i> • <i>Challenge Handshake Authentication (CHAP)</i> • <i>Microsoft Challenge Handshake Authentication (CHAP)</i> • <i>Microsoft Challenge Handshake Authentication V2 (CHAP version 2)</i>
NAS IP/Called station ID	Type the NAS IP address or Called Station ID (for more information about RADIUS Attribute 31, see RFC 2548 Microsoft Vendor-specific RADIUS Attributes). If you do not enter an IP address, the IP address of the FortiRecorder network interface used to communicate with the RADIUS server will be applied.
Server secret	Type the secret required by the RADIUS server. It must be the same as the secret that is configured on the RADIUS server.

Setting Name	Description
Server requires domain	Enable if the authentication server requires that users authenticate using their full email address (such as user1@example.com) and not just the user name (such as user1).
Transport protocol	Select the protocol that the authentication server uses: • TLS: TCP connection over TLS 12 for secure RADIUS (also called RadSec). Currently mutual authentication is not supported: FortiRecorder validates the RADIUS server's certificate, but does not send its own local certificate. Therefore the RADIUS server must not require client certificate validation. • TCP: Reliable transport of queries via a TCP connection. • UDP: Queries sent via a UDP session. Caution: Do not select UDP or TCP if queries occur over untrusted networks such as the Internet. They are not secure connections, and do not provide encryption nor authentication of the server's identity. Attackers could use this to gain unauthorized access.
CA certificate	Select the name of the certificate authority (CA) certificate that will be used to validate the signature on the RADIUS server's certificate. For details, see Working with certificates on page 112 This setting is only available if the transport protocol is set to TLS.

4. Click *OK*.

To test the query, select this profile when configuring a user account, and then attempt to authenticate using that account's login credentials.

Configuring LDAP authentication

If your users must log in to a LDAP server, then configure a LDAP profile that defines how FortiRecorder sends authentication queries to the LDAP server.

To configure an LDAP query

1. Go to *System > Authentication > LDAP*.
2. Click *New*.
3. Configure the following settings:

Setting Name	Description
Profile name	Type a unique name that can be referenced by other parts of the configuration. Do not use spaces or special characters. The maximum length is 35 characters.
Server name/IP	Type the fully qualified domain name (FQDN) or IP address of the LDAP server (for example, Microsoft Active Directory) that will be queried when an account referencing this profile attempts to authenticate.

Setting Name	Description
Fallback server name/IP	Type the fully qualified domain name (FQDN) or IP address of a secondary LDAP or Active Directory server, if any, that can be queried if the primary server fails to respond according to the threshold configured in <i>Timeout</i> .
Port	Type the port number on which the authentication server listens for queries. The IANA standard port number for LDAP is 389. LDAPS (SSL/TLS-secured LDAP) is 636.
Use secure connection	If your directory server uses SSL/TLS to encrypt query connections, select it then upload the certificate of the CA that signed the LDAP server's certificate (see Uploading trusted CAs' certificates on page 117).
Base DN	Enter the distinguished name (DN) of the part of the LDAP directory tree within which FortiRecorder will search for user objects, such as: <code>ou=People,dc=example,dc=com</code> User objects should be child nodes of this location.
Bind DN	Enter the bind DN, such as: <code>cn=FortiRecorderA,dc=example,dc=com</code> of an LDAP user account with permissions to query the Base DN. Leave this field blank if you have enabled Allow unauthenticated bind.
Bind password	Enter the password of the <i>Bind DN</i>. Click <i>Browse</i> to locate the LDAP directory from the location that you specified in <i>Base DN</i>, or, if you have not yet entered a <i>Base DN</i>, beginning from the root of the LDAP directory tree. Browsing the LDAP tree can be useful if you need to find your <i>Base DN</i>, or can't remember the attribute names. Before using, first configure <i>Server name/IP</i>, <i>Use secure connection</i>, <i>Bind DN</i>, <i>Bind password</i>, and then click <i>Create</i> or <i>OK</i>. These fields provide minimum information required to establish the directory browsing connection.
LDAP user query	Enter an LDAP query filter that selects a set of user objects from the LDAP directory. The query string filters the result set, and should be based upon any attributes that are common to all user objects but also exclude non-user objects. For example, if user objects in your directory have two distinguishing characteristics, their <code>objectClass</code> and <code>mail</code> attributes, the query filter might be: <code>(& (objectClass=inetOrgPerson) (mail=\$m))</code> where <code>\$m</code> is the FortiRecorder variable for a user's email address. This option is pre-configured and read-only if <i>Schema</i> is not <i>User Defined</i>.

Setting Name	Description
	For details on query syntax, refer to any standard LDAP query filter reference manual.
Scope	Select which level of depth to query, starting from <i>Base DN</i>. • <i>One level</i> — Query only the one level directly below the <i>Base DN</i> in the LDAP directory tree. • <i>Subtree</i> — Query recursively all levels below the <i>Base DN</i> in the LDAP directory tree.
Derefer	Select when, if ever, to dereference attributes whose values are references. • <i>Never</i> — Do not dereference. • <i>Always</i> — Always dereference. • <i>Search</i> — Dereference only when searching. • <i>Find</i> — Dereference only when finding the base search object.
User Authentication Options	Select how, if the query requires authentication, the FortiRecorder appliance will form the bind DN. The default setting is the third option: Search user and try bind DN. • <i>Try UPN or email address as bind DN</i> — Select to form the user's bind DN by prepending the user name portion of the email address (\$u) to the <i>User Principle Name</i> (UPN, such as example.com). By default, the FortiRecorder appliance will use the mail domain as the UPN. If you want to use a UPN other than the mail domain, enter that UPN in the field named <i>Alternative UPN suffix</i>. This can be useful if users authenticate with a domain other than the mail server's principal domain name. • <i>Try common name with base DN as bind DN</i> — Select to form the user's bind DN by establishing a common name to the base DN. Also enter the name of the user objects' common name attribute, such as <i>cn</i> or <i>uid</i> into the field. • <i>Search user and try bind DN</i> — Select to form the user's bind DN by using the DN retrieved for that user by <i>User Query Options</i>.
Allow Access Control Attribute	Select this option to define the access control.
Allow Admin Profile Attribute	Select this option to define the administrator profile.
Notification Options	Select the <i>Allow notification attributes</i> option to enable notifications. FortiRecorder supports the following notifications: • <i>Email attribute</i>: This attribute specifies the user's email address for notifications. • <i>SMS profile attribute</i>: This attribute specifies which SMS profile the user will use. The SMS profile attribute must match the name of the profile configured in FortiRecorder. • <i>SMS number attribute</i>: This attribute specifies the user SMS number for notification. The number format must be the same as the number in the user entry settings. • <i>Method attribute</i>: This attribute specifies the method used to notify a user. The two valid entries are <i>email</i> and <i>sms</i>.

Setting Name	Description
	<i>Embedded email images attribute</i>: This attribute specifies whether images are included in email messages to the user. The two valid entries are yes and no.
Timeout	Type the number of seconds that the FortiRecorder appliance will wait for a reply to the query before assuming that the primary LDAP server has failed, and will therefore query the secondary LDAP server. The default value is 20.
Protocol version	Select the LDAP protocol version (either 2 or 3) used by the LDAP server.
Allow unauthenticated bind	Enable to allow unauthenticated bind.
Enable cache	Enable to cache LDAP query results. Caching LDAP queries can introduce a delay between when you update LDAP directory information and when the FortiRecorder appliance begins using that new information, but also has the benefit of reducing the amount of LDAP network traffic associated with frequent queries for information that does not change frequently. If this option is enabled but queries are not being cached, inspect the value of TTL. Entering a TTL value of 0 effectively disables caching.
TTL	Enter the amount of time, in minutes, that the FortiRecorder unit will cache query results. After the TTL has elapsed, cached results expire, and any subsequent request for that information causes the FortiRecorder appliance to query the LDAP server, refreshing the cache. The default TTL value is 1440 minutes (one day). The maximum value is 10080 minutes (one week). Entering a value of 0 effectively disables caching. This option is applicable only if is enabled.

4. Click *Create*.

To test the query, configure an account where this profile is used, then attempt to authenticate using that account's credentials.

Alternatively, click the row to select the query, click *Edit*, then click *Test LDAP Query*. From the *Select query type* drop-down list, select *Authentication*, then complete the *Password* and *Mail address* fields that appear. Click *Test*. After a few seconds, a dialog should appear to indicate that either the query succeeded, or the reason for its failure, such as a network connectivity error.

Configuring single sign-on (SSO) authentication

Single sign-on (SSO) can save time for users by reducing the number of times that they must log in when using many network services. Once they log in, they can access all other authorized services that use SSO until their session expires.

In Security Assertion Markup Language (SAML) SSO, you must configure both of these to connect and authenticate with each other:

- FortiRecorder, which is the service provider (SP)
- FortiAuthenticator or other remote authentication server, which is the identity provider (IdP)

In addition to SSO, FortiRecorder also supports single log off (SLO). When someone logs out of FortiRecorder, they will also be logged out of all services that use the same federated SSO authentication.

To configure FortiRecorder SSO with Ping Identity, see the [FortiRecorder Cookbook](#).

To configure SAML SSO

1. On the IdP server, download its IdP metadata XML.

Alternatively, copy the URL where FortiRecorder can download it.

2. If you are integrating with FortiAuthenticator or Ping Identity, then on FortiRecorder, use the CLI to enable Security Fabric and the default administrator account named `admin_sso`:

```
config system csf
    set status enable
end
config system admin
    edit admin_sso
        set status enable
    end
```

The `admin_sso` account acts like a wildcard, so that you do not need to configure all FortiRecorder accounts on the IdP too. The Security Fabric provides communication for this feature. See also [Connecting to the Security Fabric on page 91](#).

3. Go to *System > Customization > Single Sign On*.
4. Configure the following:

GUI Item	Description
Enabled	Enable or disable SSO.
Identity Provider (IDP) Metadata	Enter the IdP metadata. To do this, either: • Paste the metadata XML into the text area. • Click <i>Upload</i> and select a file that contains the XML. • Click <i>Retrieve from URL</i>, and then enter the URL where FortiRecorder can download the XML.

5. Click *Apply*.

Now FortiRecorder automatically generates its SP metadata, entity ID, and ACS URL. (You might need to navigate away from the tab and return in order for it to display.)

6. Copy the following:

GUI Item	Description
Entity ID	A globally unique identifier for FortiRecorder when it connects to the IdP, such as: <code>https://FortiRecorder.example.com/sp</code>
ACS URL	The URL where FortiRecorder will receive authentication responses from the IdP (the assertion consumer service (ACS)), such as: <code>https://FortiRecorder.example.com/sso/SAML2/POST</code>
Metadata URL	The URL where the IdP can download SP metadata XML from FortiRecorder, such as: <code>https://FortiRecorder.example.com/sso/Metadata</code>

7. On the IdP server:

- a. Paste the entity ID, SP metadata URL, and ACS URL from FortiRecorder.
 - b. Select to identify users by their email addresses attribute, and then enter the attribute object identifier (OID) that authentication requests from FortiRecorder use:
`urn:oid:0.9.2342.19200300.100.1.3`
 - c. Optionally, enable and configure multi-factor authentication (MFA).
 - d. If required, add the FortiRecorder unit's certificate to the list of trusted CAs ("trust store").
(Skip this step if your IdP already trusts the certificate, directly or indirectly, via a CA certificate signing chain.)
8. On FortiRecorder, go to *System > Administrator > Administrator*. For each administrator or user account that will use SAML SSO, set *Authentication* to *Single Sign On*.
- To test SSO, attempt to authenticate on FortiRecorder using one of those accounts, and then access another service that also uses SSO. If successful, the other service should not prompt you to log in.

Connecting to the Security Fabric

FortiRecorder can connect to an upstream FortiGate root and become an integrated cluster member of the Security Fabric. This allows FortiRecorder to display network and security information from across your other deployed Fortinet devices. The Security Fabric protocol with FortiOS (for compatible versions, see the Release Notes) also provides communications for other features, such as REST API connections with other Fortinet devices and [SSO integration with FortiAuthenticator](#).

Go to *System > Customization > Security Fabric* and enable the FortiRecorder to become a Security Fabric member. Then the FortiGate that is the root of the Security Fabric can connect to the FortiRecorder appliance.

Configuring data storage on the FortiRecorder

If you need to store video for longer periods of time, you can extend your FortiRecorder appliance's built-in storage.

Configuring local storage

To view the size, disk space usage, and status of the FortiRecorder disk(s) or RAID array, go to *System > Storage > Local Storage*.

Initially, your FortiRecorder appliance will store video data on its internal hard disk drive(s). By default, it will continue to do so, regardless of the video clip's age, until all available disk space is consumed. By storing files locally first, your FortiRecorder appliance's [system resources](#) are not continuously consumed by transferring video that might not be needed, nor by transferring them while it records (which is bandwidth-intensive). However you can configure your FortiRecorder appliance to either [delete or move older videos](#) to external storage.

Configuring RAID levels

FortiRecorder-400D model comes with two pre-installed hard drives in its four hard drive bays and supports software RAID. This means that you can add two more hard drives if required.

FortiRecorder-400F comes with one 4 TB hard drive. You can have one or more RAID arrays in the logical disk. For example, if you want redundancy you can have 4 TB + 4 TB drives and 8 TB + 8 TB drives, or with no redundancy you can keep the 4 TB drive and add two 8 TB drives.

Number of Installed Hard Disk Drives	Available RAID Levels	Default RAID Level
1	0	0
2	0, 1	0
3	0, 5	0
4	0, 5, 10	0

To configure RAID levels



Back up data on the hard drive before beginning this procedure. Changing the device's RAID level temporarily suspends all data processing and erases all data on the hard drive.

1. Connect to the CLI console.
2. Enter the following command:
`execute raidlevel <level_int>`
The FortiRecorder appliance changes the RAID level and reboots.

Recommended hard drive models and capacities

Use surveillance-grade rated models, such as Western Digital WD40PURX and Seagate ST4000VX000, with storage capacity between 2 to 4 TB.

If you are using old disks from another system (RAID or LVM), erase all metadata on the drives.

Adding a RAID disk

FortiRecorder-400F and some other models support multiple hard disk drives.

To add a disk to the RAID array

1. Remove the hard disk bay from the unit.
2. Install the hard disk in the bay.
3. Insert the bay into the unit.
4. Go to *System > Storage > Local Storage*.
5. Click *Refresh*.
The newly added disk will appear under *Drives*.
6. Add the disk to an array.
7. Click *Refresh* again. The new array will appear under RAID Arrays.
8. Select the new array, and adjust the portions you want to allocate to log and video storage.
9. Click *Add To Logical Disks*.

Replacing a RAID disk

When replacing a disk in the RAID array, the new disk must have the same or greater storage capacity than the existing disks in the array. If the new disk has a larger capacity than the other disks in the array, only the amount equal to the smallest hard disk will be used. For example, if the RAID has 400 GB disks, and you replace one with a 500 GB disk, to be consistent with the other disks, only 400 GB of the new disk will be used.

FortiRecorder units support hot swap; shutting down the unit during hard disk replacement is not required.

To replace a disk in the array

1. Go to *System > Storage > Local Storage*.
2. In the row corresponding to the hard disk that you want to replace (for example, p4), select the hard disk and click *Delete*.
3. The RAID controller removes the hard disk from the list.
4. Protect the FortiRecorder unit from static electricity by using measures such as applying an antistatic wrist strap.
5. Physically remove the hard disk that corresponds to the one you removed in the GUI from its drive bay.
6. Replace the hard disk with a new hard disk, inserting it into its drive bay.
7. Click *Refresh*.

The RAID controller will scan for available hard disks and should locate the new hard disk. Depending on the RAID level, the FortiRecorder unit may either automatically add the new hard disk to the RAID unit or allocate it as a spare that will be automatically added to the array if one of the hard disks in the array fails.

The FortiRecorder unit rebuilds the RAID array with the new hard disk. Time required varies by the size of the array.

Replacing all RAID disks

If you want to replace the pre-installed hard drives with your own on FortiRecorder and re-build the RAID array, follow these instructions.

To replace all disks in the array

1. [Back up the configuration](#).
Because the X.509 certificates used by SSL/TLS connections are stored on the hard drive(s), rebuilding the array with new disks removes those certificates. Certificates are included in the configuration file backup, however. After you install the new hard drives, restore the configuration.
(Skip this step if you do not use the factory certificates and can re-import your own custom certificates later.)
2. Shut down the FortiRecorder unit.
3. Remove the hard disks.
4. Install the new hard disks.
5. Boot up the system.
6. Enter the following CLI command to rebuild the disks:
`execute factoryreset disk`
This command will use the default RAID level based on the number of drives used. You can also use the following command to rebuild the disks with the specified RAID level. For the supported RAID levels, see [Configuring RAID levels on page 91](#).
`execute raidlevel <level_int>`
The FortiRecorder sets the RAID level and then reboots.

Configuring external storage

To extend your local storage, you can use an external USB storage device if your FortiRecorder model has USB ports.

To safeguard your surveillance video in the event that your FortiRecorder appliance is destroyed by fire, flood, intrusion, or other event that it is recording, configure your FortiRecorder appliance to store its video at a remote location, such as a branch office or cloud storage provider on the Internet.



Best practice is to connect cameras and other services (GUI, CLI, external file storage, etc.) on different network interfaces so that video streams have dedicated bandwidth. Live video streams may be lower quality or have choppy motion if cameras do not have constantly available bandwidth.

Tested and supported NFS servers

- Linux NAS
- FreeNAS
- Openfiler
- EMC VNXe3150 (version 2.4.2.21519(MR4 SP2))
- EMC Isilon S200 (OneFS 7.10.3)
- Windows Server 2016

Untested NFS servers

- Buffalo TeraStation
- Cisco Linksys NAS server
- Windows Server 2003 R2 and 2008

To configure external storage

1. Go to *System > Storage > External Storage*.
2. Enable external storage.
3. Expand the *Device* section.
4. Configure the following settings:

Setting Name	Description
Protocol	Select one of the following types of storage media: • <i>External USB</i>: External USB device. • <i>iSCSI Server</i>: An iSCSI (Internet Small Computer System Interface) server. • <i>NFS</i>: A network file system (NFS) server.
Maximum size	Specify the video disk space quota that is allowed to be stored on the external storage device. You can view the remote storage usage information on <i>Dashboard > Status</i> .
Username	The user name of the FortiRecorder unit's account on the iSCSI server. This option only appears if <i>iSCSI Server</i> is the selected protocol.

Setting Name	Description
Password	The password of the FortiRecorder unit's account on the iSCSI server. This option only appears if <i>iSCSI Server</i> is the selected protocol.
Hostname/IP Address	Type either the IP address or fully-qualified domain name (such as nas.example.com) of the iSCSI or NFS server. This option only appears if <i>iSCSI Server</i> or <i>NFS</i> is the selected protocol.
Port	Type the port number on which the server listens for connections. The default is 2049 for NFS and 3260 for iSCSI. This option only appears if <i>iSCSI Server</i> or <i>NFS</i> is the selected protocol.
Directory	Enter the path of the folder on the server, relative to the mount point or user's login directory, where the FortiRecorder appliance will store the data. Note: Do not use special characters such as a tilde (~). This will cause the storage to fail. This option only appears if NFS is the selected protocol.
Encryption key	The key used to encrypt data stored on the iSCSI server. Valid key lengths are between 6 and 64 single-byte characters. This option only appears if <i>iSCSI Server</i> is the selected protocol.
iSCSI ID	The iSCSI identifier in the format expected by the iSCSI server, such as an iSCSI Qualified Name (IQN), Extended Unique Identifier (EUI), or T11 Network Address Authority (NAA). This option only appears if <i>iSCSI Server</i> is the selected protocol.

5. Expand the *Status* section.

The *Status* section indicates if the iSCSI share was successfully mounted on the FortiRecorder unit's file system. This field appears only after you configure the iSCSI share and click *Apply*.

Status may take some time to appear if the iSCSI server is slow to respond. If a Not mounted message appears, then the iSCSI share was not successfully mounted. Verify that the iSCSI server is responding and the FortiRecorder unit has both read and write permissions on the iSCSI server.

6. Click *Apply*.



If the remote iSCSI device has not been formatted, before you can use it, you must format it with the following CLI command:
`execute storage format`

7. Go to *Camera > Configuration > Camera Profile*.

8. Select the camera profile used by cameras that should use remote storage, and then click *Edit*.

9. From *Storage Options*, select *Move*.

10. Click *Create*.

Configuring email settings for notifications

If you want FortiRecorder to send email for notifications, and you want to use your own email server to send them, then configure the settings that FortiRecorder will use to connect to your email server.



In factory default settings, the mail relay server is:

notification.fortinet.net

To configure notification email settings

1. Go to *System > Configuration > Mail Server Settings*.
2. Configure the following settings:

Setting Name	Description
Host name	Type the host name for the FortiRecorder appliance. The default host name is the FortiRecorder appliance's serial number. Maximum length is 35 characters. It can include US-ASCII letters, numbers, hyphens, and underscores, but not spaces and special characters (for example, ?). The host name is used in: • command prompt of the CLI • SNMP system name. See Configuring SNMP traps and queries on page 100. • notification email, when FortiRecorder identifies itself to the email server (SMTP HELO/EHLO). The <code>get system status</code> CLI command displays the full host name. If the host name is longer than 16 characters, the name may be truncated elsewhere and end with a tilde (~) to indicate that additional characters exist, but are not displayed. For example, if the host name is FortiRecorder1234567890, then the CLI prompt would be: <pre>FortiRecorder123~#</pre> Note: This hostname is not required to be a fully qualified domain name, such as <code>nvr.example.com</code>, that is globally resolvable by DNS servers on the Internet. The hostname could be used only on your local private network. For the hostname used with remote or public network access, instead see Public Access Host name.
Mail Server Use custom mail server	Enable if you want to use a mail server instead of the default provided by Fortinet (<code>notification.fortinet.net</code>). If you do not have your own email server, this may be the name of your ISP's SMTP relay, or a 3rd-party email server such as Yahoo! or Gmail.
Mail server name	Type the fully-qualified domain name (FQDN) of your SMTP server, such as <code>mail.example.com</code>. This setting appears only if Use custom mail server is enabled.

Setting Name	Description
Mail server port	Type the port number on which your email server or SMTP relay listens for connections. The default varies by whether you enable <i>Use SMTPS</i>: if disabled, it is port 25; if enabled, it is port 465. This setting appears only if <i>Use custom mail server</i> is enabled.
Use SMTPS	Enable to initiate TLS-secured connections to the email server if it supports SSL/TLS. When disabled, SMTP connections from the FortiRecorder appliance's built-in email client to the SMTP server will occur as clear text, unencrypted. This option must be enabled to initiate SMTPS-secured connections. This setting appears only if <i>Use custom mail server</i> is enabled.
Authentication status	Enable this setting if the mail relay requires SMTP authentication (ESMTP AUTH command). Then also configure <i>User name</i>, <i>Password</i>, and <i>Configuring email settings for notifications</i>.
User name	Type the name of the account, such as jdoe or fortirecorder@example.com, that FortiRecorder will use to log in to the SMTP server. This setting is available only if <i>Use custom mail server</i> and <i>Authentication status</i> are enabled.
Password	Type the password for the account on the SMTP server. This setting is available only if <i>Use custom mail server</i> and <i>Authentication status</i> are enabled.
Authentication type	Select one of the following authentication methods: <i>AUTO</i> — Automatically detect and use the most secure SMTP authentication type supported by the email server. <i>PLAIN</i> — Provides an unencrypted, scrambled password. <i>LOGIN</i> — Provides an unencrypted, scrambled password. <i>DIGEST-MD5</i> — Provides an encrypted MD5 hash of the password. <i>CRAM-MD5</i> — Provides an encrypted MD5 hash of the password, with hash replay prevention, combined with a challenge and response mechanism. This setting is available only if <i>Use custom mail server</i> and <i>Authentication status</i> are enabled.
Sender Display name	If you want to customize the display name in the emails sent by the FortiRecorder, type the name that will displayed by the email clients. By default, the display name is FortiRecorder.
Email address	Type the sender email address (From:) that will appear in the SMTP header. The default email address is noreply@fortirecorder.com.

3. Click *Apply*.

4. Click *OK*.

To verify that FortiRecorder can send email now, expand the *Test* section, enter your email address in *Mail Recipient*, and then click *Send*.



To prevent classification as spam, it usually helps if you add the [Email address](#) of FortiRecorder to your address book.

After configuring the SMTP server and the SMS service provider, configure the cameras and FortiRecorder with your notification criteria. See [Configuring notification triggers on page 105](#) and [Configuring alert email on page 161](#).

You can customize the templates used by email notifications. See [Customizing email templates on page 109](#).

Configuring text message settings for notifications

For FortiRecorder to send SMS text messages to users or administrators, you must specify at least one service provider integration that FortiRecorder can use to send text messages.

To configure FortiRecorder to send text messages

1. Go to *System > Configuration > SMS*.
2. Click *New*.
3. Configure the following settings:

Setting Name	Description
Name	Enter a unique name for the SMS provider settings.
Description	Enter a short description of the provider.
Service provider	Select either: • <i>Twilio</i>: The Twilio API. • <i>Custom</i>: Any text message service provider that accepts messages submitted via email or web API.

If you selected Twilio, configure the following settings:

Setting Name	Description
From number	Enter the sender phone number that the text messages will use.
Account SID	Enter the account or service plan ID provided by your service provider.
Auth token	Enter the authentication token, or API key, for the account with your service provider. This setting is automatically obscured while you enter it to protect the credentials from being seen by cameras or unauthorized persons.

Otherwise, in *Type*, select either:

- *SMTP* such as for email relays
- *HTTP* such as for REST APIs over HTTPS

If using HTTP/HTTPS, configure the following settings:

Setting Name	Description
HTTP URL	Enter the scheme, domain name, and URL of your service provider's API, such as: https://example.com/sendsms Caution: Use HTTPS if possible (not plain HTTP). Plain HTTP sends data in clear text (not secure and encrypted), and could be intercepted and read or modified by attackers. Notifications from FortiRecorder could contain sensitive information, including the password or API key.
HTTP method	Select which HTTP method the API requires, either GET or POST.
HTTP/S Parameters	For each parameter that your service provider accepts or requires: 1. Click <i>New</i>. 2. If the parameter is sensitive information (for example, an API key or password) and you want to obscure its value while you enter it, enable <i>Encrypt</i>. Caution: If <i>Encrypt</i> is turned off, verify that no cameras or persons can see your screen, which would compromise security. <i>Encrypt</i> hides the display only. For a secure connection, also use HTTPS in HTTP URL. 3. In <i>Attribute</i>, enter the name of the parameter. 4. In <i>Value</i>, enter the parameter's value. Instead of fixed text, you can use variables; see the SMTP setting variables and the example below. 5. Click <i>Create</i>.

