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Administration Guide

FortiNDR 7.0.7

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FortiNDR 7.0.7 Administration Guide
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Change Log

Date	Change Description
2025-04-22	Initial release.

Introduction

FortiNDR (formerly FortiAI) is the first Fortinet Network Detection and Response product from Fortinet. Apart from the Virtual Security Analyst™ with rapid malware detection technology based on neural networks, FortiNDR is built on FortiAI's high throughput malware scanning technology with extended features to detect Network Anomalies with auto and manual mitigation techniques.

FortiNDR is the next generation of Fortinet breach detection technology, using both ML and Artificial Neural Networks (ANN) which can detect network anomalies and high velocity malware detection and verdict.

ANN is able to mimic human behavior using the Virtual Security Analyst (VSA)™, which is capable of the following:

- Detect encrypted attack (via JA3 hashs), look for presence of malicious web campaigns visited , weaker ciphers, vulnerable protocols, network intrusions and botnet-based attacks.
- Profile ML traffic and identify anomalies with user feedback mechanism.
- Quickly detect malicious files through neural network analysis including NFS file scan shares.
- Analyze malware scientifically by classifying malware based on its detected features, for example, ransomware, downloader, coinminer, and so on.
- Trace the origins of the attack, for example, worm infection.
- Outbreak search can use the similarity engine to search for malware outbreaks with hashes and similar variants in the network.
- Take advantage of Fortinet's Security Fabric with FortiGate(s) and other Fortinet Security Fabric solutions, along with 3rd party API calls, to quarantine infected hosts.

FortiNDR's neural networks run in a 2U form factor using accelerated hardware with a custom GPU such as FortiNDR-3500F, as well as using VMs with 16 or 32 vCPU support.

FortiNDR can operate in different modes: sniffer mode where it captures traffic on network from SPAN port (or mirrored if deployed as VM), integrated mode with FortiGate devices and input from other Fortinet devices (see release notes for supported devices), with inline blocking with FortiOS AV profiles (7.0.1 and higher). You can also configure FortiNDR as an ICAP server to serve ICAP clients such as FortiProxy and Squid. All modes can operate simultaneously.

Key advantages of FortiNDR include the following:

Detect network anomalies with different techniques where traditional security solutions might fail

- Provide more context to attacks such as malware campaign name, web campaign devices and users participate in, intrusions and botnet attacks
- Tracing and correlate source of malware events such as worm based detection
- Manual and automatic mitigation (AKA Response) with Fortinet Security Fabric devices (such as FortiGate, FortiSwitch, FortiNAC), as well as 3rd Party solutions (via API calls).

Getting started

Use the CLI for initial device configuration. You can enable SSH access on the port1 administration interface or any other administrative port set through the CLI command including RAID. You can also connect to the CLI using the console port. Some troubleshooting steps also use the CLI.

Use the GUI to configure and manage FortiNDR from a web browser on a management computer. We recommend using Google Chrome.

Only admins with SuperAdminProfile priveleges can SSH to use the CLI.For information, see Administrator and Admin Profiles on page 100

To connect to the FortiNDR GUI:

1. Connect to the port1 management interface using the following CLI commands:

```
config sys interface
    edit port1
    set ip x.x.x.x/24
end
```

2. In a web browser (Chrome recommended), browse to `https://192.168.1.88`.
   The GUI requires TCP port 443.
3. Use *admin* as the name and leave the password blank. Click *Login*.

Only Super Admin users can access the CLI using SSH. For more information, see Administrator and Admin Profiles on page 100.

Demo mode

The purpose of demo mode is to showcase FortiNDR GUI functionality without actual attacks, anomalies malware, nor with file scanning abilities. Demo mode will generate malware and anomalies log entries (but not the actual malware and attacks) to populate the GUI with different attack scenarios and allow you to try demo searching, logging and MITRE/JSON/IOC malware reporting functionalities.

Demo mode requires less computer resources and can run on newer laptops such as those with 2–4 vCPU and 8GB memory. For production, a minimum of 16 vCPUs and 32GB of memory is required.

If required, please contact the Fortinet sales team for an evaluation license. A licensed FortiNDR instance allows you to load ANN and have full scanning capabilities. Scanning capabilities including manual upload requires you to satisfy minimum production CPU and memory requirements (which is 16vCPU and 32GB of memory).

Demo Mode is only available on FortiNDR VM.

To turn on demo mode with the CLI:

```
execute demo on
```

Do not use functions which require scanning, such as Sniffer or Manual Upload, while in Demo Mode.

To exit demo mode with the CLI:

```
execute demo off
```

To erase the demo log with the CLI:

```
execute db restore
```

Loading the ANN database to FortiNDR for malware detection

FortiNDR utilizes both FortiGuard updates to local DB as well as lookup for detecting network anomalies. For full list of updates please refer to Appendix D - FortiGuard Updates on page 165 for details. The section below discusses one of the updates: ANN for malware detection.

The ANN (Artificial Neural Network) database enables scanning of malware using accelerated ANN. Unlike AV signatures, ANN DB does not require updates daily. ANN is only updated once or twice a week to enable detection of the latest malware.

There are two ways to update ANN. You can update using FDN (FortiGuard Distribution Network) if internet is available, or on Fortinet support website after the product is registered.

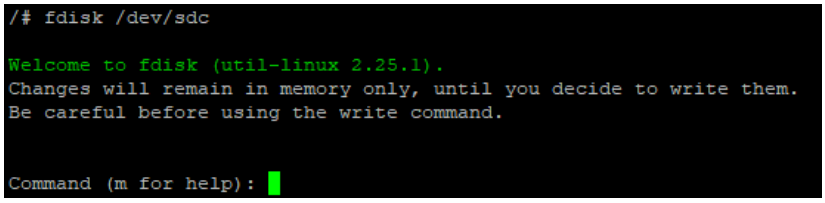
Currently FortiGuard updates are available via US, EMEA and Japan. Depending on your location, manual update might be faster. The average time of ANN update via Internet is about 1–2 hours. Using the local CLI takes about 10 minutes.

To update the ANN database using CLI:

```
execute restore kdb {disk <filename> | ftp <file name> <server_ipv4> | scp <file name>
     <server_ipv4> | tftp <file name> <server_ipv4>}
```

To update the ANN database by downloading from FDN to the FortiNDR device:

1. Format a USB drive in another Linux machine using the command `fdisk /dev/sdc`.
   Ensure the USB drive has enough capacity and create one partition using EXT4 or EXT3 format.



2. Format `sdc1` using the `mkfs.ext4 /dev/sdc1` command.

```
/# mkfs.ext4 /dev/sdc1
mke2fs 1.43.7 (16-Oct-2017)
Creating filesystem with 7554430 4k blocks and 1888656 inodes
Filesystem UUID: faec541a-8f39-4a14-a643-93cf75ae748e
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
        4096000

Allocating group tables: done
Writing inode tables: done
Creating journal (32768 blocks): done
Writing superblocks and filesystem accounting information: done

/#
```

FortiTester is a great companion for FortiNDR as FortiTester can send a malware strike pack over different protocols such as HTTP, SMB, SMTP, to simulate malware in the network. You can use FortiTester to generate malware and test FortiNDR for detection.

The following is an example of the result.

```
/# fdisk -l /dev/sdc

Disk /dev/sdc: 28.8 GiB, 30943995904 bytes, 60437492 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x2a7d7590

Device     Boot Start      End  Sectors  Size Id Type
/dev/sdc1        2048 60437491 60435444 28.8G 83 Linux
```

3. Copy `moat_kdb_all.tar.gz` and `pae_kdb_all.tar.gz` to the root directory of USB drive, in this example, `/AI_DB`.

```
/# mkdir /AI_DB
/# mount /dev/sdc1 /AI_DB/
/#
```

The following is an example of the result.

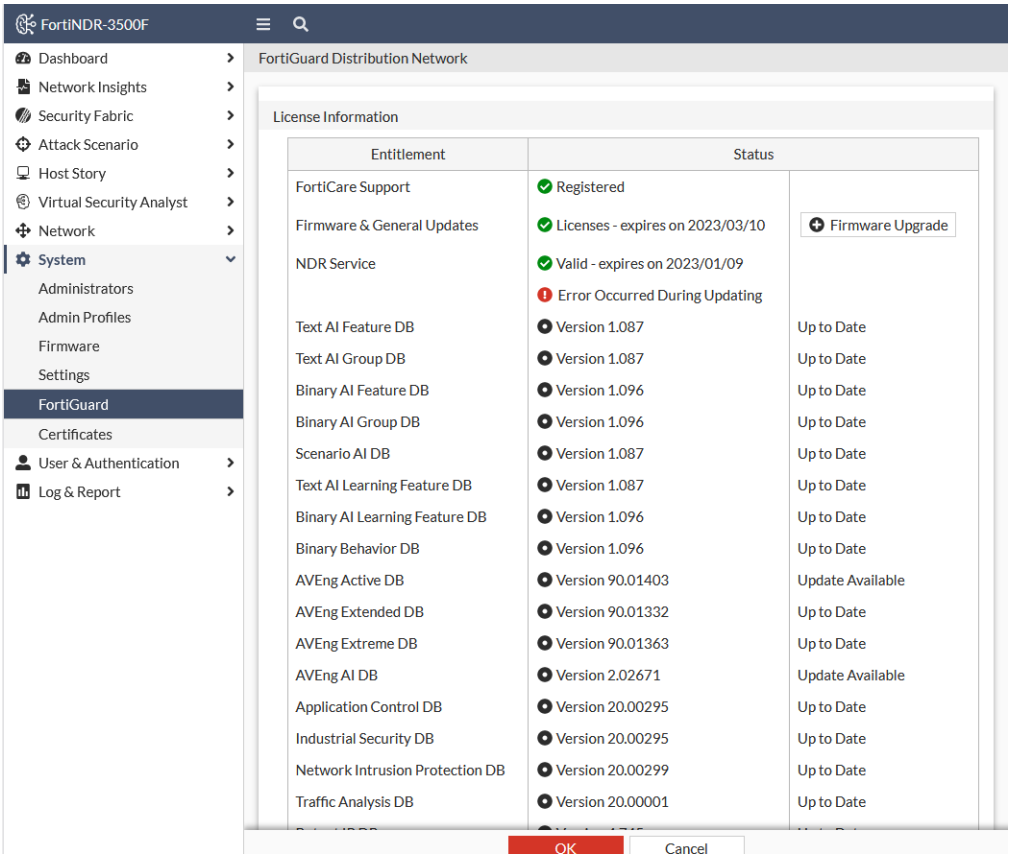
```
/AI_DB# ls
lost+found          moat_kdb_all.tar.gz  pae_kdb_all.tar.gz
/AI_DB#
```

4. Copy the files onto the FortiNDR by mounting the USB drive on the FortiNDR device and using the `execute restore kdb disk pae_kdb_all.tar.gz` and the `execute restore kdb disk moat_kdb_all.tar.gz` commands.

```
FAI35FT319000004 # execute restore kdb disk pae_kdb_all.tar.gz
This operation will first replace the current scanner db files and then restart the scanner!
Do you want to continue? (y/n)y
Mounting /dev/sda1
Mounting /dev/sdb1
Try copying file from /kdb_disk/pae_kdb_all.tar.gz to /var/spool/tmp/up_e51D0v
Copying file failed!
Mounting /dev/sdc1
Try copying file from /kdb_disk/pae_kdb_all.tar.gz to /var/spool/tmp/up_e51D0v
Get file OK.
MD5 verification succeed!
KDB files restoration completed
Scanner restart completed

FAI35FT319000004 #
```

```
FAI35FT319000004 # execute restore kdb disk moat_kdb_all.tar.gz
This operation will first replace the current scanner db files and then restart the scanner!
Do you want to continue? (y/n)y
Mounting /dev/sda1
Mounting /dev/sdb1
Try copying file from /kdb_disk/moat_kdb_all.tar.gz to /var/spool/tmp/up_uWobUb
Copying file failed!
Mounting /dev/sdc1
Try copying file from /kdb_disk/moat_kdb_all.tar.gz to /var/spool/tmp/up_uWobUb
Get file OK.
MD5 verification succeed!
KDB files restoration completed
Scanner restart completed

FAI35FT319000004 #
```

5. To verify the ANN database in the GUI, go to *System* > *FortiGuard*.



6. To verify the ANN database in the CLI, use the `diagnose kdb` command and check that there are four `KDB Test Passed` status lines.
   You can check the latest version of FortiNDR ANN at https://www.fortiguard.com/services/fortindr.

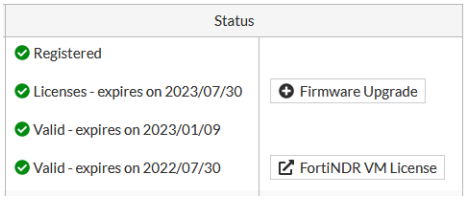
```
FAI35FT319000004 # diagnose kdb
System Time:  2020-02-11 14:50:34 PST (Uptime: 0d 22h 32m)
Start: /bin/pae2 -test

2020-2-11 14:50:34
[TEST] - Start KDB Test...
        [TEST] - Loading Group KDB...
        [TEST] - Group KDB Rec Num: 383887
        [TEST] - Loading Feature KDB...
        [TEST] - Feature KDB Rec Num: 45562000
[TEST] - KDB Test Passed

2020-2-11 14:50:48
Start: /bin/pae_learn -test

2020-2-11 14:50:48
[TEST] - Start KDB Test...
        [TEST] - Loading Mal KDB...
        [TEST] - Mal KDB Rec Num: 1770913
        [TEST] - Loading Clean KDB...
        [TEST] - Clean KDB Rec Num: 34625563
[TEST] - KDB Test Passed

2020-2-11 14:50:55
Start: /bin/moat_learn -test
2020-2-11 14:50:55
2020-2-11 14:50:55
[TEST] - Start KDB Test...
        [TEST] - Loading KDB-0...
        [TEST] - KDB-0 Rec Num: 127612293
        [TEST] - Loading KDB-1...
        [TEST] - KDB-1 Rec Num: 7058519
[TEST] - KDB Test Passed
2020-2-11 14:51:25
Start: /bin/moat_engine -test kdb
2020-2-11 14:51:25
[TEST] - Start KDB Test...
        [TEST] - Loading Group KDB...
        [TEST] - Group KDB Rec Num: 15235200
        [TEST] - Loading Feature KDB...
        [TEST] - Feature KDB Rec Num: 370576784
[TEST] - KDB Test Passed
2020-2-11 14:53:39
```

When you have finished using the USB or SSD drive, remove the drive from FortiNDR. Some disk-related CLI commands such as `execute factoryreset`, `execute partitiondisk`, or `diagnose hardware sysinfo` might treat the additional disk as the primary data partition.

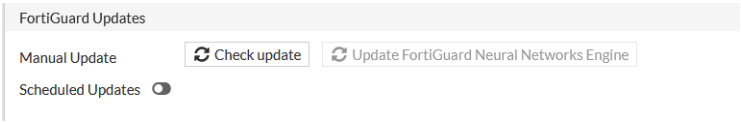
Updating the ANN database from FDS for malware detection

To update the ANN database from FDS:

1. Go to *System* > *FortiGuard*.
2. Check the *License Status* to ensure there is a valid license.
   If the license is not valid:
   - The unit cannot update from FDS.
   - Ensure the unit is not on internal FDS and the unit has a subscription for *FortiGuard Neural Networks engine updates & baseline*.



3. Click *Check Update*.
   If there are updates, an *Update Now* button appears and the *Status* column shows the components with updates.



4. Click *Update Now*.
   Due to the size of databases, the update might take several hours depending on your Internet speed. During the update, check the *Status* column.

License Status: Valid until 2021/01/03

Entitlement	Version	Last Update Date	Status
Binary AI 5			
Binary AI Engine	Version 1.000	2020/01/01 00:00:00	Up to Date
Binary AI Learning Engine	Version 1.000	2020/01/01 00:00:00	Up to Date
Binary AI Feature DB	Version 1.017	2020/03/02 04:57:45	Up to Date
Binary AI Group DB	Version 1.017	2020/03/02 04:57:45	Up to Date
Binary AI Learning Feature DB	Version 1.017	2020/03/02 04:57:45	Up to Date
Text AI 5			
Text AI Engine	Version 1.000	2020/01/01 00:00:00	Up to Date
Text AI Learning Engine	Version 1.000	2020/01/01 00:00:00	Up to Date
Text AI Feature DB	Version 1.000	2020/03/02 02:37:00	Downloading
Text AI Group DB	Version 1.000	2020/03/02 02:37:00	Downloading
Text AI Learning Feature DB	Version 1.000	2020/03/02 02:37:00	Downloading

Operating mode, protocols, and file type support

FortiNDR can operate in both detecting network anomalies as well as malware analysis using ANN. If FortiNDR functionalities are not needed, and you prefer pure file analysis, NDR functionalities can be switched off with the command "`execute ndrd {on|off}`"

For more information, see the *FortiNDR CLI Reference Guide*.

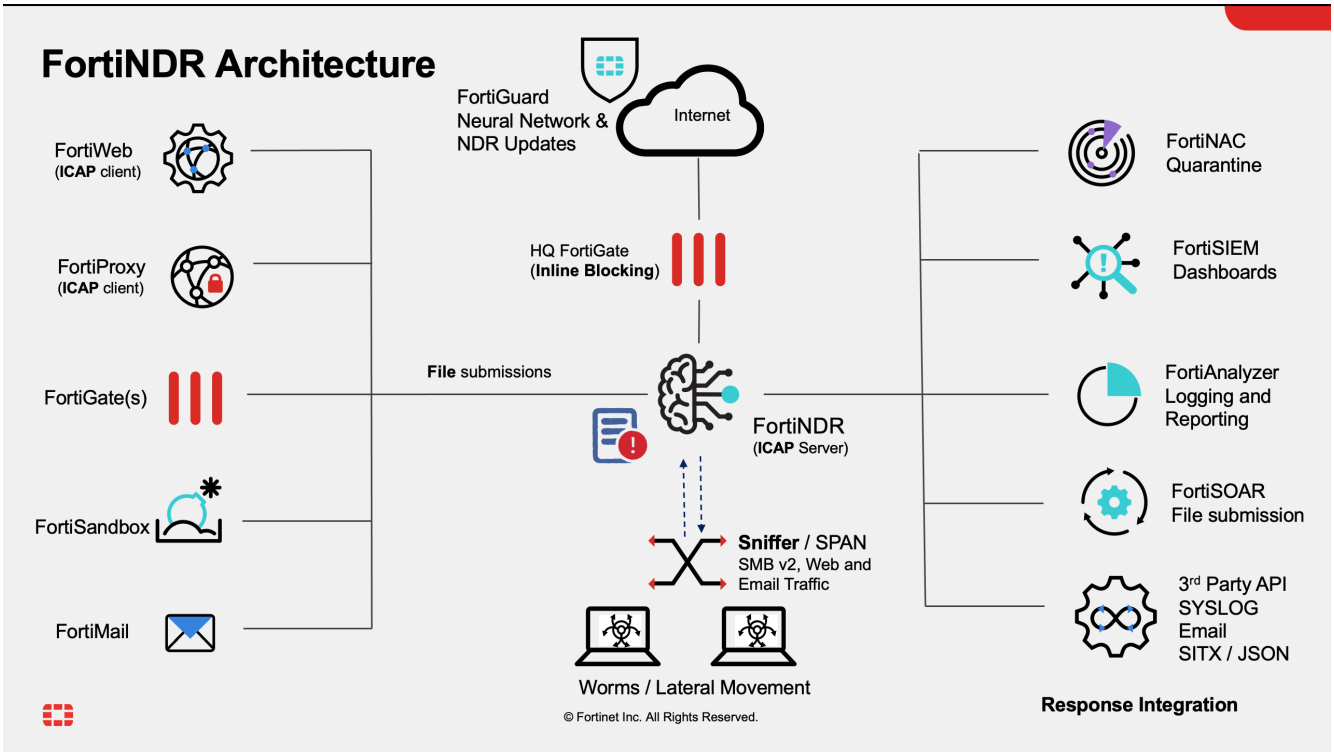
Operating Mode	Supported Devices *	Communication Protocol	File/Malware Analysis Protocols supported	NDR Network Anomalies Protocols Supported	Notes
Sniffer	N/A	N/A	HTTP, SMBv2, IMAP, POP3, SMTP, FTP	TCP, UDP, ICMP, ICMP6, TLS, HTTP, SMB, SMTP,SSH, FTP, POP3, DNS, IRC, IMAP, RTSP, RPC, SIP, RDP, SNMP, MYSQL, MSSQL, PGSQL, and their behaviors	Using SPAN port or network TAP
Integrated	FortiGate	OFTP (v5.6-v6.x), HTTP2 (v7.0 FOS)	HTTP, HTTPS (with SSL decryption), SMTP, POP3, IMAP,	N/A	FortiGate v7.0.1 supports INLINE blocking with AV profile
	FortiMail	HTTP2	SMTP		Configure under *AV profile* under FortiMail.
	FortiSandbox	HTTP2	MAPI, FTP, CIFS		
ICAP	FortiWeb	ICAP	HTTP, HTTPS	N/A	Supports using FortiNDR as ICAP server and multiple
	FortiProxy	ICAP	HTTP, HTTPS		FortiGates, FortiWeb and FortiProxy or third-party ICAP client such as Squid.

Operating Mode	Supported Devices *	Communication Protocol	File/Malware Analysis Protocols supported	NDR Network Anomalies Protocols Supported	Notes
Other / API	FortiSOAR	HTTPS API upload	HTTPS	N/A	Using API available from FortiNDR for file upload
	Scripts (refer to Appendix for sample scripts)	HTTPS API upload			
	NFS and SMB file shares	SMB/NFS	N/A	N/A	Direct map and scan

Supported file types for all operating modes:

32 bit and 64 bit PE - Web based, text, and PE files such as EXE, PDF, MSOFFICE, DEX, HTML, ELF, ZIP, VBS, VBA, JS, HWP Hangul_Office, TAR, XZ, GZIP, BZIP, BZIP2, RAR, LZH, LZW,ARJ, CAB, _7Z, PHP, XML, POWERSHELL, BAT, HTA, UPX, ACTIVEMIME, MIME, HLP, BASE64, BINHEX, UUE, FSG, ASPACK, GENSCRIPT, SHELLSCRIPT, PERLSCRIPT, MSC, PETITE, ACCESS, SIS, HOSTS, NSIS, SISX, INF, E32IMAGE, FATMACH, CPIO, AUTOIT, MSOFFICEX, OPENOFFICE, TNEF, SWF, UNICODE, PYARCH, EGG, RTF, DLL, DOC, XLS, PPT, DOCX, XLSX, PPTX, LNK, KGB, Z, ACE, JAR, APK, MSI, MACH_O, DMG, DOTNET, XAR, CHM, ISO, CRX, INNO, THMX, FLAC, XXE, WORDML, WORDBASIC, OTF, WOFF, VSDX, EMF, DAA, GPG, PYTHON, CSS, AUTOITSCRIPT, RPM, EML, REGISTRY, PFILE, CEF, PRC, CLASS, JAD, COD, JPEG, GIF, TIFF, PNG, BMP, MPEG, MOV, MP3, WMA, WAV, AVI, RM, TOR, HIBUN

FortiNDR supports quarantine with incoming webhook from FortiOS 6.4 and higher. For details, see the Release Notes. For FortiNDR to quarantine via FortiGate, you must provide VDOM information to FortiGate. For details, see Automation Framework on page 53.



Supported file types for ANN:

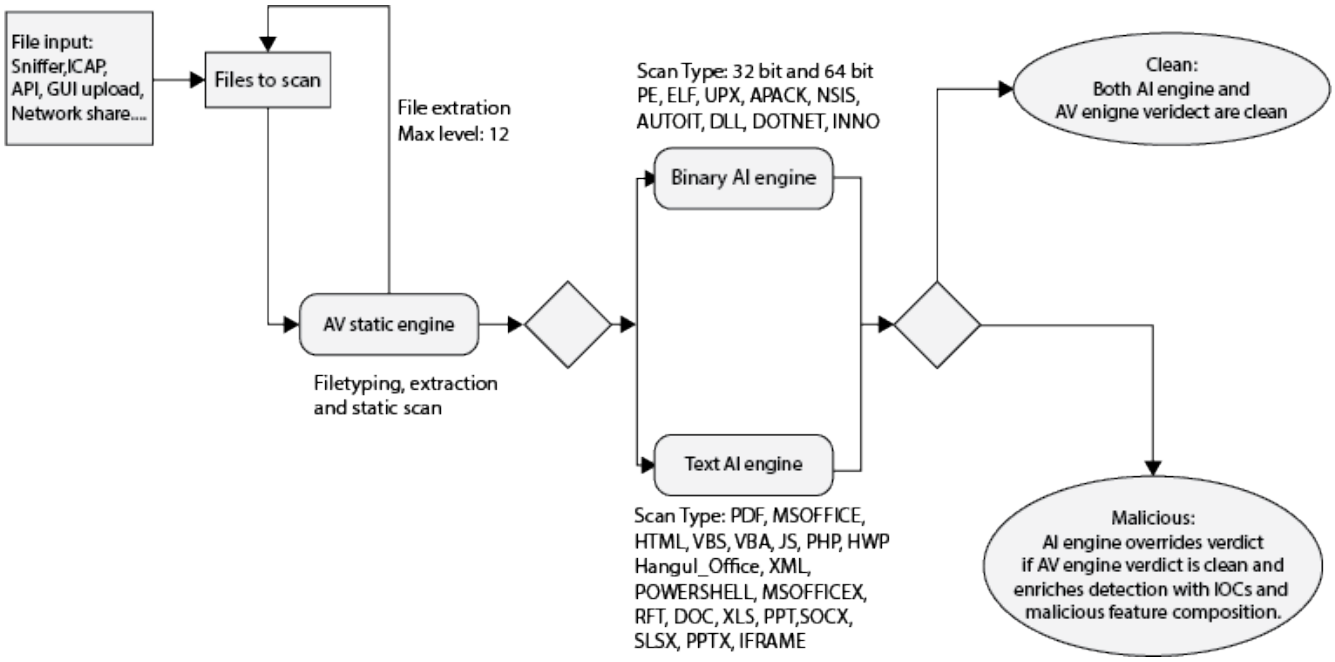
For ANN supported file types, ANN will process and provide a feature breakdown between different attack scenarios (like Ransomware, banking trojan etc) 32 bit and 64 bit PE, PDF, MSOFFICE, HTML, ELF, VBS, VBA, JS, PHP, HWP Hangul_Office, XML, POWERSHELL, UPX, ASPACK, NSIS, AUTOIT, MSOFFICEX, RTF, DLL, DOC, XLS, PPT, DOCX, XLSX, PPTX, DOTNET, INNO, IFRAME

File types supported by ANN will be scanned by the ANN and AV engines. Other supported file types will be scanned by AV engine only.

File scan flow

Stage 1

All files to be scanned go through the same flow. First, the files are scanned by the Antivirus static engine. The AV engine identifies the file types and assigns a verdict at the same time. If the files are archive files such as ZIP or TAR, they are extracted at this stage (up to 12 layers). The extracted files are then sent back to be scanned by the Antivirus static engine.



Stage 2

If it is a supported file type by ANN (listed above), file type, files are sent to either the *Binary* or *Text AI* engine for the Stage 2 scan. Files will go through the Stage 2 Scan regardless of the verdict in Stage 1. The AI engine will only override the verdict if the file is *Clean* in Stage 1 and *Malicious* in Stage 2. The Stage 2 AI scan enriches the IOC information and malicious feature composition in the sample detail view.

Architecture considerations

FortiNDR comes in both appliance and VM form factor. The appliance is FortiNDR-3500F. The VM16 and VM32 is subscription-based.

FortiNDR can work in the following modes:

- Standalone sniffer mode.
- Integrated mode with FortiGates. This mode supports all files from FortiGates and other Fortinet Security Fabric devices such as FortiSandbox etc (please refer to release notes or the data sheet for list of products supported)
- ICAP mode. FortiNDR can act as ICAP server and serve ICAP clients such as FortiGate, FortiWeb, and Squid.
- All modes can operate simultaneously.

For proof of concept, consider the following in a deployment:

- FortiNDR is a non-inline, passive device that is capable of very high files-per-second scan rate and speedy detection and verdict of malware. This is achieved by hardware accelerated Neural Networks on the appliance. FortiNDR-3500F is rated at 100000 files per hour or 27.78 files per second. FortiNDR VM has approximately 40-80% of hardware performance without GPU.
- You can use FortiNDR with lots of email, HTTP, and SMBv2 traffic in sniffer mode, and other traffic or files from FortiGates.

- By observing web, email, HTTP, and SMBv2 traffic, the FortiNDR Virtual Analyst can determine the original IP address of the malware attack by examining the historical files/traffic/infection on the network. So the more traffic you send to FortiNDR, the more data FortiNDR can analyze and use.
- For response/mitigation after threats are detected, please refer to *Security Fabric* > *Enforcement Settings* and view the automation profile for details. FortiNDR is capable of calling APIs on different products such as FortiGate, FortiNAC, 3rd Party, and FortiSwitch (via FortiGate Fortlink) for quarantine.

For file type support, see the datasheet and Administration Guide for the most up-to-date information.

Planning deployment—estimating data storage for file analysis throughput

- FAI-3500F (gen 1 & 2) uses 2 X 3.8TB SSD in RAID1 and comes with the option to purchase additional SSD HDDs.
- FNR-3500F (gen3 with fiber card) uses 4 x 3.8TB SSD in RAID10 and comes with the option to purchase additional SSD HDDs.
- FNR-VM comes with 4 different size disk images.

The following table provide guidance for FortiNDR disk storage used for malware scanning only.