For example, if your service provider requires API requests in the following format:

```
https://example.com:8080/sendsms?api_id=YOUR_ID&user=YOUR_USERNAME&to=+15555555555&text=YOUR_MESSAGE&password=YOUR_PASSWORD
```

then the settings might be:

HTTP URL	https://example.com:8080/sendsms	
HTTP method	Get	
HTTP/S Parameters	Attribute	Value
	api_id	YOUR_ID
	user	YOUR_USERNAME
	to	{{:country_code}}{{:mobile_number}}
	text	{{:message}}
	password	*****

If using SMTP, configure the following settings:

Setting Name	Description
Email to	Enter the recipient. Instead of entering a fixed recipient, you can use variables with the following tags: <code>{{:country_code}}</code> — Country code portion of the SMS number field in the user's configuration. <code>{{:mobile_number}}</code> — Phone number portion of the SMS number field in the user's configuration.
Email subject	Enter a subject line.
Email body	Enter the message body. Instead of entering a fixed body, you can use a variable with the <code>{{:message}}</code> tag.

4. Click *Create*.
5. To test your settings, double-click the settings to open them. Expand the *Test* section and in *Mobile number*, enter the telephone number for your mobile phone. Then click *Send*.
You should quickly receive a text message. If your phone does not show a notification about it, verify that the sender phone number is not blocked or flagged as a source of spam. Unknown senders' text messages may also be silent or sorted by category, depending on the mobile phone's preferences and OS version.
6. After configuring the text message service provider, select it in features that trigger notifications. See [Configuring notification triggers on page 105](#), [Configuring alert email on page 161](#), and [Configuring user and administrator accounts on page 79](#).
You can customize the templates used by text message notifications. See [Customizing email templates on page 109](#).

Configuring SNMP traps and queries

You can configure the FortiRecorder appliance's simple network management protocol (SNMP) agent to allow queries for system information and to send traps (alarms or event messages) to an SNMP manager. In this way you can use an SNMP manager to monitor the FortiRecorder appliance.

The FortiRecorder SNMP implementation is read-only. SNMP v1, v2c, and v3 compliant SNMP managers have read-only access to FortiRecorder system information and can receive FortiRecorder traps.

To configure SNMP traps and queries

1. On your SNMP manager:
 - Download the FortiRecorder management information blocks (MIBs) files from the [Fortinet Support website](#). Load the Fortinet proprietary and standard MIBs into your SNMP manager. For instructions, see the documentation for your SNMP manager.
 - Get the name of the community that the SNMP manager belongs to. If you use SNMPv3, also get the names of SNMP users that should have access to information from FortiRecorder.
2. On FortiRecorder, for the network interface that connects to the SNMP manager, enable SNMP access. See [Access: SNMP on page 36](#).
3. Go to *System > Configuration > SNMP*.
4. Expand the *SNMP System Information* section.

5. Configure the following settings:

Setting Name	Description
SNMP agent enable	Enable the SNMP service on the FortiRecorder unit .
Description	Optional. Type a comment about the FortiRecorder appliance. The description can be up to 35 characters long, and can contain only letters (a-z, A-Z), numbers, hyphens (-) and underscores (_).
Location	Type the physical location of the FortiRecorder appliance, such as f1oor2. The location can be up to 35 characters long, and can contain only letters (a-z, A-Z), numbers, hyphens (-) and underscores (_).
Contact	Enter contact information for the administrator or other person responsible for this FortiRecorder appliance. The contact information can be up to 35 characters long, and can contain only letters (a-z, A-Z), numbers, hyphens (-) and underscores (_).

6. Expand the *SNMP Threshold* section.

7. For each trap that occurs when a threshold is reached (*CPU Usage Threshold* etc.; see [Configuring an SNMP community on page 102](#) and [Configuring SNMP users on page 103](#)), configure the settings:

Setting Name	Description
Trigger	Enter the acceptable limit for resource usage. For example, you may want to monitor that FortiRecorder CPU usage remains under 80%, except for temporary spikes. You configure Trigger to be 80%, Threshold to 3, Sample Freq (s) to 30 seconds, and Sample Period (s) to 600 seconds (10 minutes). If CPU usage exceeds 80% temporarily, but then decreases again before the next measurement and remains under the limit during the 10 minute period, then FortiRecorder does not send an SNMP trap. During another period, if the limit is exceeded 3 or more times, then FortiRecorder sends a trap. Multiple traps occur if the limit is exceeded more than 3 times. See also Resource issues on page 174 .
Threshold	Enter the number of times that Trigger must be equaled or exceeded in order to reach the trap threshold.
Sample Period (s)	Enter the time period in seconds during which the FortiRecorder unit SNMP agent counts triggers. Note: Sample Period (s) must be greater than or equal to Sample Freq (s) .
Sample Freq (s)	Enter the interval in seconds between measurements of the limit. This is the maximum rate at which FortiRecorder sends traps.

8. Click **Apply**.

9. Add at least one SNMP manager ("host") that is allowed to query, and which hosts will receive traps. Depending on your SNMP version, you may also need to configure users. See [Configuring an SNMP community on page 102](#) and [Configuring SNMP users on page 103](#).

Configuring an SNMP community

By default, FortiRecorder belongs to the community named `public`. Your FortiRecorder appliance must belong to at least one community. The FortiRecorder appliance will not respond to SNMP managers whose queries do not contain a matching community name. Similarly, traps from the FortiRecorder appliance will include community name, and an SNMP manager may not accept the trap if its community name does not match.

You can add up to 16 communities. Each community can be configured differently to receive different traps. Each community can have up to 8 SNMP managers.

To add an SNMP community via the GUI

1. Go to *System > Configuration > SNMP*.
2. Enable SNMP access. For details, see [Configuring SNMP traps and queries on page 100](#).
3. Expand the *Community* section.
4. Either click *New* to add a community, or select a community and click *Edit*.
5. Configure the following settings:

Setting Name	Description
Name	Type the name of the SNMP community to which at least one SNMP manager belongs. Caution: For better security, change the default community name, and only enable SNMP on trusted networks. The default community name <code>public</code> is a popular, well-known default. Attackers will often try this name first, and SNMP v2c and older does not support authentication nor encryption.
Enable	Enable to send traps to and allow queries from this community's SNMP managers.
Community Hosts IP Address	Double-click the entry to edit it, or click <i>Create</i> to add an entry. Type the IP address and subnet mask of the SNMP managers in this community. Note: By default, there is one entry: <code>0.0.0.0/0</code> . You must add the IP address of at least one specific SNMP manager. If there are no other host IP entries, queries from all IP addresses will be accepted, but traps are effectively disabled because there is no specific destination. Caution: For better security, change the default of <code>0.0.0.0/0</code> , which includes all IP addresses. FortiRecorder sends security-sensitive traps, which should be sent only over a trusted network, and only to administrative devices.
Queries	Enable the SNMP v1 and/or v2c versions that you want FortiRecorder to accept for queries. Then in <i>Port</i> , enter the listening port on the FortiRecorder unit. See also Appendix: Port numbers on page 196 .
Traps	Enable the SNMP v1 and/or v2c versions that you want FortiRecorder to use to send traps. Then in <i>Local Port</i> , enter the source port number from which FortiRecorder sends traps, and in <i>Remote Port</i> , enter the destination port number (listening port number) on the SNMP managers.

Setting Name	Description
	See also Appendix: Port numbers on page 196 .
SNMP Event	Enable the types of SNMP traps that you want the FortiRecorder appliance to send to the SNMP managers in this community. For more information on supported traps and queries, see MIB support on page 105. Event types include: • <i>System Event</i> — FortiRecorder reboot, reload, upgrade, log disk formatting, video disk formatting, and errors about a read-only file system. • <i>RAID Event</i> — Local storage. • <i>Remote Storage Event</i> • <i>Interface IP Changed</i> • <i>Camera Event</i> — Enabling cameras, disabling, communication failure, recording failure, IP address change, and camera reboot. • <i>Notification</i> While most traps are sent each time an event occurs, the following events occur only when a threshold has been exceeded: • <i>CPU Usage Threshold</i> • <i>Memory Usage Threshold</i> • <i>Log Disk Usage Threshold</i> • <i>Video Disk Usage Threshold</i> To configure their thresholds, see Configuring SNMP traps and queries on page 100. Note: For events that don't have a configurable threshold, FortiRecorder examines the status at a regular interval. Therefore it may not always send a trap. For example, hardware status is examined every 60 seconds. Therefore if the power is off for a few seconds but returns before the next status check, no system event trap is sent.

6. Click OK.
7. To verify your SNMP configuration and network connectivity between your SNMP manager and your FortiRecorder appliance, test both traps and queries (assuming you have enabled both). Traps and queries typically occur on different port numbers, and therefore verifying one does not necessarily verify that the other is also functional. To test queries, from your SNMP manager, query the FortiRecorder appliance. To test traps, cause one of the events that should trigger a trap.

Configuring SNMP users

Similar to SNMP v1 and v2C, SNMP v3 also requires that you define SNMP managers. However it provides some better security features.

If your SNMP manager supports SNMP v3, you can use authentication to specify which of its user accounts is permitted to access information about your FortiRecorder appliance. This provides more control over who can access potentially sensitive system information. You can add up to 16 SNMP users.

SNMP v3 also provides better security by supporting privacy (encryption in transit).

To configure SNMPv3 access

1. Go to *System > Configuration > SNMP*.
2. Enable SNMP access. For details, see [Configuring SNMP traps and queries on page 100](#).
3. Expand the *User* section.
4. Click *New*.
5. Configure the following settings:

Setting Name	Description
User name	Enter the name of an SNMP user. This must match the name of the account as it is configured on your SNMP manager.
Enable	Enable the SNMP user.
Security level	Select either: • <i>No authentication, no privacy</i> — No encryption (privacy) and no authentication, similar to SNMP v1 and v2. Caution: For better security, do not use this option, except on management networks isolated from the rest of your network. Attackers could easily eavesdrop on sensitive system information and/or mimic a legitimate SNMP user. • <i>Authentication, no privacy</i> — Authentication only. No encryption (privacy). Also configure Authentication protocol. Caution: For better security, do not use this option, except on management networks isolated from the rest of your network. Attackers could easily eavesdrop on sensitive system information. • <i>Authentication, privacy</i> — Both encryption (secrecy) and authentication. Also configure Authentication protocol and Privacy protocol.
Authentication protocol	Select the hash to use for authentication, either: • <i>SHA-1</i> • <i>MD5</i> Also configure a salt in <i>Password</i>. Both the protocol and password on the SNMP manager and FortiRecorder must match. This option appears only if Security level is either <i>Authentication, no privacy</i> or <i>Authentication, privacy</i>.
Privacy protocol	Select the encryption algorithm, either: • <i>AES</i> • <i>DES</i> Also configure a salt in <i>Password</i>. Both the protocol and password on the SNMP manager and FortiRecorder must match. This option appears only if Security level is <i>Authentication, privacy</i>.

6. Similar to configuring the SNMP community, configure the other settings to specify the destination IP address for sending traps, allowed source IP addresses for receiving queries, and trap events. See [Configuring an SNMP community on page 102](#).
7. Click *OK*.
8. To verify your SNMP configuration and network connectivity between your SNMP manager and your FortiRecorder appliance, test both traps and queries (assuming you have enabled both). Traps and queries

typically occur on different port numbers, and therefore verifying one does not necessarily verify that the other is also functional. To test queries, from your SNMP manager, query the FortiRecorder appliance. To test traps, cause one of the events that should trigger a trap.

MIB support

FortiRecorder management information blocks (MIB) support most of [RFC 2665](#) (Ethernet-like MIB) and most of [RFC 1213](#) (MIB II).

To view a trap or query's name, object identifier (OID), and description, open its MIB file in a plain text editor.

MIB or RFC	Description
Fortinet Core MIB	This Fortinet-proprietary MIB enables your SNMP manager to query for system information and to receive traps that are common to multiple Fortinet devices.
FortiRecorder MIB	This Fortinet-proprietary MIB enables your SNMP manager to query for FortiRecorder-specific information and to receive FortiRecorder-specific traps.
RFC- 1213 (MIB II)	The FortiRecorder SNMP agent supports MIB II groups, except: • There is no support for the EGP group from MIB II (RFC 1213, section 3.11 and 6.10). • Protocol statistics returned for MIB II groups (IP, ICMP, TCP, UDP, and so on.) do not accurately capture all FortiRecorder traffic activity. More accurate information can be obtained from the information reported by the FortiRecorder MIB.
RFC-2665 (Ethernet-like MIB)	The FortiRecorder SNMP agent supports Ethernet-like MIB information, except the dot3Tests and dot3Errors groups.

Configuring notification triggers

After you have configured connection settings (see [Configuring email settings for notifications on page 96](#), [Configuring text message settings for notifications on page 98](#), and [Configuring SNMP traps and queries on page 100](#)), configure the recipients and categories of events that will trigger notifications. For example, notifications can be triggered by a camera or ACS device, such as via face recognition, object detection, and door buzzes.



Face and object detection notifications requires integration with FortiCentral. For details, see the [FortiCentral User Guide](#).



These settings are only for camera- and ACS-related notifications, such as motion detection. They do not configure appliance-related notifications, such as the hard disk being full. See also [Configuring alert email on page 161](#).

To configure camera notifications

1. Go to *Camera > Notification > Camera Notification*.
2. Click *New*.
3. Configure the following settings:

Setting Name	Description
Name	Enter a unique name for the notification.
Description	Optional. Enter a description or comment.
Enable	Enable or disable this notification.
Hold off period	Enter how much time to wait until FortiRecorder sends a notification. Events that occur before the hold off period ends are delayed.
When to notify	• <i>First event</i>: Only the first detection triggers a notification. A break where no detection occurs is required before an event is considered to be a new event. The amount of time of the break is determined by the Pre-Alarm (sec) and Post-Alarm (sec) settings of the camera. • <i>Evert event</i>: A notification is sent for every occurrence of a frequent event. For example, if a camera is configured to detect bicycles, and someone leaves a bike in the camera's field of view, then the camera will continually detect the bicycle.
Triggers	Select which signals will trigger a notification: • <i>Generic detection</i> • <i>Motion detection</i> • <i>Audio detection</i> • <i>Digital input (DIDO)</i> • <i>PIR detection</i> • <i>Tamper detection</i> • <i>Face detection</i>: Also configure Face detection. • <i>ACS</i>: Also configure ACS detection. • <i>Object detection</i>: Also configure Object detection. Supported triggers vary by camera model and/or ACS device. See also Detection on page 73. If you select <i>Face detection</i> or <i>Object detection</i>, additional options appear (for example, the <i>Prohibited</i> category for recognized faces).
Face detection	Select which categories of people (for example, <i>Masked</i>, <i>Unknown</i>, or <i>Prohibited</i>) trigger a notification. This setting applies only if, in Triggers, <i>Face detection</i> is enabled.
ACS detection	Select which access control event (for example, <i>Door held open</i> or <i>Door forced open</i>) trigger a notification. This setting applies only if, in Triggers, <i>ACS detection</i> is enabled.
Object detection	Select which categories of object (for example, <i>Weapon</i> or <i>Animal</i>) trigger a notification. This setting applies only if, in Triggers, <i>Object detection</i> is enabled.

Setting Name	Description
Notification Schedule	Enable notifications during specific periods of time during the day or week by selecting <i>Add schedule</i> (see Configuring a schedule on page 141). Then select where to send the notification: • <i>User</i>: Also configure Select User. • <i>SNMP</i>: See also Configuring SNMP traps and queries on page 100. • <i>Linked cameras</i>: Also configure Select Linked Camera.
Select Camera	Select which camera(s) will trigger notifications. See also Detection on page 73 .
Select User	Select whom to notify. Only administrator accounts appear as options in this list, and only if the <i>Email</i> option is enabled in their account. See Configuring user and administrator accounts on page 79. This setting applies only if, in Notification Schedule, <i>User</i> is enabled.
Select Linked Camera	Select which cameras also start to record when the cameras in Select Camera trigger a notification. Recordings from linked cameras are part of the same event. This setting applies only if, in Notification Schedule, <i>Linked camera</i> is enabled.

4. Click *Create*.

For information on how to view notifications in the GUI, see [Monitoring motion detection notifications on page 131](#).

To verify email connectivity, from FortiRecorder, trigger an alert event that matches the type and severity levels that you have chosen. Then, check your email.



To prevent classification as spam, it usually helps if you add the notification email address to your address book.

If you do not receive an alert email within a few minutes, verify that you have configured an email address for the account (see [Email on page 82](#)). Next, verify the static routes of FortiRecorder (see [Configuring routing on page 38](#)) and the policies on any firewalls or routers between the appliance and the SMTP relay. (They must allow SMTP traffic from the FortiRecorder network interface that is connected to the gateway between it and the email server.) To determine the point of connectivity failure along the network path, if the SMTP server is configured to respond to ICMP ECHO_REQUEST (ping), go to *Dashboard > Console* and enter the CLI command:

```
execute traceroute <syslog_ipv4>
```

where <syslog_ipv4> is the IPv4 address of your email server.

If that connectivity succeeds, verify that your alert email has not been classified as spam by checking your junk mail folder.

To delete a notification, select the notification name and then click *Delete*.

Customizing notification templates

You can customize messages that the FortiRecorder appliance sends.

Customizing system messages

Some messages that the GUI show to the user, such as an unauthorized login warning or [camera event notifications](#), can be customized. You can modify both their text and HTML.

Variables can be used if you want to insert the same text in a message multiple times. In addition to using predefined variables (see [Predefined variables on page 109](#)), you can create your own new, custom variables.

To create a variable for custom messages

1. Go to *System > Customization > Custom Message*.
2. Select a message row.

The *Edit Variable* button is greyed out and not available until you select a message.



The scope of a variable is for a specific message; it cannot be used in other messages or templates. If you require the same text in multiple templates or messages, create a variable in each.

3. Click *Edit Variable*.
4. Click *New*.

You can modify the variables that you create, but you cannot edit or delete the predefined variables.

5. Configure the following settings:

Setting Name	Description
Name	Enter the variable name to use in the system message. Its format is: %%<variable_name>%% For example, if you enter the name <code>downtime_warning</code> , then when you configure a customized message and insert this variable, its placement will be indicated as: %%downtime_warning%% The variable's <i>Content</i> will be inserted in that location each time FortiRecorder displays that message.
Display name	Enter a description for the variable.
Content	Enter the variable's content.

6. Click *Create*.

To customize a system message

1. Go to *System > Customization > Custom Message*.
2. Double-click the message that you want to customize, or select its row and click *Edit*.
3. Edit the text. The maximum length is 4000 characters.

Optionally, if you want to insert a variable, place your text cursor, click *Insert Variables*, and then click the name of the variable.

4. Click *OK*.

Customizing email templates

Similar to [system messages](#), you can customize the templates that FortiRecorder uses for system alerts and camera notifications via email and SMS. The templates support both custom and predefined variables (see [Predefined variables on page 109](#)).

To customize email templates

1. Go to *System > Customization > Custom Email Templates*.
2. Select the template and then click *Edit*.
3. Enter the necessary information, such as the name and a brief description.
4. In the content section, format the message in HTML. To add variables, click *Insert Variable*.
5. Determine if the HTML code was entered correctly by selecting *Preview*.
6. Click *OK*.

Predefined variables

Like the variables that you create, each predefined variable usually can only be used within the scope of a specific type of system message or email template, as shown below.

Alert email

Variable	Description
%ADDRESS%	The IP address or domain name of FortiRecorder that is used in hyperlinks. See Public Access Host name on page 48 and Access Ports Service on page 48 .
%ADMIN_USER%	The administrator notified by the message.
%CONTENT%	The content of the alert email.
%DATE%	The date when the event occurred.
%HOSTNAME%	The IP address or domain name of FortiRecorder that is used in hyperlinks. See Public Access Host name on page 48 and Access Ports Service on page 48 .
%NOTIFY_FROM%	The sender email address of the email. The value is configured in Display name and Email address .
%POSTMASTER%	The postmaster email address of the email.
%SENDER%	The sender email address of the email. The value is configured in Display name and Email address .
%SUBJECT%	The subject line of the email.

FortiCamera Mobile account registration email

Variable	Description
%%MOBILE_APPLE_BADGE%%	The placement of the Apple icon in the mobile account registration email.
%%MOBILE_APPLE_URL%%	The placement of Apple's address in the mobile account registration email.
%%MOBILE_EXPIRATION%%	The expiration time in the mobile account registration email.
%%MOBILE_GOOGLE_BADGE%%	The placement of the Google icon in the mobile account registration email.
%%MOBILE_GOOGLE_URL%%	The placement of Google's address in the mobile account registration email.
%%MOBILE_QR%%	The QR code image in the mobile account registration email.
%%MOBILE_QR_URL%%	A hyperlink alternative to the QR code image in the mobile account registration email.
%%SENDER%%	The sender email address (From:) of the email. When using the default mail server settings, the value is: FortiRecorder <noreply@fortirecorder.com>

Camera notification email

Variable	Description
%%BODY%%	The content of the camera notification message.
%%EVENT_DATE%%	The date when the event occurred.
%%EVENT_LINK%%	A hyperlink to the video recording of the event.
%%EVENT_TITLE%%	The title of the event.
%%PUBLIC_ADDRESS%%	The IP address or domain name of FortiRecorder that is used in hyperlinks. See Public Access Host name on page 48 and Access Ports Service on page 48 .
%%SENDER%%	The sender email address (From:) of the email. When using the default mail server settings, the value is: FortiRecorder <noreply@fortirecorder.com>
%%SUBJECT%%	The subject line in the email.

Camera notification web

Variable	Description
%%CAMERA_NAME%%	The name of the camera that triggered the notification.

Variable	Description
%%EVENTDATE%%	The date when the event occurred.
%%EVENT_DESCRIPTION%%	The content of the camera notification message.
%%MODEL_IMAGE%%	An image that shows the FortiRecorder model number.
%%NOTIF_NAME%%	The title of the event.
%%NOTIF_ROW%%	A hyperlink to the video recording of the event.

Customizing the theme

You can customize the interface of the FortiRecorder, such as changing the default color of the interface or adding your own custom logo.

To customize the user interface appearance

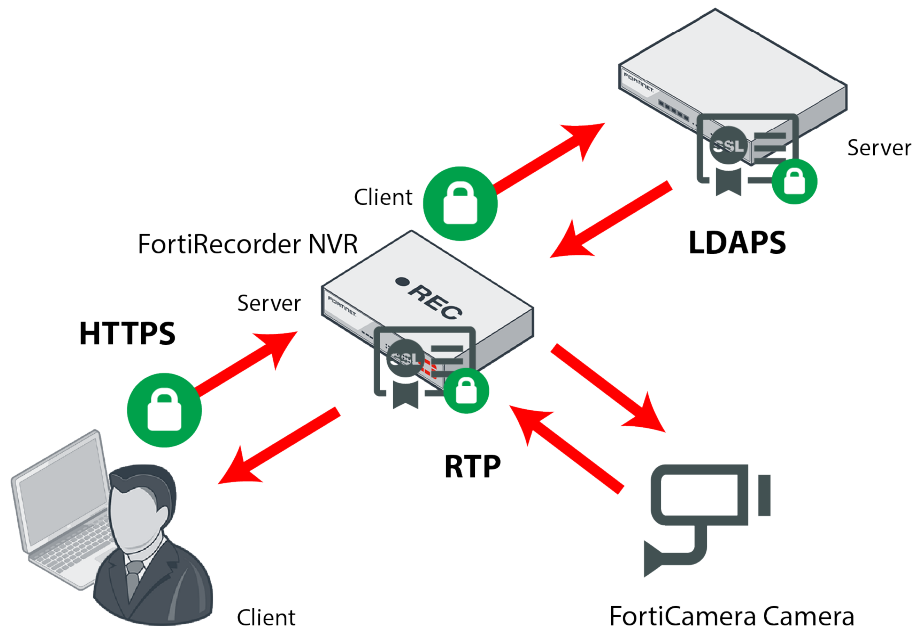
1. Go to *System > Customization > Appearance*.
2. Configure the following settings:

Setting Name	Description
Product name	Enter the name of the product.
Custom top logo	Click <i>Change</i> to upload an icon used as the favicon for the FortiRecorder GUI. The image's dimensions must be 460 pixels wide by 36 pixels tall.  Use an image with a transparent background. Non-transparent backgrounds will not blend with the underlying theme color, resulting in a visible rectangle around your logo graphic.  Uploading a graphic overwrites the current graphic. The FortiRecorder does not retain previous or default graphics. If you want to revert to the current graphic, use your web browser to save a backup copy of the image to your computer so that you can upload it again later.
Default Theme	Select the default color (red, green, blue, and light blue) for the GUI. Users can select a different theme in their preferences later, or you can specify a different theme when you configure each user account. For details, see Configuring user and administrator accounts on page 79.

3. Click *Apply*.

Working with certificates

When a FortiRecorder appliance initiates or receives a TLS connection, it will use certificates. Certificates can be used in secure connections with encryption and authentication.



FortiRecorder may require you to upload certificates and CRLs even if you do not use HTTPS.

For example, when sending alert email via SMTPS, or querying an authentication server via LDAPS, FortiRecorder will validate the server's certificate by comparing the server certificate's CA signature with the certificates of CAs that are known and trusted by the FortiRecorder appliance. See [Uploading trusted CAs' certificates on page 117](#) and [Revoking certificates on page 118](#).

Replacing the default certificate for the GUI

For HTTPS connections with the GUI and other TLS-secured services, FortiRecorder has its own X.509 server certificate. By default, the FortiRecorder appliance presents the "Factory" certificate, which can be used to encrypt the connection, but whose authenticity cannot be guaranteed and therefore may not be trusted by your web browser. This will cause your web browser to display a security alert, indicating that the connection may have been intercepted.

To prevent this false alarm, you can go to *System > Certificate > Local Certificate* to replace the certificate with one that is signed by your own CA so that it will be trusted. Thereafter, a security alert will only occur if:

- the certificate expires
- your CA revokes the certificate
- the connection has been compromised by a man-in-the-middle attack

If you have not yet requested a certificate from your CA, and if it requires one, you must first generate a certificate signing request (see [Generating a certificate signing request on page 114](#)). Otherwise, start with [Uploading & selecting to use a certificate on page 116](#).

Local Certificate		CA Certificate	Certificate Revocation List	Remote		
	View	Delete	Generate...	Download ▼	Set Default	Import... ▼
Name	Subject				Status	
Factory	/C=US/ST=California/L=Sunnyvale/O=Fortinet/OU=FortiRecorder/CN=FortiRecorder/emailAddress=support@forti...				Default	
Self	/CN=Fortinet/O=Fortinet Ltd.				OK	

GUI Item	Description
View	Select to view the selected certificate's issuer, subject, and range of dates within which the certificate is valid
Delete	Select to delete the selected certificate.
Generate	Select to generate a certificate signing request. For details, see Generating a certificate signing request on page 114 .
Download	Select to download the selected certificate's entry in certificate (CER), PKCS #12 (P12), or certificate signing request (CSR) file format. PKCS #12 is recommended if you require a certificate backup that includes the private key. Certificate backups can also be made by downloading a configuration file backup, which includes all certificates and keys.
Set status	To configure your FortiRecorder appliance to use a certificate, click its row to select it, then click this button. A confirmation dialog will appear, asking if you want to use it as the "default" (currently in use) certificate. Click OK. The <i>Status</i> column will change to reflect the new status.
Import	Select to upload a certificate. For details, see Uploading & selecting to use a certificate on page 116 .
Name	Displays the name of the certificate according to the appliance's configuration file. This will not be visible to clients.
Subject	Displays the distinguished name (DN) located in the Subject: field of the certificate. If the row contains a certificate request which has not yet been signed, this field is empty.
Status	Displays the status of the certificate. • Default — Indicates that this certificate will be used whenever a client attempts to connect to the appliance. Only one certificate can be in use at any given time. • OK — Indicates that the certificate was successfully imported. To use the certificate, select it, then use Set status to change its status. • Pending — Indicates that the certificate request (CSR) has been generated, but must be downloaded, signed, and imported before it can be used as a server certificate.

Generating a certificate signing request

Many commercial certificate authorities (CAs) will provide a web site where you can generate your own certificate signing request (CSR). A CSR is an unsigned certificate file that the CA will sign. When the CSR is generated, the associated private key that the appliance will use to sign and/or encrypt connections with clients is also generated.

If your CA does not provide this, or if you have your own private CA such as a Linux server with OpenSSL, or Microsoft Active Directory, you can use the appliance generate a CSR and private key. This CSR can then be submitted for verification and signing by the CA.

To generate a certificate request

1. Go to *System > Certificate > Local Certificate*.
2. Select *Generate*.
3. Configure the certificate signing request:

Setting Name	Description
Certification name	Enter a unique name for the certificate request, such as <code>fortirecorder.example.com</code> . This can be the name of your appliance.
Subject Information: ID Type	Select the type of identifier to use in the certificate to identify the FortiRecorder appliance: • <i>Host IP</i> — Select if the FortiRecorder appliance has a static IP address and enter the public IP address of the FortiRecorder appliance in the IP field. If the FortiRecorder appliance does not have a public IP address, use <i>E-Mail</i> or <i>Domain Name</i> instead. • <i>Domain Name</i> — Select if the FortiRecorder appliance has a static IP address and subscribes to a dynamic DNS service. Enter the FQDN of the FortiRecorder appliance, such as <code>fortirecorder.example.com</code>, in the <i>Domain Name</i> field. Do not include the protocol specification (<code>https://</code>) or any port number or path names. • <i>E-Mail</i> — Select and enter the email address of the owner of the FortiRecorder appliance in the <i>E-mail</i> field. Use this if the appliance does not require either a static IP address or a domain name. The type you should select varies by whether or not your FortiRecorder appliance has a static IP address, a fully-qualified domain name (FQDN), and by the primary intended use of the certificate. For example, if your FortiRecorder appliance has both a static IP address and a domain name, but you will primarily use the local certificate for HTTPS connections to the GUI by the domain name of the FortiRecorder appliance, you might prefer to generate a certificate based upon the domain name of the FortiRecorder appliance, rather than its IP address.
Subject Information: IP	Type the static IP address of the FortiRecorder appliance, such as <code>10.0.0.1</code>. The IP address should be the one that is visible to clients. Usually, this should be its public IP address on the Internet, or a virtual IP that you use NAT to map to the appliance's IP address on your private network. This option appears only if <i>ID Type</i> is <i>Host IP</i>.
Subject Information: Domain Name	Type the fully qualified domain name (FQDN) of the FortiRecorder appliance, such as <code>www.example.com</code> .

Setting Name	Description
	The domain name must resolve to the static IP address of the FortiRecorder appliance. See also Configuring network interfaces on page 34 . This option appears only if <i>ID Type</i> is <i>Domain Name</i> .
Subject Information: E-mail	Type the email address of the owner of the FortiRecorder appliance, such as admin@example.com. This option appears only if <i>ID Type</i> is <i>E-Mail</i> .
Key type	Displays the type of algorithm used to generate the key. This option cannot be changed, but appears in order to indicate that only RSA is currently supported.
Key size	Select a secure key size of <i>512 Bit</i> , <i>1024 Bit</i> , <i>1536 Bit</i> or <i>2048 Bit</i> . Larger keys are slower to generate, but provide better security.
Optional Information: Organization unit	Optional. Type the name of your organizational unit (OU), such as the name of your department. To enter more than one OU name, click the + icon, and enter each OU separately in each field.
Optional Information: Organization	Optional. Type the legal name of your organization.
Optional Information: Locality (City)	Optional. Type the name of the city or town where the FortiRecorder appliance is located.
Optional Information: State/Province	Optional. Type the name of the state or province where the FortiRecorder appliance is located.
Optional Information: Country/Region	Optional. Select the name of the country where the FortiRecorder appliance is located.
Optional Information: E-mail	Optional. Type an email address that may be used for contact purposes, such as admin@example.com.

4. Click **OK**.

The FortiRecorder appliance creates a private and public key pair. The generated request includes the public key of the FortiRecorder appliance and information such as the FortiRecorder appliance's IP address, domain name, or email address. The FortiRecorder appliance's private key remains confidential on the FortiRecorder appliance. The Status column of the entry is Pending.

5. Click to select the row that corresponds to the certificate request.

6. Click **Download**.

Standard dialogs appear with buttons to save the file at a location you select. Your web browser downloads the certificate request (CSR) file. Time required varies by the size of the file and the speed of your network connection.

7. Upload the certificate request to your CA.

After you submit the request to a CA, the CA will verify the information in the certificate, give it a serial number, an expiration date, and sign it with the public key of the CA.

8. If you are not using a commercial CA whose root certificate is already installed by default on web browsers, download your CA's root certificate, then install it on all computers that will be connecting to your appliance. (If

you do not install these, those computers may not trust your new certificate.)

9. When you receive the signed certificate from the CA, upload the certificate to the FortiRecorder appliance (see [Uploading & selecting to use a certificate on page 116](#)).

Uploading & selecting to use a certificate

You can import (upload) either:

- Base64-encoded
- PKCS #12 RSA-encrypted

X.509 server certificates and private keys to the FortiRecorder appliance. The format of the certificate file that you have, and whether or not it includes the private key, may vary.

If a server certificate is signed by an intermediate certificate authority (CA) rather than a root CA, before clients will trust the server certificate, you must demonstrate a link with root CAs that the clients trust, thereby proving that the server certificate is genuine. You can demonstrate this chain of trust either by:

- Appending a signing chain in the server certificate.
- Installing each intermediary CA's certificate in clients' trust store (list of trusted CAs).

Which method is best for you often depends on whether you have a convenient method for deploying CA certificates to clients, such as you may be able to for clients in an internal Microsoft Active Directory domain, and whether you often refresh the server certificate.

To append a signing chain in the certificate itself, before uploading the server certificate to the FortiRecorder appliance

1. Open the certificate file in a plain text editor.
2. Append the certificate of each intermediary CA in order from the intermediary CA who signed the local certificate to the intermediary CA whose certificate was signed directly by a trusted root CA.

For example, an appliance's certificate that includes a signing chain might use the following structure:

```
-----BEGIN CERTIFICATE-----
<server certificate>
-----END CERTIFICATE-----
-----BEGIN CERTIFICATE-----
<certificate of intermediate CA 1, who signed the server certificate>
-----END CERTIFICATE-----
-----BEGIN CERTIFICATE-----
<certificate of intermediate CA 2, who signed the certificate of intermediate CA 1 and whose
    certificate was signed by a trusted root CA>
-----END CERTIFICATE-----
```

3. Save the certificate.

To upload a certificate

1. Go to *System > Certificate > Local Certificate*.
2. Click *Import*.
3. Configure the following settings:

Setting Name	Description
Type	Select the type of certificate file to upload, either: • Local Certificate — An unencrypted certificate in PEM format.

Setting Name	Description
	• Certificate — An unencrypted certificate in PEM format. The private key is in a separate file. • PKCS12 Certificate — A PKCS #12 encrypted certificate with private key. Other available settings vary depending on this selection.
Certificate file	Click <i>Browse</i> to locate the certificate file that you want to upload. This option is available only if Type is Certificate or Local Certificate.
Key file	Click <i>Browse</i> to locate the private key file that you want to upload with the certificate. This option is available only if Type is Certificate.
Certificate with key file	Click <i>Browse</i> to locate the PKCS #12 certificate-with-key file that you want to upload. This option is available only if Type is PKCS12 Certificate.
Password	Type the password that was used to encrypt the file, enabling the FortiRecorder appliance to decrypt and install the certificate. This option is available only if Type is Certificate or PKCS12 Certificate.

4. Click *OK*.
5. To use a certificate, click its row to select it, then select *Set status* to put it in force.
6. If your web browser does not yet have your CA's certificate installed, download it and add it to your web browser's trust store so that it will be able to validate the appliance's certificate (see [Uploading trusted CAs' certificates on page 117](#)).

Uploading trusted CAs' certificates

In order to authenticate other devices' certificates, FortiRecorder has a store of trusted CAs' certificates. Until you upload at least one CA certificate, FortiRecorder does not know and trust any CAs, it cannot validate any other client or device's certificate, and all of those secure connections will fail.



FortiRecorder may require you to upload certificates and CRLs even if you do not use HTTPS. For example, when sending alert email via SMTPS, or querying an authentication server via LDAPS, FortiRecorder will validate the server's certificate by comparing the server certificate's CA signature with the certificates of CAs that are known and trusted by the FortiRecorder appliance.

Certificate authorities (CAs) validate and sign others' certificates. When FortiRecorder needs to know whether a client or device's certificate is genuine, it will examine the CA's signature, comparing it with the copy of the CA's certificate that you have uploaded in order to determine if they were both made using the same private key. If they were, the CA's signature is genuine, and therefore the client or device's certificate is legitimate.

If the signing CA is not known, that CA's own certificate must also be signed by one or more other intermediary CAs, until both the FortiRecorder appliance and the client or device can demonstrate a signing chain that ultimately leads to a mutually trusted (shared "root") CA that they have in common. Like a direct signature by a known CA, this proves

that the certificate can be trusted. For more information on how to include a signing chain, see [Uploading & selecting to use a certificate on page 116](#).

To upload a CA's certificate

1. Download a copy of your CA's certificate file.

If you are using a commercial CA, your web browser should already have a copy in its CA trust store. Export a copy of the file to your desktop or other folder. If you are using your own private CA, download a copy from your CA's server.



Verify that your private CA's certificate does not contain its private keys. Disclosure of private keys compromises the security of your network, and will require you to revoke and regenerate all certificates signed by that CA.

2. Go to *System > Certificate > CA Certificate*.

To view the selected certificate's issuer, subject, and range of dates within which the certificate is valid, click a certificate's row to select it, then click *View*.

3. Click *Import*.

4. In *Certificate name*, type a name for the certificate that can be referenced by other parts of the configuration. Do not use spaces or special characters. The maximum length is 35 characters.

5. Click *Browse* and select your CA's certificate file.

6. Click *OK*.

Time required to upload the file varies by the size of the file and the speed of your network connection.

7. To test your configuration, initiate a secure connection to an LDAPS server (see [Configuring LDAP authentication on page 86](#) and [Configuring user and administrator accounts on page 79](#)).

If the query fails, verify that your CA is the same one that signed the LDAP server's certificate, and that its certificate's extensions indicate that the certificate can be used to sign other certificates. Verify that both the appliance and LDAP server support the same cipher suites and SSL/TLS protocols. Also verify that your routers and firewalls are configured to allow the connection.

Revoking certificates

To ensure that your FortiRecorder appliance validates only certificates that have not been revoked, you should periodically upload a current certificate revocation list (CRL), which can be provided by certificate authorities (CA).



Alternatively, you can use HTTP or online certificate status protocol (OCSP) to query for certificate status. For more information, see [Revoking certificates by OCSP query on page 119](#).

To upload a CRL file

1. Go to *System > Certificate > Certificate Revocation List*.

2. Click *Import*.

3. In *Certificate name*, type the name of the certificate as it will be referred to in the appliance's configuration file.

4. Next to *Certificate file*, click *Browse*, then select the certificate file.

5. Click *OK*.

The certificate is uploaded to the appliance. Time required varies by the size of the file and the speed of the network connection, but is typically only a few seconds.

Revoking certificates by OCSP query

Online certificate status protocol (OCSP) enables you to revoke or validate certificates by query, rather than by importing certificate revocation list (CRL) files. Since distributing and installing CRL files can be a considerable burden in large organizations, and because delay between the release and install of the CRL represents a vulnerability window, this can often be preferable.

To use OCSP queries, you must first install the certificates of trusted OCSP/CRL servers.

To view or upload a remote certificate

1. Download the server certificate from your OCSP/CRL server.
2. Go to *System > Certificate > Remote*.
3. Click *Import*.
4. In *Certificate name*, type the name of the certificate as it will be referred to in the appliance's configuration file.
5. Click *Browse* and then select the certificate file.
6. Click *OK*.

The certificate is uploaded to the appliance. Time required varies by the size of the file and the speed of the network connection, but is typically only a few seconds.

Using the dashboard

FortiRecorder has several methods, including a real-time dashboard, [FortiView](#), [SNMP traps](#), and [log messages](#), that you can use to monitor system statuses.

To use the dashboard, go to *Dashboard > Status*. The default widgets on the dashboard show:

- serial number
- firmware version
- uptime
- currently logged in users
- video retention
- video storage capacity (estimated maximum retention, based on bandwidth usage for the previous 5 minutes; see also [Storage capacity on page 25](#))
- licenses (see also [Licenses on page 9](#))
- system resources (see also [Resource issues on page 174](#)), such as:
 - CPU usage
 - memory usage
 - disk space usage
- face recognition events (see also [Face recognition on page 145](#))
- audit summary (see also [Auditing for issues in configuration and operation on page 125](#))
- camera status (see [About camera statuses on page 77](#)), including any connection problems, and scheduled continuous or motion detection-triggered recording

To access this part of the GUI, you must have an administrator account, and its access profile must have *Read-Write* permission to the *System status* category. Other user accounts do not have permission. For details, see [Configuring administrator profiles on page 82](#).

Customizing the dashboard

You can customize your dashboard to show or hide widgets, and to arrange them on *Dashboard > Status*.

To move a widget, position your mouse cursor on the widget's title bar and then drag the widget to a new location.

To show or hide a widget, click *Manage Widget* and then select its name, and click *Apply*. (If the widget name is greyed out, the widget will not display.)

Icon buttons on the widget's title bar vary, but always include *Refresh* and *X* (hide).

Using the CLI Console widget

You can use SSH or Telnet to connect to the command line, but if you are already logged into the GUI, you don't need to leave it.

To access the CLI without exiting the GUI, go to *Dashboard > Console*. If you need to pop the CLI Console out to a window that you can resize and reposition or keep open while going to other places in the GUI, then click *Open in New Window*.

[Command syntax](#) for FortiRecorder is similar to other Fortinet products.

Using FortiView

The *FortiView* section of the GUI provides an overview of the general performance of your cameras, such as a camera's bandwidth usage.

Monitoring camera statistics

The *Camera Statistics* section displays various camera performance statistics, such as the bandwidth usage of specific cameras and recording gaps.

Viewing bandwidth statistics

The *Bandwidth* tab displays the amount of data transferred over the network by the cameras, including the bandwidth of remote storage and motion detection. The x-axis displays the date and time of the recording, while the y-axis displays the specific bandwidth usage. The lower the curve or bar on the graph, the less bandwidth was used during that particular time.

To edit statistics settings

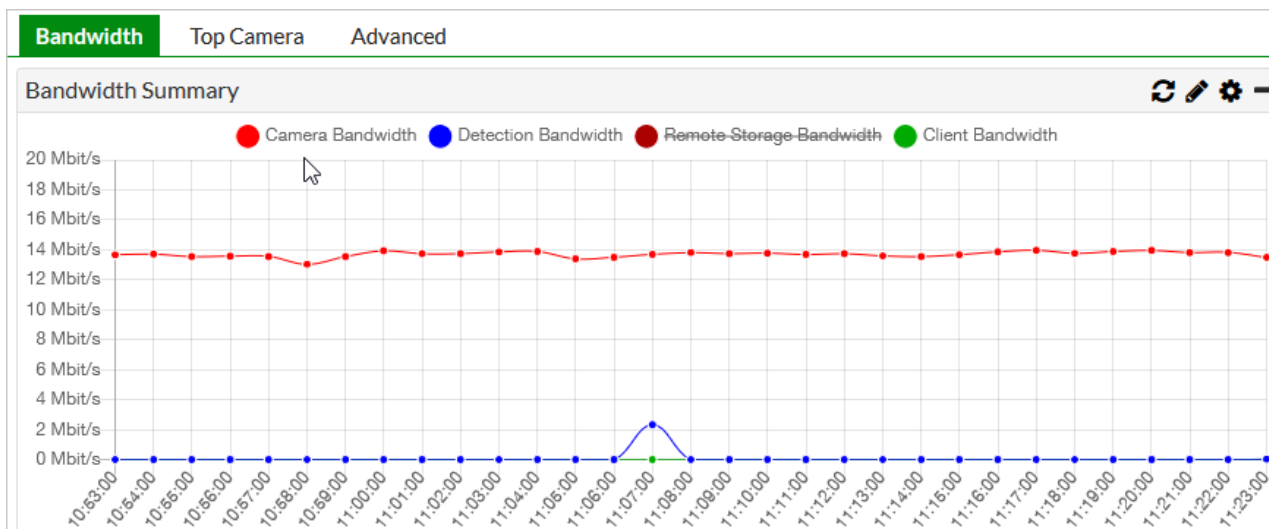
1. Go to *FortiView > Camera Statistics > Bandwidth*.
2. Click the settings gear icon on the right side of a chart (for example, *Bandwidth Summary*).
3. Configure the following settings:

Setting Name	Description
All cameras	The all cameras section allows you to configure bandwidth monitoring settings for every camera connected to your FortiRecorder. The section includes three viewing preferences: <i>Interval</i> , <i>Unit</i> , and <i>Chart type</i> .
Camera group	The camera group section allows you to configure bandwidth monitoring settings for specific camera groups created under <i>Camera > Configuration > Camera Group</i> . The section includes three viewing preferences: <i>Interval</i> , <i>Unit</i> , and <i>Chart type</i> .
Camera	The camera section allows you to configure bandwidth monitoring settings for specific cameras. Enable each camera you want to monitor. The section includes three viewing preferences: <i>Interval</i> , <i>Unit</i> , and <i>Chart type</i> .
Interval	Select the period of time to analyze bandwidth. If you select 24 hours, for example, the x-axis is sectioned into hourly points over a 24 hour period of time.
Unit	Select the unit type displayed along the y-axis.

Setting Name	Description
Chart type	Select either a line chart, which displays bandwidth information as a series of data points called "markers" connected by a line, or bar chart, which presents bandwidth data with rectangular bars with varying heights.

4. Click **OK**.

Click one of the categories to show or hide it in the chart. (~~Strikethrough~~ text indicates that the category is disabled.)



Viewing top camera usage

The *Top Camera* tab displays the performance and resource usage of each camera. Use this section to determine which cameras use the most network bandwidth and have the most motion detections.

To edit top camera settings

1. Go to *FortiView > Camera Statistics > Top Camera*.
2. Select the settings gear icon and configure the following:

Setting Name	Description
Interval	Select the period of time to analyze bandwidth. If you select 24 hours, for example, the bar graph displays the bandwidth usage of the camera in the last 24 hours.
Unit	Select the unit type displayed along the x-axis.

3. Click **OK**.

Analyzing advanced statistics

The *Advanced* tab displays details about network reliability and recording video to disk.

- **Gaps** — RTP packets for the live video or audio stream were lost in transit, or were not received in sequential order (forward or backward). This can occur when the network is too busy.
- **Recording Skips** — RTP packets were missing when FortiRecorder wrote the recording to disk.
- **Proxy Drops** — UDP packets for the live video or audio stream were dropped by the network interfaces. This can occur when FortiRecorder is too busy.
- **Collector drops** — UDP packets were dropped during internal processing and storage (I/O) operations. This can occur when the CPU and/or storage is too busy for the amount of incoming video bandwidth.

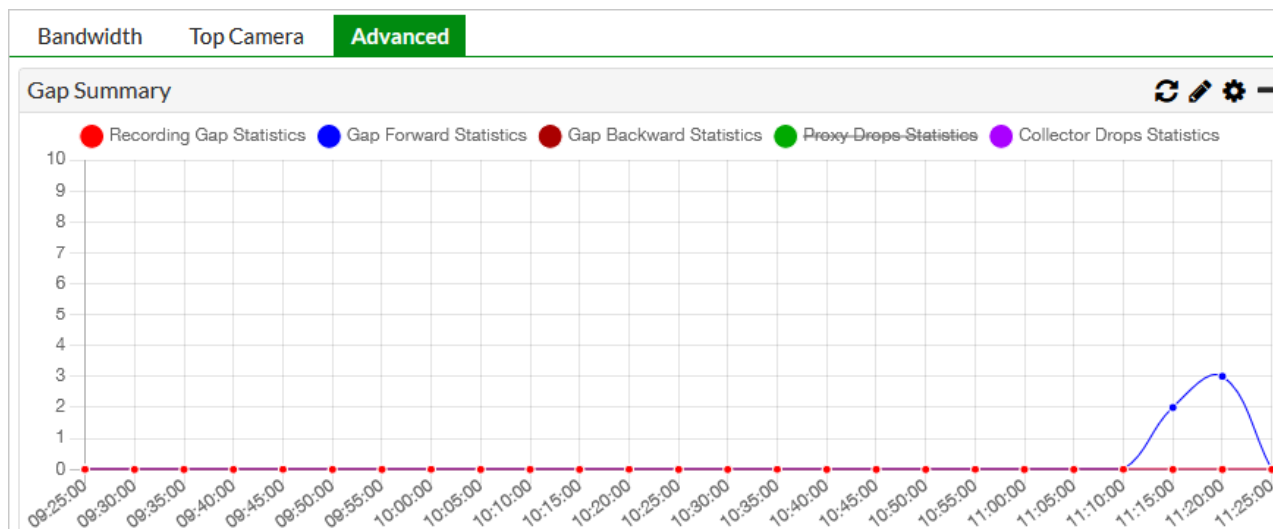
To edit the advanced chart settings

1. Go to *FortiView > Camera Statistics > Advanced*.
2. Select the settings gear icon and configure the following:

Setting Name	Description
All cameras	The all cameras section allows you to gap summary statistics settings for every camera connected to your FortiRecorder. The section includes three viewing preferences: Interval, Unit, and Chart type.
Camera group	The camera group section allows you to configure gap summary statistics settings for specific camera groups created under <i>Camera > Configuration > Camera Group</i> . The section includes three viewing preferences: Interval, Unit, and Chart type.
Camera	The camera section allows you to configure gap summary statistics settings for specific cameras. Enable each camera you want to monitor. The section includes three viewing preferences: Interval, Unit, and Chart type.
Interval	Select the period of time to analyze gap summary. If you select 24 hours, for example, the x-axis is sectioned into hourly points over a 24 hour period of time.
Unit	Select the unit type displayed along the y-axis. The higher the bar is on the line chart graph, the more dropped frames occurred during that time.
Chart type	Select either a line chart, which displays bandwidth information as a series of data points called "markers" connected by a line, or bar chart, which presents bandwidth data with rectangular bars with varying heights.

3. Click *OK*.

Click one of the categories to show or hide it in the chart. (~~Strikethrough~~ text indicates that the category is disabled.)



Viewing network connections and sessions

To display the current TCP connections and UDP sessions with your FortiRecorder, go to *FortiView > Sessions*.

If you see network connections that you do not expect, verify the *Trusted hosts* setting of all administrator accounts, and that the *IP address of DHCP cameras* has not changed.

If network connections seem to be missing, see [Connectivity issues on page 175](#).

Auditing for issues in configuration and operation

In deployments with many cameras and a large configuration, it can be useful to have a regularly updated, prioritized list of detected problems and remaining configuration tasks with suggested corrective actions. Audit reports do not require any scheduling. They are automatically updated every 24 hours, or on demand when you click the *Refresh* button.

To audit issues in the deployment

1. Go to *FortiView > Audit Report*.

Alternatively, go to *Dashboard*, and in the *Audit Summary* widget, click one of the priority levels, such as *Medium*.

Issues appear in a list sorted by priority, similar to log messages:

- **Critical** — Operation is impacted. For example:
 - cameras are in an error state
 - live video streams have been interrupted
 - available disk space is so small that FortiRecorder must delete videos before your selected retention period ends (see also [Storage capacity on page 25](#))

- *High* — Operation could be impacted soon. For example:
 - network connections have been disrupted
 - available disk space is very low
 - cameras have more than one IP address on the network
 - *Medium* — Operation might not be normal. For example:
 - failed login attempts
 - no email address to send alert email to
 - log disk is almost full
 - network connections don't have enough bandwidth and may result in skipped video frames
 - camera is using unusual amounts of network bandwidth
 - cameras are near or at their end-of-support (EOS) date (*Cameras support* and *Cameras out of Support* messages, respectively); when you upgrade FortiRecorder software (except for patches), EOS cameras will be disabled because they are not supported anymore
 - *Low* — Operation might be better if optimized, or may be missing some settings. For example:
 - camera location was not indicated
 - frequent motion detections may be more efficient with better lighting, or as continuous recording instead
 - disabled camera has no recordings and therefore could be deleted from the list on FortiRecorder
2. To show a list of issues in each priority, click the + (plus) button at the right side of the screen. Then to view an explanation and list of cameras affected by each issue, click the + (plus) button at the left side of the issue description, such as *No hostname configured*.

Monitoring

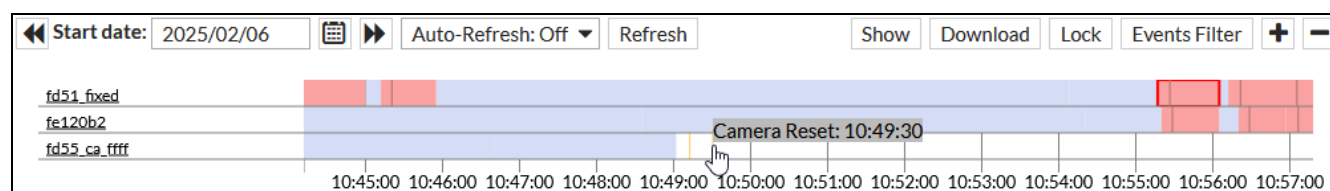
FortiRecorder has multiple monitoring tools, such as direct video surveillance and detailed summaries of camera events.

Viewing video

You can use the timeline and video player to view both live and previously recorded video from cameras.

Understanding the timeline

Below the video player for live video feeds and previously recorded videos, there is a timeline. Time ranges, annotations, and ACS events in the timeline are color-coded.