Model	Default data storage (GB)	Max. Process rate* (files/hour)	Storage retention (approx. days / months / year)
FNDR-3500F	3517	100,000	270 days / 9 months /.75 years
FNDR-VM	1024	40,000 to 80,000	265 days / 8.5 months /.75 years
FNDR-VM	2048	40,000 to 80,000	625 days / 20.5 months /1.7 years
FNDR-VM	4096	40,000 to 80,000	1345 days / 44.5 months /3.7 years
FNDR-VM	8192	40,000 to 80,000	2700 days / 90 months /7.4 years

VM16 and VM32 published file processing rate at 40,000 and 80,000 files per hour respectively

* The max. process rate depends on the average size and composition of file types. NDR disk storage depends on a few factors such as:

- Size of data disk allocated in VM
- Number of disks inserted into hardware model
- Throughput of network e.g. with sniffer
- Whether unit is used for NDR and/or pure file analysis only

Please refer to disk management section under system for more information.

Initial setup

For the meaning of LEDs, see the Quick Start Guide (QSG).

Internet Access

For FortiGuard updates please have a stable internet access from the FortiNDR unit. Go to *System* > *FortiGuard* for updates via Internet. For offline deployments please refer to Appendix D - FortiGuard Updates on page 165.

Ports

Port1 and port2 are hard-coded to be management port and sniffer port.

The following is the initial port configuration.

Port	Type	Function
Port1	10GE copper (10G or 1G autodetect)	Management port, GUI, Fabric devices files receiving, REST API, ICAP. Default IP address is `192.168.1.88` using `admin` with no password.
Port2	10GE copper (10G or 1G autodetect)	Sniffer port.
Port3 Port4	1G Copper	High availability
Port5 Port6 Port7 Port8	10G SPF+ fiber (gen3 only)	Reserve for future use*
Console	Serial port	Console serial port. 9600 baud, 8 data bits, 1 stop bit, no parity, XON/XOFF.

While the FortiGate port2 sniffer comes in 10GE copper, it also auto detects 1/10G interfaces. If the switch supports SFP+, you can use the FN-TRAN-SFP+GC transceiver.

SKU: FN-TRAN-SFP+GC

Product Name: 10GE copper SFP+ RJ45 transceiver (30m range)

Description: 10GE copper SFP+ RJ45 Fortinet transceiver (30m range) for systems with SFP+ slots.

10GE copper supports up to 100m cable distance to switch or FortiGate. Ideally the shorter the cable the better the performance, avoiding retransmission and packet loss over physical medium.

Use CAT 8 copper cable to achieve the maximum performance of up to 40Gbps for sniffer. For differences in CAT cables, see https://www.cablesandkits.com/learning-center/what-are-cat8-ethernet-cables.

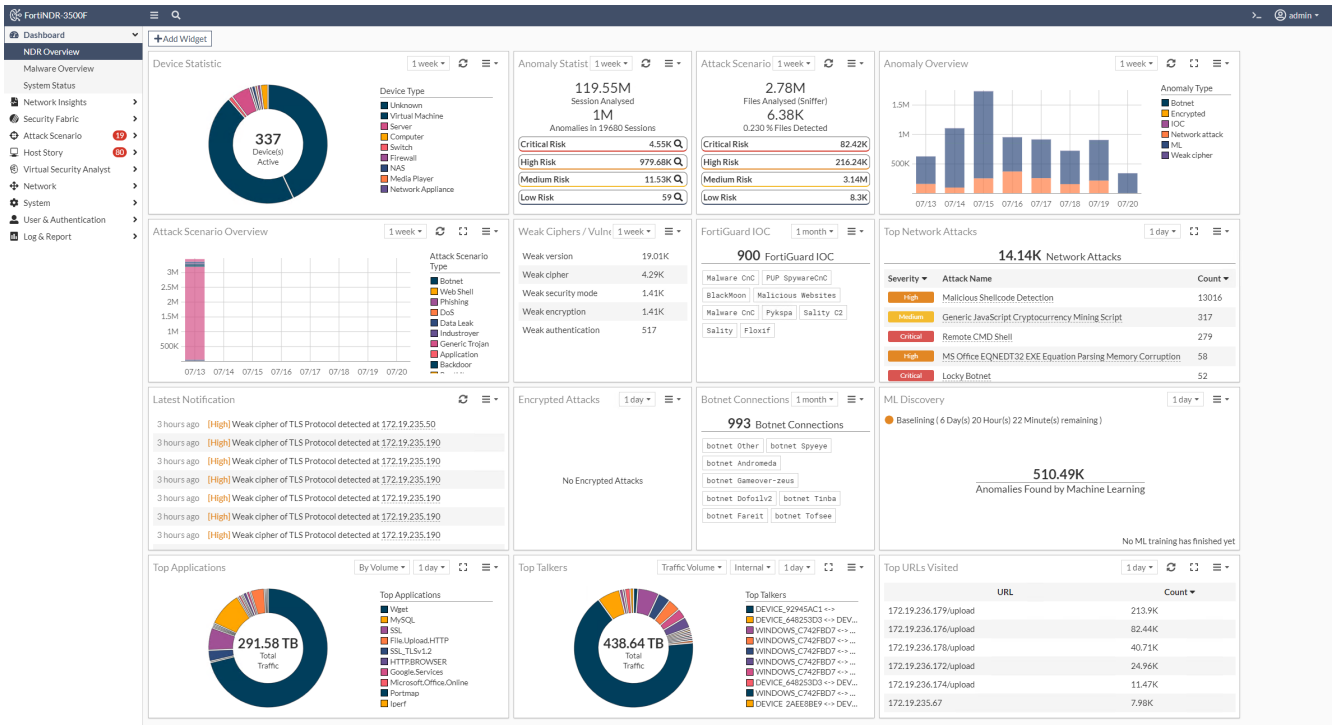
*For customers who are required to use SFP+ ports (available in gen3 hardware only) for management and capture (sniffer), pls contact local CSE for details.

Dashboard

The *Dashboard* displays the overall anomalies detected by FortiNDR as well as the system status. The Dashboard contains three views: *NDR Overview*, *Malware Overview*, and *System Status*.

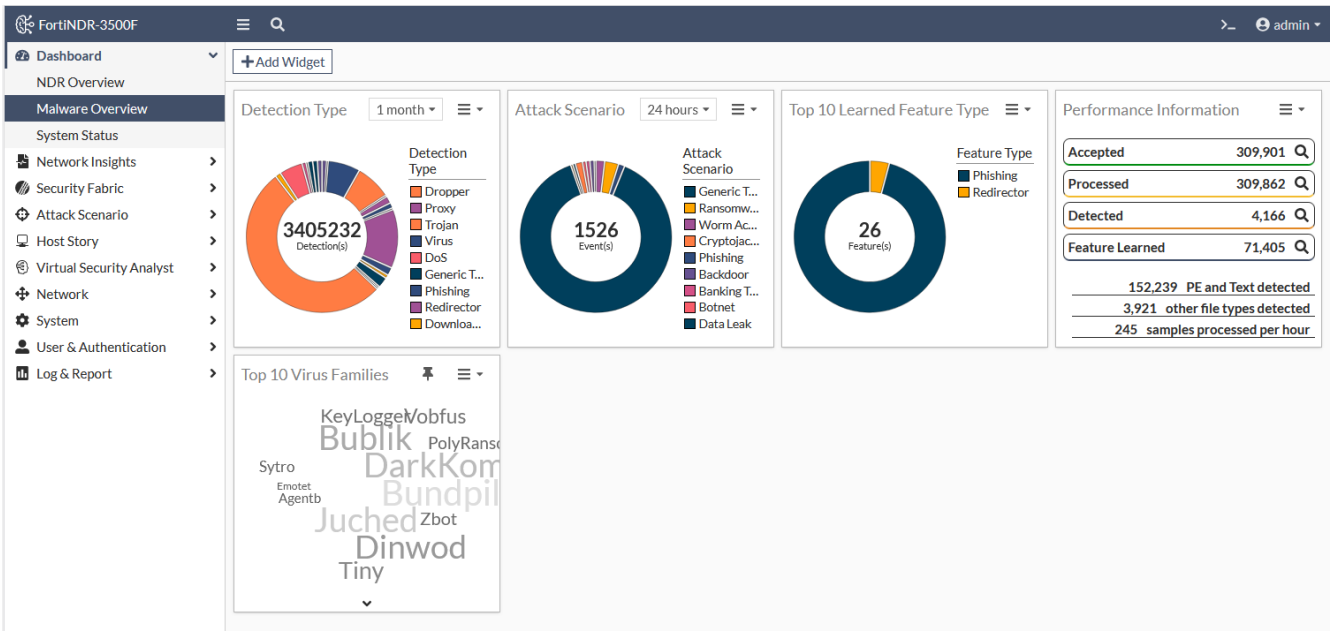
NDR Overview

The *NDR Overview* dashboard displays network detection and response statistics as charts and graphs. Each widget can be filtered with a time range of *1 day*, *1 week*, or *1 month*. When you click the *Network Insights* widgets, such as *ML Discovery* and *Botnet*, the widget expands to full screen.



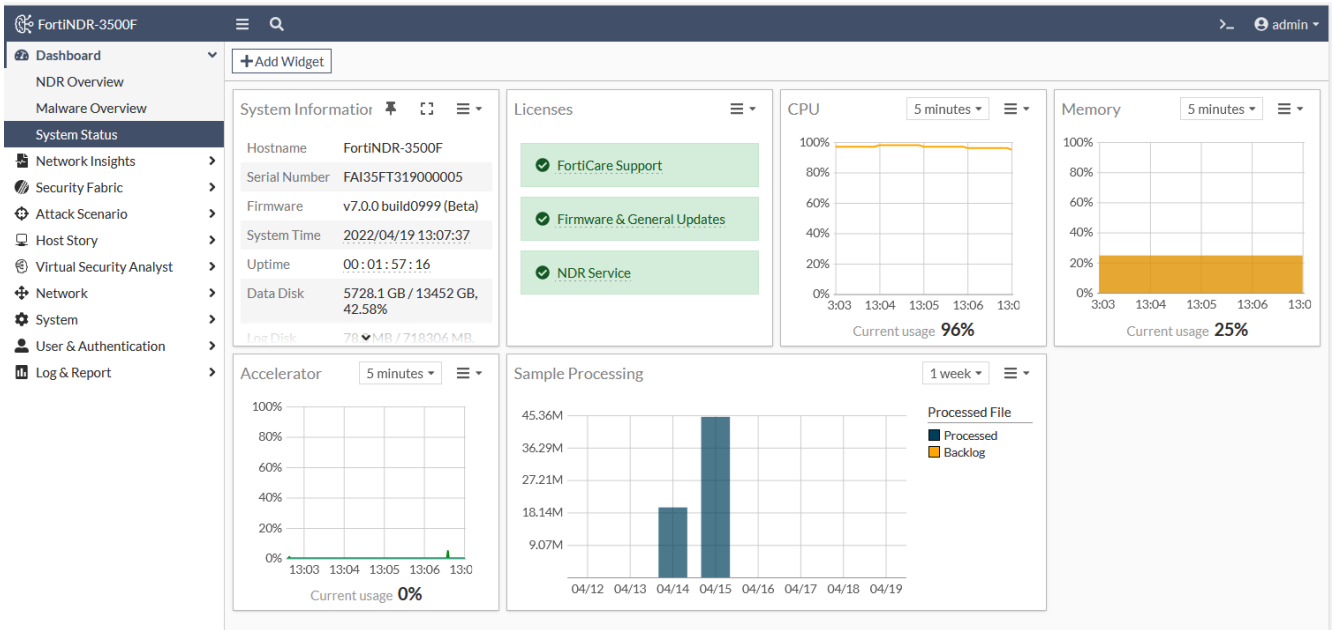
Malware Overview

The *Malware Overview* dashboard displays information about malware attacks and performance information as charts and graphs.



System Status

The *System Status* dashboard displays information about the FortiNDR device. Use this dashboard to view license information, resource usage, and the processing queue.



To add a widget to a dashboard:

1. In the dashboard banner, click *Add Widget*. The *Add Dashboard Widget* window opens.
2. Click the plus sign (**+**) next to the widget name.

3. Click *OK*.

Security Fabric

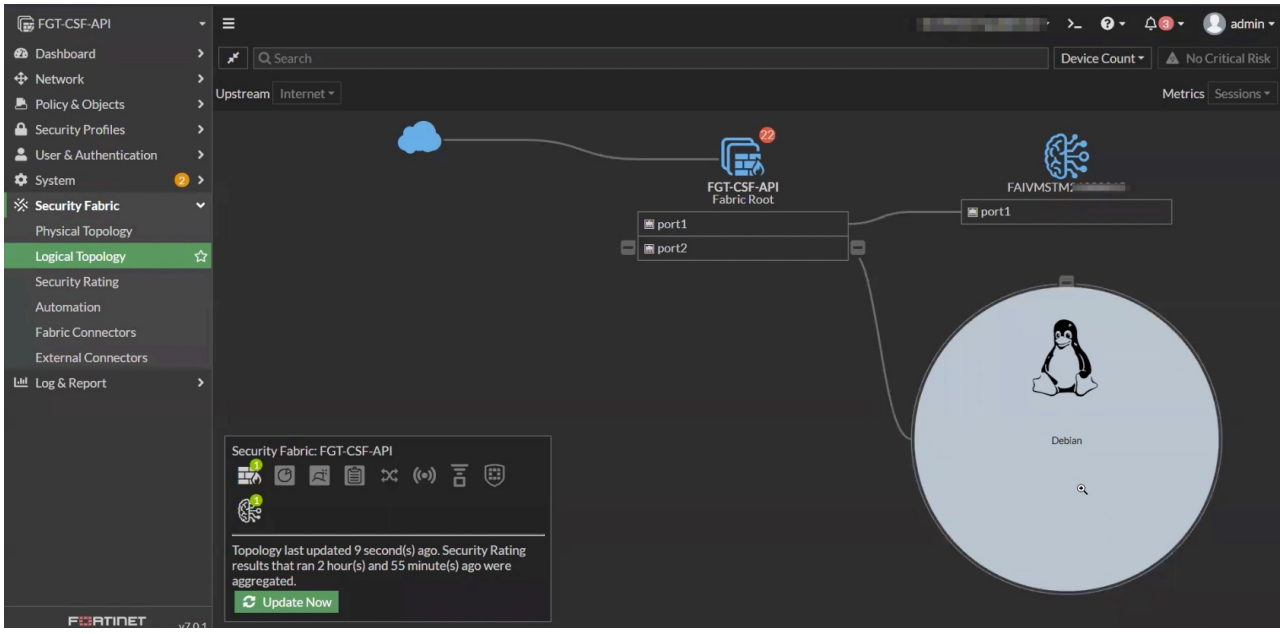
FortiGate inline blocking (FOS 7.0.1 and higher)

You can configure FortiGate to integrate with FortiNDR using inline blocking. Changes in FortiOS allow the AV profile to configure inline blocking by sending files to FortiNDR for rapid inspection and verdict. FortiGate temporarily holds the user session for FortiNDR to return a clean or malicious verdict, and then it decides if the user can download the file.

This provides more security than integrated moded because you can download the file first while the file is sent to FortiNDR (and FortiSandbox) for inspection.

To configure FortiGate AV profile inline blocking:

1. Configure FortiGate and FortiNDR Security Fabric pairing using the Security Fabric Connector. For details, see Fabric Connectors on page 40.
   This is needed for authentication between the two devices before file submission begins.
2. When pairing is complete, verify that FortiNDR appears in the FortiGate topology with the FortiNDR icon in the legend.



3. Configure the FortiGate AV profile using the following CLI commands.

```
Config system fortindr
    Set status enable
End

Config antivirus profile
    edit fai                << profile name
        Set feature-set proxy
        Config http         << or another protocol such as FTP, SMTP, IMCP, CIFS, etc.
```

```
        Set fortindr block  << or monitor
    End
Next
End
```

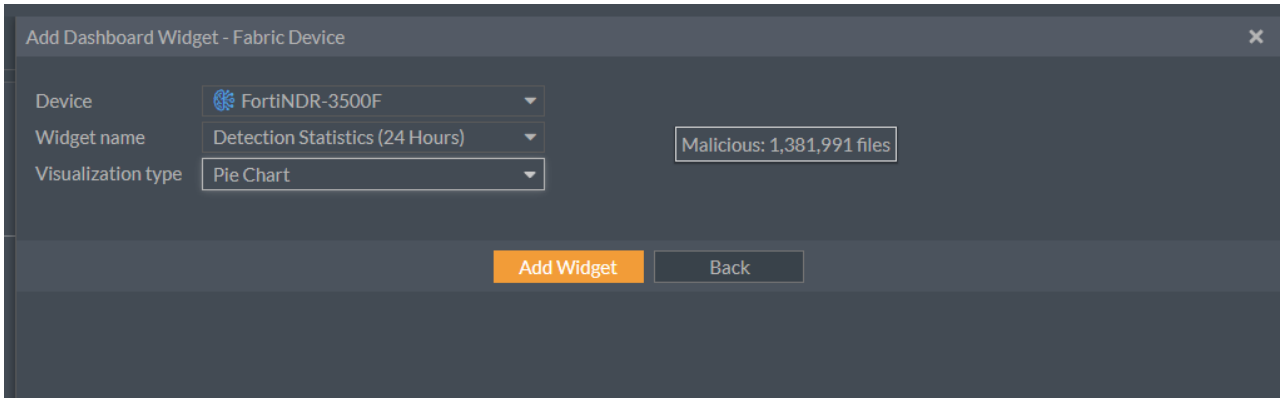
4. Apply this AV profile in the ForitOS NGFW policy.
   Both FortiGate Antivirus logs and FortiNDR logs and reports show corresponding log entries.

Tips for using FortiNDR inline blocking

- Similar to the FortiGate AV profile, a browser replacement message if as displayed if a virus is found.
  In FortiOS, the message is called FortiNDR block page, and is a customizable HTML page.

- For encrypted traffic such as HTTPS, the SSL profile must be configured on FortiGate to extract files in encrypted protocols.
- The maximum file size is determined by both FortiGate and FortiNDR. FortiNDR supports a default maximum file size of 200MB. In FortiNDR the maximum file size can be adjusted with the following CLI command:
  ```
  execute file-size-threshold
  ```
- If there are network connectivity issues that causes a timeout between the connections, FortiGate and user download operations resume after connectivity is restored.
- When FortiNDR is connected to the Security Fabric, you can configure a malware widget in the FortiOS Dashboard.

  Go to *Dashboard* > *Status* > *Add Widget* > *Fabric Device* to display the detected attack scenarios.



FortiNDR inline inspection with other AV inspection methods

The following inspection logic applies when FortiNDRinline inspection is enabled simultaneously with other AV inspection methods. The AV engine inspection and its verdict always takes precedence because of performance. The actual behavior depends on which inspected protocol is used.

HTTP, FTP, SSH, and CIFS protocols:

1. AV engine scan; AV database and FortiSandbox database (if applicable).
   - FortiNDR inline inspection occurs simultaneously.
2. AV engine machine learning detection for WinPE PUPs (potentially unwanted programs).
   - FortiNDR inline inspection occurs simultaneously.
3. Outbreak prevention and external hash list resources.
   - FortiNDR inline inspection occurs simultaneously.

If any AV inspection method returns an infected verdict, the FortiNDR inspection is aborted.

POP3, IMAP, SMTP, NNTP, and MAPI protocols:

1. AV engine scan; AV database and FortiSandbox database (if applicable).
2. AV engine machine learning detection for WinPE PUPs (potentially unwanted programs).
   - FortiNDR inline inspection occurs simultaneously.
3. Outbreak prevention and external hash list resources.
   - FortiNDR inline inspection occurs simultaneously.

In an AV profile, use `set fortindr-error-action {log-only | block | ignore}` to configure the action to take if FortiNDR encounters an error.

Accepted file types

The following file types are sent to FortiNDR for inline inspection:

7Z	HTML	RTF
ARJ	JS	TAR
BZIP	LZH	VBA
BZIP2	LZW	VBS
CAB	MS Office documents (XML and non-XML)	WinPE (EXE)
ELF	PDF	XZ
GZIP	RAR	ZIP

FortiGate integration (integrated mode with FOS 5.6 and higher)

You can send files to FortiNDR using FortiGate 5.6 and higher.

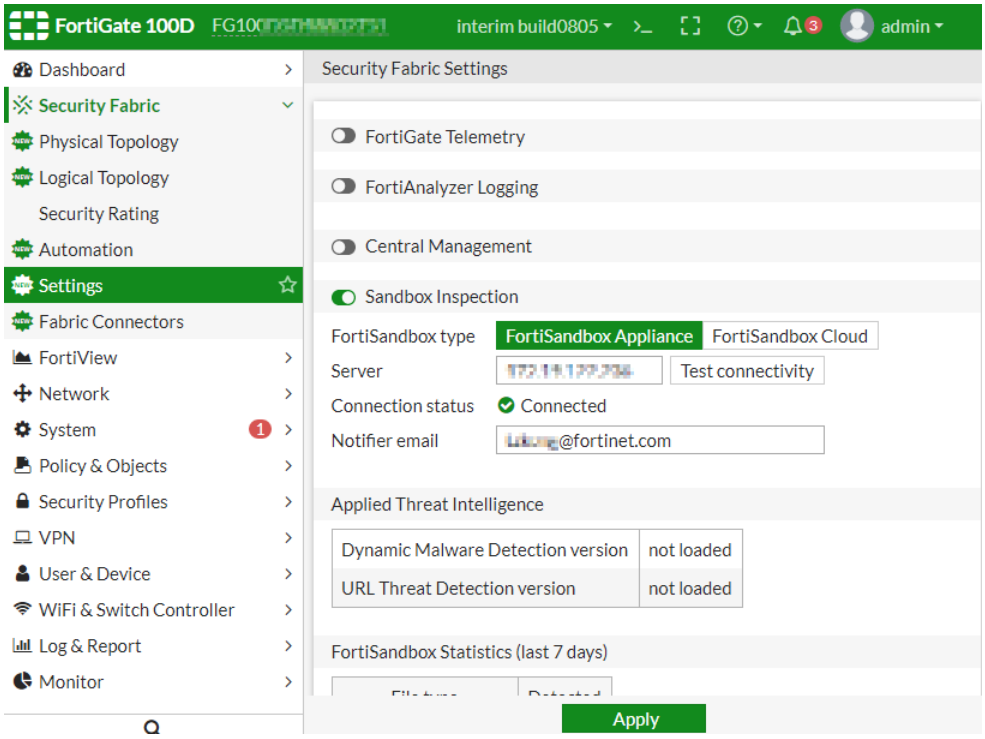
FortiGate cannot receive files from both FortiSandbox and FortiNDR simultaneously.If your FortiGate has FortiSandbox configured, consider using another mode.

FortiNDR uses the same OFTP (Optimized Fabric Transfer Protocol) over SSL (encrypted) from FortiGate to FortiSandbox. If you are not using FortiSandbox, you can use FortiGate's *Sandbox Inspection* to send files to FortiNDR.

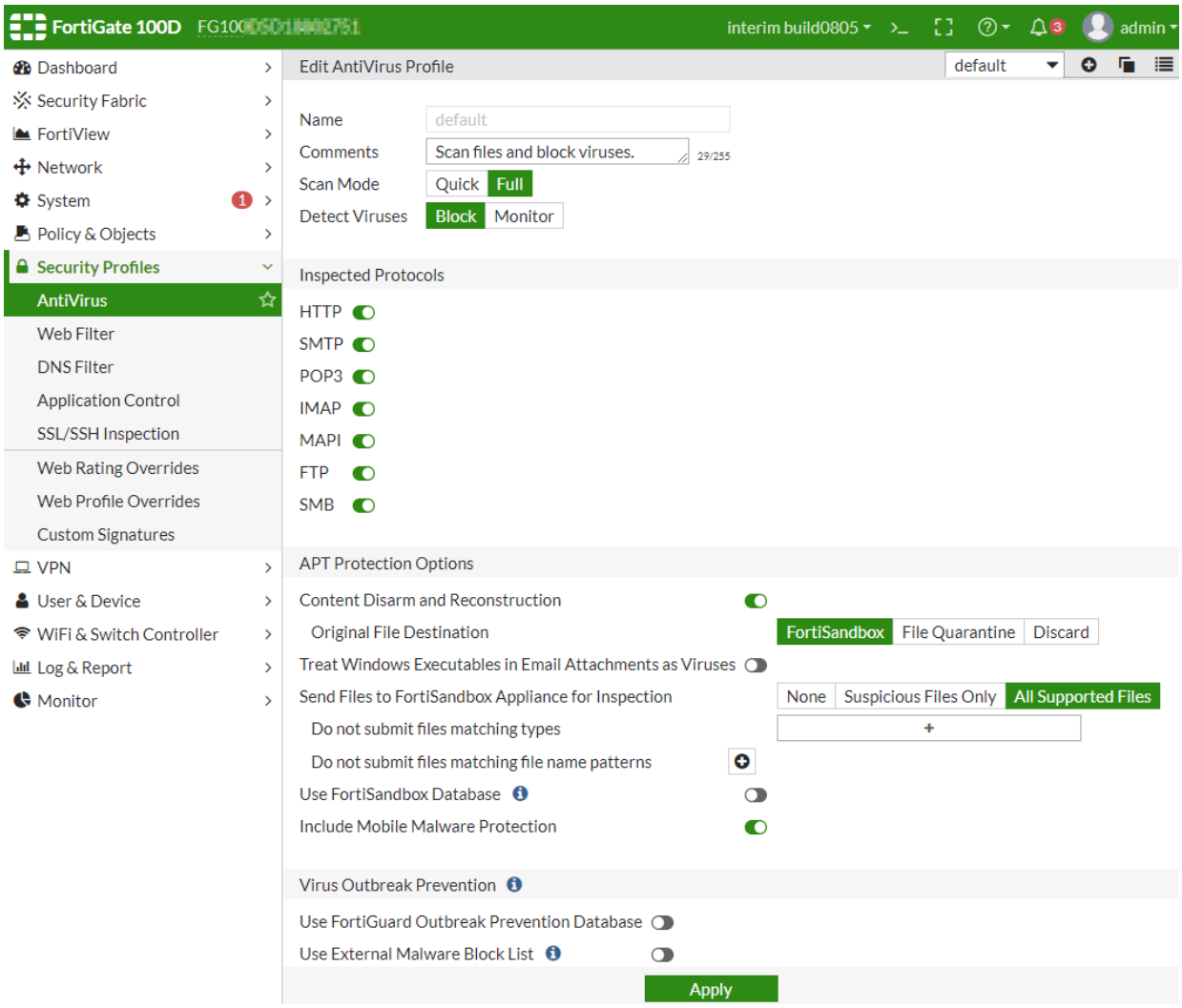
For information on configuring FortiGate, see the FortiGate documentation in the Fortinet Document Library.

To send files from FortiGate to FortiNDR:

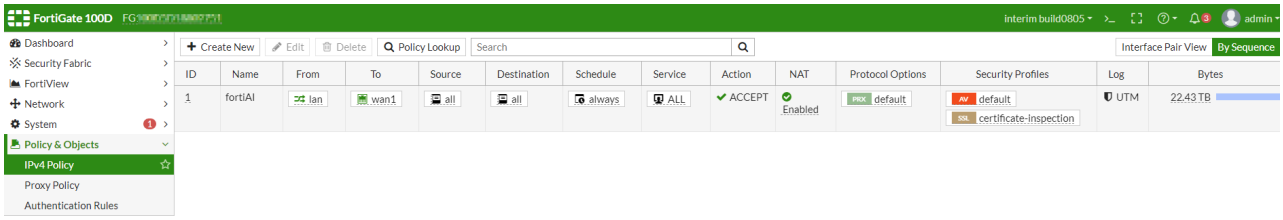
1. Set up the IP address on FortiGate.



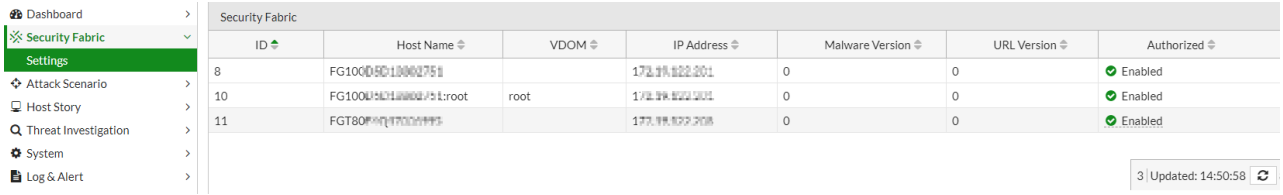
2. Configure an AV profile to send files to FortiNDR.



3. Apply AV profile in the firewall policy.



4. Authorize the FortiGate on FortiNDR for sending files.



5. Check the FortiNDR processed traffic. See FortiGate integration (integrated mode with FOS 5.6 and higher) on page 28.

Device input

The *Device Input* page displays the FortiGate (5.6 and higher) and FortiSandbox (4.0.1 and higher) devices that are sending files to FortiNDR. To view the Device Input page, go to *Security Fabric* > *Device Input*.

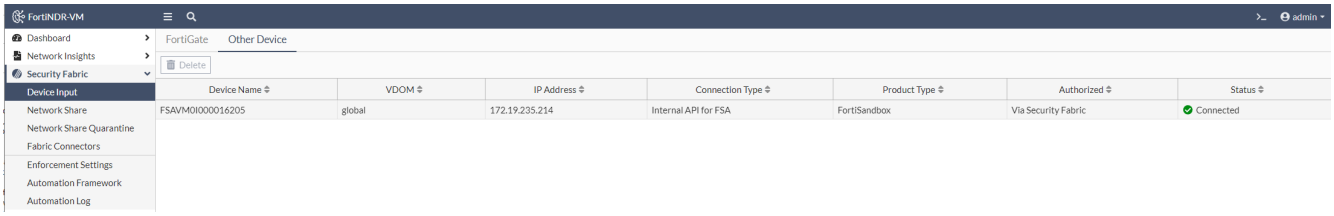
FortiGate tab

The *FortiGate* tab displays the FortiGates sending files via OFTP (FortiSandbox field with TCP port 514) and via HTTPs (FOS 7.0.1 and higher).

FortiNDR must authorize connections from FortiGate for OFTP and for inline blocking. Connect FortiNDR to the FortiGate Security Fabric to authorize the device via the Security Fabric protocol. For more information, see Security Fabric on page 25.

Other Device tab

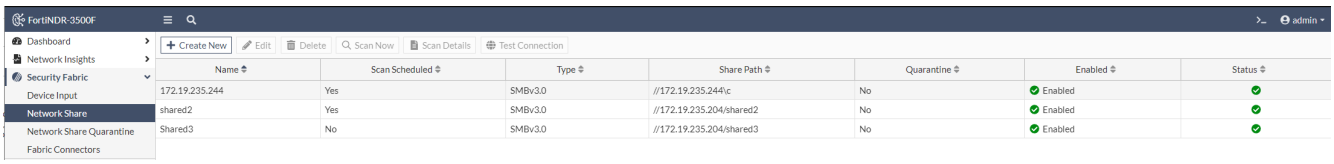
The *Other Device* tab displays FortiSandbox submissions via the FortiNDR API.



Network Share

Network File Share (or Network Share) allows FortiNDR to scan remote file locations via SMB and NFS protocol. Central quarantine with either *Move* or *Copy* of files is supported.

Create a *Network Share* profile to configure a Network Share location for inspection by FortiNDR. After the profile is configured, FortiNDR will scan the registered network's share directories.



Creating a Network Share

To create a Network Share profile, go to *Security Fabric* > *Network Share*. Register a new Network Share by providing the mounting information. Configure the profile to quarantine files separately based on their detected risk level. You can also use the profile to schedule a scan cycle of the network share location.

To create a Network Share profile:

1. Go to *Security Fabric* > *Network Share*.
2. In the toolbar, click *Create New*. The *New Network Share* page opens.
3. Enter the Network Share mounting information.

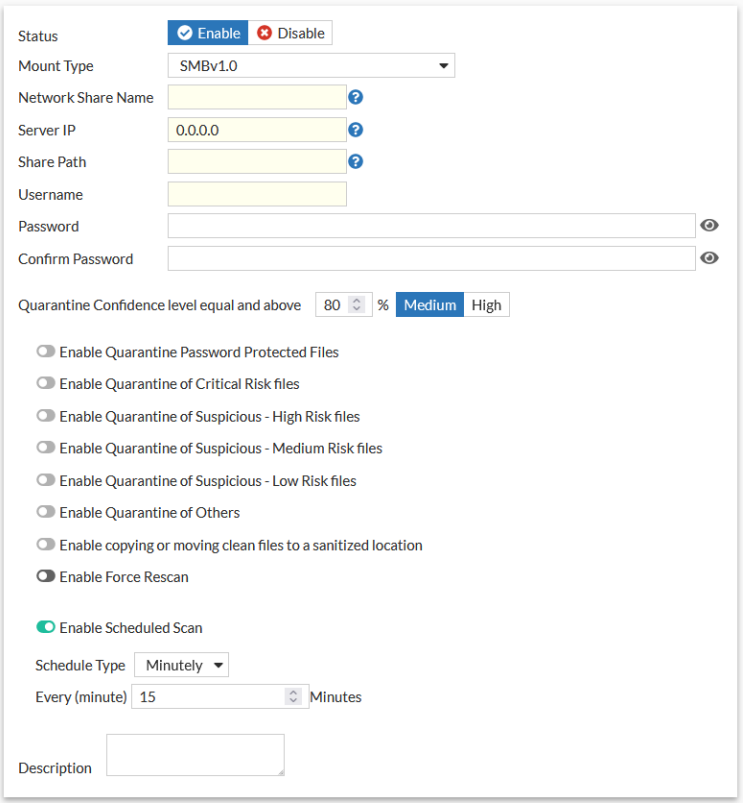
Status	*Enable* or *Disable*. *Enable* is the default.
Mount Type	Select a Network Share protocol from the list. The following protocols are supported: • SMBv1.0 • SMBv2.0 • SMBv2.1 • SMBv3.0 • NFSv2.0 • NFSv3.0 • NFS v4.0
Network Share Name	Enter a name for the Network Share.
Server IP	Enter the IP address for the Network Share.
Share Path	Enter the path for the Network Share.
Username	Enter the username for the Network Share.
Password	Enter the password for the Network Share and then confirm the password.

4. Configure the *Quarantine Confidence level equal and above*.
5. (Optional) Customize the quarantine and sanitize behaviors.

Enable Quarantine Password Protected Files	Moves password protected files to a designated quarantine location.  FortiNDR does not process password protected files.
Enable Quarantine Critical Risk Files	Moves detected files with critical risk to a designated quarantine location. This includes: • Fileless • Industroyer • Ransomware • Wiper • Worm

Enable Quarantine - High Risk Files	Moves detected files with high risk to a designated quarantine location. This includes: • Backdoor • Banking Trojan • Exploit • Infostealer • Proxy • PWS • Rootkit • Trojan
Enable Quarantine - Medium Risk Files	Moves detected files with medium risk to a designated quarantine location. This includes: • Clicker • DDoS • Downloader • Dropper • Phishing • Redirector • Virus
Enable Quarantine - Low Risk Files	Moves detected files with low risk to a designated quarantine location. This includes: • Application • CoinMiner • Generic Attack • Generic Trojan • SEP • WebShell
Enable Quarantine of Others	Moves other unprocessed files to a designated quarantine location. File types that falls under this category includes: • Files with unsupported file type • Files with Over size Limit • Empty/Irregular files
Enable Copying or Moving clean files to sanitized location	Moves or copies clean files to a location specified in the *Network Share Quarantine* profile. See, Network Share Quarantine on page 36. The *Moving* operation is only allowed for the quarantine location when *Keep Original File at Source Location* disabled. The *Copying* operation is only allowed for the quarantine location when *Keep Original File at Source Location* enabled. For information about combing Network Share and Quarantine profiles, see *Network Share Quarantine on page 36 > Combining network share and quarantine profiles*.

Create a copy of clean files for every scheduled scan at the sanitized location	When enabled, FortiNDR will create a new folder <*Network Share Profile Name*>_<*Scan Task ID*> in the sanitized location for each scheduled scan. When disabled, FortiNDR will overwrite the sanitized location with the clean files from the latest scan. Enabling this option will increase the size of the Network Share location.
Create placeholder files for malicious/Suspicious/Other files at sanitized location	Adds a placeholder file in the sanitized location. The filename pattern of the placeholder file will be <*filename*>.<*severity*>.*txt*. This helps maintain the file structure of the original network in the share folder.
Enable Force Rescan	When enabled, FortiNDR will not use cache detection even if the files are previously scanned.

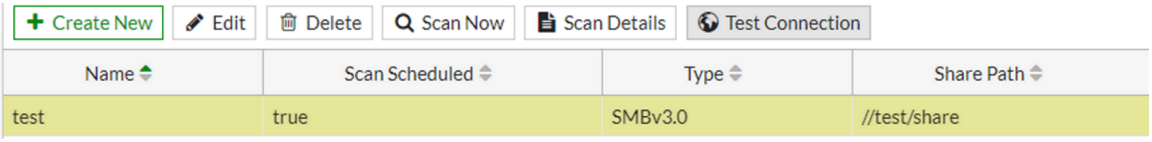


6. Click *OK*.

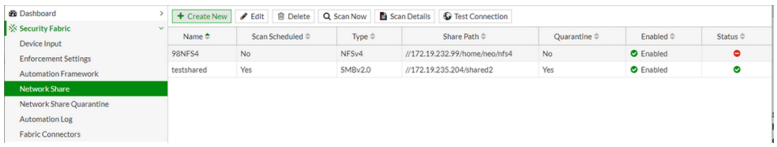
Testing connectivity

To validate the Network Share configuration:

1. Go to *Security Fabric* > *Network Share* and select a profile.
2. In the toolbar, click *Test Connection* to validate the Network Share configuration.



A green checkmark appears in the *Status* next to a valid connection.



Testing the connection will work when Network File Share is enabled. The test will fail if NFS is disabled.

Scanning a network location

To trigger a scan:

1. Go to *Security Fabric* > *Network Share* and select a profile.
2. In the toolbar, click *Scan Now*.

The *Scan Now* button will not create a new task when the Network Drive is:

- Currently mounting
- Scanning another task
- Disabled
- Not connected (*Status* is *Down*)

Scheduling a scan

You can schedule routine scanning for a Network Share location on an hourly, daily, or monthly basis. The minimum time interval for each scan is 15 minutes.

A new scan task will not be added if the network location has a scan task in process.

To schedule a scan:

1. Go to *Security Fabric* > *Network Share* and select a profile.
2. In the toolbar, click *Edit*. The *New Network Share* window opens.
3. Select *Enable Scheduled Scan*.
4. Configure the *Schedule Type* and the correspodning time interval.
5. Click *OK*.

Viewing scan results

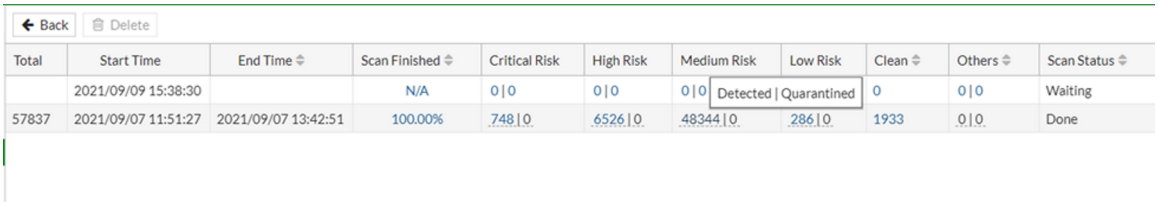
View the scan history of the Network Share directories.

To view the scan results:

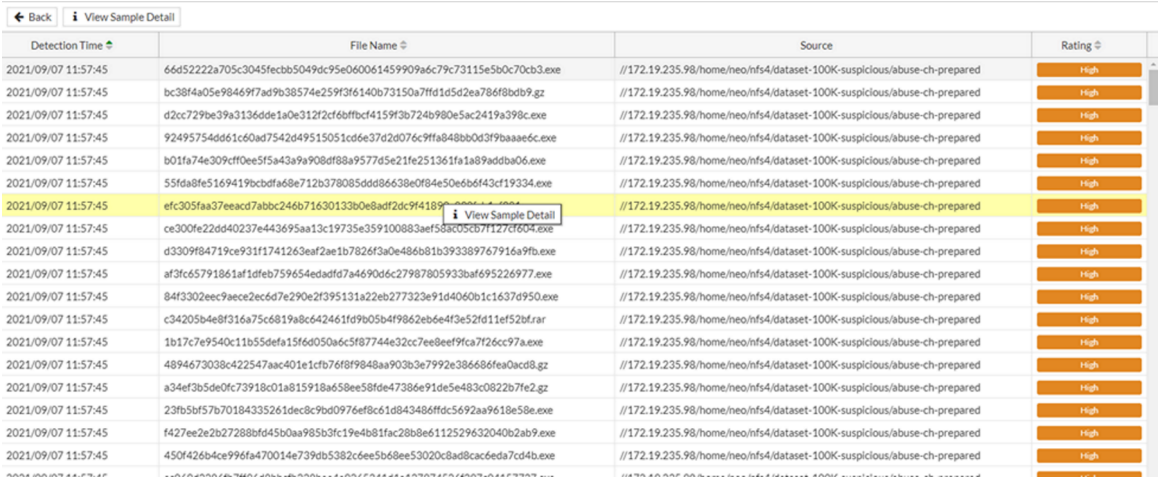
1. Go to *Security Fabric* > *Network Share* and select a profile.
2. In the toolbar, click *Scan Details*. The scan history is displayed.

   For columns with numbers:

   - The first number represents the total number of files that belong to that category.
   - The second number indicates the successful quarantine counts of that category.



3. Click the numbers to view the detection information for the samples that belong to the category.



4. Click *Back* to return to the *Network Share* pane.

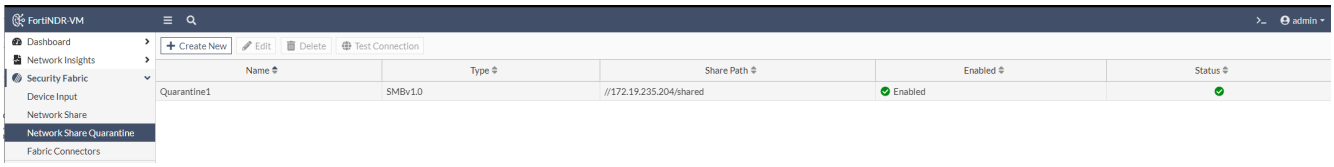
Scanning Zip files

FortiNDR can extract and process Zip files up to 10 levels. When any of the files inside the Zip file is detected, the whole zip file will be marked as malicious.

FortiNDR does not process password-protected zip files.

Network Share Quarantine

You can configure multiple quarantine profiles for different Network Share locations. Use different configurations to specify detection files with different levels to separate quarantine locations.



Quarantined files

When a file is quarantined, it creates two files in the quarantine folder:

- A copy of the original file, and
- A metadata file.

The metadata file provides information about FortiNDR's verdict of the malicious file, such as the virus name, path (URL), MD5 etc. You can refer to the meta file to understand why the file was moved or copied to the quarantine folder.

The metadata file uses the naming pattern *<Network Share File ID>.meta*. The file contains the following information:

- Network Share File ID
- Network Share ID
- Network Share Profile Name
- Scan Task ID
- File ID
- Filename
- URL
- MD5
- Detection Name

Example:

```
Network Share FileID: 351640
SID: 3 (Share ID)
JID: 44 (Job ID)
FileID: 1198941 (File ID)
```

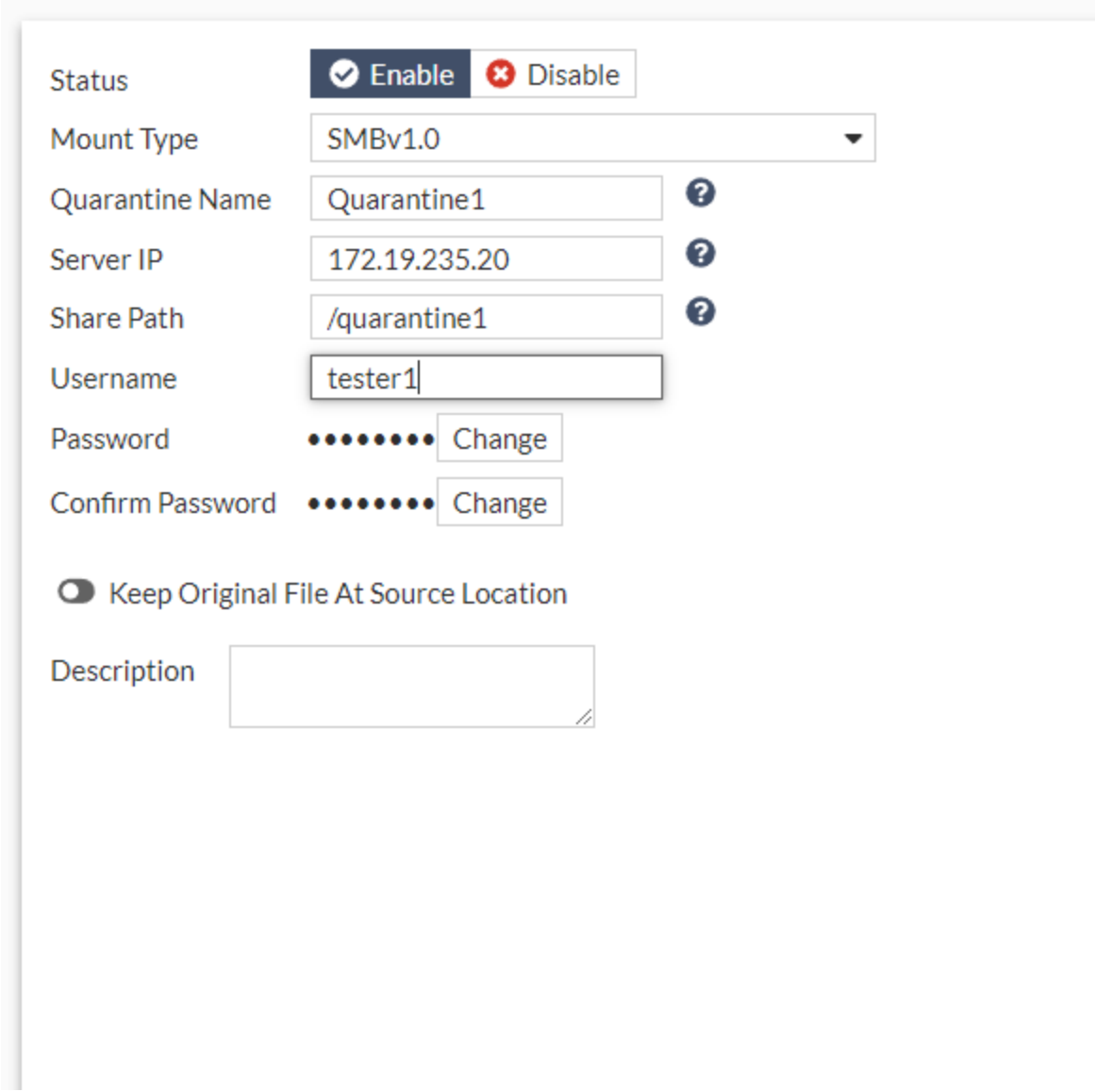
```
File Name: sample.vsc
Device: testshared
URL: //172.16.2.100/shared2/2/sample.vsc
MD5: 31e06f25de8b5623c3fdaba93ed2edde
Virus Name: W32/Wanna.A!tr.ransom
DelOriginalFile: Success
```

Creating a quarantine profile

To create a quarantine profile:

1. Go to *Security Fabric* > *Network Share Quarantine*.
2. In the toolbar, click *Create New*. The *New Quarantine Location* window opens.
3. Configure the quarantine profile mounting information.

Status	*Enable* or *Disable*.
Quarantine Name	Enter a name for the quarantine profile
Mount Type	Select a Network Share protocol from the list. The following protocols are supported: • SMBv1.0 • SMBv2.0 • SMBv2.1 • SMBv3.0 • NFSv2.0 • NFSv3.0 • NFS v4.0
Server IP	Enter the IP address for the Network Share.
Share Path	Enter the path for the Network Share.
Username	Enter the username for the Network Share.
Password	Enter the password for the Network Share and then confirm the password.



4. (Optional) Select *Keep Original File At Source Location*.

Enabling *Keep Original File At Source Location* may affect the behavior of your Network Share profile. For information, see Combining network share and quarantine profiles on page 38.

5. (Optional) In the *Description* field, enter a description of the profile.

Combining network share and quarantine profiles

The following table summarizes how enabling *Keep Original File At Source Location* affects the behavior of the quarantine and sanitize settings in a Network Share profile:

Keep Original File At Source Location	Effect	Enable Quarantine for (Critical/High/Med/Low/Password Protected/Other risk)	Effect
Enabled	Keeps the quarantine file in the source location.	*Enabled*	• Creates a copy of the quarantine file in the quarantine location and renames it *<Network Share File ID>*. • Creates a metafile with the naming pattern *<Network Share File ID>.meta* for each quarantine file.
Disabled	FortiNDR creates a placeholder file with *<Filename>.quarantined* in the original folder	*Enabled*	• Copies the quarantine file to the quarantine location and renames it *<Network Share File ID>*. • Creates a metafile with the naming pattern *<Network Share File ID>.meta* for each quarantine file. • If FortiNDR has enough permissions, it will delete the file in the source location.

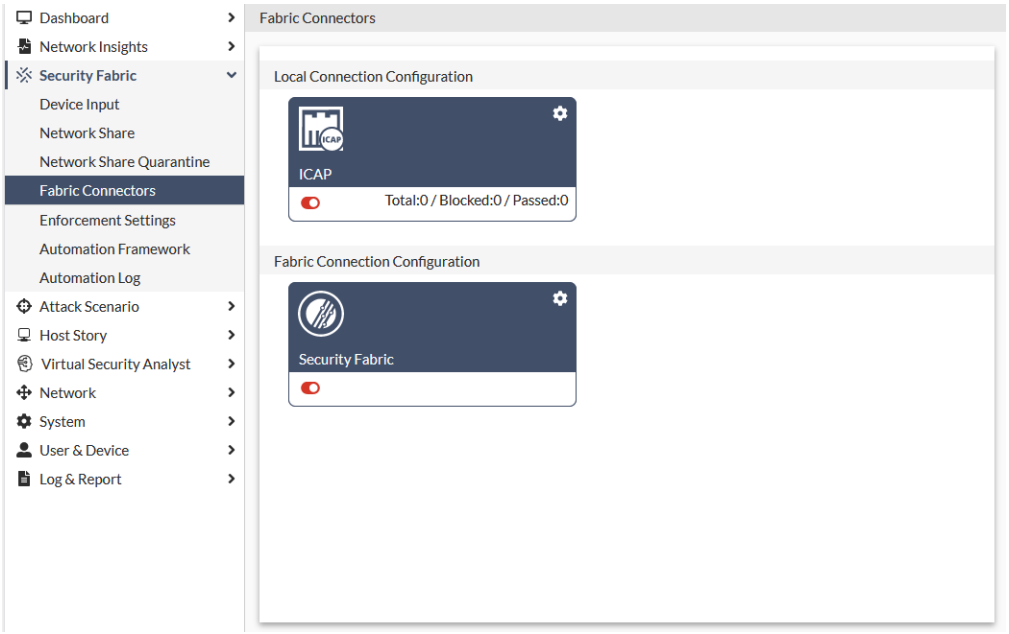
You can use the Network Share Quarantine location for both the quarantine of malicious files as well the Move/Copy of clean files. However, we recommend creating different folders for clean and malicious files.

Keep original file at source location	Move/Copy clean files to sanitized location	Effect
Enabled	*Enabled*	• Cleans files in the source location. • Copy the clean files to the Network Share Quarantine.
Enabled/*Disabled*	*Disabled*	• FortiNDR scans NFS but does not move or copy the files.
Disabled	*Enabled*	• Move the clean files to the Network Share Qaurantine. • FortiNDR attempts to delete the original files.

The *Move* operation involves copying and deleting files. FortiNDR can only delete files if it has sufficient permissions to do so.

Fabric Connectors

Fabric Connectors allow FortiNDR to connect to the Fortinet Security Fabric. ICAP allows connections to FortiGate and FortiWeb, and third-party devices such as Squid clients.



ICAP Connectors

FortiNDR can act as an ICAP server to allow ICAP clients such as FortiGate, Squid, and others to offload web traffic for scanning.

Use the ICAP connector to:

- Stop patient zero in the web browsing client.
- Stop malware coming from web browsing.
- Scan for malware in web traffic without using FortiGate AV profiles.
- Offload to FortiNDR for existing FortiSandbox customers who cannot use OFTP .

ICAP connectors are not suitable for high traffic volumes. If the sample submit rate is higher than six sumbmissions per second, we recommend using the *Inline Blocking* feature in FortiGate to do the sample submitting instead.

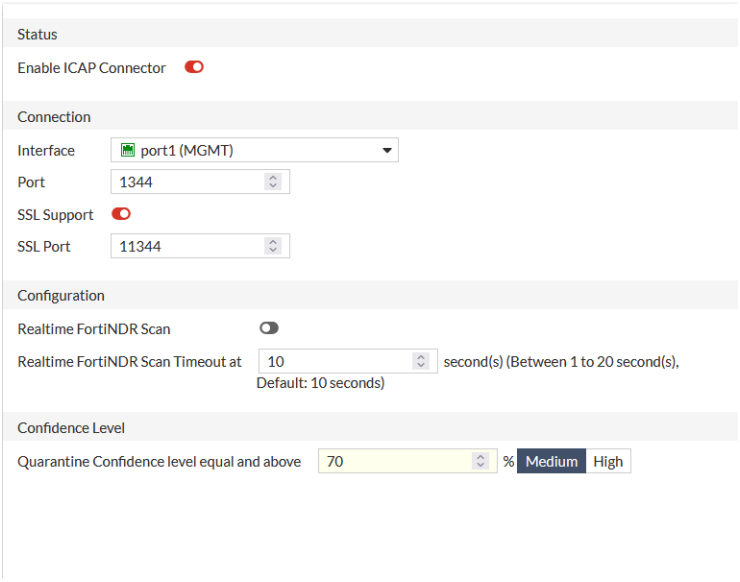
To integrate FortiNDR with FortiGate ICAP:

1. In FortiGate:
   a. Add the ICAP server.
   b. Create an ICAP profile.
   c. Add the ICAP profile to a policy.
2. In FortiNDR, configure the ICAP server.

For an example of setting up an ICAP Connector, see FortiNDR and FortiGate ICAP configuration example on page 41.

To enable ICAP in FortiNDR:

1. Go to *Security Fabric* > *Fabric Connectors* and click the *ICAP* card.
2. Click *Enable ICAP Connector*.
3. Configure the ICAP settings and click *OK*.



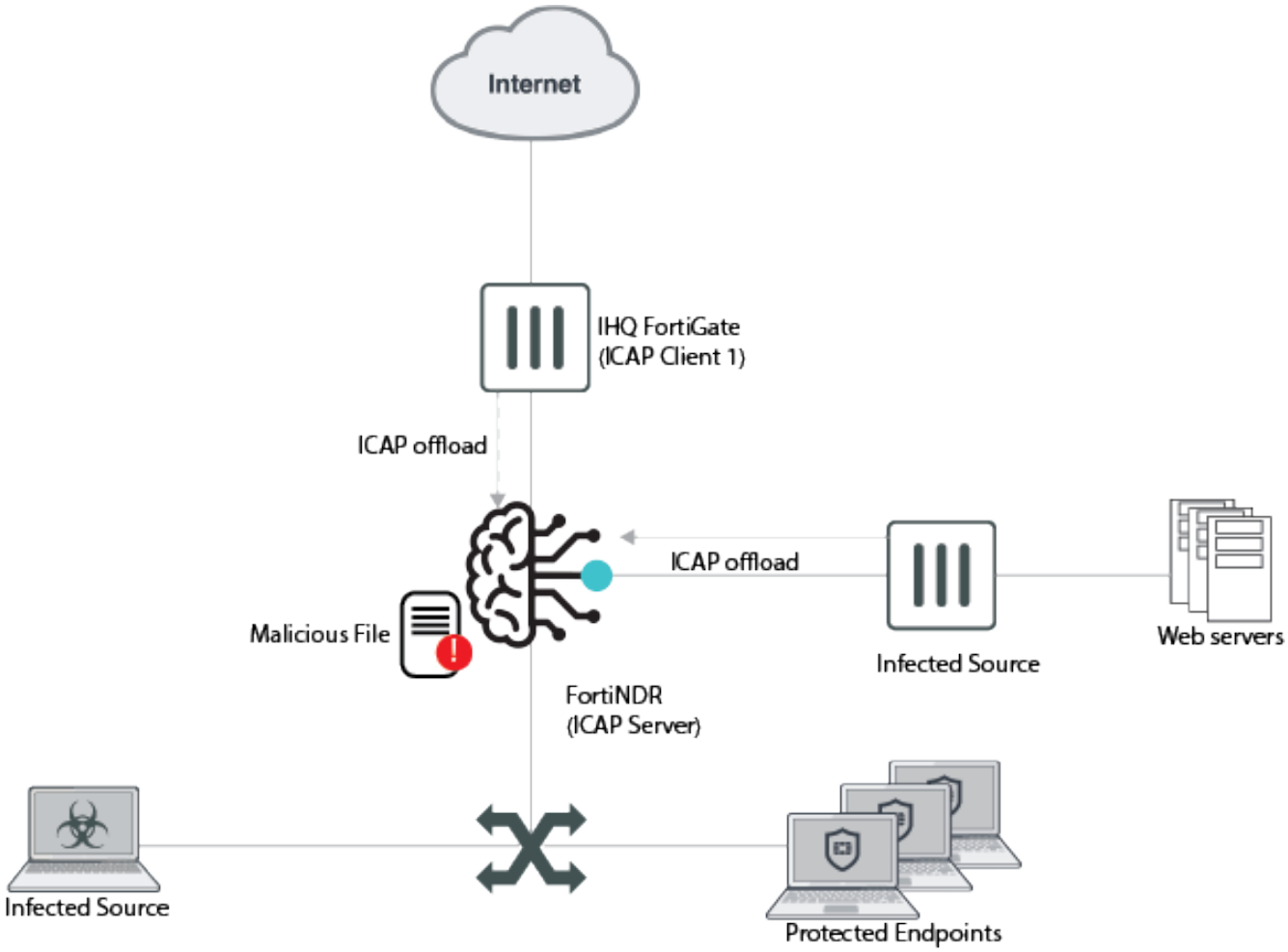
FortiNDR and FortiGate ICAP configuration example

The following is an example of setting up FortiNDR and FortiGate ICAP integration including client experience. This example requires FortiNDR(formerly FortiAI) 1.4 or higher and FortiOS 6.2 or higher.