- **Yellow:** FortiRecorder and camera system events, such as a software update or reboot. Recordings cannot be stored while FortiRecorder is unavailable.
- **Light blue:** Previously recorded video.
- **Dark blue:** Temporary recording that has been manually initiated. See also [Viewing live video on page 128](#).
- **Bright blue:** Annotation in the recording. See also [Annotating a video on page 129](#).
- **Red:** Motion detection-triggered recording.
- **Dark red:** ACS events, such as a card swipe or door being forced open.
- **White:** No recording in that period of time.

If you hover your mouse cursor over an event, annotation, or time range, then a tool tip appears with more information. If you click the time line, a bright red outline indicates which time range or event you have selected.

To show events on the timeline

1. Go to *Monitor > Video > Video*.
2. Above the video players (if any), in the top right corner, click *Select Cameras* and select which cameras' events to include. If you select multiple cameras, then the timeline will have multiple rows.
FortiRecorder and ACS system events are automatically included.
3. Below the video players, in the top right corner of the timeline, click *Events Filter* and select the type of events and/or annotations to include, such as motion detection (*Detection Recordings*) and face recognition (*Face Detection*).
4. If you want to jump to another date or time on the timeline, then either:

- enter *Start date*
 - drag the timeline to the left or right
5. Zoom in or zoom out to specific moments on the timeline either by:
- scrolling your mouse wheel
 - clicking the + (plus) and - (minus) buttons

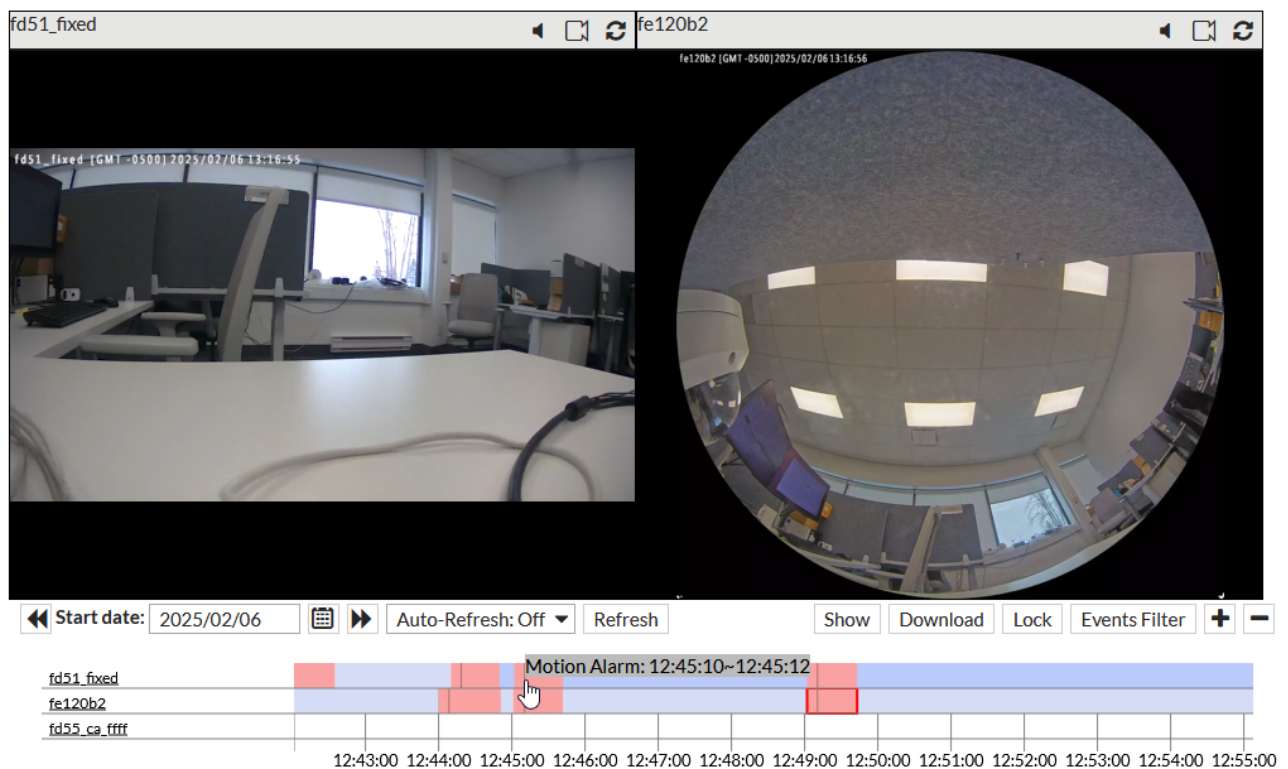
Viewing live video

You can use the video player to watch the live video feed from a camera, regardless of whether it is currently scheduled to be recording.

During this, if the camera is not scheduled to record, then the live video feed is temporarily recorded in memory, but not saved on the hard drive. When you stop watching the live feed from that camera, the temporary recording is deleted **unless** you manually initiate a recording.

To view and record a live video feed

1. Go to *Monitor > Video > Video*.



2. Use the [timeline](#) to select which cameras and events to view.
The live video stream from the cameras plays.
3. If a live video stream is too dark, too bright, too blurry or too gray, then:
 - a. Click the title bar of a view pane to select that camera.
The *Show Camera Control* button becomes available.
 - b. Click *Show Camera Control*.

c. Adjust:

- *Brightness*
- *Contrast*
- *Saturation*
- *Sharpness*

and then click *Apply*. After a few seconds, the change should appear in the live video stream. Adjust your settings again until the video has good sharpness, color, and lighting.



Adjust these settings carefully. After video is recorded, you cannot adjust them again unless you download the file and use video editing software. Video editing software may not be able to completely correct very bad lighting and color.



Alternatively, these settings can be adjusted while configuring the camera. See [Brightness](#), [Contrast](#), [Saturation](#), and [Sharpness](#).

d. Click *Close*.

4. If you want to start recording the live video stream, then in the top right corner of the video pane, click *Record*. To stop a manual recording, either click *Stop*, or go to another page in the GUI.



If recording has been automatically triggered (continuous schedule or motion detection), then the manual *Stop* button is not available. Instead, you can change the [Recording](#) setting or schedule.

Annotating a video

While watching or recording a live video feed, you can insert markers on the timeline with notes about what you see.

1. Go to the live video feeds. See [Viewing live video on page 128](#).
2. Click the title bar of a view pane to select that camera.
The *Show Camera Control* button becomes available.
3. Click *Show Camera Control*.
4. In the text area, enter your notes and then click *Annotate*.

An annotation marker is inserted on the timeline. If the camera was not already recording, it will now start so that the annotation has an associated video recording.

Viewing previously recorded video

You can play any previously recorded video, including those manually initiated while watching a live video feed. Snapshots can also be viewed.

1. Go to *Monitor > Video > Video*.
2. [Use the timeline](#) to jump to a previous date or time.

3. Click to select the time range or event that you want to view.

The *Show*, *Download*, and *Lock* buttons become available. If you selected an event with an associated snapshot images from nearby cameras, then a dialog also displays those images. If your FortiRecorder unit has a USB port, then the *Export to USB* button also becomes available.

4. Click *Show*.

A video player appears in a pop-up window.

5. If there is important evidence, and you want to prevent the video clip from being deleted by storage policies, then click *Lock*.

Downloading video

If you are required to show video evidence of a particular incident to authorities, you can download video to your computer so that you can upload it to them.

Alternatively, if your FortiRecorder unit has a USB port, then you can export the video onto a USB drive, and give the USB drive to authorities.

1. If you want to export video to a USB disk:
 - a. On your computer, plug in the USB disk.
 - b. Format the disk's file system as either a VFAT (for compatibility with Windows or Mac computers) or ext4 (for Linux).
 - c. Eject the disk.
 - d. On the FortiRecorder unit, plug in the disk.
2. Go to *Monitor > Video > Video* or *Monitor > Video > Event*.
3. Use the [timeline](#) to jump to a previous date or time.
4. Click to select the time range or event that you want to download.

The *Download* button and, if a USB drive is plugged in, *Export to USB* button become available.
5. Click *Download* or *Export to USB*.

The video uses the MP4 file format with your selected [video codec](#), which can be viewed on computers with compatible video players. All video files are signed with an RSA 2048-bit signature to provide tamper protection. This applies to files stored locally, remotely, and downloaded. Quality of previously recorded video depends on the camera's settings.

Monitoring events

You can display events from FortiRecorder and its connected cameras and other devices such as motion detection, DIDO, and ACS without loading the live video feeds of your cameras. Monitoring this way saves network bandwidth.

Viewing events as a timeline

You can view the timeline separately from camera live video feeds, with no video players.

1. Go to *Monitor > Event > Event*.
2. Use the [timeline](#) to find motion detection and other events.

Viewing events as a table

Alternatively to the timeline, you can view events and recordings as a table.

Each entry in the list contains:

- start and end time of the event
- camera that the event occurred on (if applicable; FortiRecorder system events have no associated camera, but [ACS events have an associated camera](#))
- type of the event, such as *Annotate*, *ACS*, *Motion Detection*, *System* (FortiRecorder), and *Camera* (recording interruptions etc. that are not a motion detection alarm)
- subtype of the event, such as *Motion Alarm*, *System Reboot*, *Access Granted*, *Door Forced Open*, etc.

To display events as a table

1. Go to *Monitor > Event > Event List*.
2. Click *Select Cameras* and select which cameras' events to include.
3. In *Start date* and *End date*, select the time range of events.
4. Click *Events Filter* and select the type of events and/or annotations to include.

Exporting video from an event

See [Downloading video on page 130](#).

Monitoring motion detection notifications

If you have configured notifications based on events detected by cameras (see [Configuring notification triggers on page 105](#)), accounts configured to be notified can log in to the GUI and review the video clips. If you have configured email settings, then these accounts will also receive an email when a camera detects an event. Notifications contain snapshot images from the video clip of the detected motion or, depending on your configuration, a link directly to the video clip. (See [Customizing email templates on page 109](#).) In this way, recipients can quickly assess whether or not the event is serious, or just a false alarm.

Occasionally, you might also sometimes be required to review these notifications if, for example, the usual recipient is on vacation. If you have permissions (see [Configuring administrator profiles on page 82](#)), you can do this from the GUI, without logging in to a separate account. Alternatively, you can add yourself to the list of people that will receive a notification via email.

To monitor camera-based notifications

1. Go to *Monitor > Camera Notifications > Notification Events*.
2. From *Select recipient*, select either *All*, or the account that should have received the notification.

The list of notifications is filtered by the recipient criteria. Only matching notifications appear.

3. In the *Message* column, click the link to view that notification.

A new browser tab or window opens, displaying the notification that was included in the email body, if any. By default, the notification includes images that are key frames from the motion detection video clip.

4. To view the motion detection video clip, click a key frame image.

A video player replaces the notification, and begins to play the video. See also [Viewing previously recorded video on page 129](#).

Monitoring ACS notifications

If you have configured camera-based notifications (see [Configuring notification triggers on page 105](#)), accounts configured to be notified can log in to the GUI and review the video clips. If you have configured email settings, then these accounts will also receive an email when a camera detects an event. Notifications contain snapshot images from the video clip of the detected motion or, depending on your configuration, a link directly to the video clip. (See [Customizing email templates on page 109](#).) In this way, recipients can quickly assess whether or not the event is serious, or just a false alarm.

Occasionally, you might also sometimes be required to review these notifications if, for example, the usual recipient is on vacation. If you have permissions (see [Configuring administrator profiles on page 82](#)), you can do this from the GUI, without logging in to a separate account. Alternatively, you can add yourself to the list of people that will receive a notification via email.

To monitor ACS notifications

1. Go to *Monitor > Camera Notifications > Notification Events*.

2. From the *Select recipient* drop-down list, select either *All*, or an account that should have received the notification.

The list of notifications is filtered by the recipient criteria. Only matching notifications appear.

3. In the *Message* column, click the link to view that notification.

A new browser tab or window opens, displaying the notification that was included in the email body, if any. By default, the notification includes images that are key frames from the motion detection video clip.

4. To view the motion detection video clip, click a key frame image.

A video player replaces the notification, and begins to play the video.

Understanding the logs

Log messages record important events on your FortiRecorder for extensive monitoring over extended periods of time.

FortiRecorder appliances can log many different activities including:

- camera recording events
- administrator-triggered events such as logout and configuration changes
- system-triggered events including system failures

For details on specific messages, see the [FortiRecorder Log Reference](#).

You can select a [severity](#)(priority) level that log messages must meet in order to be recorded.

The FortiRecorder appliance can save log messages to its memory, or to a remote location such as a Syslog server or FortiAnalyzer appliance. For details, see [Configuring log settings on page 159](#).

To download a log file

1. Go to one of the log types, such as *Monitor > Log > Event*.
2. Right click a log.
3. Click *Export to Table*.

FortiRecorder converts the log entry to a CSV file, and then your web browser downloads it.

Log severity levels

Each log message contains a *Severity (pri)* field that indicates the [severity](#) of the event that caused the log message, such as *pri=warning*.

Level (0 is greatest)	Name	Description
0	Emergency	The system has become unusable.
1	Alert	Immediate action is required.
2	Critical	Functionality is affected.
3	Error	An error condition exists and functionality could be affected.
4	Warning	Functionality could be affected.
5	Notification	Information about normal events.
6	Information	General information about system operations.

For each location where the FortiRecorder appliance can store log files (disk, Syslog or FortiAnalyzer), you can define a severity threshold. The FortiRecorder appliance stores all log messages equal to or exceeding the log severity level selected.

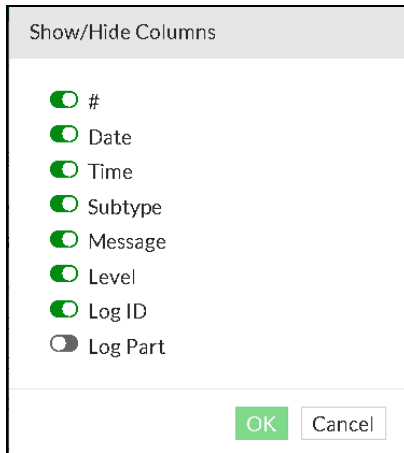
For example, if you select *Error*, the FortiRecorder appliance stores log messages whose log severity level is *Error*, *Critical*, *Alert*, and *Emergency*.

Displaying and organizing logs

You can show, hide, and re-order the display of logs.

To display or hide columns in logs

1. Go to one of the log types, such as *Monitor > Log > Event*.
2. Select the *Configure View* drop-down menu.
3. Click *Show/Hide Columns*.



Dialog box titled "Show/Hide Columns" with a list of columns and their visibility status (indicated by green circles):

- #
- Date
- Time
- Subtype
- Message
- Level
- Log ID
- Log Part

Buttons: OK, Cancel

4. Enable or disable the columns.
5. Click **OK**.

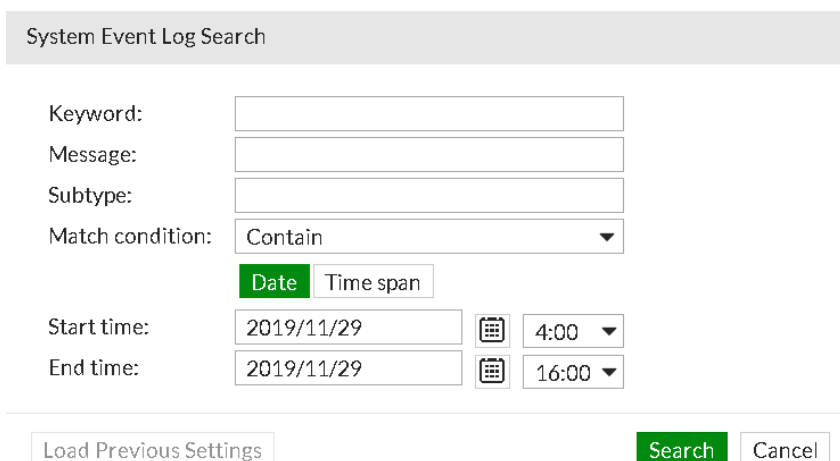
To arrange the columns and rows

1. Select and drag the column into the position.
2. Hover your mouse cursor over one of the column headings. An arrow will appear on the right side of the heading. Click the arrow to display a drop-down menu, then select either *Sort Ascending* or *Sort Descending* to sort the rows from either first to last, or last to first, based upon the contents of that column.
3. Column settings do not usually persist when you go to another location in the GUI, nor from session to session. If you want to keep the settings, you must select *Save View* from the *Configure View* drop-down menu.

Searching logs

When viewing logs, you can locate a specific log message by searching for it.

1. Go to one of the log types, such as *Monitor > Log > Event*.
2. Click *Search*.



System Event Log Search

Keyword:

Message:

Subtype:

Match condition:

☒ Date ☐ Time span

Start time:

End time:

3. Configure the following settings:

Setting Name	Description
Keyword	Type the word or phrase to search. The word may appear in any of the fields of the log message (for example, <i>Action</i> and/or <i>Message</i>) or in any part of that field's value. If entering multiple words, they must occur uninterrupted in that exact order. For example, entering admin as a keyword will include results such as: User admin2 logout from GUI(172.16.1.15) where part of the word appears in the middle of the log message. However, entering: User logout would not yield any results, because in the log messages, those words are always interrupted by the name of the account, and therefore do not exactly match your search key phrase. This setting is optional.
Message	Type all or part of the exact value of the <i>Message</i> field (msgfield when viewing a raw, downloaded log file) of the log messages that you want to find. This setting is optional.
Subtype	Enter the subtype, such as admin or system.
Match condition	Select whether your match criteria are specified exactly (<i>Contain</i>) or you have indicated multiple possible matches using an asterisk in <i>Keyword</i> (<i>Wildcard</i>).
Time	Select the date and time range that contains the log message that you are searching for. This setting is optional. Note: The date fields default to the current date. If you want to search for a previous event, you must configure this setting.

4. Click *Search*.

Viewing logs

The event log section displays every administrative event that occurs on the FortiRecorder system, such as unsuccessful login attempts and system failures.

Camera log displays the start and stop recording events, factory resets, and various other camera-related events on FortiRecorder.

Detection log displays instances of camera detections, such as motion detection.

You can use the GUI to view and download locally stored log messages. (You cannot use the GUI to view log messages that are stored remotely on Syslog or FortiAnalyzer devices.) Log messages are in human-readable format, where each log field's name, such as *Message* (msg field when viewing a raw, downloaded log file), indicates its contents.

To view log messages

1. Go to *Monitor > Log > Event*. Columns and appearance varies slightly by the log type.
2. From the *Level* and *Type* dropdown lists, select the level of severity and type of log you are searching for.
3. Double-click the row of a log file for a more detailed description of the log message.

Contents of the log section (some settings are only available in certain log types):

Setting Name	Description
Level	Select a severity level to hide log messages that are below this threshold (see Log severity levels on page 133).
Subtype	Select a subcategory (corresponding to the <i>Subtype</i> column) to hide log messages whose subtype field does not match.
Go to line	Type the index number of the log message (corresponding to the <i>#</i> column) that you want to jump to in the display.
Search	Click to find log messages matching specific criteria.
Back	Click to return to the list of log files stored on the hard drive of FortiRecorder.
Save View	Click to keep your current log view settings for subsequent views and sessions.
#	The index number of the log message within the log file. By default, the rows are sorted by timestamp in descending order, starting with the most recent log message. Note: In the current log file, each log's index number changes as new log messages are added, pushing older logs further down the stack. To find the same log message later, remember its timestamp and <i>Message</i>, not its #.
Date	The date on which the log message was recorded. When in raw format, this is the log's date field.
Time	The time at which the log message was recorded. When in raw format, this is the log's time field.
Action	The action the camera performed, such as stopping and starting recording.
Subtype	The category of the log message, such as admin for events such as authentication or configuration changes, or system for events such as disk consumption or connection failures. When in raw format, this is the log's subtype field.
Log ID	A dynamic log identifier within the system, not predictable, indicative of the cause nor necessarily a unique identifier. When in raw format, this is the log's <i>log_id</i> field.
Detection Type/Subtype	The particular kind of detection the camera registered, such as motion.
Message	The log message that describes the specific occurrence of a recordable event.

Monitoring face recognition

Face recognition monitoring provides a comprehensive log of events captured by the AI-enabled cameras. For information on configuring face recognition, see [Notifications via face recognition on page 150](#).

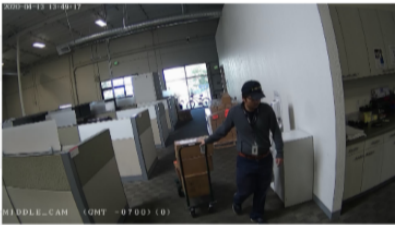
In *Monitor > Face Recognition*:

- *Abnormal Events* displays instances when policies for abnormal events were triggered.
- *Normal Event* displays instances when policies for normal events were triggered.
- *Activity* displays instances when faces were captured by an AI camera, whether or not there was a policy associated with it.

Double-click a log to see more details. Hovering your mouse cursor over the question mark icon in the *Person* row displays an image of the detected face.

Abnormal Event Details

Column	Content
Date	2020-04-13
Time	13:49:18
Type	event
Person	Unknown ?
Camera	MIDDLE_CAM
Location	



Close

You can filter through logs by person, camera, rule, and or time range by using the dropdown menu.

Monitoring DHCP status

For all devices that are using your FortiRecorder appliance's built-in DHCP server, you can display the current DHCP lease status and assigned IP address. This can be useful when:

- You need to find and block unauthorized devices that are connecting to your network.
- Camera connections are periodically interrupted because they do not have a DHCP reservation, and therefore their IP address changes.

To view the DHCP lease list, go to *Monitor > DHCP Status > DHCP*.

Monitoring network security

FortiRecorder records all of the failed login attempts and the IP addresses that are currently blocked from accessing the GUI and CLI. You can review and unblock IP addresses if an administrator or user has accidentally entered an incorrect password too many times.

To unblock an IP address

1. Go to *Monitor > Security > Blocked IP*.
2. Select the IP address.
3. Click *Add to Exempt List*.

Network security

There are features to harden the network security of your FortiRecorder appliance.

Configuring intrusion detection

Intrusion attempt detection can block IP addresses if failed login attempts from that IP address reach the threshold.

The blocking duration is based on the history of the IP address. If IP address has been blocked in the past, then FortiRecorder will block the IP address for a longer time. The maximum time an IP address can be blocked is 45 days.

For example, if you set the initial block period to 10 minutes, depending on the user's number of violations, the actual maximum block time can be up to 2 hours. If you set it to 30 minutes, the block time can be up to 12 hours.

If a user has consecutive unsuccessful login attempts within a certain period of time, the user's IP address is automatically added to an automatic dynamic exempt list.

To configure intrusion detection

1. Go to *Security > Intrusion Detection > Settings*.
2. Configure the following settings:

Setting Name	Description
Status	Select <i>Enable</i> , <i>Disable</i> , or <i>Monitor only</i> (log, but do not block).
Access tracking	Enable or disable what types of login access are tracked: CLI or Web. <i>CLI</i> is access via SSH or Telnet; <i>Web</i> is GUI access via HTTP(S).
Initial block period	Specify how long the IP address will be blocked after its failed login attempts reach the threshold for the first time. The actual block time will be increased for repeated offenders. The default setting is 10 minutes. Tip: To avoid false positives, avoid using a longer initial block time setting. The recommended setting is less than 30 minutes.

3. Click *Apply*.

To manually exempt IP addresses from authentication reputation tracking

1. Go to *Security > Intrusion Detection > Exempt IP*.
2. Click *New*.
3. Enter the IP address and netmask.
4. Click *Create*.

To remove IP addresses from the auto exempt list

1. Go to *Security > Intrusion Detection > Auto Exempt IP*.
2. Select the IP address.

3. Click *Delete*.

Schedules

Schedules are used by multiple features, such as determining when to record video, or when to allow a user to access a camera. In order to be accurate, schedules require a correct [system time](#).



For camera notification schedules, gaps are allowed, but overlaps are not. One-time schedules take precedence over recurring schedules.

Configuring a schedule

Schedules are used by multiple features. Often it is useful to schedule when cameras will record.



If no schedules are selected for a camera, or when the selected schedules conflict with each other, then FortiRecorder uses the default schedule, named Always.

1. Go to *Schedule > Schedule > Schedule*.
2. Click *New*.
3. Configure the following settings:

Setting Name	Description
Name	Enter a unique name for the schedule.
Description	Optional. Enter a description.
Type	Select a schedule type: • <i>Recurring</i>: Specified times on selected days, every week. • <i>One-time</i>: Only on a specific date and time.
Days	If <i>Type</i> is <i>Recurring</i> , select the days of the week when the schedule will be active.
All day	Enable if you want the schedule to be active during the whole day. Disable if you want to configure <i>Start time/End time</i> .
Start time/End time	Select the time range for the schedule. Instead of using the time on the clock, you can schedule according to the cycles of day and night that vary from summer to winter. For details, see Configuring the sunrise and sunset time on page 142 .

Setting Name	Description
	 You cannot create a recurring recording schedule where the hours vary by each day of the week, but you can achieve the same effect if you create multiple schedules, one for each day of the week.

- Click *Create*.
- To use the schedule, select it in one of the features that use it, such as [Configuring device access control on page 84](#) or [Configuring camera profiles on page 60](#).
To view the schedule that the camera is currently using, you can go to *Camera > Configuration > Camera*, click a row to select the camera, and then click *View Schedule*.

Configuring the sunrise and sunset time

When specifying schedules, you can use a specific date and time, or the time of sunrise and sunset, which varies during the year from summer to winter. This is useful if, for example, you want to record only during the night.

To get the sunrise and sunset time

- Go to *Schedule > Schedule > Settings*.
- Enter the geographical latitude and longitude where the FortiRecorder and camera are located.
- Click *Calculate*.

The time of sunrise and sunset on a few days is displayed.



When using a combination of sunrise or sunset and the specific time, if the time crosses the boundary of sunrise or sunset, the schedule has no effect.

For example, if the sunrise is at 8:00 AM and you set the schedule from sunrise to 7:00 AM, then the schedule has no effect.

Analytics

Video analytics can find specific instances of motion on your cameras, along with instances during the recording when FortiRecorder recognized specific people or objects.

Using motion detection analytics

You can search through recordings for changes (motion detections) in a defined area of the video during certain periods of time. This allows you to find specific events after the initial live viewing. Once completed, you can view the search results in a graph format.

To run analytics tasks

1. Go to *Analytics > Motion > Task*.
2. Click *New*.
3. Select a camera from the drop-down menu.
4. Select the type of motion you are attempting to detect from the Type drop-down menu. Motion detection analyzes the video for changes in position of an object relative to its surroundings, while motion heatmap reviews the recordings of a camera and overlays motion areas into a heatmap, which can help determine areas with more traffic.
5. Specify the time frame.
6. Click *Create*.

Time required varies, but could be a few minutes. After the task is completed, double-click the task to view the results. You can adjust the sensitivity and threshold of the search result.