Topology

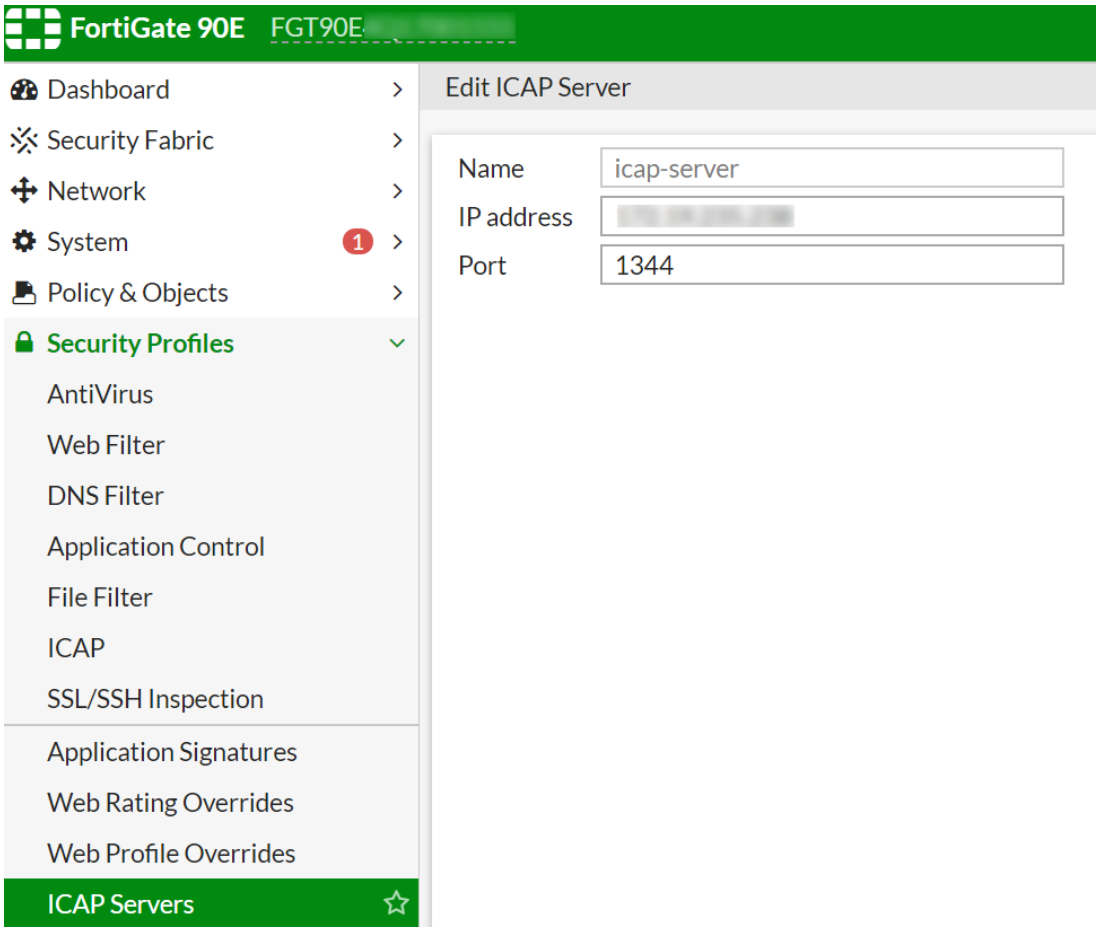
In this example, the ICAP server performs malware scanning on HTTP and HTTPS requests. If the ICAP server is unable to process a request, then the request is blocked. Streaming media is not considered by the filter so it is allowed through and is not processed.

FortiNDR and FortiGate ICAP integration works with SSL deep inspection.



To add the ICAP server to the FortiGate in the GUI:

1. Go to *Security Profiles* > *ICAP Servers* and click *Create New*. If you do not see *ICAP* in the navigation menu, enable the feature with the GUI. See Feature visibility.

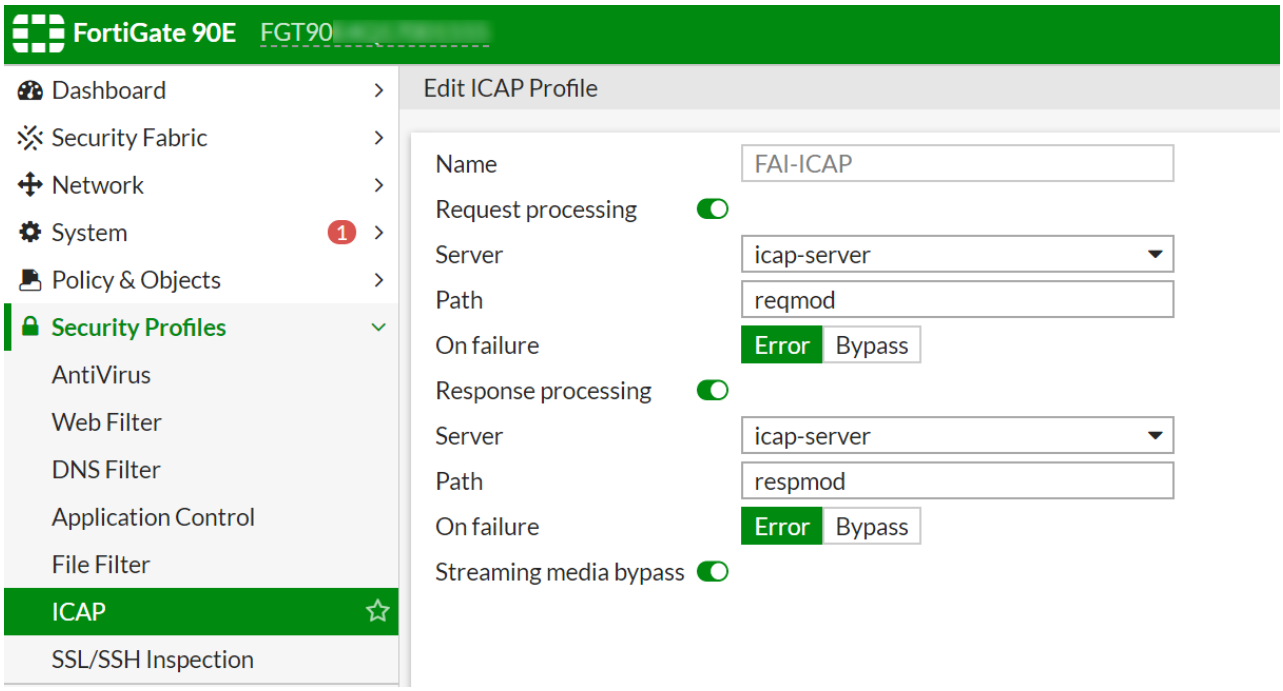


2. For *Name*, enter a name for the ICAP server, such as *icap-server*.
3. Enter the *IP address* of the ICAP server.
4. If required, enter a new *Port* number. The default is 1344.
5. Click *OK*.

The default maximum number of concurrent connections to ICAP server is 512 connections. You can change this default using the CLI.

To create an ICAP profile in the FortiGate GUI:

1. Go to *Security Profiles* > *ICAP* and click *Create New*.



2. For *Name*, enter a name for the ICAP profile, such as *FAI-ICAP*.
3. Enable *Request processing* and set the following.

Server	Select the ICAP server. In this example, select *icap-server*.
Path	Enter the path to the processing component on the server. For FortiNDR, enter *reqmod*.
On failure	Select *Error* to block the request. If the message cannot be processed, it is blocked.

4. Enable *Response processing* and set the following.

Server	Select the ICAP server. In this example, select *icap-server*.
Path	Enter the path to the processing component on the server. For FortiNDR, enter *respmod*.
On failure	Select *Error* to block the request. If the message cannot be processed, it is blocked.

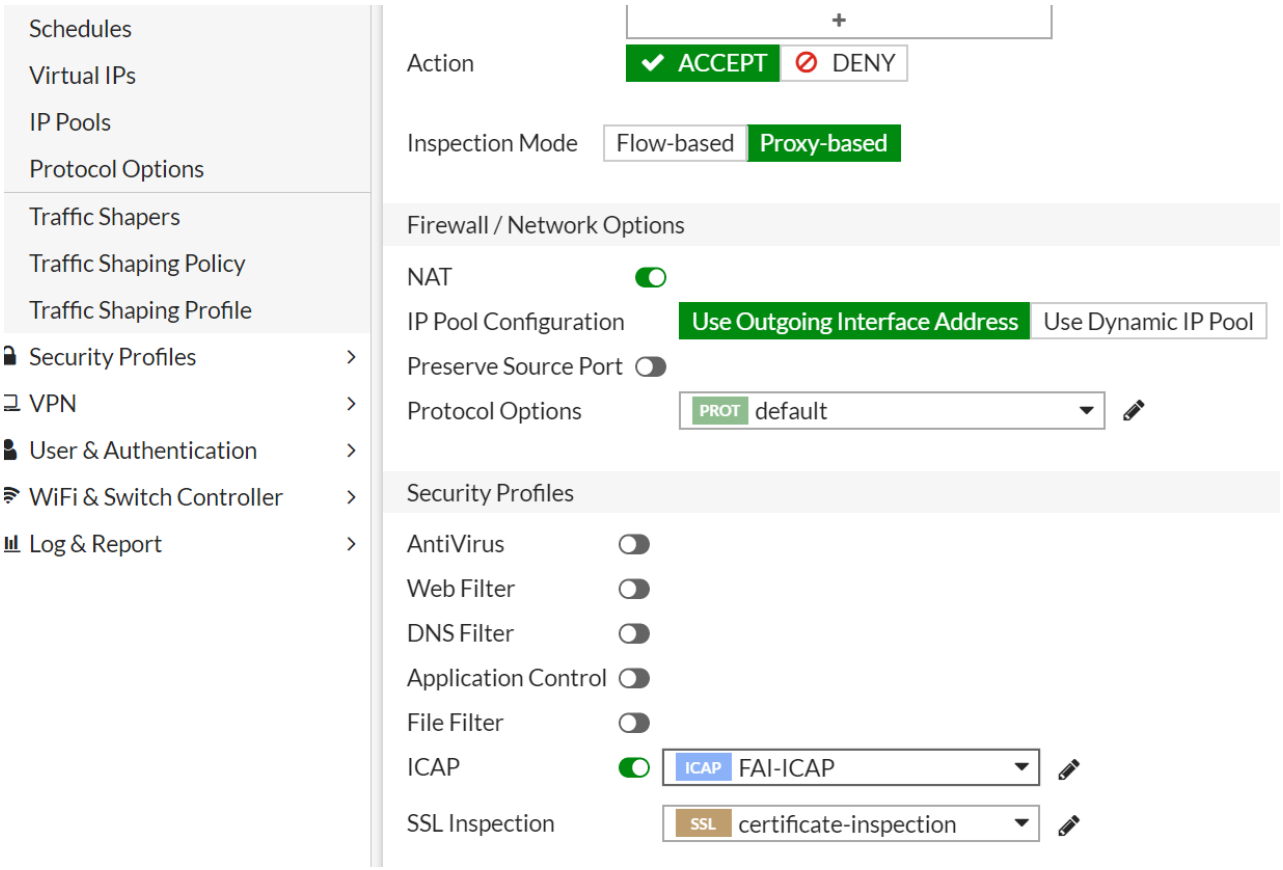
5. We recommend you enable *Streaming media bypass* to not offload streaming media to the ICAP server.

For optimal performance, disable this option only when traffic is low and all files must be inspected.

6. Click *OK*.

To add the ICAP profile to a policy in the FortiGate GUI:

1. Go to *Policy & Objects* > *FireWall Policy* and click *Create New*.



2. Configure the policy to apply to the required traffic.
3. Set *Inspection Mode* to *Proxy-based*.
4. In the *Security Profiles* section, enable *ICAP* and select the ICAP server. In this example, select *FAI-ICAP*.
5. Click *OK*.

To add the ICAP server via the CLI:

```
config icap server
    edit "icap-server"
        set ip-address 172.19.235.238
        set port 1344
        set max-connections 512
    next
end
```

To create an ICAP profile via the CLI:

```
config icap profile
    edit "FAI-ICAP"
        set request enable
        set response enable
        set streaming-content-bypass enable
        set request-server "icap-server"
        set response-server "icap-server"
        set request-failure error
        set response-failure error
        set request-path "reqmod"
        set response-path "respmod"
        set methods delete get head options post put trace other
    next
end
```

To add the ICAP profile to a policy via the CLI:

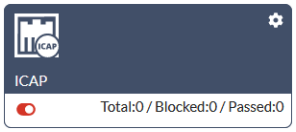
```
config firewall policy
    edit 5
        set name "fai"
        set srcintf "virtual-wan-link"
        set dstintf "virtual-wan-link"
        set srcaddr "FABRIC_DEVICE"
        set dstaddr "FABRIC_DEVICE"
        set dstaddr-negate enable
        set action accept
        set schedule "always"
        set service "ALL"
        set utm-status enable
        set inspection-mode proxy
        set ssl-ssh-profile "certificate-inspection"
        set icap-profile "FAI-ICAP"
        set logtraffic disable
        set fsso disable
        set nat enable
    next
end
```

FortiNDR ICAP configuration

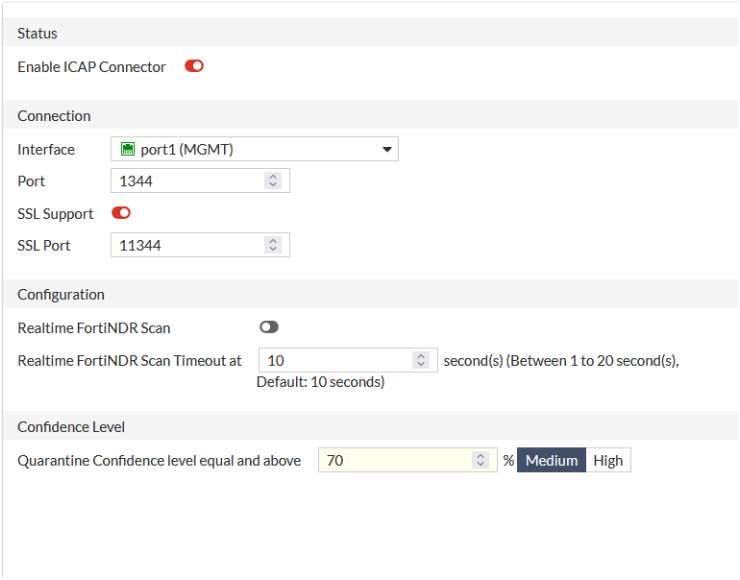
Use the GUI to configure the ICAP server. Configuration via CLI is not currently supported.

To configure the ICAP server:

1. Go to *Security Fabric* > *Fabric Connectors*.
2. In the *ICAP* connector tile, click the settings icon at the top right.



3. Turn on *Enable ICAP Connector*.



4. In the *Connection* section, configure the following.

Interface	Select the interface from the dropdown menu. Default is *port1*.
Port	Enter the port number. Default is *1344*.
SSL Support	Enable.
SSL Port	Enter the SSL Port number. Default is *11344*.

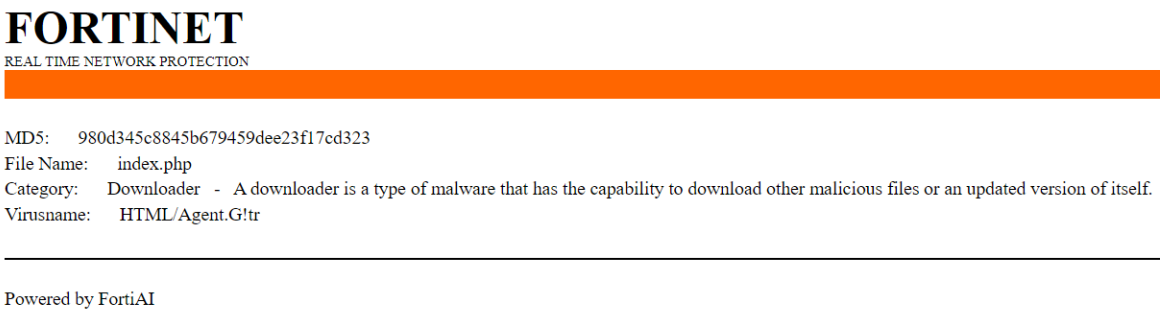
5. In the *Configuration* section, configure the following.

Realtime FAI Scan	Enable. This setting allows FortiNDR to complete new file scanning and obtain the verdict result before sending back the ICAP response.
Realtime FAI Scan Timeout	Enter the value for the ICAP server to wait for the verdict result. Default is 30 seconds.

6. In the *Confidence Level* section, select or enter the *Quarantine Confidence level*. Default is 80%.
Files verdict results with confidence level equal to or higher than this setting are treated as bad and block code is returned.
7. Click *OK*.

Client experience

On client PCs' web traffic, if the FortiNDR ICAP server returns a malicious verdict, the client PC gets a message in its browser. See the following example.



Security Fabric Connector

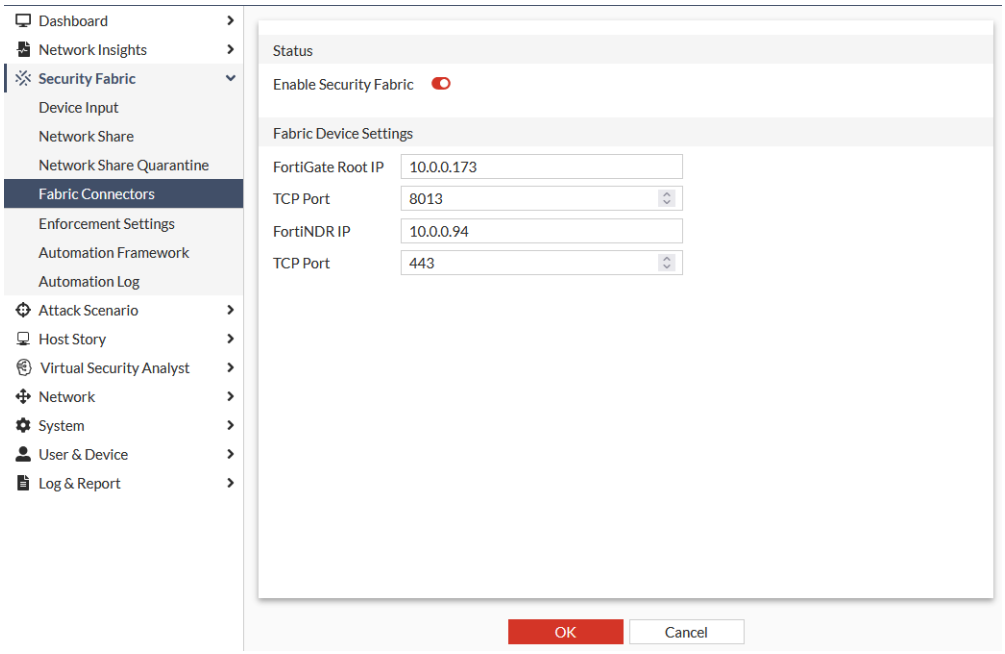
FortiNDR (formerly FortiAI) 1.5.0 and FortiOS 7.0.0, FortiNDR can join FortiGate Security Fabric. After connecting to the Security Fabric, FortiNDR can share information such as FortiNDR system information and malware types detected.

When FortiNDR has joined the FortiGate Security Fabric, FOS can see FortiNDR as a device in its physical and logical topology. FOS can add widgets such as malware distribution to identify the types of malware on the network, which is a function of the FortiNDR Virtual Security Analyst.

To configure the Security Fabric connector:

1. Go to *Security Fabric* > *Fabric Connectors* and click the *Security Fabric* card.
2. Click *Enable Security Fabric* to enable the connector.
3. Configure the connector settings and click *OK*.

   FortiNDR uses the port1 IP address as the management port. The FortiGate Security Fabric IP address uses the FortiGate root IP address. Changing default ports is not recommended.



Enforcement

Enforcement provides an extra layer of logic to deal with the detection discovered by FortiNDR and delivers follow-up actions to Security Fabric devices. FortiNDR periodically evaluates the latest batch of detection based on enforcement settings. If any detection satisfies the criteria for the next cause of action, the system then looks at which automation profile the detection falls under and performs the response action accordingly.

The system uses the webhook registered to the automation profiles or predefined APIs to carry out different enforcement strategies. FortiNDR supports the following action types:

- FortiGate Quarantine (Previously known as Ban IP action)
- FortiNAC Quarantine (FortiNAC version v9.2.0+ support)
- FortiSwitch Quarantine via FortiLink
- Generic Webhook

FortiNDR combines the information from the Automation Framework and the Enforcement Settings to generate enforcement actions.

Enforcement Settings

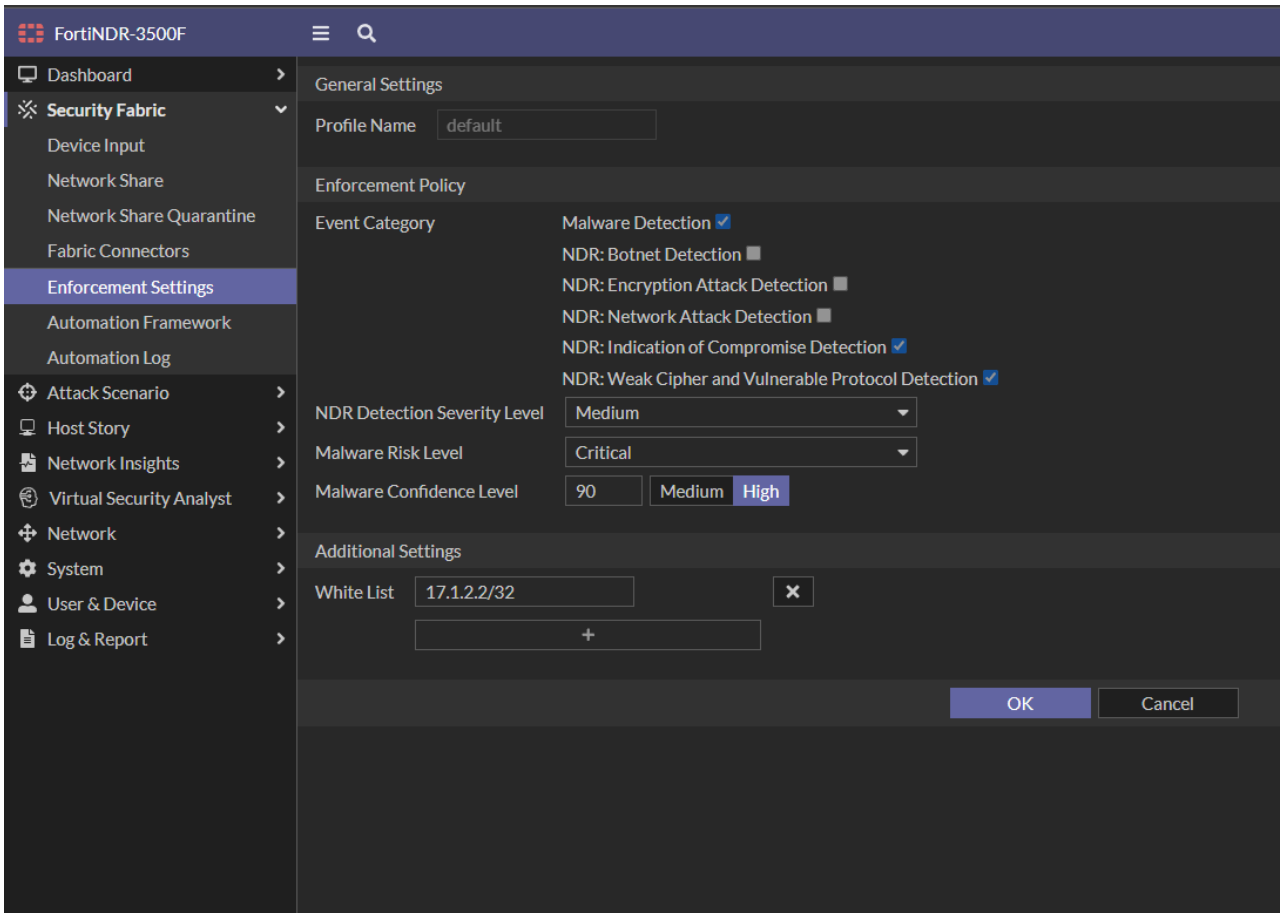
Enforcement Settings are policies for FortiNDR to filter out malicious detections and NDR anomaly detections when executing enforcement. These policies include Event Category, NDR Detection Severity Level, Malware Risk Level, Malware Confidence Level, and Allow List.

Register the automation stitches webhook you created in FortiGate so that FortiNDR can execute the enforcement. FortiNDR combines the information from the Automation Framework and the Enforcement Settings to generate enforcement actions.

To create and enforcement profile:

1. Go to *Security Fabric* > *Enforcement Settings*.
2. In the toolbar, click *Create New*. The *General Settings* page opens.
3. Configure the profile settings.

Profile Name	Enter a name for the profile.
Event Category	Select one of the following options: • *Malware Detection* • *NDR: Botnet Detection* • *NDR: Encryption Attack Detection* • *NDR: Network Attack Detection* • *NDR: Indication of Compromise Detection* • *NDR: Weak Cipher and Vulnerable Protocol Detection*
NDR Detection Severity Level	Select *Critical*, *High*, *Medium* or *Low* severity from the dropdown.
Malware Risk Level	Select *Critical*, *High*, *Medium* or *Low* severity from the dropdown.
Malware Confidence Level	Enter a numeric value for the confidence level and click either *Medium* or *High*.
White List	Enter the IP address you want to exclude as a trigger. If the source IP matches the entry, the profile will not be triggered even if the event and severity level match.



4. Click *OK*.

Creating an Enforcement Profile

Use Enforcement Profiles to triggers an NDR response based on event category and its risk level.

Response actions are based on API calls, either to Fortinet Fabric Products or third-party products. Please ensure API is enabled on the receiving side. FortiNDR supports execution and undo actions. Technically these are two different API calls, which are called to trigger an action and undo an action. For example, quarantine and release of IP.

Duplicate anomalies

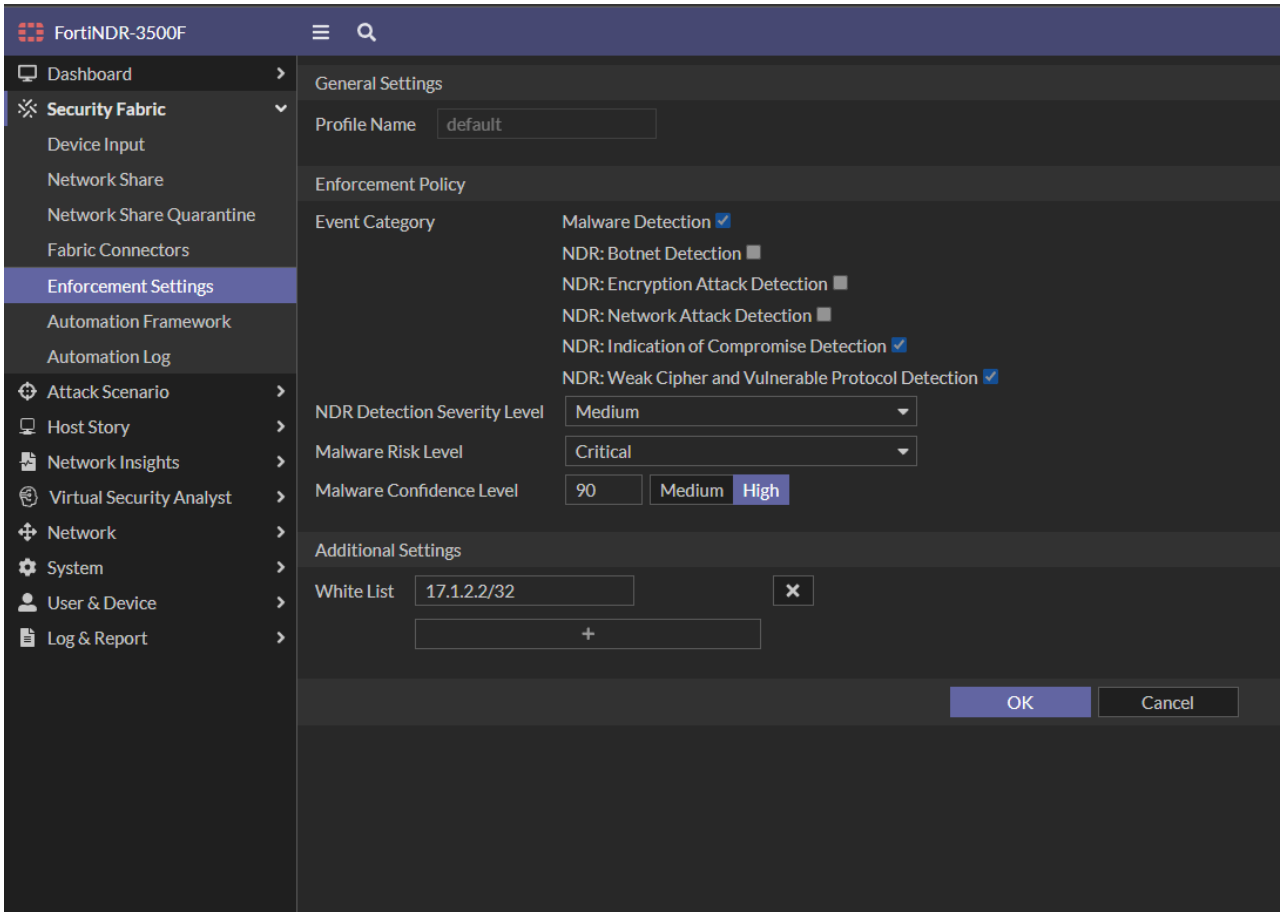
- A response is only triggered once when multiple events in NDR anomalies in the same category (e.g. IOC campaign) occurs within one minute.
- IA response is recorded as a duplicate when multiple events in NDR anomalies in the same category occur every minute after that.

To create and enforcement profile:

1. Go to *Security Fabric* > *Enforcement Settings*.
2. In the toolbar, click *Create New*. The *General Settings* page opens.

3. Configure the profile settings.

Profile Name	Enter a name for the profile.
Event Category	Select one of the following options: • *Malware Detection* • *NDR: Botnet Detection* • *NDR: Encryption Attack Detection* • *NDR: Network Attack Detection* • *NDR: Indication of Compromise Detection* • *NDR: Weak Cipher and Vulnerable Protocol Detection*
NDR Detection Severity Level	Select *Critical*, *High*, *Medium* or *Low* severity from the dropdown.
Malware Risk Level	Select *Critical*, *High*, *Medium* or *Low* severity from the dropdown.
Malware Confidence Level	Enter a numeric value for the confidence level and click either *Medium* or *High*.
White List	Enter the IP address you want to exclude as a trigger. If the source IP matches the entry, the profile will not be triggered even if the event and severity level match.