Using computer vision analytics

Computer vision processes events generated by face and object detection.

FortiRecorder can detect important objects such as a vehicle or a weapon. Object detection in FortiRecorder is treated as a camera-related event, similar to motion detection.

For face recognition, FortiCentral installations can create models of the faces that your cameras see, and then store them in a database on FortiRecorder. Every FortiCentral that runs face detection can contribute to your face recognition database. This distributed processing scales well as your organization grows. FortiRecorder can then use computer vision to analyze digital images to identify important people via face recognition.



Alternatively, you can perform face modeling and face recognition at a centralized location, on FortiRecorder.

Both methods store their analysis results on FortiRecorder. However, the results are stored in separate databases. On FortiRecorder:

- *Analytics > Computer Vision*: Face modeling by FortiCentral. Both FortiCentral and FortiRecorder can query this database for face recognition. For details on face recognition in FortiCentral, see the [FortiCentral User Guide](#).
- *Face Recognition > User Asset*, etc.: Face modeling by FortiRecorder. Currently, only FortiRecorder can query this database for face recognition. FortiCentral cannot use it. For details, see [Face recognition on page 145](#).

For information about viewing logs and managing the databases via REST API, see the [FortiRecorder REST API Reference](#).

To enable detection actions

1. Go to *Analytics > Computer Vision > Computer Vision*.
2. Enter the amount of time to use to decide on a recognized face or object in the *Accept detection after* field.
More time allows the camera a chance to get a more complete view of the object or face so that FortiRecorder can avoid misinterpretations.
3. Enable *Face detection action*. Face detection is organized into categories:
 - *Prohibited*: Individuals who are prohibited from accessing the building.
 - *VIP*: Individuals who are very important and are not security threats.
 - *Expired*: The time is past the expiry date of the person recorded.
 - *Unknown*: Individuals who are detected but not matched to an individual in the database.
 - *Regular Person*: Individuals who are recognized as common visitors, such as guests, employees, or contractors.
4. Enable *Object detection action*. Object detection is organized into categories:
 - *Person*: An individual.
 - *Motion*: Something that has generated motion.
 - *Weapon*: A detected tool that can cause harm.
 - *Vehicle*: A transportation machine, such as a bike, a car, or a train.
 - *Animal*: A non-human creature, such as a bird or a dog.
 - *Item*: An object, such as a backpack or a suitcase.
 - *Sport*: Athletic equipment, such as skis or a skateboard.

Each category can be further filtered by only enabling parts of the group in the analytics processor.
5. From the drop-down menu, select the action of FortiRecorder when it detects each category:
 - *No action*: Ignore events of this type.
 - *Event*: Accept events of this type, process them for notification, and display them on timelines and logs.
 - *Event clip*: Accept events of this type, process them for notification, display them on timelines and logs, and generate a video clip at the moment of detection.
6. Click *Apply*.

Face recognition

Face recognition on FortiRecorder uses artificial intelligence (AI) to identify unique faces and enact policies based on configured information. For example, you can identify faces as "known" and enter information about them in the face recognition database, such as their job role or their department. The information can be used to track when the person usually appears and how often so that you can create notification policies about unexpected occurrences or unauthorized locations.



Alternatively, you can process face modeling and face recognition in a distributed way, with FortiCentral installations.

Both methods store their analysis results on FortiRecorder. However, the results are stored in separate databases. On FortiRecorder:

- *Analytics > Computer Vision*: Face modeling by FortiCentral. Both FortiCentral and FortiRecorder can query this database for face recognition. For details on face recognition in FortiCentral, see the [FortiCentral User Guide](#).
- *Face Recognition > User Asset*, etc.: Face modeling by FortiRecorder. Currently, only FortiRecorder can query this database for face recognition. FortiCentral cannot use it.



Face recognition requires Internet access and is supported on FortiRecorder-200D, 400D, 400F and VM. For FortiRecorder-VM, a minimum of 4 GB of memory is required, but 8 GB or more is recommended.

To enable face recognition in the GUI

1. Go to *Dashboard > Status*. In the *License Information* widget, verify that you have a valid license for face recognition.



If the license is expired or invalid, then only the previous 7 days of face recognition data (face clusters, timeline, events, and activity) will display.

2. Go to *Camera > Configuration > Camera Profile*.
3. Select the camera profile to enable face recognition on and then select *Edit*.
4. Expand the *Recording* section. In *Recording type*, enable *Motion detection*. In *Store on*, enable FortiRecorder.
5. Click *OK*.
6. Go to *Face Recognition > User Asset > AI Cameras*.
7. In the *AI Status* column, enable AI for one or more cameras.

Face recognition AI only analyzes video from the selected cameras. Analysis results in face clusters, which you must review and confirm in order to ensure accurate face recognition. Continue with [Identifying faces on page 146](#).

To enable face recognition in the CLI

Enter these commands:

```
config system global
  set face-recognition enable
```

end

Identifying faces

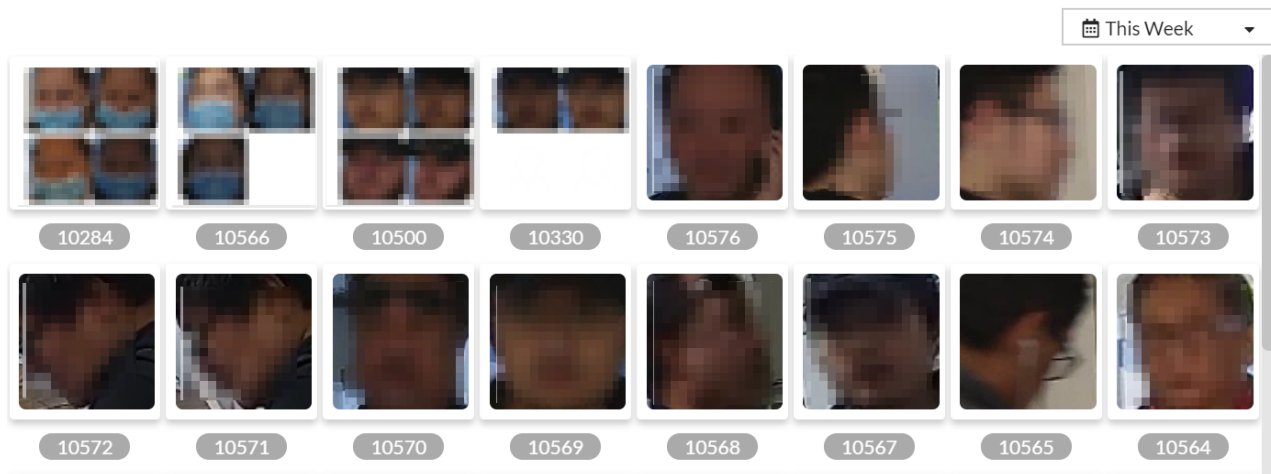
A face cluster is a collection of images of the same person detected by face recognition AI. Face clusters are categorized as either known or unrecognized (new) faces.

Reviewing new faces

All unrecognized face clusters are categorized as new faces. If you know the person, you can link the face cluster to that person's record in the face recognition database so that FortiRecorder can recognize the face.

To link a new face cluster to a person

1. Go to *Face Recognition > Face Cluster > New Faces*.
2. Select the time range from the dropdown menu to display face clusters captured in that time period.



3. Select a face cluster to open all images that the AI has grouped as the same person.
4. Confirm that all images contain the same person. If an image does **not** show the same person, then hover over the image and click the trash can icon in order to correct the AI.



Verify every face in the face cluster. If faces are not correctly identified, and you do not correct it, then AI identification will be less accurate.

5. Either:
 - From the *Search User* dropdown menu, select an existing person to whom the face cluster belongs. The five closest matches appear.
 - Click *New User* and enter their person's name, role, and department and then click *Save*. For details, see [Configuring a department and role on page 147](#).
6. Click *Link all to user*.

The individual's face cluster is now a known face. All future face images are analyzed by the AI and categorized by their face cluster.

Reviewing known faces

Known face clusters contain images of people that are recognized by face recognition AI, or that you manually linked to an entry in the face recognition database.

To edit known face clusters

1. Go to *Face Recognition > Face Cluster > Known Faces*.
2. Select the face cluster for a person to open that record. For details, see [Configuring a department and role on page 147](#).
3. Hover your cursor over the profile picture and click *More*.
All the face clusters manually linked to the user are displayed.

Configuring a department and role

The face recognition database ("user assets") can contain information that you enter about the people that face recognition detects, such as the person's name and department. This can provide more context when you receive [notifications](#) or use the [timeline](#).

To create a new job role

1. Go to *Face Recognition > User Asset > Department and Role*.
2. Expand the *Role Management* section.
3. Click *New*.
4. Enter the *Role Name* and *Description*.
5. Click *Save*.

To create a new department

1. Go to *Face Recognition > User Asset > Department and Role*.
2. Expand the *Department Management* section.
3. Click *New*.
4. Enter the *Department Name* and *Description*.
5. Click *Save*.



You can also create a new department and role from the *UserDB* section by selecting the user's row and then selecting the *Edit* button.

Configuring a floor plan

You can use a floor plan to indicate where cameras are in the building. This can be used to locate people that face recognition detects.

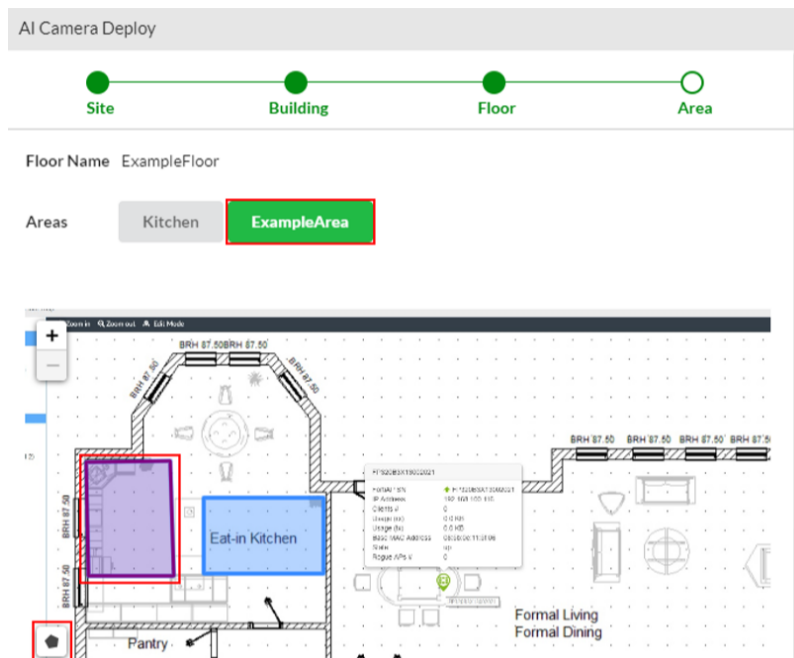
To configure a floor plan

1. Go to *Face Recognition > User Asset > Floor Plan*.
2. Click *Create floor plan*.
3. Click *Create new site* and enter a name for the site, or select an existing site. Click *Next*.

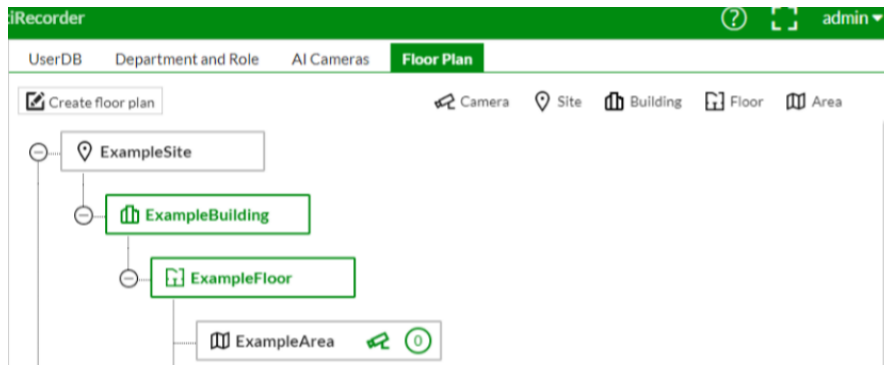


Currently, only one site and one building are supported. If you already have a site and/or building, then there is no button to create a new site or a new building.

4. Click *Create a new building* and enter the name and address of the building. Mark the building's location on the provided map. Click *Next*.
5. Click *Create a new floor* and enter the name of the floor, or select an existing floor from the *Choose a Floor* dropdown menu. If you create a new floor upload an image of the floor plan. Click *Next* and then enter the dimensions. Click *Next*.
6. Select the polygon icon to draw on an area in the floor plan. Once the area is drawn, enter a name for the area and click *Save*.



7. Click *Finish*.
A flowchart of your site appears.



Locating cameras and setting processing schedules

You can assign an AI-enabled camera to a specific location in a floor plan to show where the camera is located and therefore where a person's face was detected.

You can also set an existing FortiRecorder schedule to an AI camera so that the face recognition AI module prioritizes processing the video within the designated schedule timeline first.

To assign a location to a camera

1. Go to *Face Recognition > User Asset > AI Cameras*.
2. Select the camera row and then click *Assign*.
3. Follow the prompt on the screen to select the site, building, and floor for the **location** of the camera.
4. Select the name of the area or select the area from the floor plan.
5. Select the location of the camera within the selected area.
6. Select *Done*.

To set a schedule for an AI-enabled camera

1. Go to *Face Recognition > User Asset > AI Cameras*.
2. Select the camera to highlight the row in blue.
3. Click *Schedule*.
4. From *Video Process Priority*, select either:
 - *Latest high priority*: AI processes the newest video first.
 - *Earliest high priority*: AI processes the oldest video first.
5. From *Schedule*, select the schedule that governs the face recognition AI module. Face recognition AI will not function outside of the schedule.
6. Click *Save*.

Notifications via face recognition

Face recognition policies log and/or alert you to occurrences that fit your criteria.

For example, you could set a policy that sends you an SMS text message whenever an unknown person's face is captured on camera in a high security location.

1. Go to *Face Recognition > Policy > Policy*.
2. Click *New*.
3. Enter a *Rule Name*.
4. From the *Event Type* dropdown list, select either:
 - *Normal*: Any expected occurrence. For example, an employee enters the building at the usual time to start his shift. Although the event is normal, you might still want to be notified of the event's occurrence.
 - *Abnormal*: Any unexpected occurrence. For example, an employee enters an area of the building that he should not have access to, and doesn't usually enter.
5. From the *Site, Building, Floor, and Area* dropdown lists, indicate the location that you want to monitor.
6. From the *Person* dropdown list, select the [face cluster](#) that will match the policy.
7. From the *Action* dropdown list, select one or more actions to do when the policy is matched:
 - *alert*
 - *email*
 - *sms*
8. Click *Save*.

Searching the face recognition database

You can browse and search information in the face recognition database.

+ New...
Edit...
Delete...

1 / 21
Records per page: 25
Search User
Total:512

Pic.	Name	Role	Department	Ref
	security	default-role	default-department	●
	w56	default-role	default-department	●
	f114	default-role	default-department	●
	p47	default-role	default-department	●
	f113	default-role	default-department	●
	f112	default-role	default-department	●
	f111	default-role	default-department	●
	f110	default-role	default-department	●

To view face recognition information about a person

1. Go to *Face Recognition > User Asset > UserDB*.
2. Select the user. A profile appears displaying the following information:
 - *Activity by date*: The user's activity on camera over multiple days within an hourly timeline.
 - *All activities*: The user's activity on camera within a daily timeline.

Green circles represent when an individual's face was captured on camera. The darker the circle, the more frequent the appearances. Hover your mouse over the circle to view more details or select the circle to view the captured video footage.



Zoom in or out of the timeline by hovering your mouse over the timeline and scrolling up or down. Pan across the timeline by clicking and dragging left or right.

To add a person to the face recognition database

1. Go to *Face Recognition > User Asset > UserDB*.
2. Click *New*.
3. Enter the user's name.
4. Select their role and department from the dropdown menus.

Using the face recognition timeline

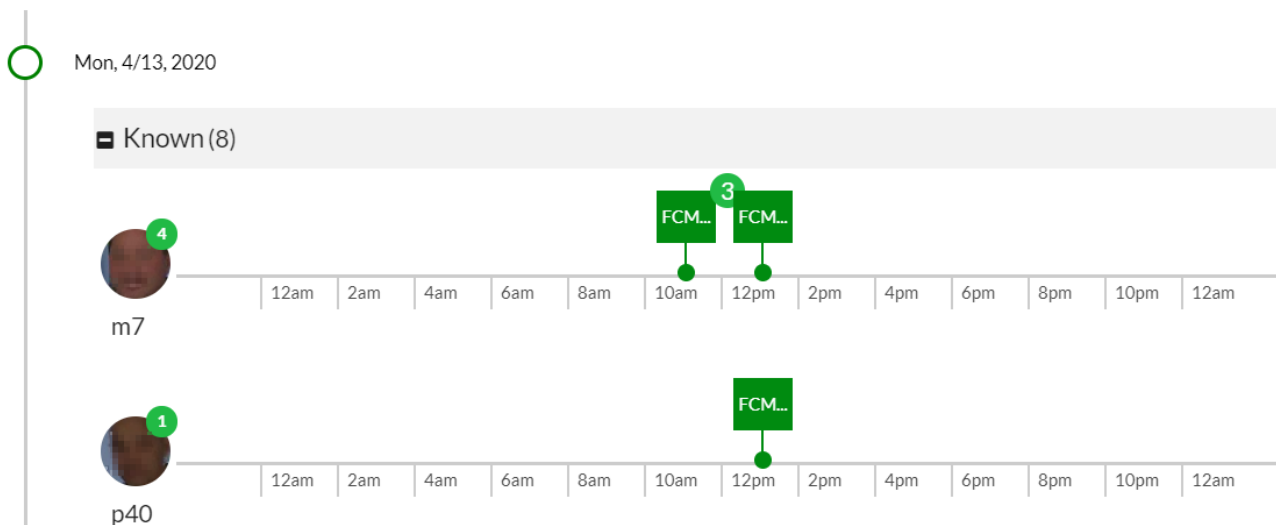
Go to *Face Recognition > Face Timeline* to view a timeline of daily activities of people detected by AI-enabled cameras.

Face Timeline

100% of the video source has been parsed

📅 This Week ▼

📺 All ▼



Each day contains a list of *Known* and *New* face clusters and a timeline of their appearances on specific cameras during the 24 hour period.

Select an appearance to view more details and view video footage of the appearance.

Filter the timeline display by selecting the range of time and the AI-enabled camera from the dropdown menus.

Integrating with an ACS

FortiRecorder can be integrated with access control systems (ACS) to monitor ACS events such as door opening, forced entries, granted entries, and denied entries. When an event happens, the associated cameras can record the event.

Adding an ACS system

To integrate FortiRecorder with an access control system (ACS), specify the ACS connection, login credentials, and event actions.

To add an ACS system

1. Go to **ACS > Configuration > ACS**.
2. Configure the following settings:

Setting Name	Description
Status	Enable to use this ACS server.
Type	Select either a: • Kantech EntraPass • Advantech ADAM-6051-D Ethernet Remote I/O
User Name	Enter the ACS user name. This option appears if Type is <i>EntraPass</i> .
Password	Enter the password of the ACS user name. This option appears if Type is <i>EntraPass</i> .
Address	Enter the IP address of the ACS server.
Port	Enter the listening port number of the ACS server. This option appears if Type is <i>EntraPass</i> .
Secure	Enable if the ACS server requires secure connections (HTTPS). This option appears if Type is <i>EntraPass</i> .
Actions	For each ACS event type (<i>Door open</i> , etc.), select the action that it triggers on FortiRecorder: • <i>no action</i> • <i>event</i>: Add a marker on the timeline on FortiRecorder. • <i>event clip</i>: Record a short video clip only. See also Associating cameras with ACS elements on page 154.

Associating cameras with ACS elements

After you've connected your FortiRecorder to the ACS system, you can assign cameras to the ACS events in the ACS *Source Map*. For example, if you have camera A and camera B installed and pointed at the front entrance of the building, you can associate them with the front door.

1. Go to **ACS > Configuration > Source Map**.
2. Select a source such as a door.
3. Click *Edit*.
4. In the dialog, select the matching camera from the *Camera List* and click >> to move it to the *Member* list.
5. When an ACS event occurs, you can view the video from the associated camera. See [Monitoring ACS events on page 154](#).

Monitoring ACS events

To view events detected by ACS, go to **Monitor > ACS**.

On the upper right corner, click *Select ACS Devices* to filter the events by ACS devices.

Setting Name	Description
Time	Time stamp when the event was triggered.
Name	Location of the triggered event.
Card Info	Card holder's name.
Event	Name of the event, as listed under ACS > Configuration.
Cameras	Cameras recording the events.
Description	Description of the events.

Configuring video services

The *Service* section contains a variety of tools to adjust how you view videos.

Configuring video sharing

This section contains options to enable video and image sharing in FortiRecorder.

Sharing video streams

You can share videos from your cameras on web sites. This allows users to the live feed of a camera—without being prompted to log into the FortiRecorder appliance.

For example, if your web browser supports HTML5, you can insert the following code into a web page:

```
<iframe
  frameborder="10"
  scrolling="no"
  width="640"
  height="480"
  src="https://10.0.0.5/api/v1/FRC_LiveView?id=FD51
      &width=640&height=480&view_mode=3
      &hostName=10.0.0.5
      &username=videoService&password=1234">
  <p>iframes are not supported by your browser.</p>
</iframe>
<br />
<script>
  setInterval(function() {
    var req = new XMLHttpRequest();
    req.open('GET',
      "https://10.0.0.5/api/v1/FRC_LiveView?id=FD51
        &username=videoService&password=1234
        &heartbeat=1", true);
    req.send();
  }, 10000);
</script>
```

where:

- 10.0.0.5 is the IP address of the FortiRecorder
- id is the name of the camera as defined on the FortiRecorder
- width and height are the size of the <iframe>
- username and password are a login for the service as defined on the FortiRecorder in the following procedure

Once you have entered the code into your web page, configure the FortiRecorder unit to allow your web page to access the camera group via HTTPS.

If you want to share the video stream via RTSP, the user can use a RTSP client to access the video at:

```
rtsp://<user_name>:<password_str>@<fortirecorder_ipv4>:<port_int>/camera=<id>
```

For example:

```
rtsp://videoService:1234@10.0.0.5:554/camera=FD51
```

For details, see the [FortiRecorder REST API Reference](#).

To configure video sharing

1. Embed the video stream into a web page with HTML code similar to what is shown above, and/or configure video players to connect via RTSP.
2. On FortiRecorder, go to *Service > Video > Stream*.
3. Enable *Status*.
4. In *Username* and *Password*, enter the login credentials that the web page or video players will use to connect to the share.
5. In *Protocol*, enable the network protocols that users will use to connect to the camera: *HTTPS* and/or *RTSP*.
6. In *Camera Group List*, select the camera groups that you want to share with users, and then click the right arrow button (*>>*).
7. Click *OK*.

Downloading video clips via API

You can enable FortiRecorder to allow an external service to make REST API queries to downloading video clips from selected cameras. For details, see the [FortiRecorder REST API Reference](#).

To configure video clips

1. Go to *Service > Video > Clip*.
2. Enable the status button.
3. Enter a password.
4. Select which cameras video clips can be retrieved from by selecting the camera group's name and then the right arrow.
5. Click *Apply*.

Sharing snapshot images

You can configure your FortiRecorder unit to upload images from a camera group. Using the image service your cameras will capture a snapshot image at specified intervals and upload the image to an FTP server.

Alternatively, you can use the REST API to download snapshots. For details, see the [FortiRecorder REST API Reference](#).

To configure image sharing

1. Optionally, if your FTP server is also a web server, you can embed an image file name into a web page, similar to [Sharing video streams on page 155](#).
FortiRecorder will be configured to upload snapshot images to this file name. The web page will display the snapshot.
2. On FortiRecorder, go to *Service > Video > Image*.
3. Enable *Status* to enable FTP uploads.
4. In *Interval*, enter the number of seconds between each snapshot.
5. Enter the FTP settings.
6. In the *Select Camera* section, click *New* and select the cameras whose snapshots you want to share.
7. Enable or disable image processing.

The FortiRecorder retrieves these settings and sends privacy processed snapshots at the chosen interval.



Camera live video feeds **must** remain open in a view pane on FortiCentral where privacy analytics are active. Image processing is done by FortiCentral installations that are connected to FortiRecorder.

8. Click *Apply*.

Streaming recorded video clips to YouTube

To stream live video to YouTube, you must create a YouTube account. You can only stream one camera per YouTube account.

To stream live video to YouTube

1. Go to *Service > Video > YouTube*.
2. Click *New*.
3. Enter a name for this task.
4. Enter a description for this task.
5. Select which camera you want to stream.
6. In *Encoder Setup*, enter the server URL and stream name or key. This is the information you get when you set up the YouTube account.
7. Click *Create*.

Using the monitor display port

On FortiRecorder- 100D and 400D models, there is a video display port. You can specify which camera's video will be displayed on the screen.

To use the monitor display

1. Go to *Service > Monitor Display > Monitor Display*.
2. Enable the status
3. Specify how to use the camera label on the monitor from the drop-down menu.

4. Click *New* to add a camera.
5. Select the camera from the drop-down menu and then specify which video stream to display, either viewing or recording.
6. Click *OK*.

Using Chromecast with FortiRecorder

You can use Google Chromecast with FortiRecorder to remotely monitor video streams from a camera on a mobile device, a computer, or a TV.



For FortiRecorder to discover the Chromecast device, you must connect it to a FortiRecorder private network port. However, for Chromecast to fetch and stream videos from FortiRecorder, FortiRecorder must have a public port reachable from the Internet and a valid certificate. See also [Configuring the public port numbers and domain name on page 46](#) and [Replacing the default certificate for the GUI on page 112](#).

In addition to streaming video content, FortiRecorder can also stream photos to a Chromecast device.

To connect Chromecast to FortiRecorder

1. Connect Chromecast to a FortiRecorder private network port.
2. On the FortiRecorder GUI, go to *Service > Chromecast > Device*.
3. Click *Discover* to search for Chromecast.

If successful, the discovered device will be listed in the device table. See also [Appendix: Port numbers on page 196](#).

To configure Chromecast in FortiRecorder manually

1. Go to *Service > Chromecast > Device*.
2. Either click *New* to manually add and configure a new device, or select a discovered device from the device list and click *Configure*.
3. Enable *Status*.
4. Enter the name, location, and address of the Chromecast device.
5. Select the way to present the information on the Chromecast device from the *Layout* drop-down menu.
6. Select the cameras that you want to stream.
7. Click *Create*.

To stream photos to a Chromecast device

1. Go to *Service > Chromecast > Image*.
2. Click *Add*.
3. Select the file and then click *Open*.

Analyzing logs and alerts

You can use log messages and alerts to analyze important events that have been recorded on FortiRecorder.