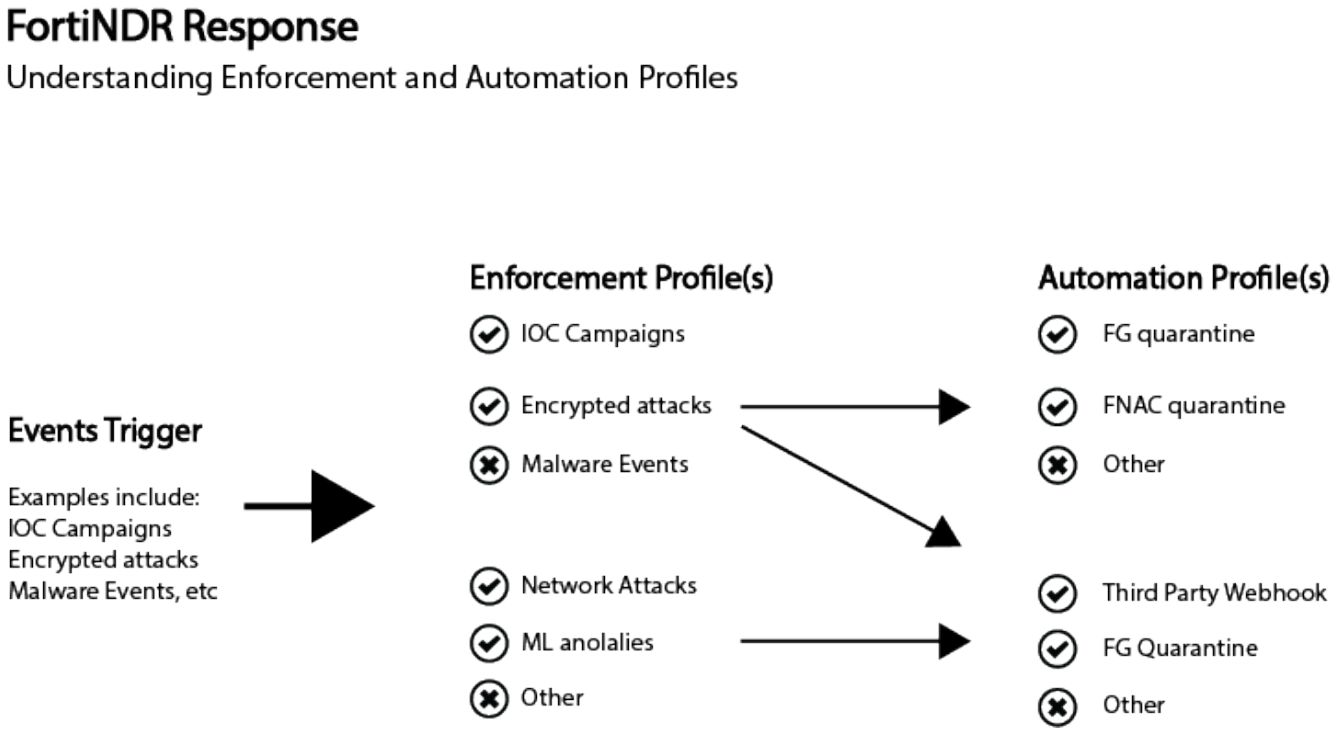


4. Click *OK*.

For NDR detection *Severity Level* and *Malware risk level*, severity is inclusive of higher severity levels. For example, if *High* is selected, the enforcement profile will match both HIGH and CRITICAL events.

Automation Framework

A single enforcement profile can be selected with different automation profiles. This provides you with more flexibility in the response action. The following diagram illustrates the relationship between Enforcement and Automation profiles.

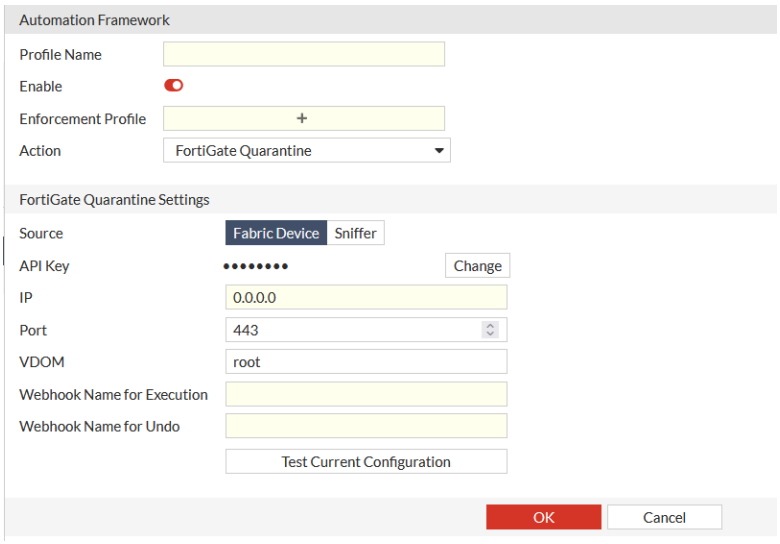


To create an automation profile:

1. Go to *Security Fabric* > *Automation Framework*.
2. In the toolbar, click *Create New*.

3. Configure the profile settings:

Profile Name	Enter a name for the profile.
Enable	Enable or disable the framework.
Enforcement Profile	Click to select and profile from the *Enforcement Settings*. See Creating an Enforcement Profile on page 51.
Action	Select one of the following actions: • *FortiGate Quarantine* • *FortiNAC Quaranitne* • *Generic Webhook*
Source	**Fabric Device**: If the source of detection came from OFTP, the enforcement is only executed to a matching automation profile with a matching IP address and VDOM.
	Sniffer: If the source of detection came from a sniffer, the enforcement is adapted by all profiles where *Trigger Source* is *Sniffer*. Since detection sourced from sniffer does not contain information about which fabric device monitors the infected IP address, it is your responsibility to specify the correct device IP address and VDOM.
API Key	Enter the device API key
IP	Enter the device IP address.
Port	Enter the device port number.
VDOM	Enter the VDOM info. Only applicable to FortiGate Quarantine and FortiSwitch Quarantine via FortiLink.
WebHook Name for Execution	Select the FortiGate webhook for execution action, such as `ip_blocker`. Only applicable to *FortiGate Quarantine* and *FortiSwitch Quarantine via FortiLink*.
WebHook Name for Undo	Select the FortiGate webhook for undo action, such as `ip_unblocker`. Only applicable to *FortiGate Quarantine* and *FortiSwitch Quarantine via FortiLink*.
Webhook Execution Settings	Enter the URL, Method, Header and HTTP body Template for Execution webhook settings. Only applicable to *Generic Webhook*.
Webhook Undo Settings	Enter the URL, Method, Header and HTTP body Template for Undo webhook settings. Only applicable to *Generic Webhook*.



4. Test the configureaiton
5. Click *OK*.

FortiGate quarantine webhook setup example

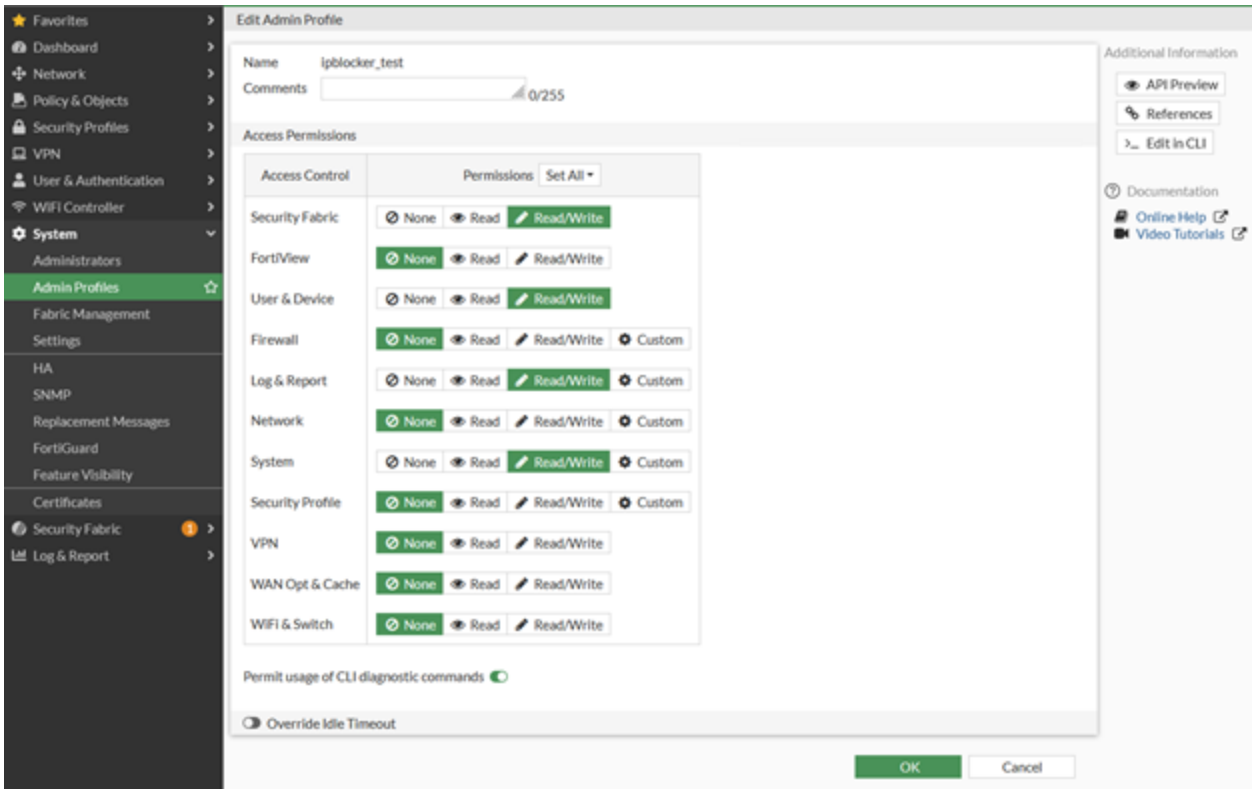
To create an automation profile for *FortiGate Quarantine* (Formerly Ban IP action) or *FortiSwitch Quarantine via FortiLink*, the incoming webhook needs to be setup on FortiGate to accept requests from FortiNDR. You can register them in *Security Fabric > Automation Framework*.

The following example shows you how to set up webhooks for FortiGate Quarantine to quarantine infected hosts through FortiGate.

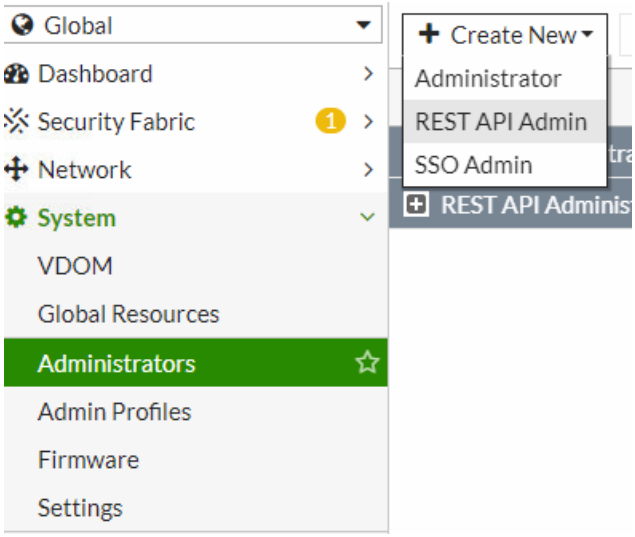
To set up a webhook for Ban IP:

1. In FortiGate, go to *System > Admin Profiles* and create a profile, for example, *ipblocker_test* and set the following *Access Permissions*.

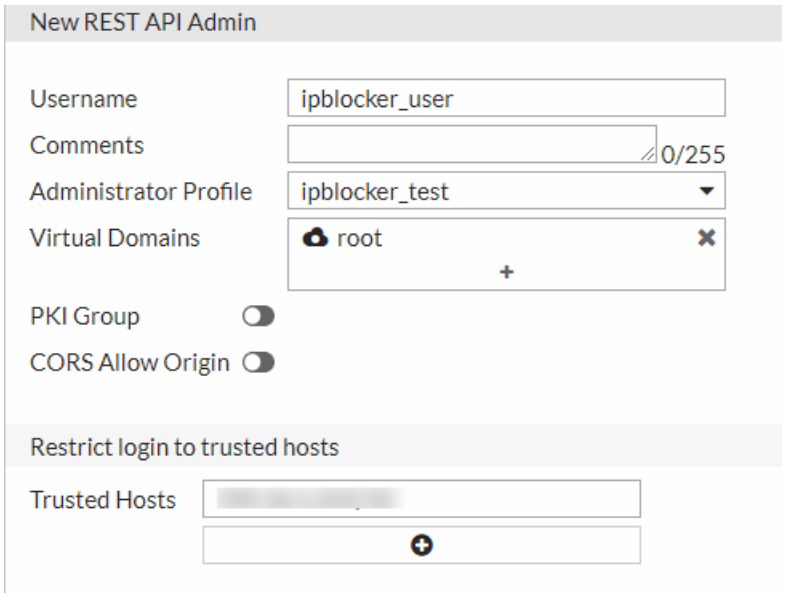
Ensure the selected Administrator profile has sufficient privileges to execute CLI scripts.



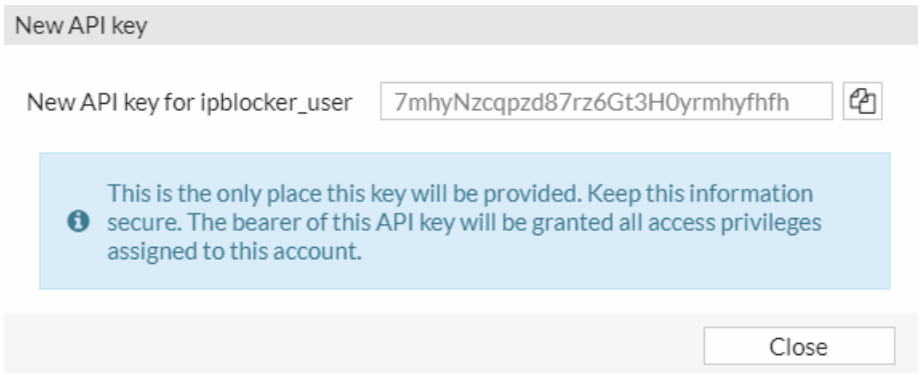
2. In FortiGate, go to *System* > *Administrators* and create a *REST API Admin* using the *ipblocker_test* admin profile.



3. Select the *Virtual Domains* to be associated with the generated API key.
   You can also restrict access to FortiNDR by setting up *Trusted Hosts* for the API profile.

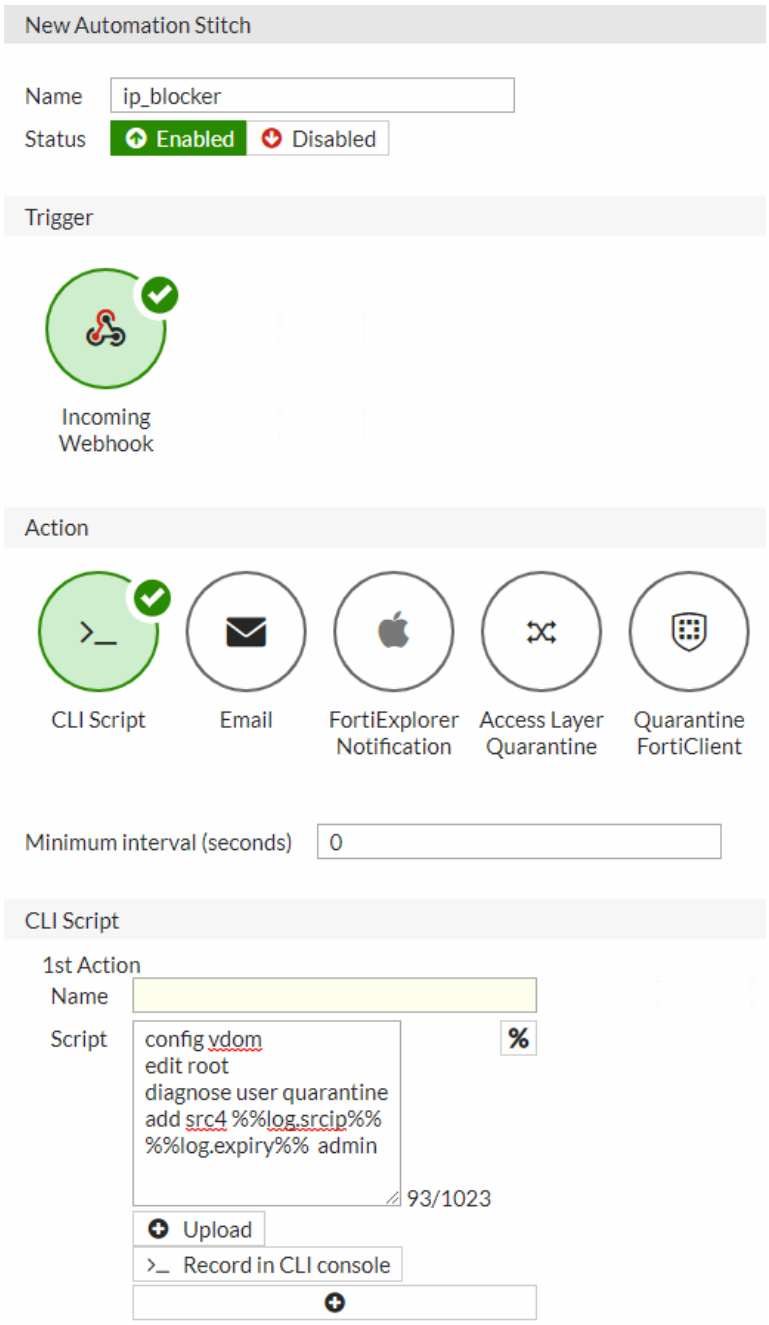


4. Save the generated *New API key* as you need that to register the automation profile in FortiNDR.



5. In FortiGate, go to *Security Fabric* > *Automation* and create an *Automation Stitch* for Ban IP actions. Select *Incoming Webhook* and enter a *Name* to be used to register the automation profile.
6. In the *New Automation StitchCLI Script* section, enter the following script. Substitute `root` with a VDOM.

```
config vdom
edit root
diagnose user quarantine add src4 %%log.srcip%% %%log.expiry%% admin
```



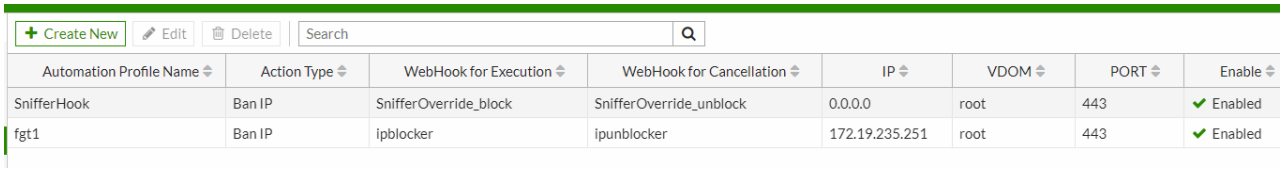
This example requires two webhooks, one that executes the Ban IP action (this *ip_blocker* example). Another webhook executes the unban IP action.

We recommend maintaining a consistent naming pattern for the Stitch and Trigger names. For example, *ip_blocker* and *ip_unblocker*.

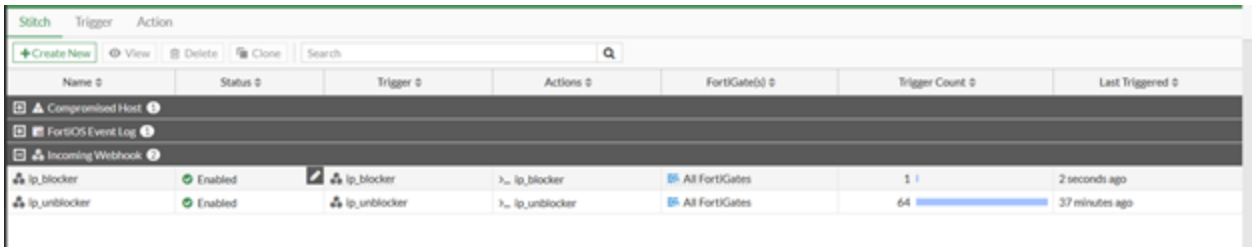
7. Repeat the above step to create a webhook to execute the unban IP action, for example, *ip_unblocker*.
   In the *New Automation StitchCLI Script* section, enter the following script for the unban IP action. Substitute `root` with a VDOM.

```
config vdom
edit root
diagnose user quarantine delete src4 %%log.srcip%%
```

FortiOS v6.4:

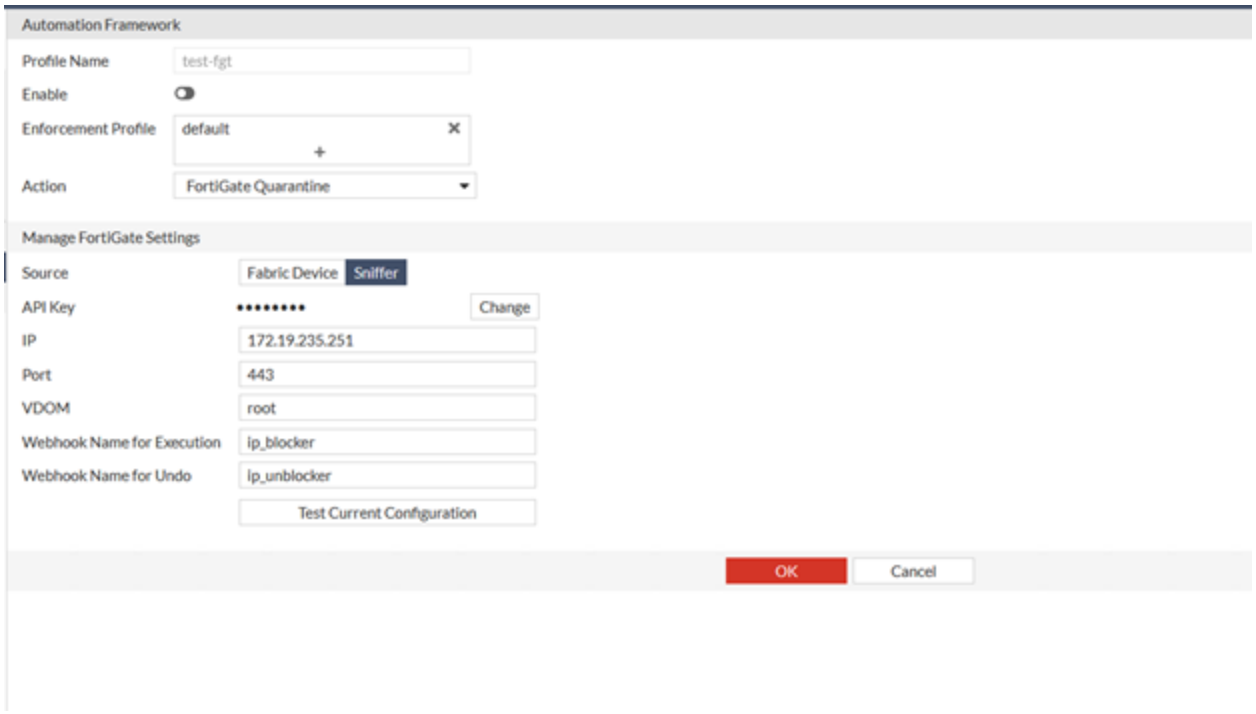


FortiOS v7.0.1



For the CLI script example, `config vdom edit root` is not needed when FortiGate disabled VDOM mode.

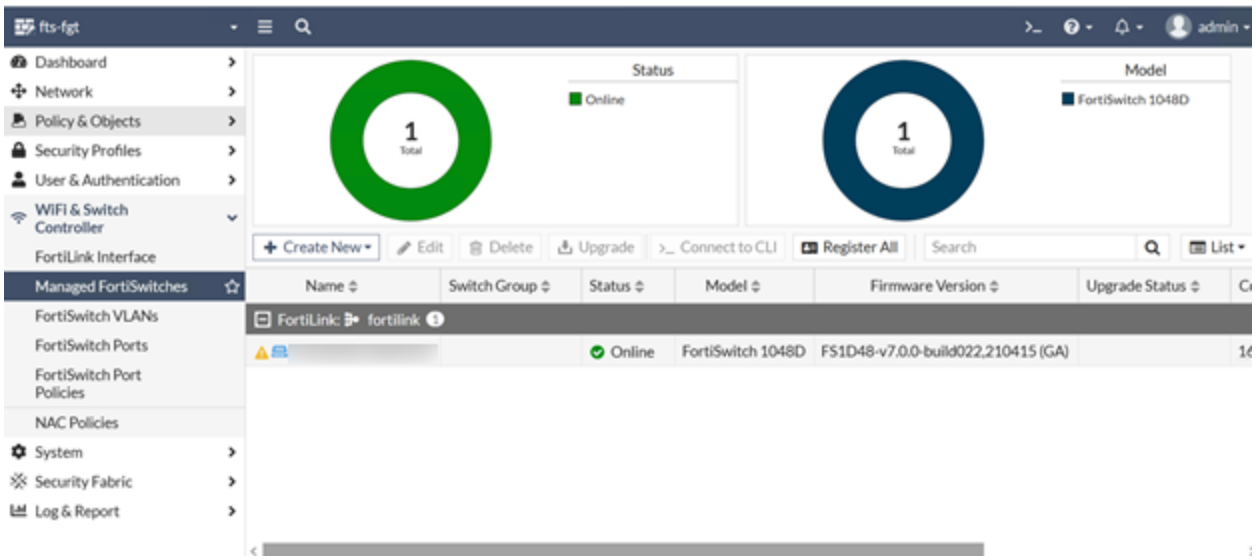
8. Register the Webhook name in the Automation Profile.



FortiSwitch quarantine setup example

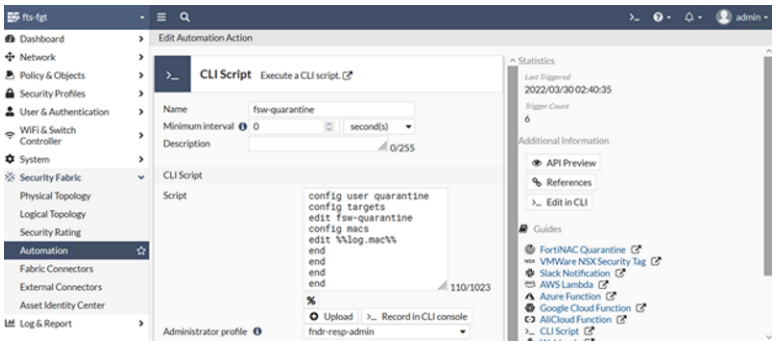
FortiNDR supports quarantining devices that are connected to a FortiSwitch which is managed by FortiGate. FortiSwitch is connected to a FortiGate and is configured in FortiLink mode. FortiNDR will utilize FortiGate's incoming webhook to provide the device's MAC address for quarantine/undo quarantine.

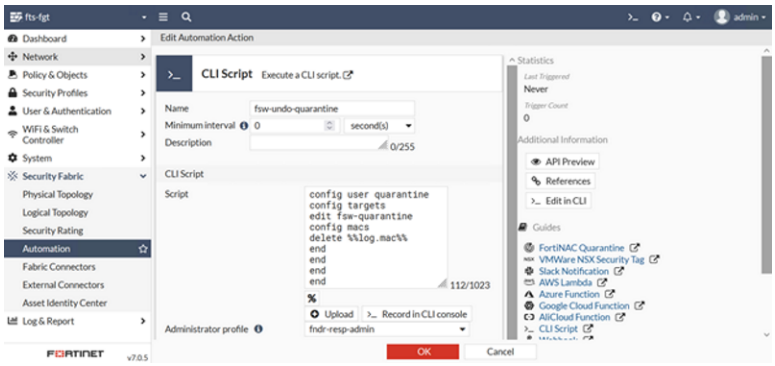
For information about configuring FortiLink, see Configuring FortiLink.



To setup FortiSwitch quarantine on FortiNDR:

1. Following the steps for creating a webhook on FortiGate in FortiGate quarantine webhook setup example on page 55. Note that the CLI script for quarantine and undo quarantine should be updated.