Configuring log settings

To diagnose problems or to track actions that the FortiRecorder appliance does as it receives and processes video, configure the FortiRecorder appliance to record log messages. See also [Understanding the logs on page 132](#).



Avoid recording very frequent log messages, or that use low thresholds for *Log level* such as *Information* or *Notification*, to the local hard disk for an extended period of time. Excessive logging frequency can cause undue wear on the hard disk and may cause premature failure.

To configure logging

1. Go to *Logs & Alert > Log Settings > Local*.
Alternatively, if you want logs to be stored remotely, go to *Logs & Alert > Log Settings > Remote*.
2. If you are configuring locally stored logs, configure the following settings:

Setting Name	Description
Log file size	Type the file size limit of the current log file in megabytes (MB). The log file size limit must be between 1MB and 1000 MB. Note: Large log files may decrease display and search performance.
Log time	Type the time (in days) of the file age limit. If the log is older than this limit, even if has not exceeded the maximum file size, a new current log file will be started. Valid range is between 1 and 366 days.
At hour	Select the hour of the day (24-hour format) when the file rotation should start. When a log file reaches either the age or size limit, the FortiRecorder appliance rotates the current log file: that is, it renames the current log file (elog.log) with a file name indicating its sequential relationship to other log files of that type (elog2.log, and so on), then creates a new current log file. For example, if you set the log time to 10 days at hour 23, the log file will be rotated at 23:00 (11:00 PM) on the 10th day.
Log level	Select the severity level that a log message must equal or exceed in order to be recorded to this storage location.

Setting Name	Description
	For details, see Log severity levels on page 133 .
Log options when disk is full	Select what the FortiRecorder will do when the local disk is full and a new log message is caused, either: • <i>Do not log</i> — Discard all new log messages. • <i>Overwrite</i> — Delete the oldest log file in order to free disk space, and store the new log message.
Logging Policy Configuration	Select what type of FortiRecorder events and camera events you want to log. You can enable an entire category of event, such as Detection Events or you can enable individual detections within each category by expanding the category and then toggling the event you want to log.

3. If you are configuring remote log storage, click *New*, then configure the following settings:

Setting Name	Description
IP	Type the IP address of a Syslog server or FortiAnalyzer.
Port	Type the UDP port number on which the Syslog server listens for log messages. The default is 514.
Level	Select the severity level that a log message must equal or exceed in order to be recorded to this storage location. For details, see Log severity levels on page 133. Caution: Avoid recording log messages using low severity thresholds such as Information or Notification to the local hard disk for an extended period of time. A low log severity threshold is one possible cause of frequent logging. Excessive logging frequency can cause undue wear on the hard disk and may cause premature failure.
Facility	Select the facility identifier the FortiRecorder will use to identify itself to the Syslog server if it receives logs from multiple devices. To easily identify log messages from the FortiRecorder when they are stored on a remote logging server, enter a unique facility identifier, and verify that no other network devices use the same facility identifier.
CSV format	Enable if your Syslog server requires comma-separated values (CSV). Note: Do not enable this option if the remote host is a FortiAnalyzer. FortiAnalyzer does not support CSV-formatted log messages.
Logging Policy Configuration	Select what type of FortiRecorder events and camera events you want to log.

4. To verify logging connectivity, from FortiRecorder, trigger a log message that matches the type and severity levels that you have chosen to store on the remote Syslog server or FortiAnalyzer. Then, on the remote host, confirm that it has received that log message.



If you will be sending logs to a FortiAnalyzer appliance, you must add the FortiRecorder to the device list on FortiAnalyzer, and allocate enough disk space. Otherwise, depending on its configuration for unknown devices, FortiAnalyzer may ignore the logs. When the allocated disk space is full, it may drop subsequent logs.

If the remote host does not receive the log messages, verify the FortiRecorder's static routes (see [Configuring routing on page 38](#)) and the policies on any intermediary firewalls or routers (they must allow Syslog traffic from the FortiRecorder network interface that is connected to the gateway between it and the Syslog server). To determine the point of connectivity failure along the network path, if the FortiAnalyzer or Syslog server is configured to respond to ICMP ECHO_REQUEST (ping), go to *Dashboard > Console* and enter the command:

```
execute traceroute <syslog_ipv4>
```

where <syslog_ipv4> is the IPv4 address of your FortiAnalyzer or Syslog server.

Configuring alert email

FortiRecorder can send alert emails whenever an important system event occurs, such as the hard disk being full.

To configure alert email settings

1. Configure the mail server settings so that FortiRecorder can send email. For details, see [Configuring email settings for notifications on page 96](#).
2. Go to *Logs & Alert > Alert Email > Configuration*.
3. Click *New*.

You can configure up to 10 recipient email addresses.

4. In *Email to*, enter the recipient email address that FortiRecorder will use, such as:

```
admin@example.com
```



This setting is only for appliance-related notifications, such as the hard disk being full. It does not configure the recipient of camera-related notifications, such as motion detection. See [Configuring notification triggers on page 105](#).

5. Click *Create*.
6. Go to *Logs & Alert > Alert Email > Category*. Mark the check boxes of all appliance events that you want to trigger an alert, such as:

Setting Name	Description
System events	Enable to notify when serious system events occur such as daemon crashes. See also Resource issues on page 174 .
Disk is full	Enable to notify when the disk partition that stores log data is full. See also Data storage issues on page 174 .

Setting Name	Description
Camera device altered	Enable to notify when a defined camera configuration has been enabled or disabled, or if there are problems with the camera. (The FortiRecorder will not control or record video from a camera that is not enabled in its list of known, configured devices. See Configuring cameras on page 63 .)
Camera communication error	Enable to notify when there has been a network error during communications between the FortiRecorder and camera. See also Connectivity issues on page 175 .
Camera recording error	Enable to notify when an issue prevents a camera from recording. See also Video viewing issues on page 172 and Connectivity issues on page 175 .
Camera alert summary	Enable notify when various alerts have been triggered.
Video disk events	Enable to notify when the disk partition that stores video data is full. See also Data storage issues on page 174 .

7. Click *Apply*.

Best practices

Fine-tuning and best practice tips can help to run your FortiRecorder appliance securely and reliably.

While many features are optional, some practices are strongly recommended because they reduce complication, risk, and potential issues.



This section includes only recommendations that apply to a combination of multiple features, to the entire appliance, or to your overall network. For feature-specific recommendations, see the tips in each feature's instructions.

Hardening security

FortiRecorder is designed to manage IP cameras and store video. While FortiRecorder does have some security features, its primary focus is surveillance. It always should be protected by a network firewall, and physically kept in a restricted access area.

Should you want to protect the appliance from accidental or malicious misuse from people within your private network, this section lists tips to further enhance security.

Topology

- To protect your surveillance system from hackers and unauthorized network access, install the FortiRecorder appliance and cameras behind a network firewall such as a FortiGate. FortiRecorder is not a firewall. FortiRecorder appliances are designed specifically to manage cameras and store video.
- If remote cameras or people will be accessing the appliance via the Internet, through a virtual IP or port forward on your router or FortiGate, configure your router or firewall to restrict access, allowing only their IP addresses. Require firewall authentication for connections from network administrators and security guards.
- Make sure traffic cannot bypass the FortiRecorder appliance in a complex network environment, accessing the cameras directly.
- If you do not need remote access while traveling or at home, do not configure it. If you do, however, apply strict firewall policies to the connection, and harden all accounts and administrative access (see [Administrator access on page 164](#), and [Operator access on page 164](#), and [Configuring the public port numbers and domain name on page 46](#)). Keep the FortiRecorder software up-to-date, especially with security patches(see [Updating the firmware on page 49](#)).
- Disable all network interfaces that should not receive any traffic. (Set the [Administrative Status](#) to *Down*.) For example, if administrative access is typically through port1, cameras are connected to port2, and network file storage and the Internet are connected to port3, then you would disable ("bring down") port4. This would prevent an attacker with physical access from connecting a cable to port4 and thereby gaining access if the configuration inadvertently allows it.

Administrator access

- As soon as possible during initial FortiRecorder setup, give the default administrator, "admin", a password. This super-administrator account has the highest level of permissions possible, and access to it should be limited to as few people as possible. See [Setting the "admin" account password on page 33](#).
- Administrator passwords should be at least 8 characters long and include both numbers and letters.
- Change all passwords regularly. Set a policy — such as every 60 days — and follow it.
- Instead of allowing administrative access to the FortiRecorder appliance from any source, restrict it to trusted internal hosts (see [Trusted hosts on page 80](#)).
- On those computers that you have designated for management, apply strict patch and security policies. Always password-encrypt any FortiRecorder configuration backup that you download to those computers to mitigate the information that attackers can gain from any potential compromise. If your computer's operating system does not support this, you can use third-party software to encrypt the file.
- Do not give administrator-level access to all people who use the system. Usually, only a network administrator should have access to the network settings. Others should have operator accounts. This prevents others from accidentally or maliciously breaking the appliance's connections with cameras and computers. See [Configuring administrator profiles on page 82](#).
- By default, an administrator login times out if it is idle for more than 5 minutes. You can change this to a longer period in the idle timeout settings, but Fortinet does not recommend it. Left unattended, a GUI or CLI session could allow anyone with physical access to your computer to change FortiRecorder settings. Small idle timeouts mitigate this risk. See [Configuring the public port numbers and domain name on page 46](#).
- Restrict administrative access to a single network interface (usually port1), and only allow the management access protocols that you use.

Use only the most secure protocols. Disable [Access: PING](#), except during troubleshooting. Disable [Access: HTTP](#), [Access: SNMP](#), and [Access: TELNET](#) unless the network interface only connects to a trusted, private administrative network. See [Configuring network interfaces on page 34](#).

Operator access

- Authenticate users only over encrypted channels such as HTTPS. Authenticating over non-secure channels such as Telnet or HTTP exposes the password to any eavesdropper. For certificate-based server or FortiRecorder authentication, see [Replacing the default certificate for the GUI on page 112](#).
- Immediately revoke certificates that have been compromised. If possible, automate the distribution of certificate revocation lists (see [Revoking certificates on page 118](#)).

Optimizing performance

When configuring your FortiRecorder, many settings and practices can yield better performance.

All deployment components can affect performance:

- FortiRecorder
- cameras

- computer with FortiCentral or a web browser that connects to FortiRecorder
- network devices such as NAS for remote storage

Total performance is a combination of:

- input—video compression, image quality, image complexity, video resolution, frame rate, number of cameras
- output—to either FortiCentral or a web browser, for both live video streams and playing previous recordings
- storage—copies of video files for each motion detection clip, or only [markers in an existing continuous recording](#) (markers are smaller than copies of large video files)



Performance bottlenecks are usually:

- Network bandwidth to and from FortiRecorder

Separate network and a dedicated port on FortiRecorder for camera connections only are recommended. [Lower resolution, quality, or frame rate for the live video stream](#) is recommended.

To troubleshoot issues such as high bandwidth usage, video stream [gaps](#), or dropped (skipped) packets or frames for each camera, go to:

- *FortiView > Camera Statistics > Bandwidth*
- *FortiView > Camera Statistics > Advanced.*
- CPU of computers with FortiCentral or web browsers

Displaying multiple video streams at the same time is CPU-intensive.

See also [Sizing guidelines on page 23](#).

Computer CPU usage

If you need to view 8 or more live video streams simultaneously, then for less powerful computers, you might need to optimize CPU usage. If the video "freezes" or motion is not smooth, or if cameras do not quickly respond to PTZ controls:

1. Use diagnostic tools (for example, Task Manager on Microsoft Windows). Examine CPU usage while you are experiencing video problems to verify that the cause is not other software.
Ideally, the CPU usage should be below 50%.
2. For each camera, create another video profile. Reduce the video resolution, quality, and/or frames per second until performance is good, and then in the [camera profile's Viewing stream profile](#), select the new video profile.
For live video, 10 FPS is often enough. 30 FPS might be required if the camera records an area with more movement, but causes significantly more CPU usage.

See also [Configuring video profiles on page 58](#) and the [FortiCentral User Guide](#).

FortiRecorder RAM and CPU usage

Delete or disable unused cameras. FortiRecorder allocates memory with each camera, regardless of whether it is currently receiving video from it. Extra cameras increase memory usage.

CPU usage can also increase if you configure some recording type and storage settings. See [About recording types on page 57](#).

Logging and alert performance

If you have a FortiAnalyzer appliance, store the logs from FortiRecorder on FortiAnalyzer to avoid system resource usage associated with writing logs to the hard disks on FortiRecorder. See [Configuring log settings on page 159](#).

If you do not need a log or alert, disable it to reduce the use of system resources.

Reduce repetitive log messages. Use the alert email settings, to define the interval that emails are sent if the same condition persists following the initial occurrence. See [Configuring alert email on page 161](#).

Avoid recording log messages using low severity thresholds, such as information or notification, to the local hard disk for an extended period of time. Excessive logging frequency saps system resources and can cause undue wear on the hard disk and may cause premature failure.

Packet capture performance

[Packet capture](#) can be useful for troubleshooting but can be resource intensive. To minimize the performance impact on your FortiRecorder appliance, use packet capture only during periods of minimal traffic. Use a local console CLI connection rather than a Telnet or SSH CLI connection, and stop the command when you are finished.

Network bandwidth usage

To reduce latency associated with DNS queries, use a DNS server on your local network as your primary DNS.

Bandwidth usage correlates with the number of simultaneous video streams, video bit rate, and storage options (local or remote). See also [Bandwidth per camera on page 24](#), [Configuring log settings on page 159](#), [Configuring video profiles on page 58](#), and [Configuring camera profiles on page 60](#).

Video performance

Video performance is a combination of the video input (from the cameras) and the video output (to the browser for live views and playback).

Input performance factors

- Maximum number of cameras streaming to the FortiRecorder simultaneously
- Recording schedule (motion detection-triggered only or continuous)
- Video resolution, frame rate, and image quality

Output performance factors

- Number of user sessions
- Number of live camera views per user session
- Maximum number of simultaneous live views by users

Resolution has the most impact on the overall performance.

- Low resolution — n MB/s
- Medium resolution — $2n$ MB/s
- High resolution — $6n$ MB/s

High resolution video generates 3 times as much raw data as the default, medium resolution. If a raw video stream cannot be efficiently compressed, then the result is that **bandwidth and/or disk space required per camera, and per login session, are multiplied**.

For example, for a FortiCam-20A camera, FortiRecorder can store on its local hard drive about 36 days' worth of high resolution video, but about 240 days' worth of low resolution video.

Amount of motion in the camera's field of view also affects performance. Constant and/or rapid motion or color changes result in larger files and video streams, because video compression cannot encode it as efficiently. To improve compression, exclude areas of irrelevant motion such as fans or blinking lights from the camera's field of view.

For sizing guidelines and estimates on the amount of video that you will be able to store, contact your reseller. Alternatively, expand your storage by configuring a network storage location (see [Configuring external storage on page 94](#)).

Variable vs. constant vs. constrained bit rate video

Bandwidth used by the video stream is determined by the [Bitrate mode](#) setting.

Variable bit rate mode means that the network bandwidth used by the camera varies by:

- video profile settings
- what the camera records

People and things that move or have flashing lights also result in more bandwidth usage. High resolution video profiles use more bandwidth than medium or low resolution (see [Bandwidth per camera on page 24](#)).

Constant bit rate mode means that the bandwidth used by the camera is relatively constant, regardless of what the camera records. It is more predictable in deployments where bandwidth and/or [storage capacities](#) are limited. Bandwidth used by the video stream is determined by the bit rate setting.

In general, variable bit rate mode has relatively consistent video quality, but bandwidth varies. Constant bit rate mode has video quality that varies, but predictable bandwidth. You can choose a constant bit rate mode with more bandwidth to avoid lower quality that can otherwise occur during rapid motion, but the compromise is that it uses unnecessary bandwidth when there is no activity.

Usually, there is little difference in video quality between variable and constant bit modes (assuming the same screen resolution and frame rates), and the constant bit rate mode gives more reliable output from cameras.

Constrained bit rate mode is a combination of variable and constant. Bitrate adjusts to meet the quality target, but cannot exceed the maximum.

You can monitor the effect of bitrate on video storage capacity, retention, and network bandwidth. See [Using the dashboard on page 120](#).

Software updates and backups

Update to the [newest firmware](#) as soon as possible to receive new security features and stability enhancements.

Regular configuration backups are also important.

Backups

Make a backup before doing anything that can cause large configuration changes, such as:

- upgrading the firmware
- entering the CLI commands `execute factory reset` or `execute restore`
- clicking the *Restore* button in the *System Information* widget on the dashboard

To mitigate impact in the event of a network compromise, always password-encrypt your backups. If your operating system does not support this feature, you can encrypt the file using third-party software.

Once you have tested your basic installation and verified that it functions correctly, create a backup. Aside from being best practice, this "clean" backup can be used to:

- troubleshoot a non-functional configuration by comparing it with this functional baseline (via tools such as `diff`)
- rapidly restore your installation to a simple yet working point (see [Restoring a previous configuration on page 169](#))
- batch-configure FortiRecorder appliances by editing the file in a plain text editor, then uploading the finalized configuration to multiple appliances (see [Restoring a previous configuration on page 169](#))

After you have a working deployment, back up the configuration again after any changes. Then you can rapidly restore your configuration exactly to its previous state if a change does not work.

Backups can be performed on-demand, but you can also schedule FortiRecorder to make them regularly. Alternatively, you can also use FortiCentral to back up the FortiRecorder configuration.



Configuration backups do not include backups of video data or logs. For information about video backup, see [Configuring external storage on page 94](#).

To back up the configuration (on-demand)

1. Log in to the GUI as the `admin` administrator.
Other administrator accounts do not have the required permissions.
2. Go to *Dashboard > Status*.
3. In the *System Information* widget, in the *System configuration* row, click *Backup*.
Alternatively, go to *System > Maintenance > Configuration* and click *System configuration backup*.
If your browser prompts you, navigate to the folder where you want to save the configuration file and click *Save*.
Your browser downloads the configuration file. Time required varies by the size of the file and the speed of your network connection, but could take several seconds.

To back up the configuration (scheduled)

1. Log in to the GUI as the `admin` administrator.
Other administrator accounts do not have the required permissions.
2. Go to *System > Maintenance > Configuration*.
3. Expand the *Scheduled Backup* section.
4. Select the frequency, either:
 - *Not scheduled* (disabled; backups are on-demand only)
 - *Daily*
 - *These Days*and then configure:
 - *Max backup number*: The maximum number of backup files. When this limit is reached, FortiRecorder will not make more backups until you delete an existing backup file.
 - *At hour*: The time of day when the backup occurs, according to a 24-hour clock.
 - days of the week (this option appears only if you selected *These Days*)
5. If you want to store backups on FortiRecorder [local storage](#), then enable it.
6. If you want to store backups on a remote server, then enable it and expand that section. Configure the following settings:

Setting Name	Description
Protocol	Currently only SFTP is supported.
Server name/IP	Enter the domain name or IP address of the server.
User name	Enter the user name that FortiRecorder will use when it connects to the server.
Password	Enter the password for that user name.
Remote directory	Enter the path of the folder on the server, such as <code>/Users/FortiRecorder</code> , where the FortiRecorder appliance will store the data.

7. Click *Apply*.

Restoring a previous configuration

If you downloaded a configuration backup, you can upload it to revert the appliance's configuration to that state.

Restoring the configuration can also be used to reconfigure the appliance from its [default settings](#) (including during [provisioning](#)), after [downgrading the firmware](#), or after a [clean install](#).



Configuration files can also be used as a script to batch configure many features or appliances at once: download a configuration file backup, edit the file in a plain text editor such as Notepad++ or Microsoft Visual Studio Code, then upload the configuration to the FortiRecorder appliances.

To upload a configuration via the GUI

1. Go to *Dashboard > Status*.

In the *System Information* widget, in the *System configuration* row, click *Restore*.

Alternatively, go to *System > Maintenance > Configuration* and click *Restore Configuration*.

2. Locate the FortiRecorder configuration backup file. (It has a .conf file extension.)

3. Click *Upload*.

Your web browser uploads the configuration file and the FortiRecorder appliance restarts with the new configuration. Time required to restore varies by the size of the file and the speed of your network connection. Your GUI session will be terminated when the FortiRecorder appliance restarts.

4. To continue using the GUI, if you have not changed the IP address and static routes of the GUI, refresh the page in your web browser and log in again.

Otherwise, to access the GUI again, in your web browser, modify the URL to match the new IP address of the network interface. For details, see [Connecting to the FortiRecorder GUI on page 30](#).

Troubleshooting

These guidelines can help you resolve issues if your FortiRecorder appliance is not behaving as you expect.

Login issues

If you cannot go to the login page at all, it is usually a connectivity issue instead (see [Connectivity issues on page 175](#)) unless all accounts are configured to accept login only from specific IP addresses, or authentication has been externalized to an LDAP or RADIUS server.

If a user lost or forgot their password, the "admin" account can reset other accounts' passwords (see [Resetting passwords on page 171](#)).

When an administrator account cannot log in from a specific IP

If an administrator is entering the correct account name and password, but cannot log in from some or all computers, then examine that account's [trusted host](#) setting. It should include all networks where that person is allowed to log in, such as your office, but should not be too broad.

Remote authentication query failures

If your network administrators' or other accounts reside on an external server (for example, FortiAuthenticator or Microsoft Active Directory), first switch the account to be locally defined on the FortiRecorder appliance. If the local account fails, correct connectivity between the client and appliance (see [Connectivity issues on page 175](#)). If the local account succeeds, troubleshoot connectivity between the appliance and your authentication server. If routing exists but authentication still fails, you can verify correct vendor-specific attributes and other protocol-specific fields by running a packet trace (see [Packet tracing on page 184](#)).

Resetting passwords

If someone has forgotten or lost their password, or if you need to change an account's password and you do not know its current password, the "admin" administrator can reset the password.

If you forget the password of the administrator, however, you will not be able to reset its password through the GUI. You can reset the FortiRecorder to its default state (including the default administrator account and password) by restoring the firmware. For instructions, see [Installing firmware on page 50](#).

To reset an account's password

1. Log in as the admin administrator account.
2. Go to *System > User > User*.
3. Select the row to select the account whose password you want to change.
4. Click *Edit*.
5. In the New Password and Confirm Password fields, type the new password.
6. Click *OK*.

The new password takes effect the next time that account logs in.

Not able to push setting and log shows an error on password

A problem can occur when you try to push settings to the FortiCamera. The log message shows an issue with the password.

FortiRecorder will change the FortiCamera password during the initial configuration. The password is unique to each FortiCamera and is based on the MAC address. To fix the problem, perform the following:

1. Perform a factory reset on the physical FortiCamera. For details, see [Resetting the configuration on page 192](#).
2. Manually add the MAC address of the FortiCamera to the FortiRecorder settings.

Video viewing issues

If you can connect to FortiRecorder, and your cameras can connect with your FortiRecorder, but you cannot view video that is streamed or stored on FortiRecorder, verify that you have installed software that can view live streams (which use RTP) and files (which use MP4 format).



Different media players can interfere with each other. By default, some installers take file type associations previously belonging to other players and re-assign them to the new software. If you installed software to view downloaded video files, for example, and suddenly could no longer view live video streams, you might need to fix the file associations for RTP and/or MP4.

If you have installed a suitable media player but still cannot view the video, try clicking the panel arrows to hide and then show the panel again. For some Windows computers, this can solve the problem. (This QuickTime issue does not affect macOS computers.)

If this does not trigger the video to play, verify that its codec software does not have any conflicts, and is capable of displaying H.264 video. Media players' codec plug-ins can come from many sources, and if you have installed multiple codecs for the same format, display problems can arise.

Live feed delay

Before QuickTime will begin playing a video stream, it must buffer a few seconds' worth of data. The time that QuickTime requires to do this may result in a few seconds' difference between what you see happening in the live video feed, and what is happening in reality now.

You can minimize this by:

- Changing the camera's Resolution setting to the lowest acceptable resolution
- Changing the camera's Resolution setting to the lowest acceptable resolution
- Improving the bandwidth and latency of your network

Video not being sent to FortiRecorder

If the camera itself does not seem to be sending video to the FortiRecorder, although it has booted, has network connectivity, and you have configured a recording schedule on the FortiRecorder, you may see camera log messages such as:

Camera 'c1' is in an incorrect state: 'idle'. The expected state is 'continuous'.

Usually this is self-correcting. If not, or if a camera is otherwise unresponsive, reboot the camera:

```
execute camera reboot <camera_name>
```

If this does not solve the problem, try either upgrading the camera's firmware or resetting the camera to factory defaults, then re-configuring it (see the camera's QuickStart Guide).

Notification issues

If you are not receiving any email after motion detection records a clip, but you have configured camera notifications, first verify that the SMTP email settings on your FortiRecorder are correct, and that it can connect to your email server to send email. Then check that notifications are not being blocked or sent to your spam or junk mail folder. (Some anti-spam systems mistakenly mark repeated or frequent email as spam.)

If you are receiving the email, and there are video links (that is, FortiRecorder has not been configured to email still images but you cannot view the video from the email:

1. Verify that you have installed the QuickTime video player software on your computer.
2. Verify that your computer can connect to the IP address of FortiRecorder. Unless you have configured FortiRecorder with your public IP, this is a private network IP address, and can only be reached when you are connected to your office's network. It cannot be viewed from the Internet. If you want to log in to the GUI and/or view video clips while out of the office, you must configure port forwarding and/or a virtual IP (VIP) on your firewall or Internet router, and configure the FortiRecorder to link to this public IP address in snapshot notifications.

If you are receiving too many notifications, change the configuration so that your FortiRecorder will only send snapshot notifications during suspicious periods, and focuses motion detection only on areas that do not cause false alerts, such as fans or blinking lights.

Resource issues

If the system resource usage appears to be abnormally high according to the *System Resource* widget on the dashboard or the CLI command:

```
diagnose system load
```

then you can view the current resource consumption of each process. This can be used to find processes that are using too much resources. For example, if you enter the command:

```
diagnose system top delay 5 lines 15
```

then it shows a list of the 15 most demanding processes, and refreshes the list every 5 seconds. The list includes the process names, their process ID (pid), activity status, CPU usage, and memory usage. The list continues to periodically refresh until you press q (quit).

If the issue corresponds with a configuration change or new hardware, then you might need to change the configuration (especially to reduce frequent logging, [reduce high resolution video streams](#), and change [video storage options](#)), reduce traffic load, or contact [Fortinet Technical Support](#).

Downloading a trace log

If Fortinet Technical Support requests a trace log for system analysis purposes, you can download one using the GUI.

Trace logs are compressed into an archive (.gz file extension), and contain information that supplements debug-level log files.

1. Go to *System > Maintenance > Configuration*.
2. At the bottom of the tab, select *Download trace log*.

Data storage issues

If FortiRecorder cannot locally store any data such as logs, reports, and video, verify that FortiRecorder has not used all of its local storage capacity by entering this CLI command:

```
diagnose hardware sysinfo df
```

which will include disk usage for all mounted file systems, such as:

```
System Time: 2023-06-27 11:13:25 EDT (Uptime: 0d 20h 51m)
```

Filesystem	Size	Used	Avail	Use%	Mounted on
proc	0	0	0	-	/proc
sysfs	0	0	0	-	/sys
devtmpfs	1.0G	7.6M	1017M	1%	/dev

none	0	0	0	-	/dev/pts
/dev/sdb1	371M	178M	193M	48%	/data
/dev/vga/vga2	137G	409M	135G	1%	/var/log
/dev/vga/vga3	2.6T	2.4T	177G	94%	/var/spool
cgroup	0	0	0	-	/cgroup/cpu_and_mem



You can use alerts to notify you when FortiRecorder has almost consumed its hard disk space. You can also configure FortiRecorder to overwrite old logs rather, and not stop logging when the disk is full. This might not prevent full disk problems for other features, however. To free disk space, delete files such as old reports and video that you do not need.

If a full disk is not the problem, examine the configuration to determine if an administrator has disabled those features that store data.

If neither of those indicate the cause of the problem, verify that the disk's file system has not been mounted in read-only mode, which can occur if the hard disk is experiencing write problems. For details, contact [Fortinet Technical Support](#).

Deleting all video clips

Enter the LI commands:

```
execute partitionlogdisk
execute formatvideodisk
```

FortiRecorder reboots.

Currently there is no CLI command to delete an individual video clip.

Connectivity issues

One of your first tests when configuring a new device should be to determine whether data such as video is received, and whether commands and schedules are being sent to it. You should also test whether notification email can be sent, and user accounts can log in to the GUI and view live video feeds.

After initial setup, do not interrupt connectivity. FortiRecorder might sometimes be able to recover if, for example, a camera receives a new IP address from the DHCP server. However this can cause disruptions to recording, and camera log messages such as:

Camera 'c1' experienced an interruption that may result in a loss of recording.

If connections unexpectedly fail or perform erratically, examine the following in order:

1. [Checking hardware connections on page 176](#)
2. [Bringing up network interfaces on page 176](#)
3. [Examining the ARP table on page 177](#)
4. [Examining routing on page 177](#)
5. [Discovery fails on page 181](#)
6. [Multiple DHCP servers on page 181](#)
7. [Unauthorized DHCP clients or DHCP pool exhaustion on page 181](#)
8. [Examining IP sessions on page 182](#)
9. [Resolving IP address conflicts on page 183](#)
10. [Examining live video streams on page 184](#)
11. [Packet tracing on page 184](#)



Troubleshooting is in order from more low-level [OSI layers](#) of your network (physical, link/Ethernet, network/IP) to the higher-level, more application-specific protocols. If your network is not new, then lower-level networking is usually already working, so you might want to start with later sections instead. Application-layer protocols such as RTSP are more often specific to FortiRecorder, cameras, and surveillance devices.

Checking hardware connections

If no traffic arrives on a network interface even though the configuration appears to be correct, or if network performance is less than you expect, then it might be a problem with the physical hardware. Verify the following in order:

1. If the cable or its connector are loose or damaged, or you are unsure about the cable's type or quality, change it or test with a loopback jack.
2. Verify that the LED lights for the network ports indicate a firm electrical contact when you plug network cables into the appliance. For LED indications, see your model's QuickStart Guide.
3. If traffic ingresses and egresses, but performance is not what you expect, verify that the [MTU](#) matches other devices on your network.
4. If the hardware connections are firm and the appliance is powered on, but you cannot connect — even using a local console connection to the CLI rather than a network connection — then there might be a problem during boot. Verify that the network interface is up (see [Bringing up network interfaces on page 176](#)). If the network interface is already up, or if you cannot connect to verify it, contact [Fortinet Technical Support](#).

Bringing up network interfaces

If a network interface is disabled, all connections will fail—regardless of whether the cables are physically connected.



If the network interface's *Status* column is a red "down" arrow, its administrative status is currently down and it will not receive or emit packets, even if you otherwise configure it. To bring up the network interface, change the [Administrative Status](#) setting. The column does not indicate the detected physical link status; it is the administrative status that indicates whether you permit network interface to receive and/or transmit packets.

For example, if the cable is physically unplugged, `diagnose netlink interface list port1` may indicate that the link is down, even though you have administratively enabled it.

In the GUI, go to *System > Network > Interface*. If the status is down (a down arrow on red circle), click *Bring Up* next to it in the *Status* column to bring up the link.

Alternatively, you can enable an interface in the CLI:

```
config system interface
edit port2
set status up
end
```

Examining the ARP table

When connectivity cannot be established or is periodically interrupted, but hardware and link status is not an issue, the first place to look is at a slightly higher layer in network connections: the address resolution protocol (ARP) table. While most devices' MAC address is bound to the hardware at the manufacturer and not easily changed, some devices have configurable or virtual MACs. In this case, you should verify that there is no conflict which could cause the IP to resolve to a different network port whenever that other device is connected to your network.

Functioning ARP is especially important in high availability (HA) topologies. If changes in which MAC address resolves to which IP address are not correctly propagated through your network, failovers may not work.

To display the ARP table in the CLI, enter:

```
diagnose netlink neighbor list
diagnose netlink neighbor6 list
```

Examining routing

If the MAC resolves correctly, but IP connectivity fails, try using ICMP to determine if the host is reachable, or to locate the point on your network at which connectivity fails. You can do this from the FortiRecorder appliance.

IP layer connectivity fails when an IP address or routes are incorrectly configured. Static routes specify where to send traffic when it leaves the FortiRecorder appliance: you can specify through which network interface a packet will leave, and the IP address of a next-hop router that is reachable from that network interface. Routers are aware of which IP addresses are reachable through various network pathways, and can forward those packets along pathways capable of reaching the packets' ultimate destinations. Your FortiRecorder itself does not need to know the full route, as long as the routers can pass along the packet.

You must configure FortiRecorder with at least one static route that points to a router, often a router that is the gateway to the Internet. You may need to configure multiple static routes if you have multiple gateway routers (for example, each of which should receive packets destined for a different subset of IP addresses), redundant routers (for example, redundant Internet, WAN, or ISP links), or other special routing cases.

However, often you will only need to configure one route: a default route.

For example, if a device is directly attached to one physical port on the FortiRecorder, but all other destinations, such as connecting clients, are located on distant networks, such as the Internet, you might need to add only one route: a default route that indicates the gateway router through which the FortiRecorder appliance can send traffic in the direction towards the Internet.



If your computer is not directly attached to one of the physical ports of the FortiRecorder appliance, you might also require a static route so that your computer can connect with the GUI and CLI.

To determine which route a packet will be subject to, FortiRecorder examines each packet's destination IP address and compares it to those of the static routes. It will forward the packet along to the route with the largest prefix match, automatically egressing from the network interface on that network. (Egress port for a route cannot be manually configured.) If multiple routes match the packet, the FortiRecorder appliance will apply the route with the smallest index number. For this reason, you should give more specific routes a smaller index number than the default route.

The ping command sends a small data packet to the destination and waits for a response. The response has a timer that may expire, indicating that the destination is unreachable via ICMP. ICMP is part of Layer 3 on the OSI Networking Model. ping sends Internet Control Message Protocol (ICMP) ECHO_REQUEST packets to the destination, and listens for ECHO_RESPONSE packets in reply. Beyond basic existence of a possible route between the source and destination, ping tells you the amount of packet loss (if any), how long it takes the packet to make the round trip (latency), and the variation in that time from packet to packet (jitter).

Similarly, traceroute sends ICMP packets to test each hop along the route. It sends three packets to the destination, and then increases the time to live (TTL) setting by one, and sends another three packets to the destination. As the TTL increases, packets go one hop farther along the route until they reach the destination.

Most traceroute commands display their maximum hop count — that is, the maximum number of steps it will take before declaring the destination unreachable — before they start tracing the route. The TTL setting may result in routers or firewalls along the route timing out due to high latency. If you specify the destination using a domain name, the traceroute output can also indicate DNS problems, such as an inability to connect to a DNS server.

By default, FortiRecorder appliances will respond to ping and traceroute. However, if FortiRecorder does not respond, and there are no firewall policies that block it, ICMP type 0 (ECHO_RESPONSE or "pong") might be effectively disabled. By default, traceroute uses UDP with destination ports numbered from 33434 to 33534. The traceroute utility usually has an option to specify use of ICMP ECHO_REQUEST (type 8) instead, as used by the Windows tracert utility. If you have a firewall and you want traceroute to work regardless of your computer's OS (Apple Mac, Linux, and Microsoft Windows), then you must allow both protocols inbound through your firewall (UDP ports 33434 - 33534 and ICMP type 8).

Some networks block ICMP packets because they can be used in a ping flood or denial of service (DoS) attack if the network does not have anti-DoS capabilities, or because ping can be used by an attacker to find potential targets on the network.

To enable ping & traceroute responses from FortiRecorder

1. Go to *System > Network > Interface*.

To access this part of the GUI, you must have *Read* and *Write* permission in your administrator's account access profile to items in the *Router Configuration* category.

2. In the row for the network interface which you want to respond to ICMP type 8 (ECHO_REQUEST) for ping and UDP for traceroute, click *Edit*.

3. Enable *Access: PING*.



Disabling *PING* only prevents FortiRecorder from **receiving** ICMP type 8 (ECHO_REQUEST) or type 30 and traceroute-related UDP.

It does not disable FortiRecorder CLI commands such as `execute ping` or `execute traceroute` that **send** such traffic.

Since you typically use these tools only during troubleshooting, you can allow ICMP, the protocol used by these tools, on interfaces only when you need them. Otherwise, disable ICMP for improved security and performance.

4. Click *OK*.

The appliance should now respond when another device such as your management computer sends a ping or traceroute to that network interface.

To verify routes between cameras and FortiRecorder via GUI

1. Go to *Camera > Configuration > Camera*.
2. Click a row to select a camera.
3. Click *Verify*.

Results and troubleshooting steps are similar to below.

To verify routes between cameras and FortiRecorder via CLI

1. Use the `execute ping` command on FortiRecorder with the camera's IP address to verify that a route exists between the two.
2. If possible, temporarily connect a computer at the camera's usual physical location, using the camera's usual IP address, so that you can use its ping command to test traffic movement along the path in both directions: from the location of the camera (temporarily, the computer) to the FortiRecorder, and the FortiRecorder to the camera.

If the routing test succeeds, continue with step 4.



Connectivity via ICMP only proves that a route exists. It does not prove that connectivity also exists via other protocols at other layers such as HTTP.

If ping shows some packet loss, investigate:

- cabling to eliminate loose connections
- ECMP, split horizon, or network loops
- dynamic routing such as OSPF
- all equipment between the ICMP source and destination to minimize hops

If the routing test fails, and ping shows total packet loss:

- verify cabling to eliminate loose connections
- continue to the next step



Both ping and traceroute require that network nodes respond to ICMP. If you have disabled responses to ICMP on your network, hosts may appear to be unreachable to ping and traceroute, even if connections using other protocols can succeed.

For example, you might use ping to determine that 172.16.1.10 is reachable:

```
FortiRecorder-200D# execute ping 172.16.1.10
PING 172.16.1.10 (172.16.1.10): 56 data bytes
64 bytes from 172.16.1.10: icmp_seq=0 ttl=64 time=2.4 ms
64 bytes from 172.16.1.10: icmp_seq=1 ttl=64 time=1.4 ms
64 bytes from 172.16.1.10: icmp_seq=2 ttl=64 time=1.4 ms
64 bytes from 172.16.1.10: icmp_seq=3 ttl=64 time=0.8 ms
64 bytes from 172.16.1.10: icmp_seq=4 ttl=64 time=1.4 ms
```

```
--- 172.20.120.167 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 0.8/1.4/2.4 ms
or that 192.168.1.10 is not reachable:
FortiRecorder-200D# execute ping 192.168.1.10
PING 192.168.1.10 (192.168.1.10): 56 data bytes
Timeout ...
Timeout ...
Timeout ...
Timeout ...
Timeout ...
```

```
--- 192.168.1.10 ping statistics ---
5 packets transmitted, 0 packets received, 100% packet loss
```

3. Use the `tracert` or `traceroute` command on both the computer (which is temporarily substituting for the camera) and FortiRecorder to locate the point of failure along the route, the router hop or host at which the connection fails.

For example, if it fails at the second hop, you might see:

```
FortiRecorder-200D# execute traceroute 192.168.1.10
traceroute to 192.168.1.10 (192.168.1.10), 32 hops max, 72 byte packets
 1 192.168.1.2 2 ms 0 ms 1 ms
 2 * * *
```

Each line lists the routing hop number, the IP address and FQDN (if any) of that hop, and the 3 response times from that hop. Typically a value of <1ms indicates a local router. The asterisks (*) indicate no response from that hop in the network routing.

If the route is broken when it reaches the FortiRecorder, first examine its network interfaces and routes. To display network interface addresses and subnets, enter:

```
FortiRecorder-200D# show system interface
```

To display all recently-used routes (the routing table cache) with their priorities, enter:

```
FortiRecorder-200D# diagnose netlink rtcache list
```



The index number of the route in the list of static routes in the GUI is not necessarily the same as its position in the cached routing table (`diagnose netlink rtcache list`).

You may need to verify that there are no misconfigured DNS records or other problems at the physical, network, and transport layer.

If these tests succeed and a route exists, but you cannot receive video feeds or use FortiRecorder to update the camera's network settings, an application-layer problem is preventing connectivity.

4. For application-layer problems, on the FortiRecorder, examine the:
 - camera network settings (these may have become out-of-sync if you modified them while the camera was disabled)
 - certificates (if connecting via HTTPS)

On routers and firewalls between the host and the FortiRecorder appliance, verify that they permit HTTP, HTTPS, and RTP connectivity between them.

Also, if the computer's DNS query cannot resolve the host name, output similar to the following appears:

```
example.com: Name or service not known
Cannot handle "host" cmdline arg `example.com' on position 1 (argc 1)
```

Discovery fails

Discovery of devices by the FortiRecorder uses UPnP, mDNS, and ONVIF. For it to work, devices usually must be on the same IP subnet as the FortiRecorder, and must not be blocked by firewalls or other network filtering. If cameras are not on the same subnet, you may still be able to facilitate discovery traffic by configuring your FortiGate or other device with multicast forwarding.

If you do not know which device is impeding discovery, you can either:

- Temporarily attach the cameras to a closer point on the network, such as a local switch or directly to the FortiRecorder, so that discovery is not blocked. See [Quick setup on page 13](#).
- Manually add the camera to the FortiRecorder unit's list of known cameras, skipping discovery. See [Configuring cameras on page 63](#).

Multiple DHCP servers

The FortiRecorder appliance has a built-in DHCP server. By default, it is disabled.

If you enable it and your network has another DHCP server (for example, your ISP's cable modem, a router, or a Windows or Linux server), verify that:

- both are not serving requests on the same network segment (which could create a race condition)
- both are not using the same pool of IP addresses (which could lead to IP address conflicts — see [Resolving IP address conflicts on page 183](#))

To verify that your appliance and cameras are sending and receiving lease requests, you can perform a packet trace (see [Packet tracing on page 184](#)) and/or use the event log to look for:

- DHCPDISCOVER (destination IP address is broadcast, not specifically to FortiRecorder)
- DHCPOFFER
- DHCPREQUEST
- DHCPACK

Unauthorized DHCP clients or DHCP pool exhaustion

Usually, returning DHCP clients will receive the same IP address lease. However if computers or other devices are accidentally using IP addresses that the FortiRecorder's built-in DHCP server should be allocating to cameras, and the pool of available DHCP IP addresses becomes exhausted, cameras may be unable to get or retain an IP address.

To determine which devices are using your pool of DHCP IP addresses, compare the MAC address of each device's network adapter to the list of current DHCP clients in *Monitor > DHCP > DHCP* or enter this command in the CLI:

```
execute dhcp lease-list
```

Output is like the following:

port3	IP	MAC-Address	VCI	Expiry
	192.168.200.100	20:10:7a:5a:28:d1	udhcp 0.9.8	Thu Oct 4 15:01:22
	192.168.200.101	20:10:7a:5a:29:38	udhcp 0.9.8	Wed Oct 3 11:17:12

To correct this situation:

1. Configure unintentional DHCP clients so that they do not use DHCP (that is, they have a static IP address) and so their IP address is not in the range used by the DHCP pool.
2. Clear the list of DHCP clients to allow legitimate DHCP clients (your cameras) to obtain a lease:

execute dhcp clear-lease

New clients that were previously unable to get an IP address will receive an IP address for the first time.

Returning clients' s IP addresses may change because the built-in DHCP server no longer has any memory of their previous lease, and may assign them a new IP address if another client has claimed that IP address first.

(This may result in temporary IP address conflicts and therefore connectivity interruptions while the DHCP server assigns new leases.)

Examining IP sessions

If a route exists, but there appears to be a problem establishing or maintaining TCP or IP-layer sessions between FortiRecorder and a computer or camera on your IP network, then there are multiple possible causes, such as:

- [Trusted hosts](#) is misconfigured
- protocols or port numbers are not matched or blocked by NAT or firewalls
- [IP address conflicts](#)
- short [Lease time \(Seconds\)](#) on the DHCP server
- wrong IP address
- socket exhaustion

You can view a snapshot of FortiRecorder's session table according to the IP layer. Go to *FortiView > Sessions > Sessions*.

Sessions					
1 / 1 Records per page: 50					
Protocol	From IP	From Port	To IP	To Port	Expire(secs)
tcp	172.20.131.111	554	172.20.131.47	26914	0
tcp	192.168.55.89	61179	172.20.131.47	80	599
tcp	192.168.55.89	61181	172.20.131.47	80	599
tcp	192.168.55.89	61180	172.20.131.47	80	599
tcp	172.20.131.223	554	172.20.131.47	40548	0
tcp	192.168.55.89	61176	172.20.131.47	80	594
udp	172.20.131.223	6971	172.20.131.47	30289	0
udp	172.20.131.111	6971	172.20.131.47	32931	0
udp	172.20.131.111	6973	172.20.131.47	35571	0

GUI Item	Description
Protocol	The protocol of the session according to the "protocol" ID number field (or, for IPv6, "next header") in the IP header of the packets. • <i>icmp</i> — 1 (Due to the speed of ICMP messages, this is rarely seen in the session list.) • <i>tcp</i> — 6 • <i>udp</i> — 17 (Due to the speed of UDP datagrams, this is rarely seen in the session list.)
From IP	The source of the session according the source field in the IP header. If source NAT is occurring, this is not necessarily the IP address in the original packet from the client.
From Port	The source port number. For a list of port numbers that can originate from the FortiRecorder, see Appendix: Port numbers on page 196.
To IP	The destination according to the destination field in the IP header. If destination NAT is occurring, this is not necessarily the IP address in the original packet from the client.
To Port	The destination port number. For a list of port numbers that can be received by the FortiRecorder, see Appendix: Port numbers on page 196.
Expire (seconds)	The session timeout in seconds. The expiry counter is reset when packets are sent or received, indicating that the session is still active.

To refresh the session list snapshot with the most current list, click the dotted circle (*Refresh*) icon to the left of *Records per page*.

To sort the session list based upon the contents of a column, hover your mouse cursor over the column's heading then click the arrow that appears on the right side of the heading, and select either *Sort Ascending* or *Sort Descending*.

If you expect sessions that do not exist, be aware that some protocol designs (notably UDP) do not have persistent sessions. Their sessions will almost immediately expire and be removed from the session list, and therefore it may be very difficult to get a session list snapshot during the short time that the datagram is being transmitted. TCP has persistent connections, where the socket is maintained until data transmission either is confirmed to be finished or times out. Therefore TCP connections persist in the session table for a much longer time.

If you still do not see the sessions that you expect, verify that your firewall or router allows traffic to or from those IP addresses, on all expected source and destination port numbers (see [Appendix: Port numbers on page 196](#)).

If you notice unexpected sessions with the FortiRecorder GUI or CLI, verify that you have configured all accounts' *Trusted hosts* setting.

Resolving IP address conflicts

If two or more devices are configured to use the same IP address on your network, this will cause a problem called an IP address conflict. Only one of those identically addressed devices can have IP-layer connectivity at a time. The

other will be ignored, effectively causing it to behave as if it were disconnected. (If multiple devices were to use the same IP address, routers and switches would not be able to determine with certainty where to deliver a packet destined for that IP address. To prevent this, routers and switches will only let one of the devices use the IP address.)

Typically IP conflicts are caused when either:

- you have accidentally configured 2 devices with the same static IP address
- you have accidentally configured a device with a static IP address that belongs to the DHCP pool
- 2 DHCP servers accidentally have pools in the same range of IP addresses, and are each independently assigning their clients the same IP addresses

Your cameras, of course, have no screen, and cannot display any IP address conflict error message. However, you may notice symptoms such as interrupted video streams whenever a new device connects to the network or reboots.

If you have configured your FortiRecorder's built-in DHCP server, first verify that it is not using the same DHCP pool as another DHCP server on your network. Next, you can use the CLI to determine whether MAC addresses from other devices' network adapters have stolen IP addresses that should belong to your cameras. See [Unauthorized DHCP clients or DHCP pool exhaustion on page 181](#). If, however, you have transitioned your cameras to use static IP addresses, you must use another method.

- Use the ARP table of either your FortiRecorder (see [Examining the ARP table on page 177](#)) or router to determine which MAC address (and therefore which computer or device's network adapter) has taken the IP address.
- If a computer is using the same IP address as another device, such as your cameras, it may periodically complain of an IP address conflict. This computer may be the source of the conflict.

Once you have found the source of the problem, configure that computer or device to use a unique IP address that is not used by any other device on your network.

Examining live video streams

Live video feeds are sensitive to packet loss, latency, and high bandwidth usage. This can cause video that is blurry or motion that is not smooth (low video frame rate). For details on how to diagnose these problems, see [Packet tracing on page 184](#) and [Video performance on page 166](#).

Packet tracing

When troubleshooting networks, verifying hardware connections and routing with `execute ping` and `execute traceroute` CLI commands are often enough to diagnose the problem. For more rare problems, you can use traffic capture to see more low-level information.

Packet tracing is also known as packet sniffing, packet capture, packet analysis, or traffic capture. It can record information about all of the Ethernet frames that arrive—regardless of whether the destination MAC address matches the network interface.

FortiRecorder appliances have a built-in packet trace feature. By using it, you or [Fortinet Support](#) can diagnose problems that are otherwise difficult to detect. For example, it can show:

- malformed packets (protocol is not RFC-compliant)
- dropped packets
- intermittent packet loss during ping

- wrong network address translation (NAT)
- wrong port forwarding
- wrong session setup
- ARP broadcast storms or floods
- OSI Layer 2 bridge loops
- SSL/TLS handshake errors
- wrong source address when a device has multiple IP addresses, on multiple networks

For example, you can make a packet trace during a continuous ping. This shows ARP MAC address resolution, the source and destination IP addresses, the protocols and port number used, and whether FortiRecorder received a reply (the destination was reachable via that route) as expected.



CPU usage and disk space usage is increased during a packet trace. On busy networks, this can be very resource intensive, and cause delays in live video streams. Performance is better if you packet trace only:

- while required, and stop when finished
- when the network is not busy, maybe at night
- with a local console CLI connection, not network (Telnet/SSH/HTTP/HTTPS)

If you only need a simple packet capture, configure it [via GUI](#), where it can be given a time limit.



Before using packet capture, think about filter criteria. Too much data is more difficult to analyze. It will be easier if you:

- limit the time range, or number of packets
- exclude IP addresses, port numbers, and protocols that are not relevant

For example, maybe you only need to trace communications with one device, or only RTP video packets.

More complex IP address, port number, and protocol filters can be configured [via CLI](#).

Packet tracing via GUI

1. Go to *System > Network > Traffic Capture*.
2. Click *New*.
3. Configure the following settings:

Setting Name	Description
Description	Enter a unique name for the packet trace file.
Duration	Enter a time range for the packet trace.
Interface	Select which network interface you want to trace traffic with, or <i>All</i> to trace traffic on all network interfaces.
IP/Host	Optional. If you want to trace traffic only to specific destination IP addresses, enter up to 3 domain names or IP addresses.

Setting Name	Description
	Alternatively, configure <i>Exclusion</i> instead.
Filter	Select either: • <i>None</i>: Capture all port numbers and protocols. This can be required by protocols that use multiple port numbers, or to see a correlated sequential order of multiple protocols. For example, it is common to see DNS over UDP before HTTPS over TCP, and RTCP before RTP. • <i>Use protocol</i>: Only capture traffic on the port number you specify. Valid range of port numbers is from 1 to 65535.
Exclusion	Optional. If you don't want to trace traffic with specific IP addresses or port numbers, enter the domain names or IP addresses and port numbers to exclude. Alternatively, configure <i>IP/Host</i> instead.

4. Click *Create*.
Packet tracing begins immediately.
5. When the packet trace is complete, either refresh the page in your web browser, or return to *System > Network > Traffic Capture*. (If the traffic capture is complete, its *Status* column will show *Stopped*.)
6. Click to select the packet trace file, and then click *Download*.
7. On your computer, open the PCAP file in compatible software such as [Wireshark](#).
Compare the captured traffic with the expected behavior.

Packet tracing via CLI

Instead of reading packet capture output directly in your CLI display, you usually should save the output to a plain text file using your CLI client. Saving the output provides several advantages. Packets can arrive more rapidly than you may be able to read them in the buffer of your CLI display, and many protocols transfer data using encodings other than US-ASCII. Therefore it is usually easier to analyze the output by saving it to a file, and then opening it in a network protocol analyzer application.

For example, you could use PuTTY to save the output to a file. Methods vary. See the documentation for your CLI client.