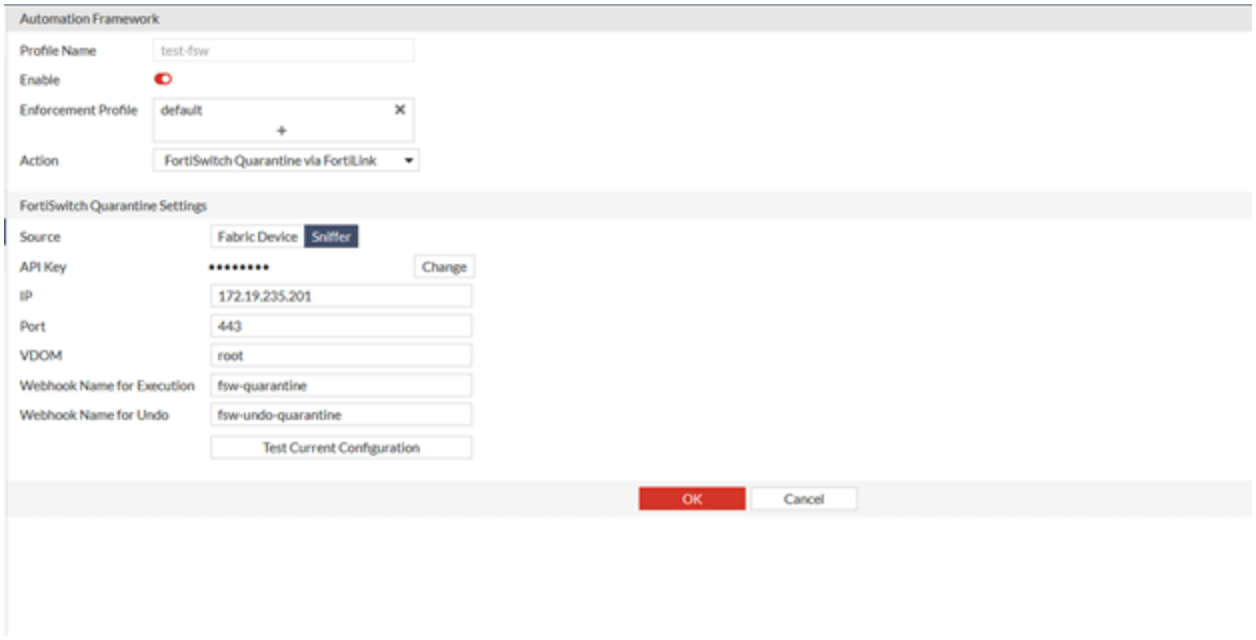




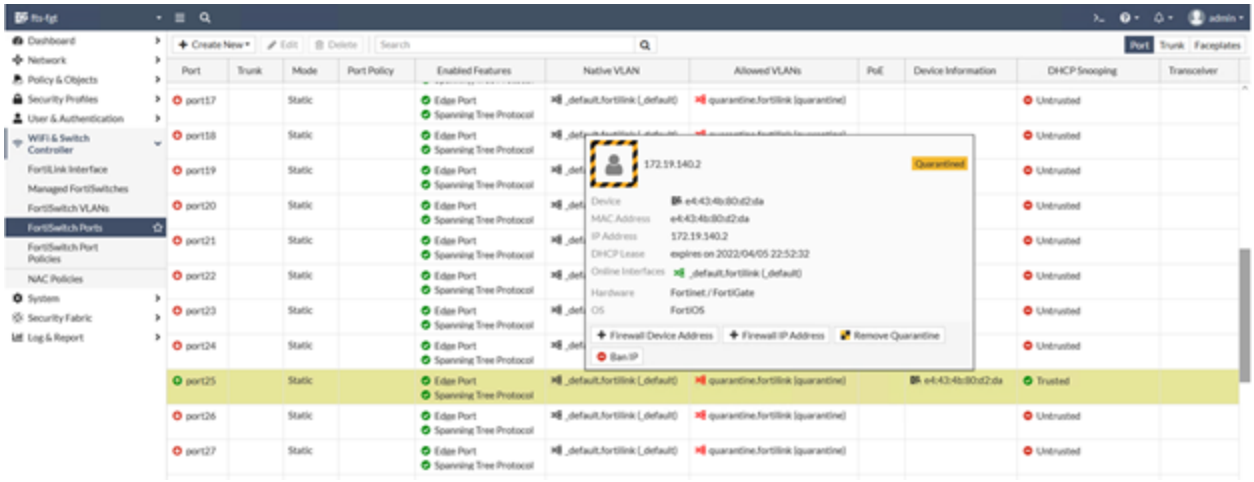
The CLI script for quarantine and undo quarantine should be updated.

2. Register webhooks on FortiNDR .

The device settings such as *IP* and *Port* are the IP and port of the managing FortiGate device.



3. Click the *Test* button to test the current configuration.



4. Click *OK*.

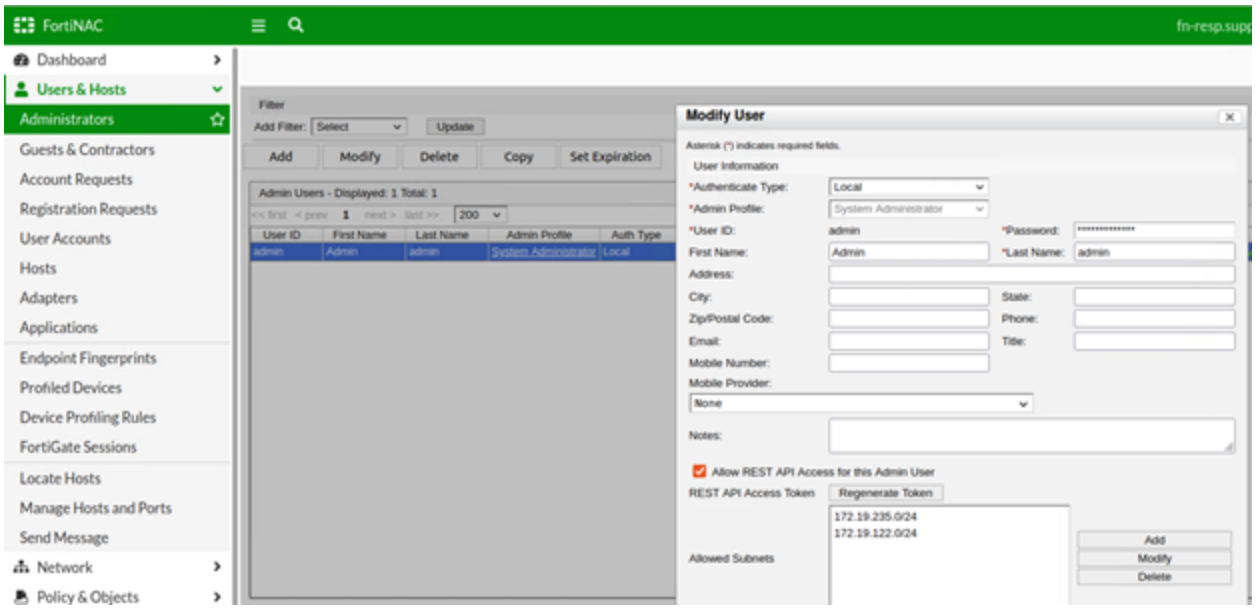
FortiNAC quarantine setup example

FortiNDR supports FortiNAC quarantine by calling FortiNAC rest API to enable and disable the Host record that matches the supplied IP address.

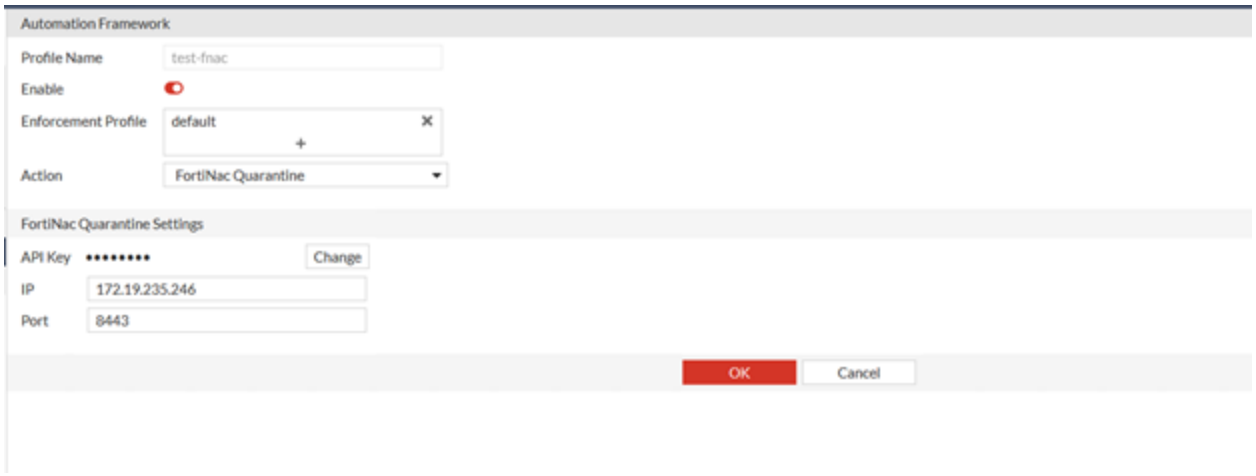
For information about configure FortiNAC, see the *FortiNAC Administration Guide* in the Document Library.

To setup FortiNAC quarantine on FortiNDR:

1. In FortiNAC:
   a. Go to *Users & Hosts* > *Administrators* > *Modify User*.
   b. Enable *REST API access to FortiNAC* and generate HTTP API access token.
   c. Click *OK*.



2. Create new automation profile with action type: *FortiNAC Quarantine*.

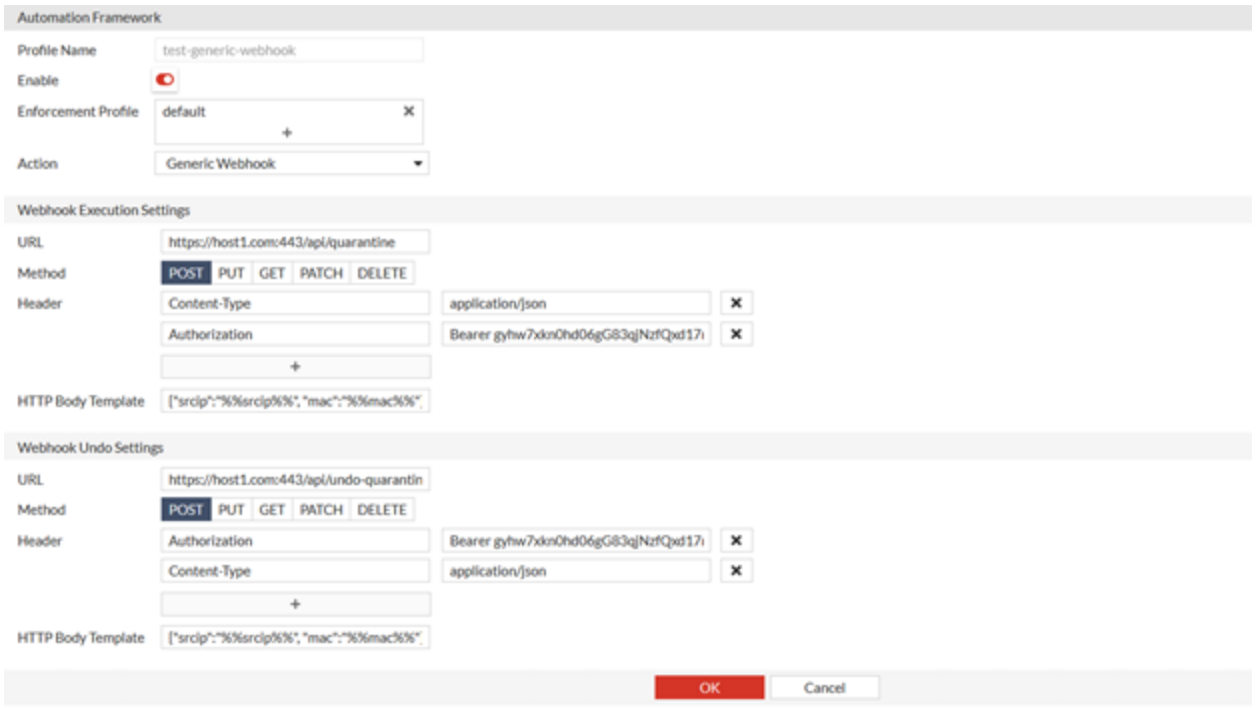


3. When response action has been triggered, the detected IP that needs to be quarantined will be sent to FortiNAC via FortiNAC's REST API call.

Generic Webhook setup example

Generic Webhook action makes HTTP requests to a specific server with custom headers, bodies, methods and URL. Please ensure API or webhook is enabled on the server side.

The HTTP body can use parameters from FortiNDR detection results. Wrapping the parameter with `%%` will replace the expression with the value for the parameter. The supported parameters are: `%%srcip%% and %%mac%%`

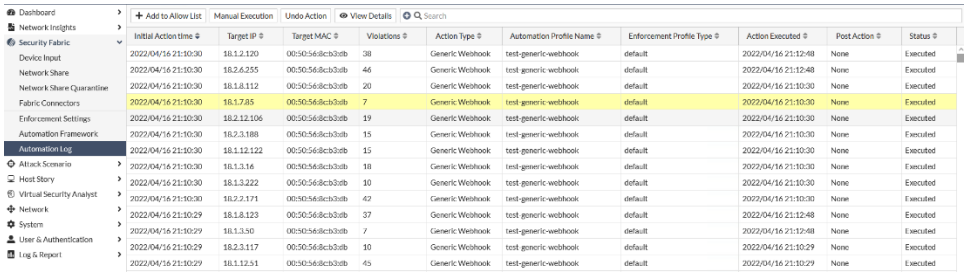


Automation log

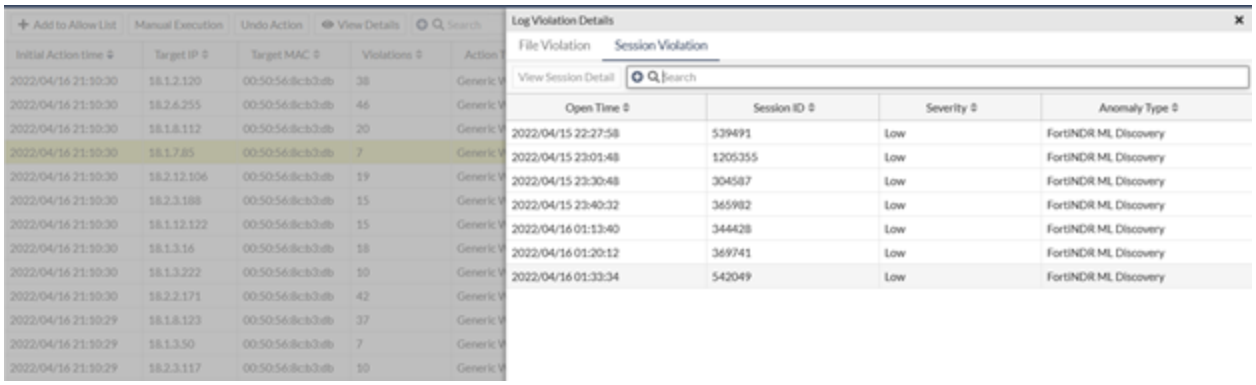
Automation Log records each enforcement action generated by FortiNDR.

The *Violations* column shows the total number of malware detections and NDR anomalies found on that target device. Double-click a log entry to see more details about the violation, such as malicious files that caused the violation. The number of violations is calculated within the digest cycle of 1 minute.

The *Enforcement Profile* column indicates which profile the enforcement settings set at the time the event is triggered.



Violation details



Automation Status and Post action

The following table is a summary of the *Status* and its relationship with *Post Action*. You can execute a post action by selecting an entry and clicking an action button above the table.

Status	Description	Possible Post Action
Active	When enforcement action fails, the system retries for five times. If the action succeeds, the *Status* changes to *Executed*. If the action fails, the *Status* changes back to *Active*.	None
Executed	Enforcement action succeeded.	Undo Action
Failed	Exceed the retry limit of five times.	Manual Execution
Duplicated	Another executed entry has been detected with same automation profile, target IP and target mac address.	None
Undo Success	Undo an enforcement action that succeeded.	None
Omitted	Action was prohibited from execution by restriction, for example, allow-listed.	Manual Execution

FortiSandbox integration (FortiSandbox 4.0.1 and higher)

The FortiSandbox deployment with an integrated FortiNDR can increase detection coverage and overall throughput. Submitted files goes through the following logic:

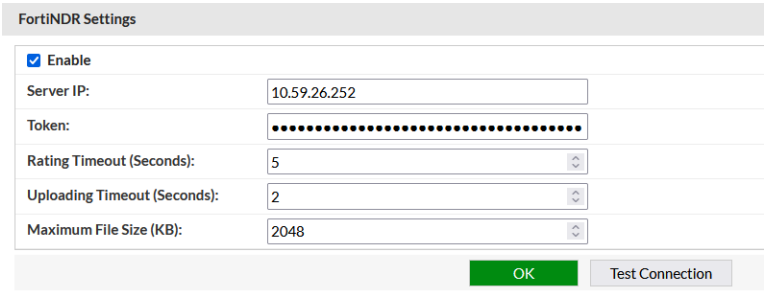
1. FortiSandbox performs its pre-filtering and Static Scan analysis. If any known malware is found, the result is returned.
2. When *FortiAI Entrust* is enabled under FortiSandbox *Scan Profile*, FortiSandbox sends the files to FortiNDR via API for FortiNDR's verdict of *malware* or *absolute clean*, and the result is returned. If a file is not *absolute clean*, then the next step is performed.
3. FortiSandbox performs its Dynamic Scan analysis to capture any IOC.

With this integration, FortiNDR reduces the load on FortiSandbox's Dynamic Scan and assists FortiSandbox with determining malware type, such as banking trojan, coinminer, and so on, based on the features observed.

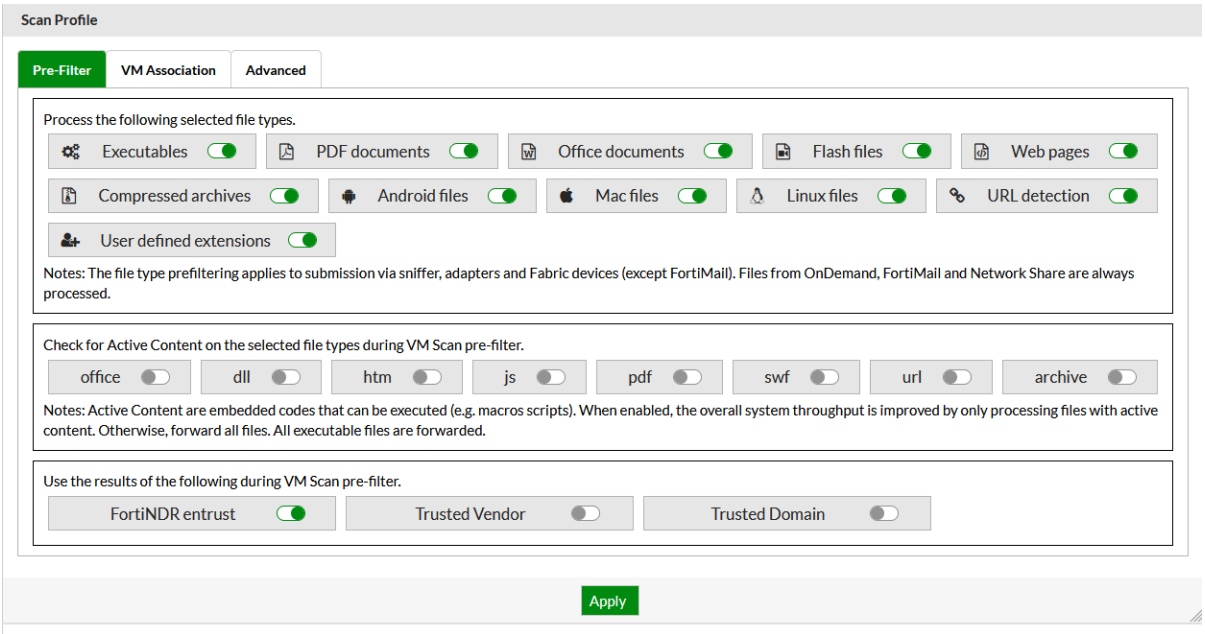
High level configuration steps are as follows:

1. Generate a FortiNDR API token associated with a user. You can use the GUI in *System* > *Administrator* or use the CLI command `execute api-key <user-name>` .
   For details, see Appendix A - API guide on page 151.
2. In FortiSandbox, configure FortiSandbox FortiAI settings using the FortiNDR IP address, token generated, and other parameters.
3. Click *Test Connection* and check that you get a message that *FortiNDR is accessible*.
4. Configure FortiSandbox scan profile to enable *FortiNDR Entrust*.
5. When file submission begins, FortiSandbox appears in FortiNDR in *Security Fabric* > *Device Input* in the *Other Devices* tab.
   You can review FortiNDR logs for submission details.

This is an example of the FortiSandbox FortiNDR setting.



This is an example of FortiSandbox Scan profile configuration with *FortiNDR Entrust*. When FortiSandbox is configured, it appears in FortiNDR under *Device Input*.



Network Insights

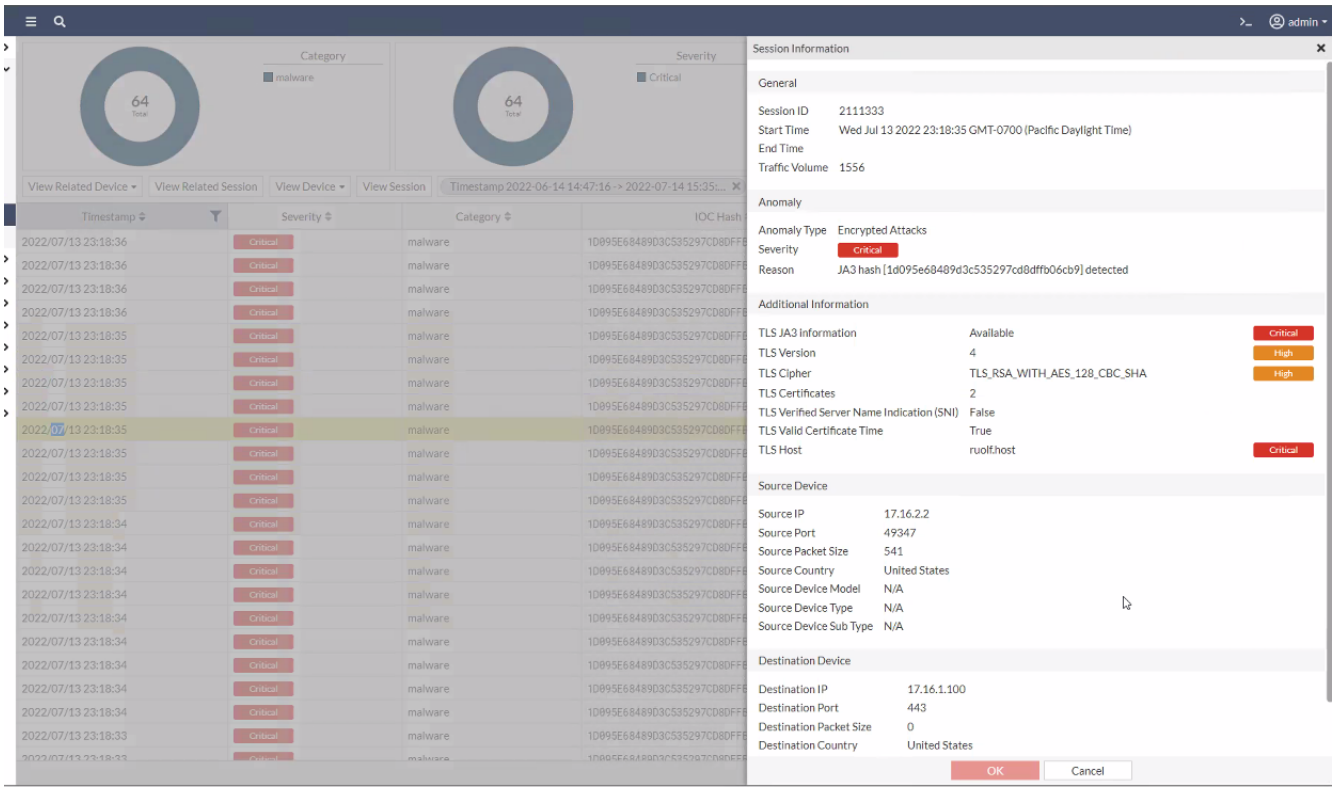
Network Insights monitors display information about NDR detections. Detections are organized by category *Botnet*, *FortiGuard IOC*, *Network Attacks*, *Weak/Vulnerable Communication*, *Encrypted Attack* and *ML Discovery*. The charts in *Network Insights* can display a maximum of 30,000 insights.

Double-click an entry in the monitor to view *Additional Information* in the *Session Information* pane. The *Additional Information* section contains useful information related to the attack. There could be multiple reasons for each session ID to be considered anomalies.

- For *Botnet* type anomalies, the *Additional Information* section shows *DNS Hostname*, *DNS OPCODE*, *DNS RETCODE*.
- For *Network Attack*, *Weak/Vulnerable Communication*, and *Encrypted Attack* types, the *Additional Information* section shows the reason why the session was flagged by Intrusion detection.

The reasons may vary depending on the severity levels. The Anomaly severity level is chosen by the highest.

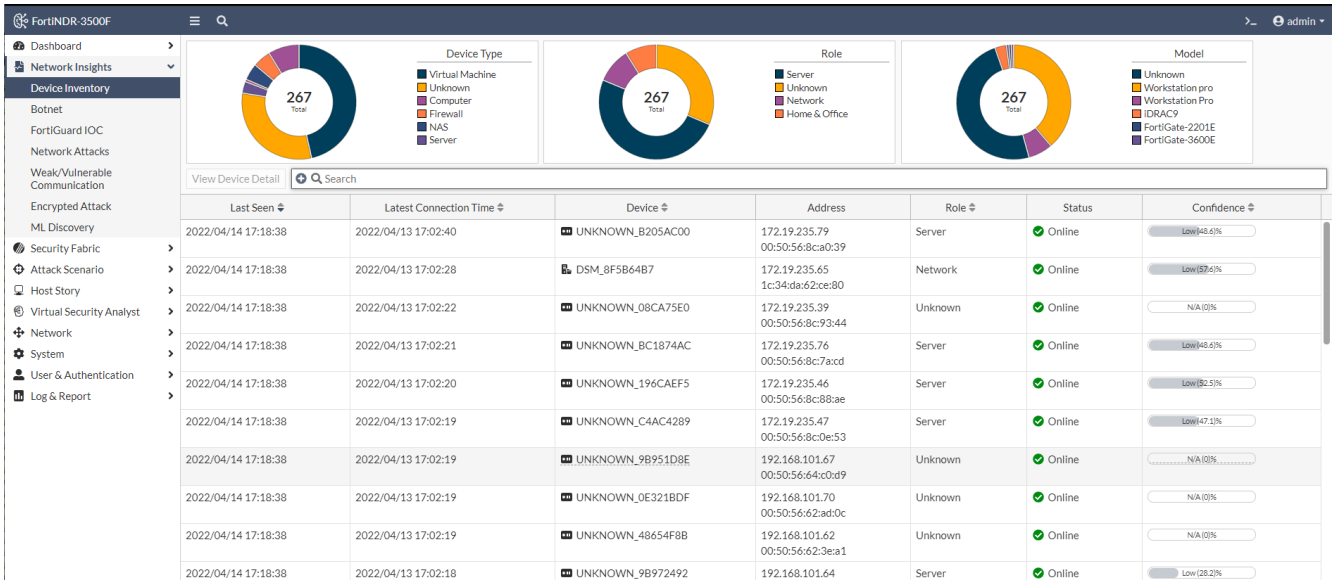
The image below shows the *Additional Information* in the *Encrypted Attack* anomaly. The reason for this anomaly is the JA3 hash. FortiNDR utilizes both JA3 client and server SSL fingerprints in detection, reducing the number of false positives.



Device Inventory

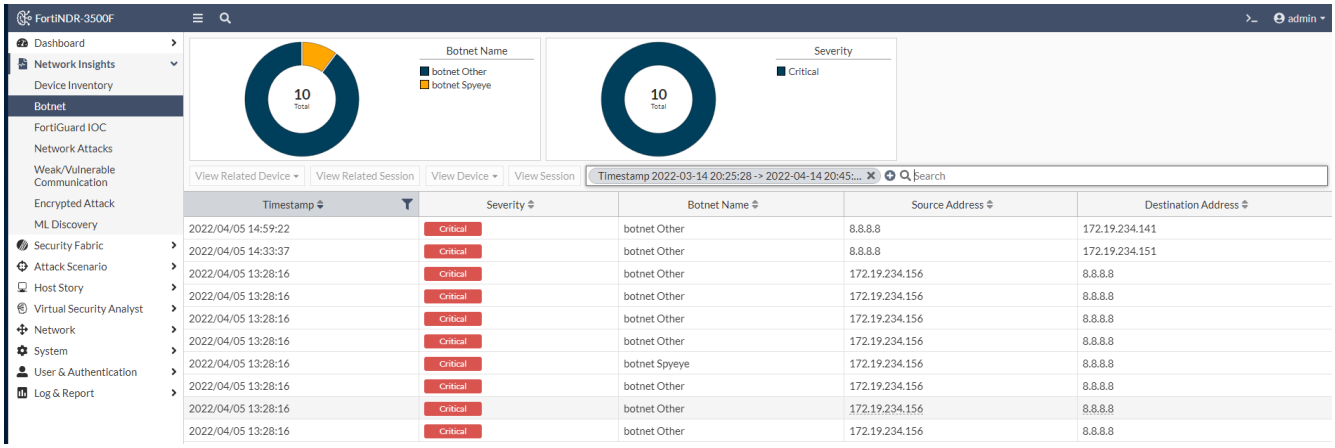
The Device Inventory page displays the discovered devices. The *Device* and *Role* columns are dependent on IOT lookup service.

The device name in the Device column is determined by *OS_hash* of the mac address *Status* (*online/offline*). If FortiNDR does not see a session from a device within 60 seconds, the status will be *offline*.



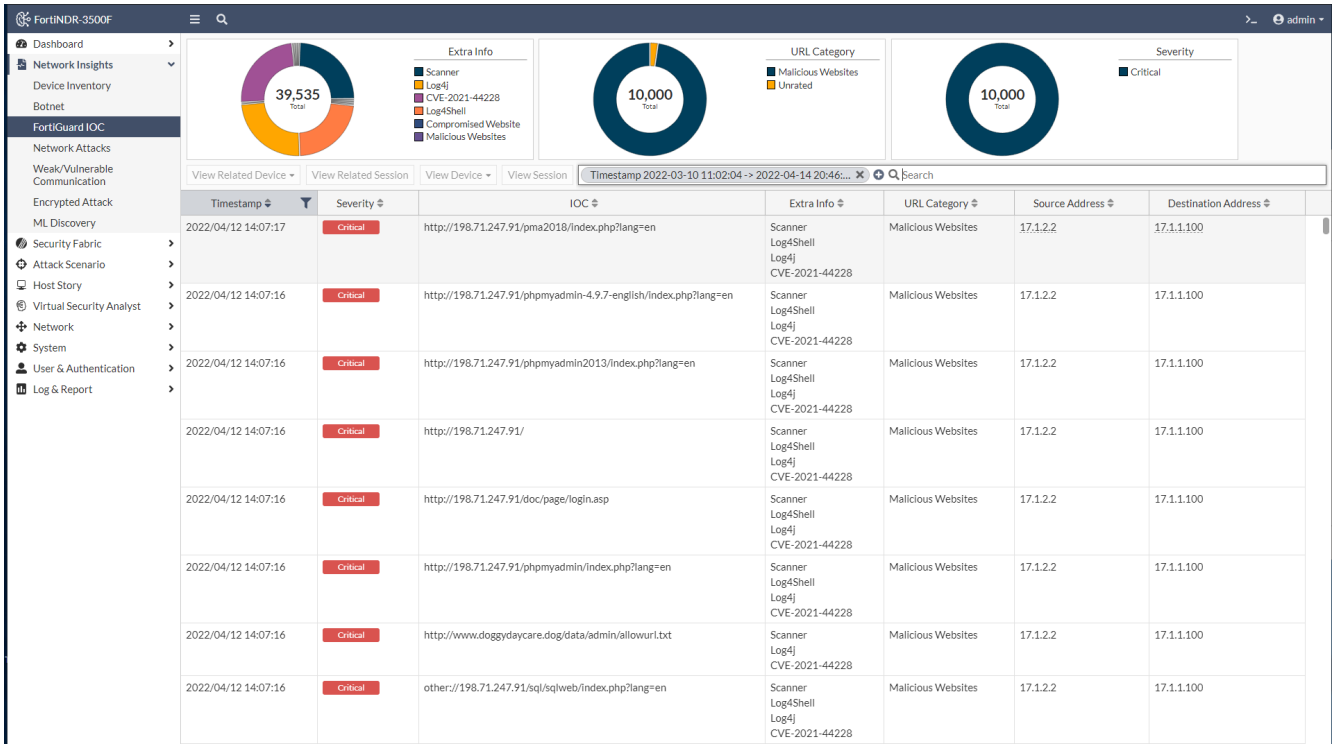
Botnet

Botnet displays the botnet traffic detections. If there is a known Botnet name, it will be displayed.



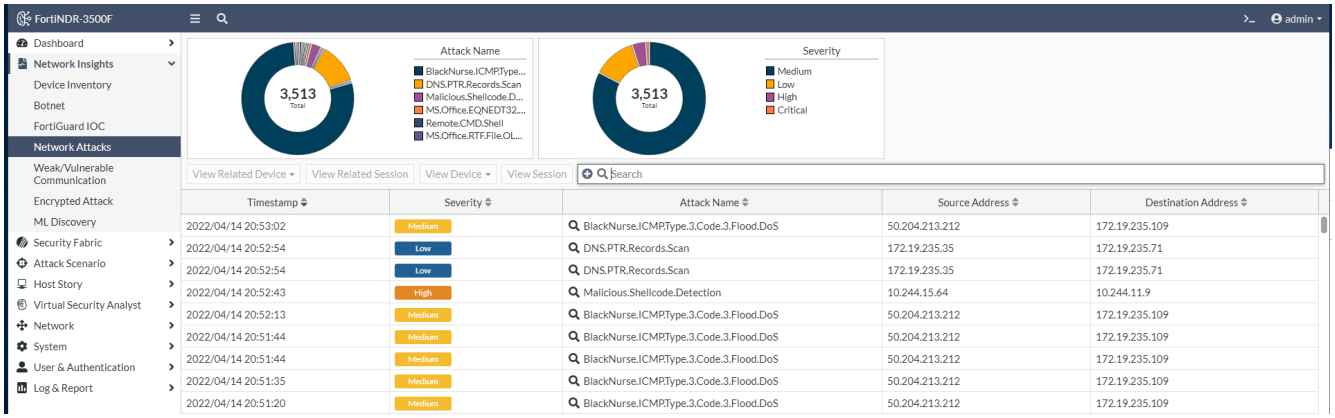
FortiGuard IOC

FortiGuard IOC detections are suspicious URLs and IPs that are flagged by FortiGuard. This anomaly discovery depends on FortiNDR look up to FortiGuard IOC service. Apart from URL category (e.g. malicious websites), you will also see in *extra info* column any campaign name involved (e.g. Solarwind, Locky Ransomware).



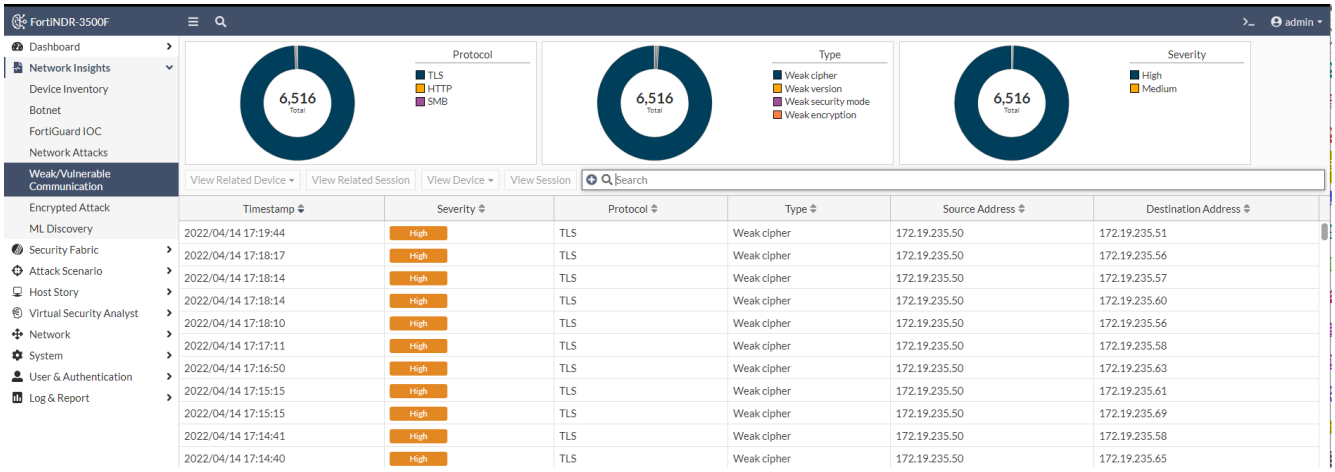
Network Attacks

Network Attacks are known attacks detected by Network Intrusion Protection Database.



Weak/Vulnerable Communication

The *Weak/Vulnerable Communication* page displays the list of weak or vulnerable communication detected on port2. For example, a weak cipher used by an older version of SSL.



Weak/Vulnerable Communication types

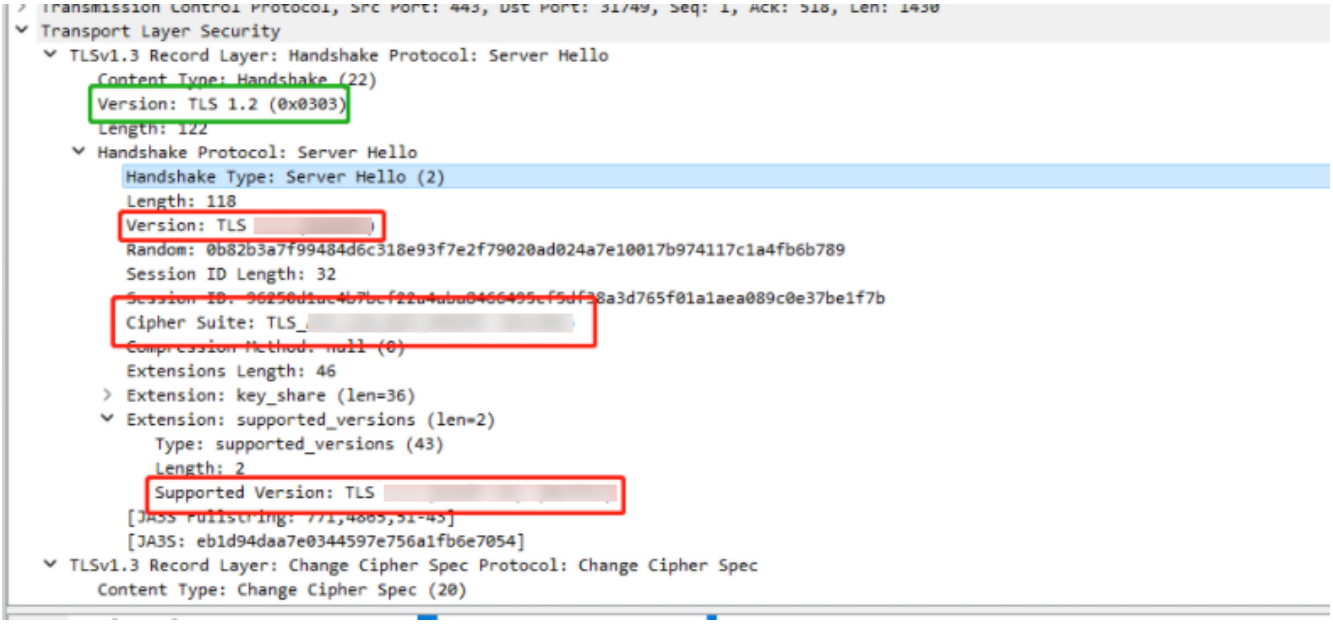
The following table provides a definition for each of the weak/vulnerable communication types:

Communication type	Description
Weak record version	Weak TLS record layer version.
Weak version	Weak TLS handshake version.
Weak support version	Weak TLS handshake extension supported version.
Weak cipher	Weak TLS handshake cipher suite.
Weak security mode	SMB protocol uses level security mode.
Weak extended security	SMB protocol uses outdated extended security negotiation option.
Weak dialect	SMB uses outdated dialect version.
Weak encryption	SMB or SSH uses risky encryption algorithm. For example, SMB protocol with encryption disabled.
Weak authentication	Email protocols are using risky authentication methods. For example, POP3 uses authentication *cram-md5*, `Postgres` uses `MD5` password as authentication type.
Weak server	HTTP or RTSP server version is outdated.
Weak method	HTTP, SIP or RTSP protocol uses weak request method. For example, HTTP protocol uses DELETE as request method.
Weak banner	Weak or outdated email server version. For example, Outdated Cyrus IMAP server

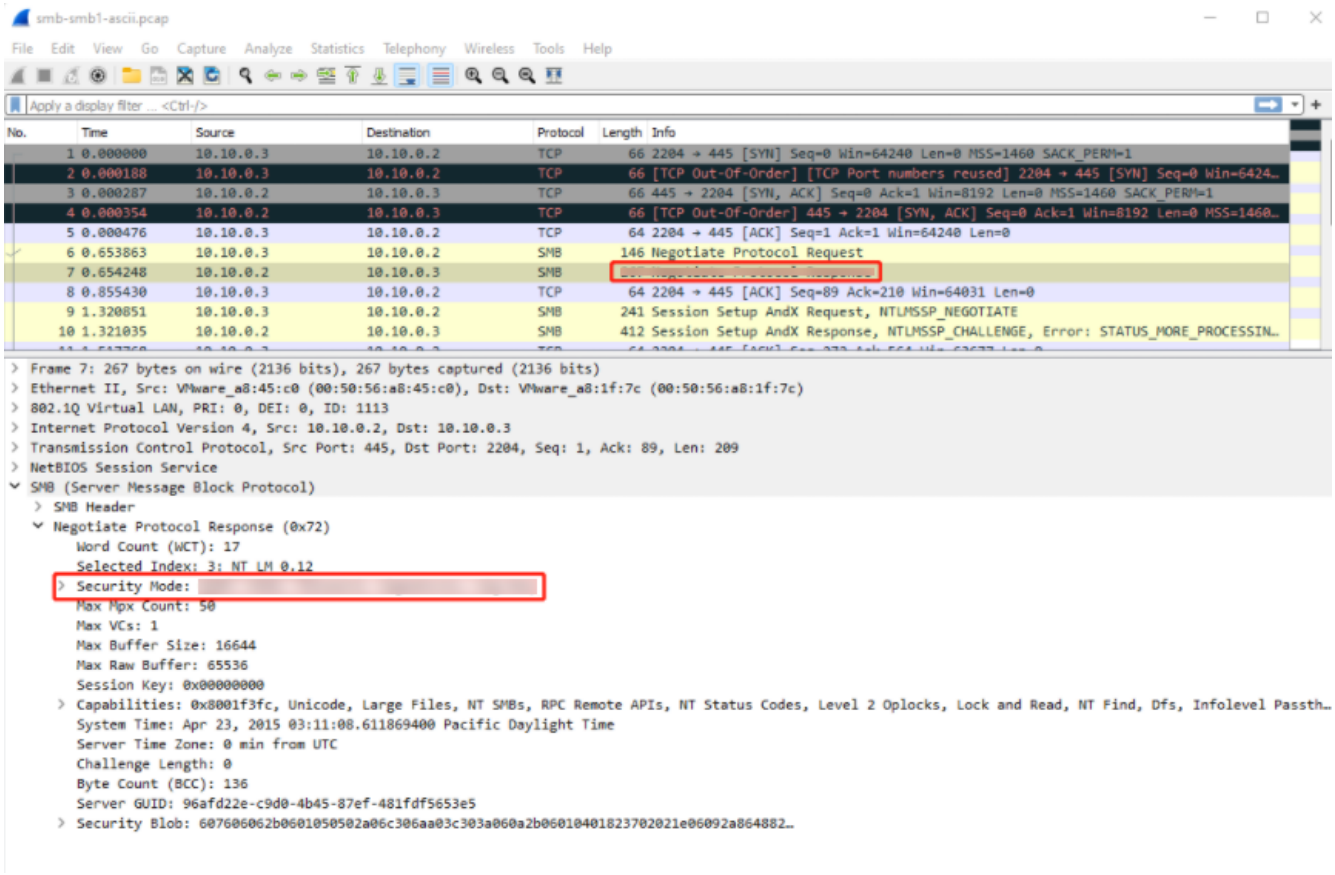
Communication type	Description
Weak encrypt algo server client	Weak encryption option is used in SSH, such as rc4, rc3, rc2.
Weak capability	IMAP or POP3 capability command uses option AUTH=PLAIN.
Weak security	SMB protocol uses low level security mode.
Weak encrypt method	RDP protocol uses low level encryption methods such as ENCRYPTION_METHOD_40BIT.
Weak encrypt level	RDP protocol uses low encryption level such as ENCRYPTION_LEVEL_NONE
Weak msg flags	SNMP protocol uses risky flags such as 0x00-02, 0x04-06 and 0x08-ff.
Weak server version	MYSQL, TDS, Posgres or SIP server version is outdated.
Weak auth algo	POP3, SMTP or IMAP authentication method option is too risky. For example, POP3 uses PLAIN authentication option.
Weak protocol version	MYSQL protocol version outdated.
Weak encrypt	TDS encryption option is disabled.
Weak fedauth	TDS protocol disables `FedAuthRequired` option.

Examples

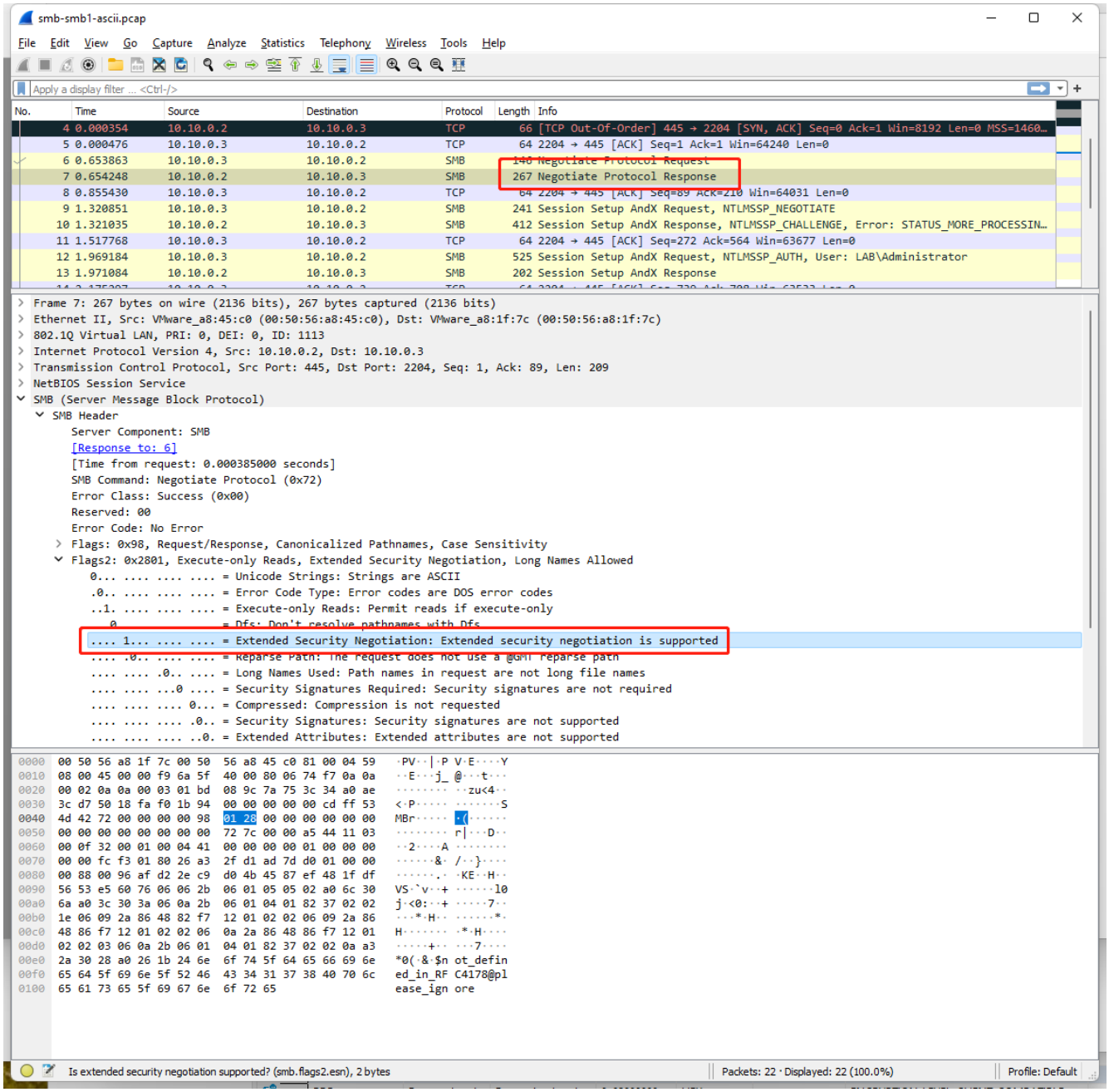
Wireshark pcap



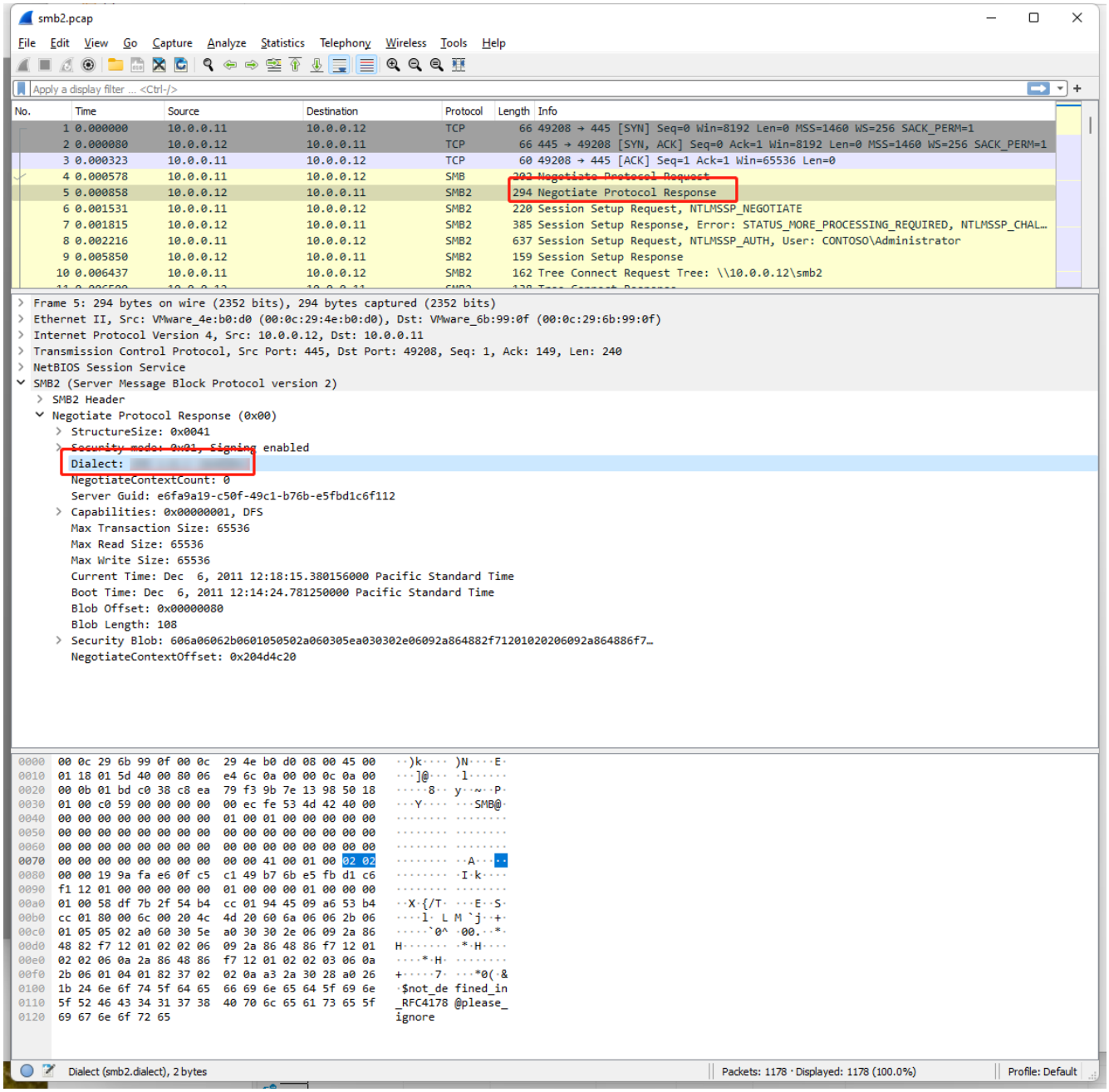
Weak security mode



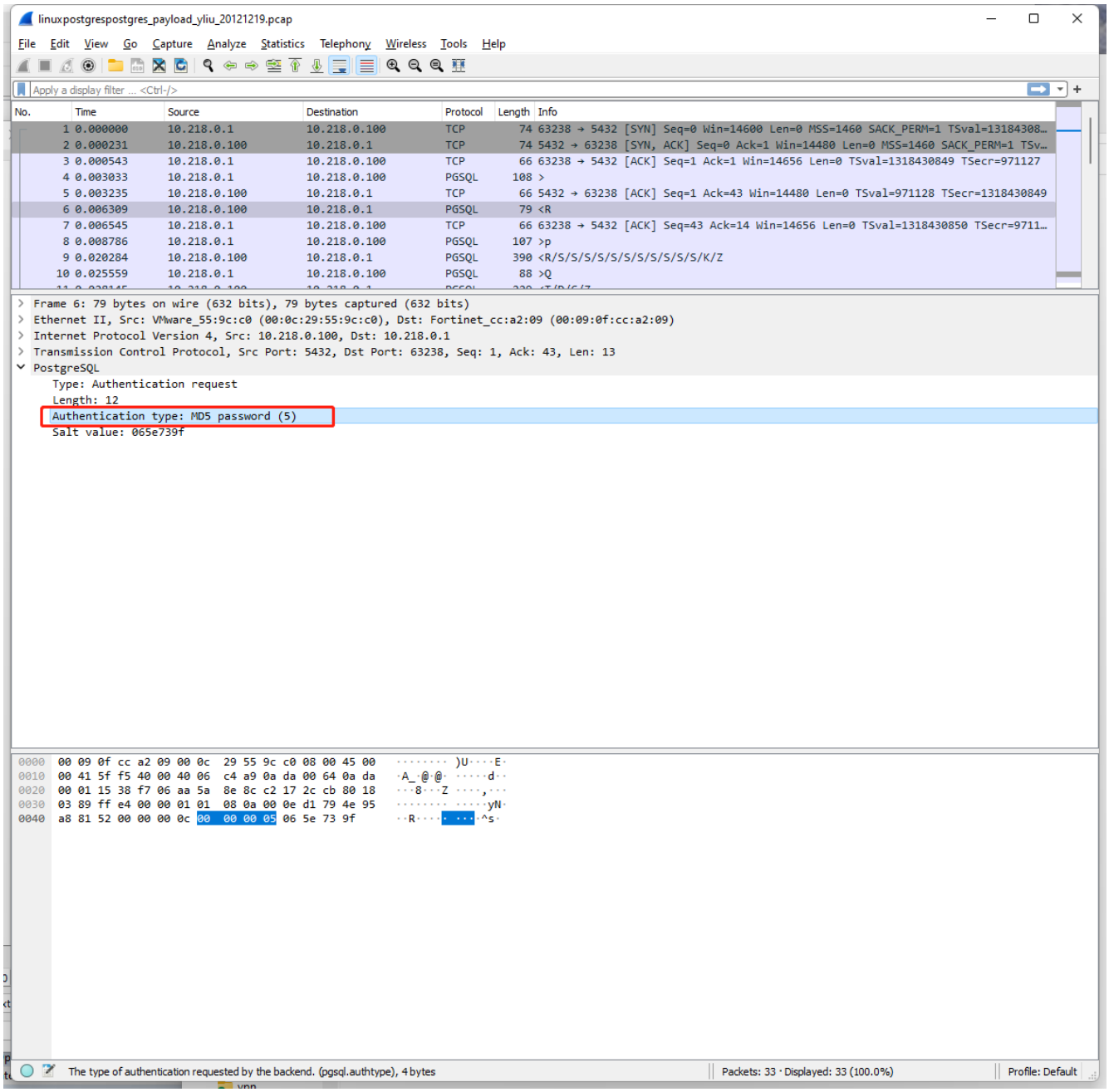
Weak extended security



Weak dialect

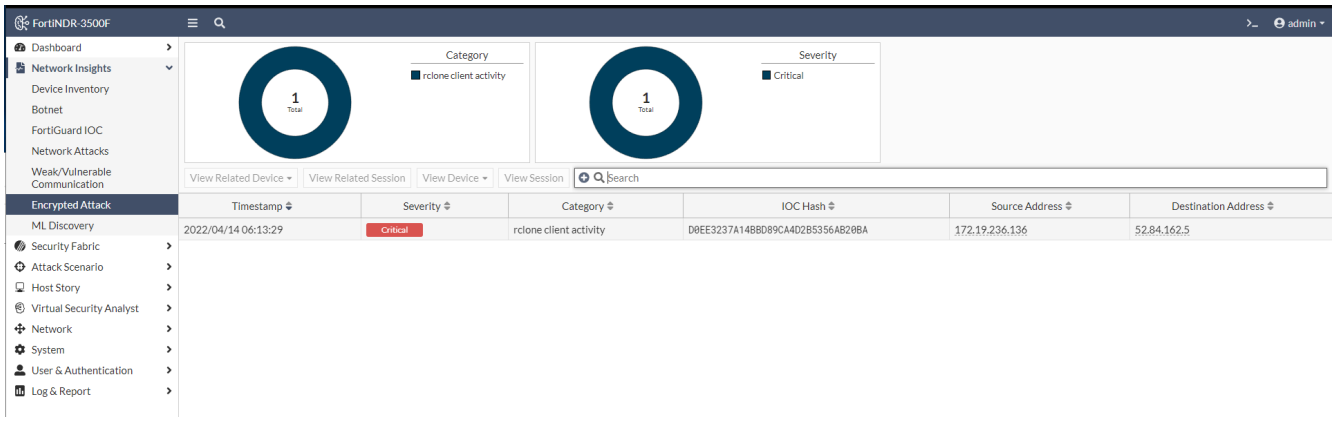


Weak authentication



Encrypted Attack

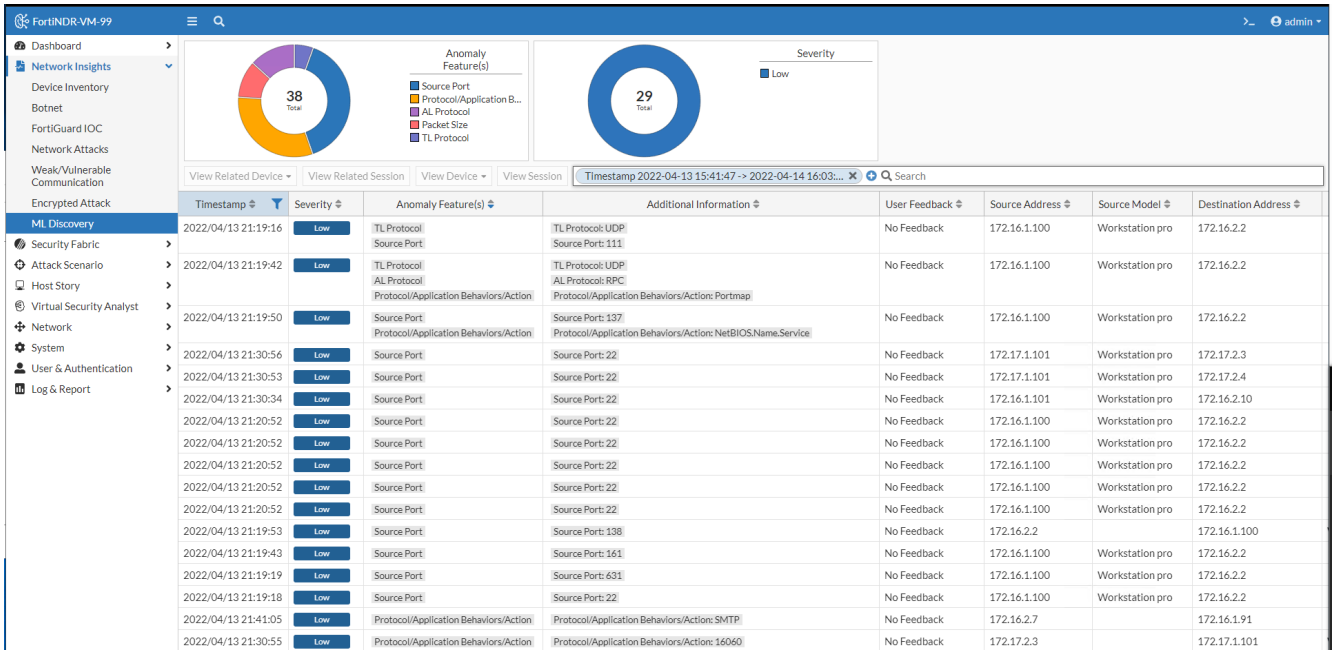
Encrypted attacks are detected by analyzing JA3 hashes in TLS transactions. FortiNDR will utilize both JA3 client and server SSL fingerprints in detection, resulting in fewer false positive detections.