Requirements

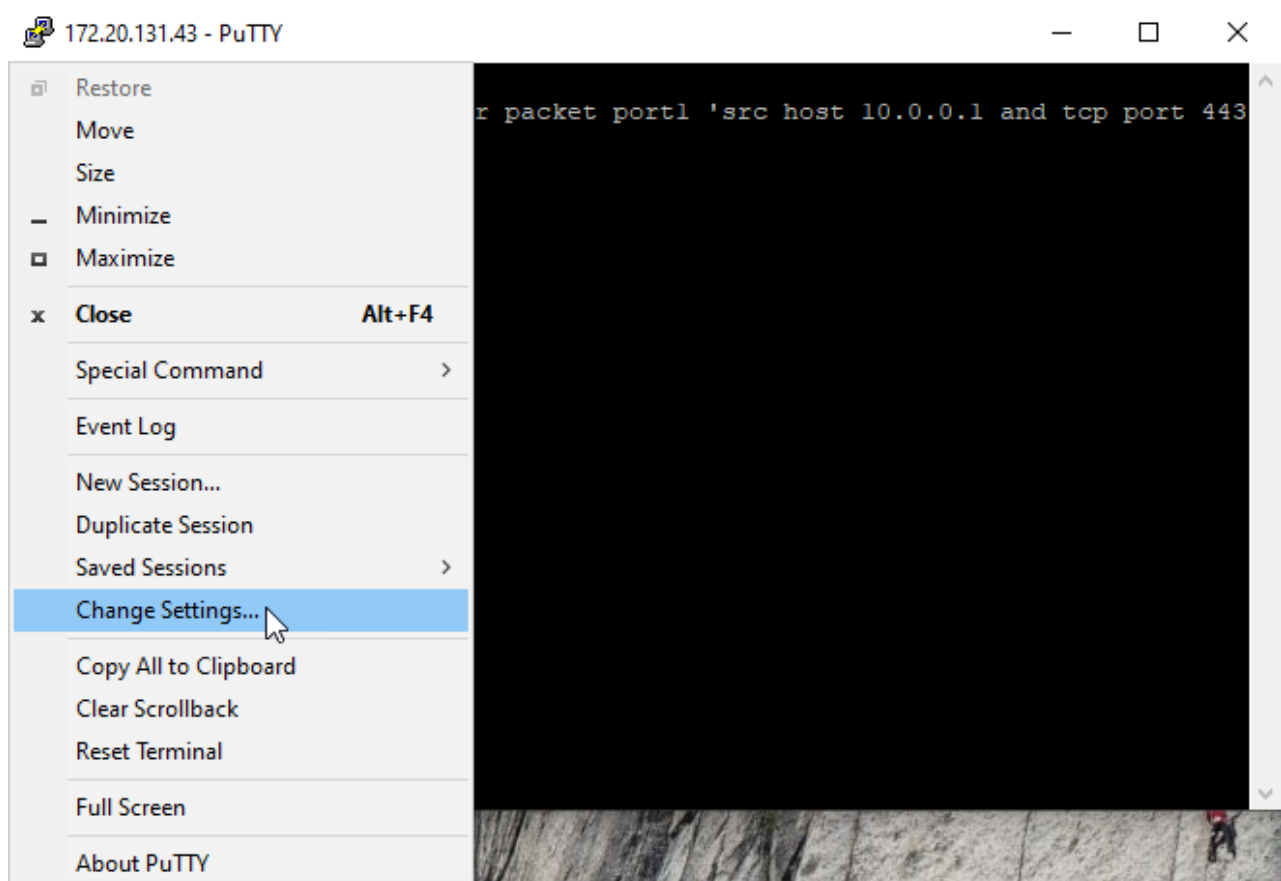
- terminal emulation software such as [PuTTY](#) or [OpenSSH](#)
- plain text editor such as [Notepad++](#)
- Perl interpreter such as [Strawberry Perl](#)
- fgt2eth.pl script (download at the bottom of [Using the FortiOS built-in packet sniffer](#))
- network protocol analyzer software such as [Wireshark](#)



The fgt2eth.pl script is provided as-is, without any implied warranty or technical support.

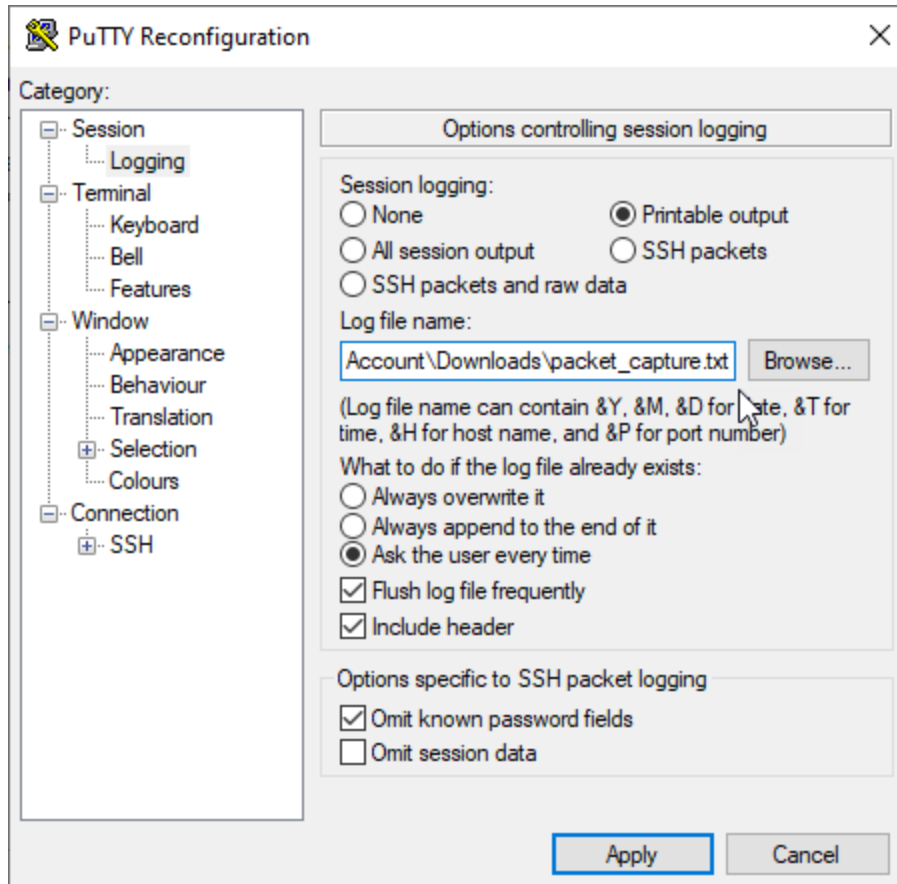
To use packet capture with PuTTY and Wireshark

1. On your computer, start PuTTY. Connect to the FortiRecorder appliance using a local console, SSH, or Telnet connection.
2. Type the packet capture command, but **do not press Enter yet**.
For example, to capture HTTPS and HTTP traffic with the source IP address 10.0.0.1, you can type:
`diagnose sniffer packet port1 'src host 10.0.0.1 and (tcp port 443 or tcp port 80)' 3`
 See also [diagnose sniffer CLI syntax on page 189](#).
3. In the upper left corner of the window, click the PuTTY icon to open its drop-down menu, then click *Change Settings*.



A dialog appears where you can configure PuTTY to save output to a plain text file.

4. In the *Category* tree on the left, go to *Session > Logging*.
5. In the *Session logging* area, select *Printable output*.
6. In *Log file name*, click the *Browse* button, then choose where to save the packet capture file. (You do not need to save it with the `.log` file extension.)



7. Click *Apply*.
8. Press Enter on the CLI to start packet capture.
If you did not specify a number of packets to capture, then when you have captured enough, press Ctrl + C.
9. Close the PuTTY window.
10. Start Notepad++. Open the packet capture file.
11. Delete the first and last lines, which look like this:

```
===== PuTTY log 2023.06.16 11:58:00 =====
...
```

```
FK400D3016000000 #
```

These are a PuTTY timestamp and the command prompt, which are not part of the packet capture. If you do not delete them, they could interfere with the conversion script in the next step.

12. Open a command prompt (cmd.exe). Enter the commands to to use `fgt2eth.pl` to convert plain text file to a PCAP format:


```
cd C:\Users\MyAccount\Downloads\
fgt2eth.pl -in packet_capture.txt -out packet_capture.pcap
```

 where:
 - `packet_capture.txt` is the name of the packet capture file from PuTTY
 - `packet_capture.pcap` is the name of the converted output file
13. On your computer, open the PCAP file in compatible software such as [Wireshark](#).
Compare the captured traffic with the expected behavior.

diagnose sniffer CLI syntax

Packet capture syntax on FortiRecorder appliances is similar to that of FortiGate appliances. If you omit all parameters for the command, the command captures all packets on all network interfaces until you press Ctrl + C.

```
diagnose sniffer packet [{any | <interface_name>}
                        [{none | '<filter_str>'}
                        [{1 | 2 | 3 | 4 | 5 | 6}
                        [<packets_int>
                        [{a | <any_str>}]]]]]
```

where:

- <interface_name> is the name of a network interface, such as port1. Alternatively, type any to match all network interfaces.
- '<filter_str>' is the filter that specifies which protocols and port numbers that you want to capture, such as 'tcp port 80'. [Filters use tcpdump syntax](#). If you do not want a filter, but you want to configure parameters after this one, type none.
- <packets_int> is the number of packets to capture before stopping. If you do not specify this parameter, packet capture output is printed to your CLI display until you stop it by pressing Ctrl+C.
- {a | <any_str>} is either a (to include an absolute, full UTC timestamp in the format yyyy-mm-dd hh:mm:ss.ms; use this format if you need to correlate a FortiRecorder packet capture with another device's packet capture), or any other text (to include a timestamp that is the amount of time since the start of the packet capture, in the format ss.ms)
- {1 | 2 | 3 | 4 | 5 | 6} is an integer indicating which details to include about network interface names, Ethernet frames, IP packet headers, and/or packet payloads.
 - 1 — Include the packet capture timestamp, and basic fields of the IP header: source IP address, destination IP address, protocol name, and destination port number. Does **not** display all fields of the IP protocol header.

Example:

```
interfaces=[any]
```

```
filters=[none]
```

```
0.747195 172.20.131.143.6970 -> 172.20.131.43.33740: udp 1448
```

- 2 — All of the output from 1, plus the packet payload in both hexadecimal and ASCII.

Example:

```
interfaces=[any]
```

```
filters=[none]
```

```
0.927132 172.25.188.213.60407 -> 172.20.131.43.22: ack 594494863
```

```
000000 45 00 00 28 63 d2 40 00 7c 06 02 cf ac 19 bc d5 E..(c.@.|.....
```

```
000010 ac 14 83 2b eb f7 00 16 39 9f 83 88 23 6f 45 8f ...+....9...#oE.
```

```
000020 50 10 17 ff ed 72 00 00 00 00 00 00 00 00 00 P....r.....
```

- 3 — All of the output from 2, plus the link frame (Ethernet) header.

Example:

```
interfaces=[any]
```

```
filters=[none]
```

```
0.131709 172.20.132.187.6970 -> 172.20.132.43.38262: udp 99
```

```
000000 00 00 00 00 00 01 00 22 f4 ce 5e 04 08 00 45 00 .....".^...E.
```

```
000010 00 7f 62 15 00 00 40 11 b7 49 ac 14 84 bb ac 14 ..b...@..I.....
```

```
000020 84 2b 1b 3a 95 76 00 6b c6 48 80 e0 cf f4 59 ba .+.:.v.k.H....Y.
```

```
000030 bd 77 12 be 36 32 41 9b 98 01 89 8c 05 21 1e 23 .w..62A.....!.#
```

```
000040 35 c4 6b 11 8f 34 10 47 88 d8 38 8c d8 41 1e 23 5.k..4.G..8..A.#
```

```
000050 60 d0 8e c4 78 8f 11 8e fa 23 70 27 e6 80 c2 11 `...x....#p'....
```

```
000060 c3 7a 80 f1 9b 01 fb 36 9f 50 16 3c 9d dc 07 9e .z.....6.P.<....
```

```
000070 a0 08 48 fc 02 cc 27 80 57 0f c1 56 68 06 e8 47 ..H...'.W..Vh..G
```

```
000080 01 1e 23 81 08 47 00 66 07 e0 04 20 80 ..#..G.f.....
```

- 4 — All of the output from 1, plus the network interface name. This can be necessary if you are capturing packets from multiple network interfaces at once, and need to know which packet was seen by which interface.

Example:

```
interfaces=[any]
```

```
filters=[none]
```

```
0.942892 port1 in 172.20.131.143.6970 -> 172.20.131.43.33740: udp 1448
```

- 5 — All of the output from 2, plus the network interface name.

Example:

```
interfaces=[any]
```

```
filters=[none]
```

```
0.394962 port1 in 172.25.188.213.60407 -> 172.20.131.43.22: ack 594500767
```

```
000000 45 00 00 28 66 a9 40 00 7c 06 ff f7 ac 19 bc d5 E..(f.@.|.....
```

```
000010 ac 14 83 2b eb f7 00 16 39 9f 8d 98 23 6f 5c 9f ...+....9...#o\.
```

```
000020 50 10 18 00 cc 51 00 00 00 00 00 00 00 00 00 P....Q.....
```

- 6 — All of the output from 3, plus the network interface name.

Example:

```
interfaces=[any]
```

```
filters=[none]
```

```
0.790631 port1 in 172.25.188.213.60407 -> 172.20.131.43.22: ack 594502111
```

```
000000 00 00 00 00 00 01 90 6c ac 99 ce 60 08 00 45 00 .....l...`..E.
```

```
000010 00 28 67 10 40 00 7c 06 ff 90 ac 19 bc d5 ac 14 .(g.@.|.....
```

```
000020 83 2b eb f7 00 16 39 9f 8f 78 23 6f 61 df 50 10 .+....9...x#oa.P.
```

```
000030 18 00 c5 31 00 00 00 00 00 00 00 00 00 00 ...1.....
```

Example: HTTPS packet capture

In this example, you capture all TCP port 443 (typically HTTPS) traffic occurring through port1, regardless of its source or destination IP address. The capture uses verbosity level 3.

A specific number of packets to capture is not specified. As a result, the packet capture continues until the administrator presses Ctrl + C. The command confirms that five packets were seen by that network interface.

(Verbose output can be very long. As a result, output shown below is truncated after only one packet.)

```
FK400D3016000013 # diagnose sniffer packet port1 'tcp port 443' 3
```

```
System Time: 2023-06-16 16:07:51 EDT (Uptime: 4d 6h 48m)
```

```
interfaces=[port1]
```

```
filters=[tcp port 443]
```

```
4.795077 172.25.188.213.56340 -> 172.20.131.43.443: syn 457421310
```

000000	00 10 f3 37 6c e3 90 6c ac 99 ce 60 08 00 45 00	...7l...l...`...E.
000010	00 34 69 6b 40 00 7c 06 fd 29 ac 19 bc d5 ac 14	.4ik@. ...)
000020	83 2b dc 14 01 bb 1b 43 b1 fe 00 00 00 00 80 02	.+.....C.....
000030	fd 80 2e bb 00 00 02 04 05 48 01 03 03 08 01 01	H.....
000040	04 02	..

Resetting the configuration

Before you sell your FortiRecorder appliance, or if you are not sure what part of your configuration is causing a problem, you can reset it and its cameras to their default settings and erase data. (If you have not updated the firmware, this is the same as resetting to the factory default settings.)



Back up your configuration and export any important video recordings before beginning this procedure, if possible. It erases the configuration and data on the [local storage](#) of FortiRecorder. You cannot undo the operation, except by restoring the configuration. Data cannot be restored. See [Backups on page 168](#).



Alternatively, you can reset the FortiRecorder's configuration to its factory default values for a specific software version by restoring the firmware during a reboot (a "clean install"). See [Restoring firmware \("clean install"\) on page 193](#).

To reset your cameras' configuration, connect to the CLI and enter these commands:

```
config camera devices
  edit <camera_name>
    set status disable
  end
execute camera factoryreset <camera_name>
```

To securely delete your data from the FortiRecorder, enter these commands:

```
execute erase-filesystem
execute formatlogdisk
```

To reset the FortiRecorder's configuration, enter this command:

```
execute factoryreset
```

After the procedure, either you or the next owner must perform setup again. Resetting the configuration could include the IP addresses of network interfaces, so that person must re-connect to the CLI or GUI in order to perform setup. See [Setup on page 22](#).

Restoring firmware ("clean install")

Restoring the firmware can be useful if:

- you are unable to connect to the FortiRecorder appliance using the GUI or the CLI
- you want to install firmware without preserving any existing configuration ("clean install") a firmware version that you want to install requires a different size of system partition (see the Release Notes for the firmware)
- a firmware version that you want to install requires that you format the boot device (see the Release Notes accompanying the firmware)

Unlike updating firmware, restoring firmware re-images the boot device, including the signatures that were current at the time that the firmware image file was created. Also, restoring firmware can only be done during a boot interrupt, before network connectivity is available, and therefore requires a local console connection to the CLI. It cannot be done through an SSH or Telnet connection.



Alternatively, if you cannot physically access the appliance's local console connection, connect the appliance's local console port to a terminal server to which you have network access. Once you have used a client to connect to the terminal server over the network, you will be able to use the appliance's local console through it. However, be aware that from a remote location, you may not be able to power cycle the appliance if abnormalities occur.

To restore the firmware



Back up your configuration before beginning this procedure, if possible. Restoring firmware resets the configuration, which could include the IP addresses of network interfaces. For information on backups, see [Software updates and backups on page 168](#). For information on reconnecting to a FortiRecorder appliance whose network interface configuration was reset, see [Connecting to the FortiRecorder GUI on page 30](#).

1. Download the firmware file from the Fortinet Technical Support web site:
<https://support.fortinet.com/>
2. Connect your management computer to the FortiRecorder console port using a RJ-45-to-DB-9 serial cable or a null-modem cable.
3. Initiate a local console connection from your management computer to the CLI of the FortiRecorder appliance, and log in as the `admin` administrator, or an administrator account whose access profile contains Read and Write permissions in the Maintenance category.
4. Connect port1 of the FortiRecorder appliance directly or to the same subnet as a TFTP server.
5. Copy the new firmware image file to the root directory of the TFTP server.
6. If necessary, start your TFTP server. (If you do not have one, you can temporarily install and run one such as `tftpd` (Windows, macOS, or Linux) on your management computer.)



Because TFTP is not secure, and because it does not support authentication and could allow anyone to have read and write access, you should only run it on trusted administrator-only networks, never on computers directly connected to the Internet. If possible, immediately shut down `tftpd` off when you are done.

7. Verify that the TFTP server is currently running, and that the FortiRecorder appliance can reach the TFTP server.
To use the FortiRecorder CLI to verify connectivity, enter the following command:
`execute ping 192.168.1.168`
where 192.168.1.168 is the IP address of the TFTP server.
8. Enter the following command to restart the FortiRecorder appliance:
`execute reboot`
9. As the FortiRecorder appliances starts, a series of system startup messages appear.
Press any key to display configuration menu.....
10. Immediately press a key to interrupt the system startup.



You have only 3 seconds to press a key. If you do not press a key soon enough, the FortiRecorder appliance reboots and you must log in and repeat the `execute reboot` command.

If you successfully interrupt the startup process, the following messages appears:

```
[G]: Get firmware image from TFTP server.
[F]: Format boot device.
[B]: Boot with backup firmware and set as default.
[Q]: Quit menu and continue to boot with default firmware.
[H]: Display this list of options.
```

Enter G,F,B,Q,or H:

Please connect TFTP server to Ethernet port "1".

11. If the firmware version requires that you first format the boot device before installing firmware, type F. Format the boot disk before continuing.
12. Press G to get the firmware image from the TFTP server.
The following message appears:
Enter TFTP server address [192.168.1.168]:
13. Type the IP address of the TFTP server and press Enter.
The following message appears:
Enter local address [192.168.1.188]:
14. Type a temporary IP address that can be used by the FortiRecorder appliance to connect to the TFTP server.
The following message appears:
Enter firmware image file name [image.out]:
15. Type the file name of the firmware image and press Enter.
The FortiRecorder appliance downloads the firmware image file from the TFTP server and displays a message similar to the following:
Save as Default firmware/Backup firmware/Run image without saving:[D/B/R]?
16. Press D.
The FortiRecorder appliance downloads the firmware image file from the TFTP server. The FortiRecorder appliance installs the firmware and restarts. The time required varies by the size of the file and the speed of your network connection.
The FortiRecorder appliance reverts the configuration to default values for that version of the firmware.
17. To verify that the firmware was successfully installed, log in to the CLI and type:
`get system status`
The firmware version number is displayed.

- 18.** Either reconfigure the FortiRecorder appliance or restore the configuration file. See [Restoring a previous configuration on page 169](#) .



If you are downgrading the firmware to a previous version, and the settings are not fully backwards compatible, the FortiRecorder appliance may either remove incompatible settings, or use the feature's default values for that version of the firmware. You may need to reconfigure some settings.

Appendices

This section contains reference tables.

Appendix: Port numbers

Communications between the FortiRecorder appliance, cameras, and your computer require that network administrators configure any routers and firewalls between them to permit specific protocols and port numbers.

The following tables list the **default** port numbers used by FortiRecorder services. Many are configurable. See the [Configuring the public port numbers and domain name on page 46](#) for incoming traffic; for outgoing traffic, see the documentation for each feature.

Source port numbers are [ephemeral port numbers](#) (1024 to 65535).



Many stateful firewall policies automatically allow **replies** if they have already allowed a TCP connection or UDP session to start.

If your firewall does not, then you must also configure it to allow packets in the opposite direction. This requires that you open ephemeral port numbers (1024 to 65535).

Outgoing traffic

These are the port numbers and protocols that FortiRecorder uses to connect to the cameras, your servers, and services on the Internet such as FortiCloud and FortiGuard.

Most features do not require an Internet connection, and can be used in an airgapped deployment where services are provided by the local network (LAN) instead.

Protocol	Destination Port Number	Purpose
ICMP	N/A	execute ping and execute traceroute CLI commands. See Connectivity issues on page 175 .
ARP	N/A	MAC address resolution
TCP	22	SFTP for configuration backups. See Backups on page 168 .
TCP	25	SMTP for alert email and notifications about motion detection. See Configuring alert email on page 161 and Configuring notification triggers on page 105 .
UDP	53	DNS queries for domain names. See Configuring network interfaces on page 34 .

Protocol	Destination Port Number	Purpose
UDP	69	TFTP for backups, restoration, and firmware updates. See commands such as <code>execute backup</code> or <code>execute restore</code> .
HTTP	80	Sending network settings and recording signals to cameras. See Configuring cameras on page 63 .
UDP	123	NTP clock time synchronization. By default, FortiRecorder synchronizes its time with NTP servers at Fortinet. See Configuring the system time on page 48 .
HTTPS	443	- Sending network settings and other configurations to cameras - License validation by Fortinet for face recognition AI. See Upload licenses on page 55.
UDP	514	Syslog for external logging. See Configuring log settings on page 159 .
TCP/UDP	554, 8554	TLS for signaling to cameras, including to start a video stream. See Viewing live video on page 128 .
UDP	1900	UPnP (SSDP) query for discovery of cameras. Unicast to devices in your specified IP address range. See Discovering cameras in remote networks on page 56 .
UDP	3702	ONVIF query for discovery of cameras. Unicast to devices in your specified IP address range. See Discovering cameras in remote networks on page 56 .
UDP	5353	mDNS queries for discovery of cameras and Chromecast. Multicast to 224.0.0.251. See Discovering cameras in remote networks on page 56 and Using Chromecast with FortiRecorder on page 158 .
TCP	10000	TLS secure tunnel for camera configuration, notifications, and queries to FortiCamera Cloud. Does not include video streams. See Managed by cloud on page 66 , and Viewing live video on page 128 .
TCP	61614	TLS for signaling to FortiCamera Cloud, including to start a video stream. See Managed by cloud on page 66 , and Viewing live video on page 128 .
TCP	8008-8009	Video streaming to Chromecast. See Using Chromecast with FortiRecorder on page 158 .
UDP	1-65535	
UDP	1024-65535	Video streaming, audio, metadata, STUN and TURN for NAT traversal and media stream route selection when in a hybrid deployment with FortiCamera Cloud. See Managed by cloud on page 66, and Viewing live video on page 128. Destination IP addresses are FortiCamera Cloud, users, and firewalls or NAT routers in front of FortiRecorder and users. In this deployment pattern, FortiRecorder acts as a private relay/proxy. It makes the same network traffic as a camera would to the cloud, except that there may be more sessions with FortiRecorder's IP address, multiplied by the number of cameras.

Protocol	Destination Port Number	Purpose
		Tip: For fastest performance, allow video streams along all paths between FortiRecorder and users, not just through FortiCamera Cloud. Signaling and media streams may use different paths. See also video stream paths with ortiCamera Cloud. Note: Normally, for the path through a NAT router/firewall, the first STUN packet to the router/firewall is dropped. Yours or FortiRecorder's next outgoing STUN packet automatically adds a mapping to the router/firewall's session table (also called a hole punch) so that further incoming packets can reach their destination. More dropped packets indicate a problem. Double NAT and symmetric NAT (some vendors also call it dynamic NAT, PAT, or carrier grade NAT) do not support STUN. For details, see RFC 4787 (Endpoint-Independent Mapping).

Incoming traffic

These are the default listening port numbers and protocols on FortiRecorder.

Protocol	Destination Port Number	Purpose
ICMP	N/A	Responses to execute ping and execute traceroute CLI commands. See also Access: PING on page 36 .
ARP	N/A	MAC address resolution responses
TCP	21	FTP for receiving motion detection video clips from cameras. See Configuring notification triggers on page 105 Currently, this port number is not configurable.
TCP	22	SSH administrative CLI access. See also Access: SSH on page 36 .
TCP	23	Telnet administrative CLI access. See also Access: TELNET on page 36 .
TCP	80	HTTP administrative GUI access. See also Access: HTTP on page 36 .
TCP	443	HTTPS administrative GUI access. Only occurs if the destination address is a network interface's IP address. See also Access: HTTPS on page 36 .
UDP	1900, 3702	Discovery of FortiRecorder by cameras.
UDP	5000-14999	Receiving video from cameras (RTP). See also Access: RTSP on page 37 .
TCP	554	Live video feeds (RTP) in the HTTP/HTTPS administrative GUI. See Viewing live video on page 128 .
TCP	3010	Camera-based notifications. See Configuring notification triggers on page 105 . Currently, this port number is not configurable.

Protocol	Destination Port Number	Purpose
TCP	3011	Tunnel with the FortiCamera Mobile app (formerly called FortiRecorder Mobile) or for FortiCentral to use the cameras, store face recognition data, and more. See also Access: FRC-Central on page 37 and the FortiCentral User Guide .

Appendix: Maximum values

This table shows the maximum number of configuration objects or limits that vary by them, and are not a guarantee of performance. For values such as hardware specifications that do not vary by software version or configuration, see your model's QuickStart Guide.

	FortiRecorder 100D	FortiRecorder 200D/400D/400F	FortiRecorder VM
Cameras connected	16	64	Up to 1024 Controlled by license
System interfaces	5	10 (50 on 400F)	10
Routes	20	250	250
Administrator accounts	20	50	250
LDAP profiles	20	20 (50 on 400F)	20
SNMP communities	2	16	16
SNMP community hosts	2	16	16
Remote log servers	1	3 (5 on 400F)	3
Local certificates	10	40 (80 on 400F)	40
CA certificates	10	256	256
Remote certificates	10	40 (80 on 400F)	40
SNMP users	2	16	16
SNMP user hosts	2	16	16
Camera devices	32	256	4096
Camera groups	256	256	256
DHCP server leases	256	256	256
Camera notifications	256	256	256

	FortiRecorder 100D	FortiRecorder 200D/400D/400F	FortiRecorder VM
Video profiles	256	256	256
Camera profiles	256	256	256
Schedules	256	256	256
Motion detection windows	3	3	3
Privacy mask windows	3	3	3

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