ML Discovery

The *ML Discovery* page displays a list of anomalies detected by Machine Learning configuration. Each row is based on a session. The configuration and baselining of ML Discovery is located under *Virtual Security Analyst* > *ML configuration*. ML discovery is switched ON by default.

- The *Anomaly Features* column displays the feature or feature combinations that caused the anomaly.
- The *Additional Information* column provides a glance of the abnormal feature value(s).
- The *Use Feedback* column is where you can enter positive or negative feedback to the detection.



Double-click an entry to view the *Session Information* pane. Right-click an entry to:

- *View Related Device*: The related source and destination devices.
- *View Related Session*: All the sessions for the source device.

- *View Device*: The source and the destination device.
- *View Session*: The reason why the session is considered to be an anomaly by ML.

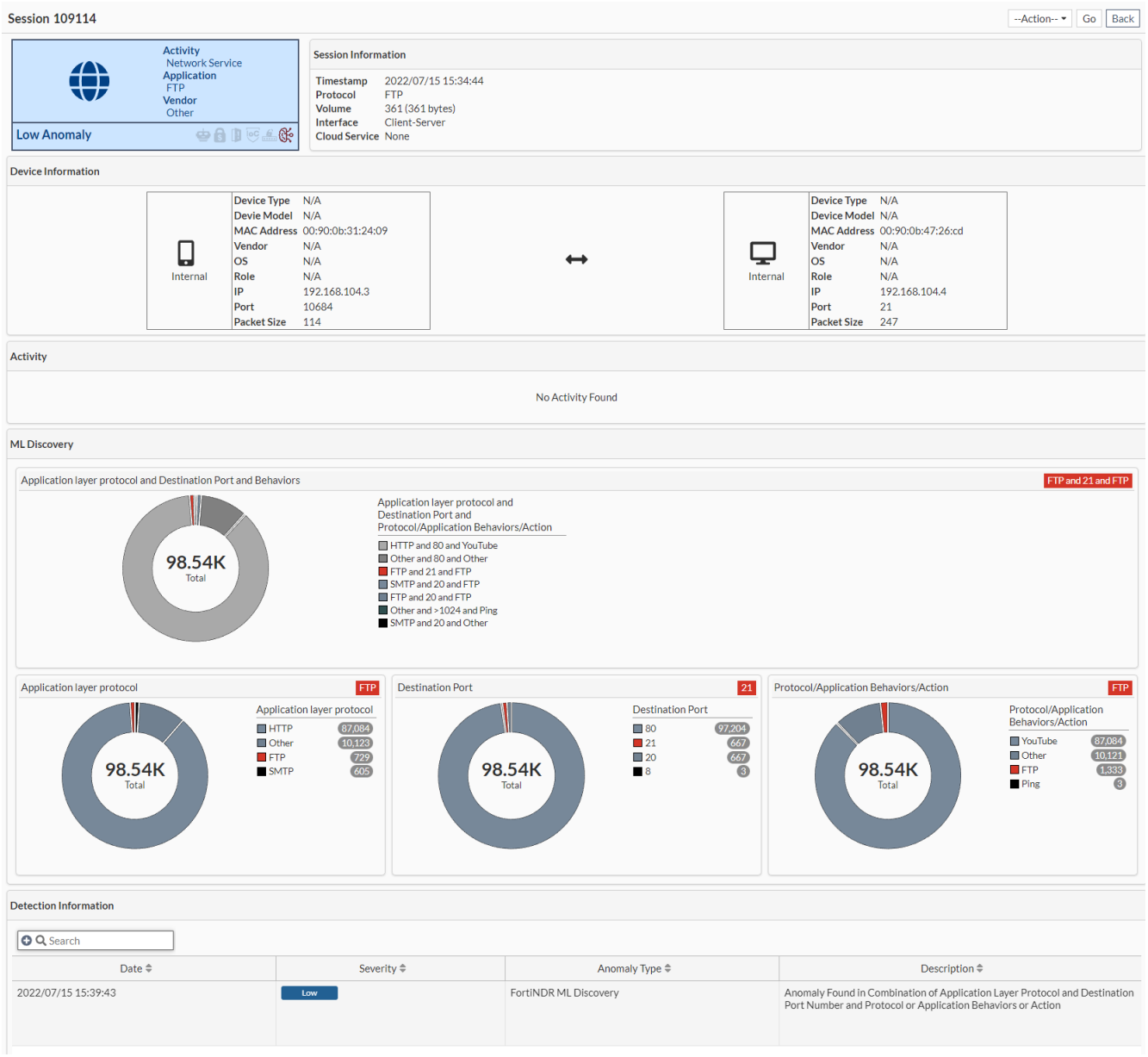
Example:

The image below shows a ML anomaly detection triggered by 3 features:

- *Application layer protocol*: FTP
- *Destination Port*: 21
- *Protocol/Application Behaviors/Action*: FTP

The *Application layer protocol and Destination Port and Behaviors* pie chart shows the distribution of the three features. The anomaly in the example is triggered because *FTP-21-FTP* has deviated from the baseline. In other words, the FTP connection from *192.168.104.3* to *192.168.104.4* has never been seen in the baseline before.

The *Application layer protocol*, *Destination Port* and *Protocol/Application Behaviors/Action* charts show the distribution for each feature. The distribution information is a snapshot based on the source device at the moment of the detection. It is normal for a feature highlighted in red not to have the lowest count in the chart. This is because the highlighted feature may occur multiple times suddenly within a very short period when being detected.



The *Application layer protocol and Destination Port and Behaviors* chart is not displayed when the ML anomaly detects a new Source IP or Destination IP that has never been seen in the baseline.

Add feedback a session

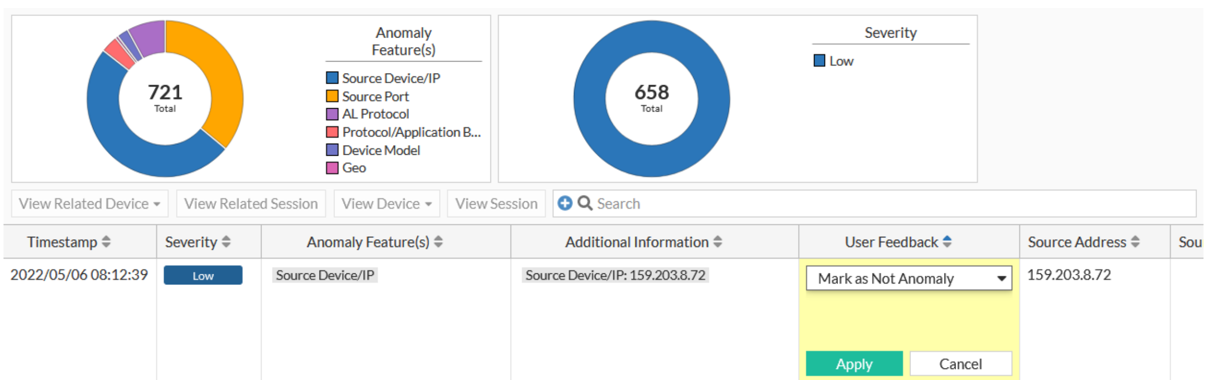
The *User Feedback* column allows you to provide feedback for Machine Learning discoveries to correct false positives.

To add feedback to session anomaly:

1. Go to *Network Insights > ML Discovery* and select a session in the table.
2. Hover over the *User Feedback* column until the *Edit* icon appears and click it.
3. From the *Feedback* dropdown, select one of the following options.

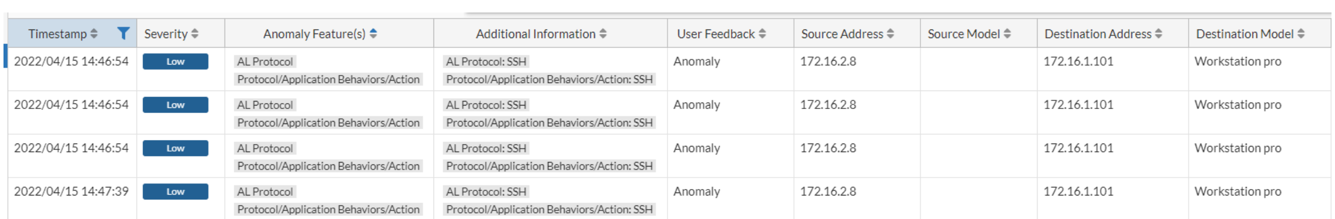
Option	Description
Mark as Not Anomaly	Select this option to force the next baseline training with new traffic to EXCLUDE the same detection in future. This typically takes 5-10 minutes depending on the network traffic.
Mark as Anomaly	Select this option to add positive feedback to the detection. This does not affect the baseline training other than acting a place for you to comment on the detection.

When multiple sessions share the same value in the *Anomaly Feature(s)* column, you will only need to add feedback once to apply the feedback to all of the sessions.



4. Click *Apply*.

The following image is an example of multiple ML discoveries with the same value in the *Anomaly Feature(s)* column. In this scenario, you will only need to add feedback once to mark all the sessions as *Anomaly*.

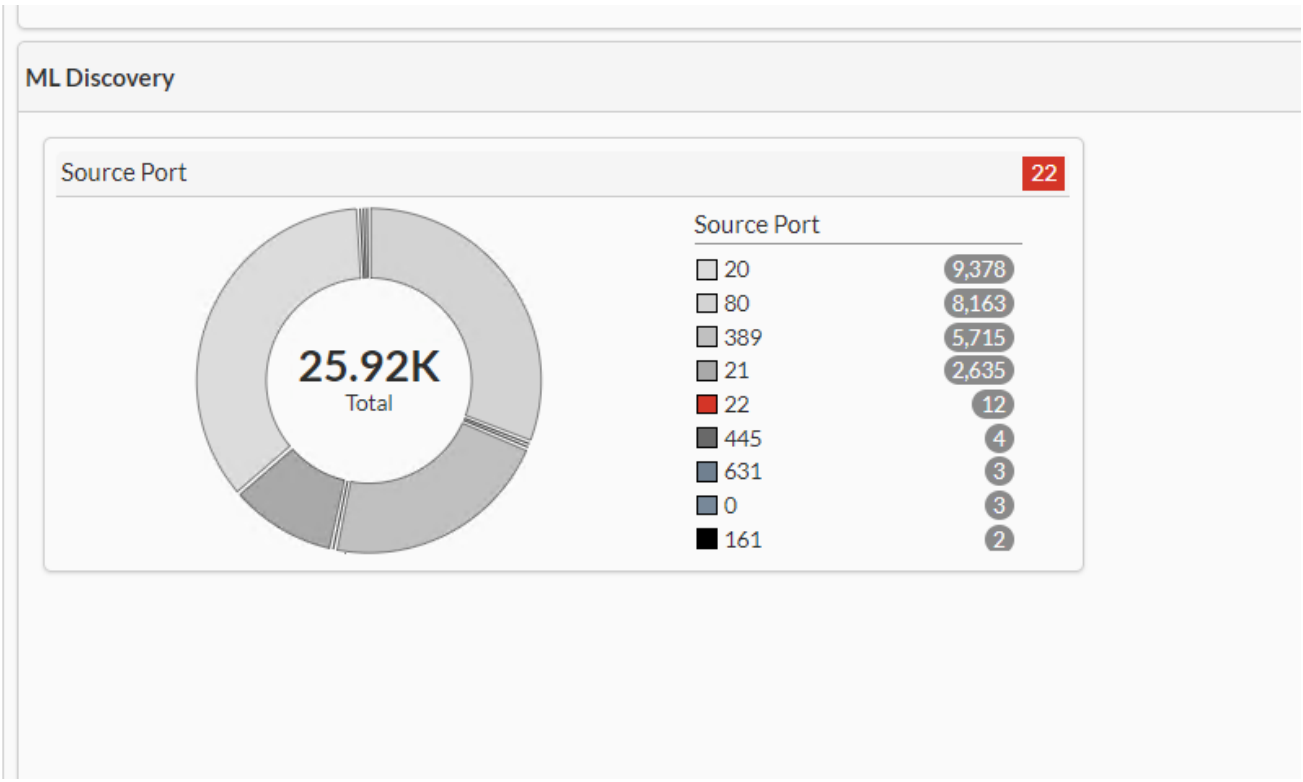


Timestamp	Severity	Anomaly Feature(s)	Additional Information	User Feedback	Source Address	Source Model	Destination Address	Destination Model
2022/04/15 14:46:54	Low	AL Protocol Protocol/Application Behaviors/Action	AL Protocol: SSH Protocol/Application Behaviors/Action: SSH	Anomaly	172.16.2.8		172.16.1.101	Workstation pro
2022/04/15 14:46:54	Low	AL Protocol Protocol/Application Behaviors/Action	AL Protocol: SSH Protocol/Application Behaviors/Action: SSH	Anomaly	172.16.2.8		172.16.1.101	Workstation pro
2022/04/15 14:46:54	Low	AL Protocol Protocol/Application Behaviors/Action	AL Protocol: SSH Protocol/Application Behaviors/Action: SSH	Anomaly	172.16.2.8		172.16.1.101	Workstation pro
2022/04/15 14:47:39	Low	AL Protocol Protocol/Application Behaviors/Action	AL Protocol: SSH Protocol/Application Behaviors/Action: SSH	Anomaly	172.16.2.8		172.16.1.101	Workstation pro

View Session

To drill-down to the session details, right-click an entry to open *View Session*.

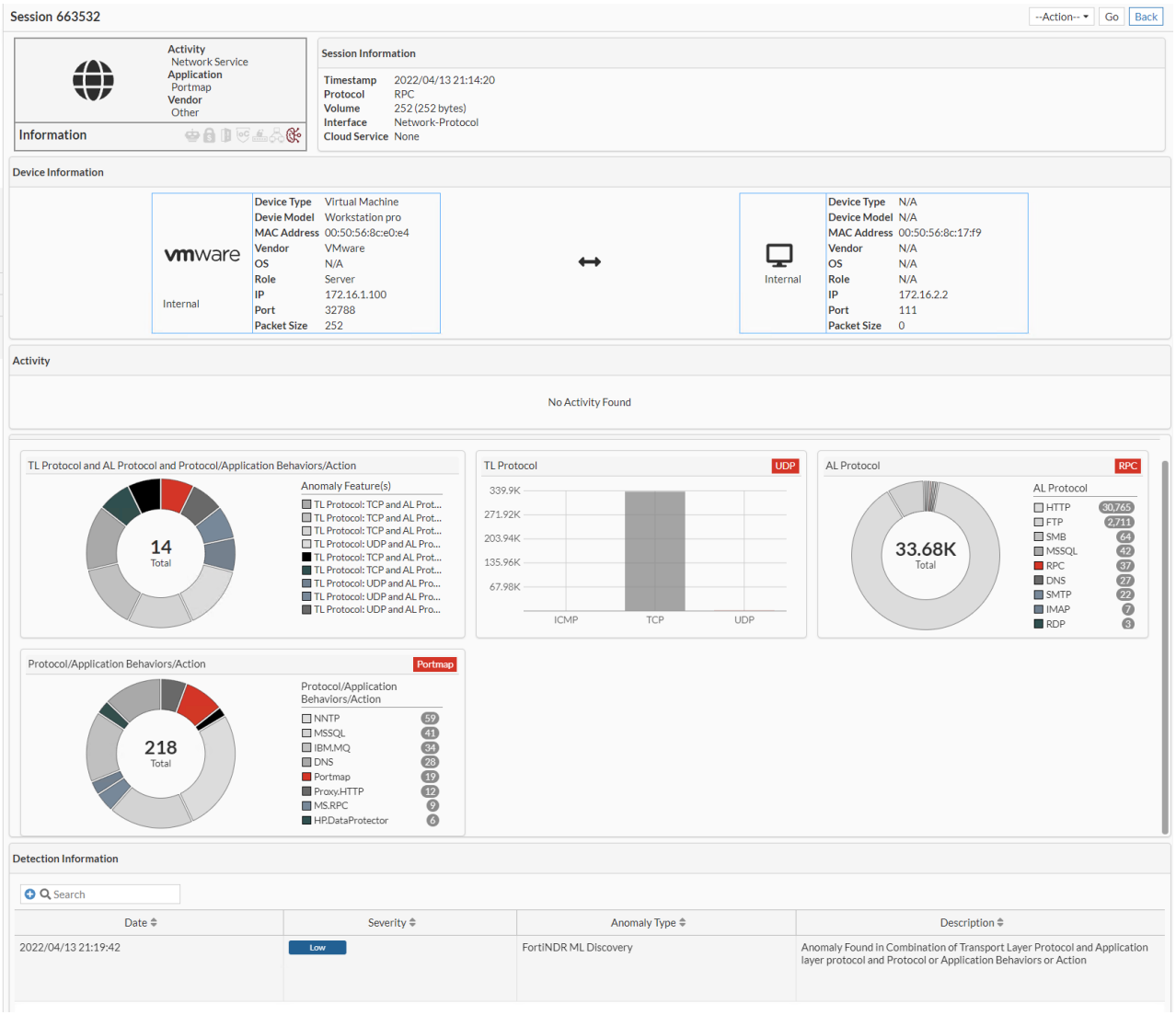
In *ML Discovery* the session shows the distribution of the feature that caused the anomaly. In the image below, the session was flagged because it was trying to use port 22, which is the SSH connection.



If the anomaly is caused by:

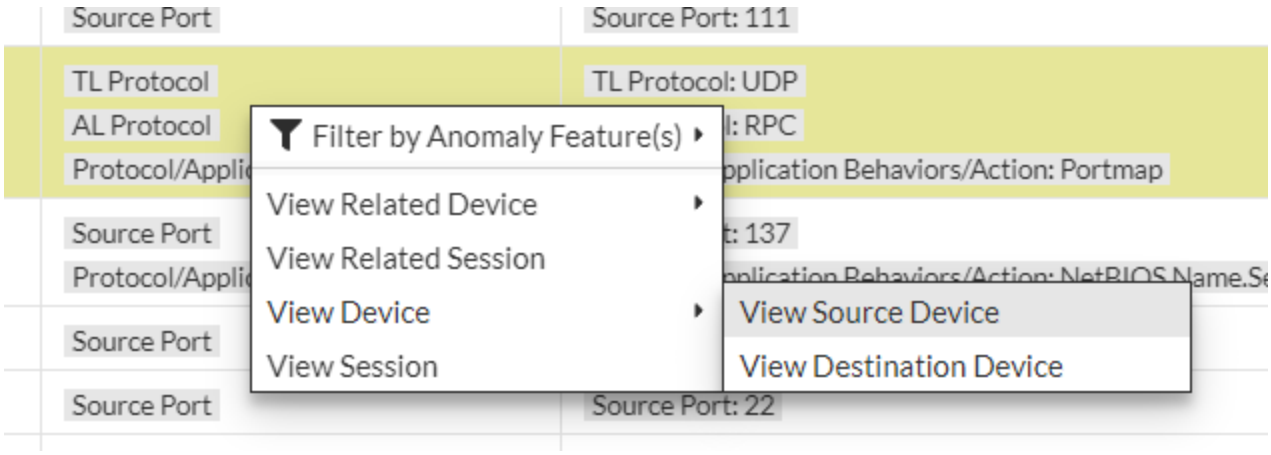
- A new IP joining the network, the distribution graph is not displayed. The new IP address is displayed instead.
- A combination of features the session displays the distribution of the combination as well as the individual distributions. For example, the following anomaly is caused by the combination of *Transport Layer Protocol*,

Application Protocol and *Protocol/Application Behaviors/Action*.

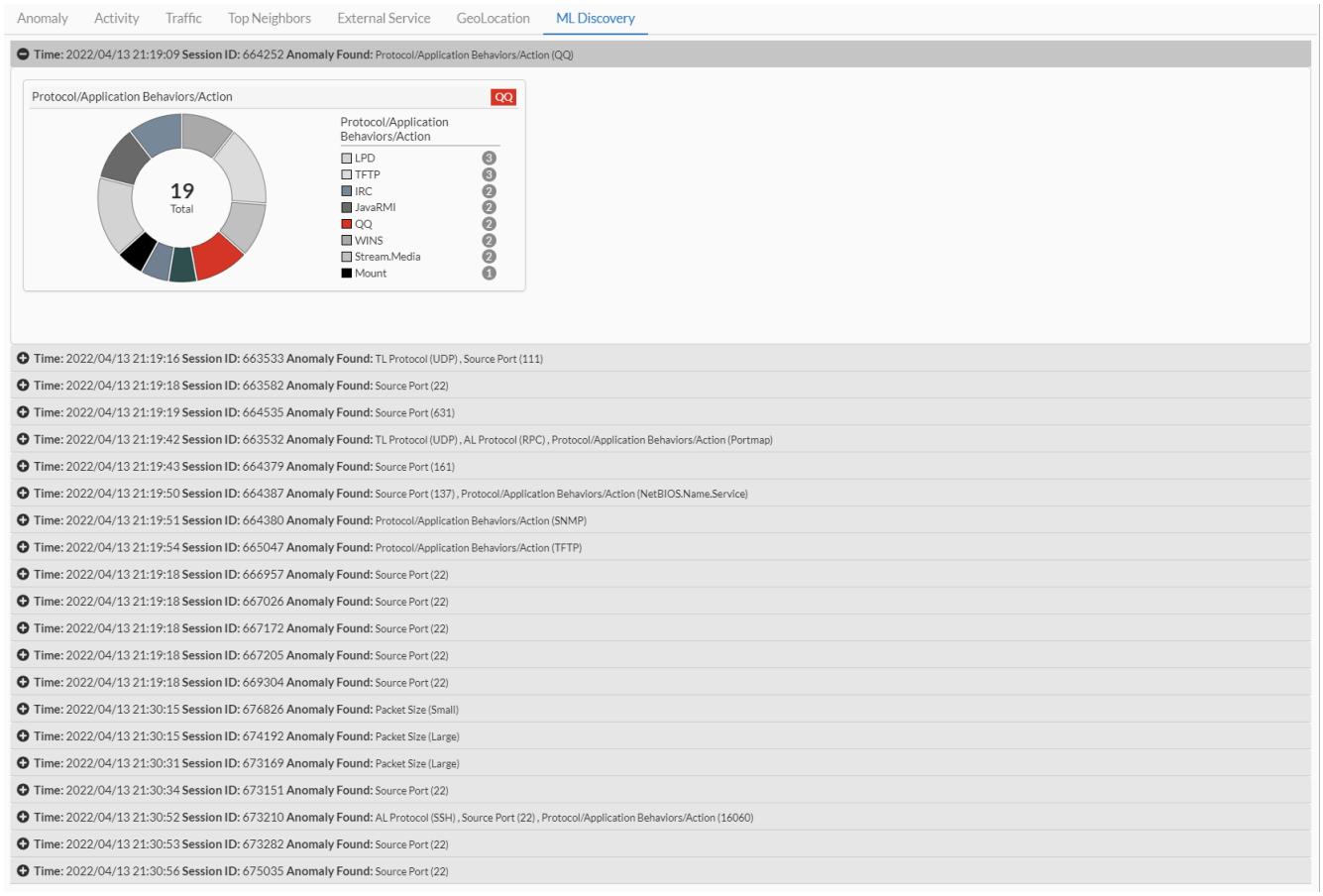


View Source Device and View Destination Device

You can view Source and Destination Device by right-clicking an entry and clicking in *View Device* > *View Source Device* or *View Destination Device*.



To view this device's ML anomalies, click the *ML Discovery* tab. The following image shows a series of ML anomalies found on the same device.

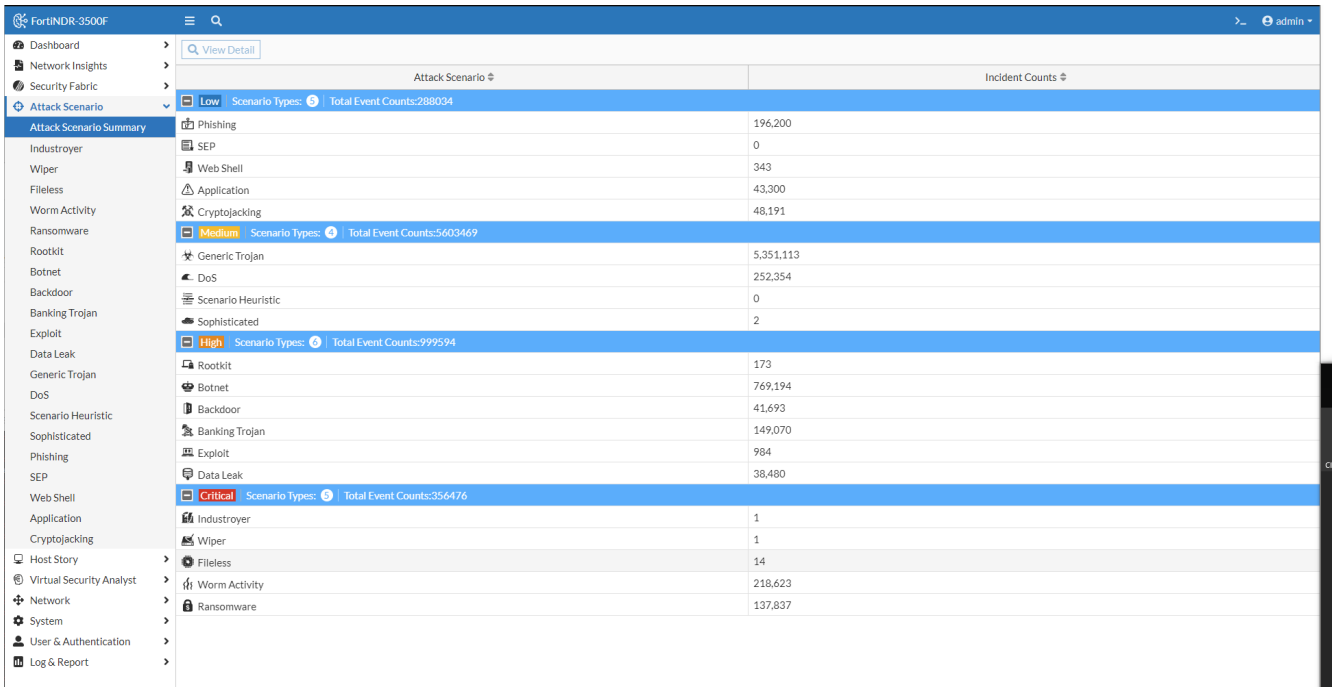


Attack Scenario

FortiNDR uses attack scenarios to identify malware attacks. FortiNDR scientifically classifies the malware attack times into attack scenarios, making FortiNDR your personal malware analyst on the network.

Most security technologies can only tell you that your network is infected with virus names without much context. FortiNDR moves beyond that to tell you exactly what the malware is trying to achieve providing SOC analysts more insightful information for their investigation.

The *Attack Scenario Summary* counts the number of incidents of all the attack scenario types. They are organized into *Critical*, *High*, *Medium*, or *Low* severity.



Scenario types

FortiNDR can detect the following attack scenarios:

Severity	Scenario	Description
Low	Cryptojacking	Cryptojacking is a type of cybercrime where a malicious actor uses a victim's computing power to generate cryptocurrency.
Low	Application	A broad category of software that might download and install additional, unwanted software that could perform activities not approved or expected by the user.

Severity	Scenario	Description
Low	Web Shell	A script that can be uploaded to a web server to allow remote administration of the machine. Infected web servers can be Internet-facing or internal to the network where the web shell is used to pivot further to internal hosts.
Low	SEP	Attackers use Search Engine Poisoning to take advantage of your rankings on search engine result pages.
Low	Phishing	A fraudulent attempt to obtain sensitive information such as usernames, passwords, and credit card details by disguising itself as a trustworthy entity in an electronic communication.
Medium	Sophisticated	Malware that contains more than one attack scenario.
Medium	Scenario Heuristic	Scenario heuristic identifies applications or software that demonstrates an array of suspicious traits.
Medium	DoS	This can access connection handling remotely, perform denial of service, or distributed DoS.
Medium	Generic Trojan	Any malicious computer program which misleads users of its true intent.
High	Banking Trojan	Malicious software that can access confidential information stored or processed through online banking systems.
High	Backdoor	This can give a hacker unauthorized access and control of your computer.
High	Data Leak	A data leak is when sensitive data is exposed physically on the Internet where malicious actors can access it.
High	Rootkit	Software tools that enable an unauthorized user to get control of a computer system without being detected.
High	Exploit	A piece of software, a chunk of data, or a sequence of commands that uses a bug or vulnerability to cause unintended or unanticipated behavior on computer software, hardware, or something electronic, usually computerized.
High	Botnet	A botnet is a network of hijacked computers and devices infected with bot malware and remotely controlled by a hacker.
Critical	Ransomware	Malicious software that can block access to a computer system until money is paid.
Critical	Fileless	A variant of computer-related malicious software that is exclusively a computer memory-based artifact.
Critical	Wiper	Malware that erases contents in the hard disk of an infected computer. It's usually designed to destroy as many computers as possible inside the victim's networks.
Critical	Industroyer	A malware framework originally designed to deliver specific

Severity	Scenario	Description
		cyberattacks on power grids. The recent generation of this malware has also started to target industrial control systems.
Critical	Worm Activity	A worm is capable of spreading itself to other systems on a network.

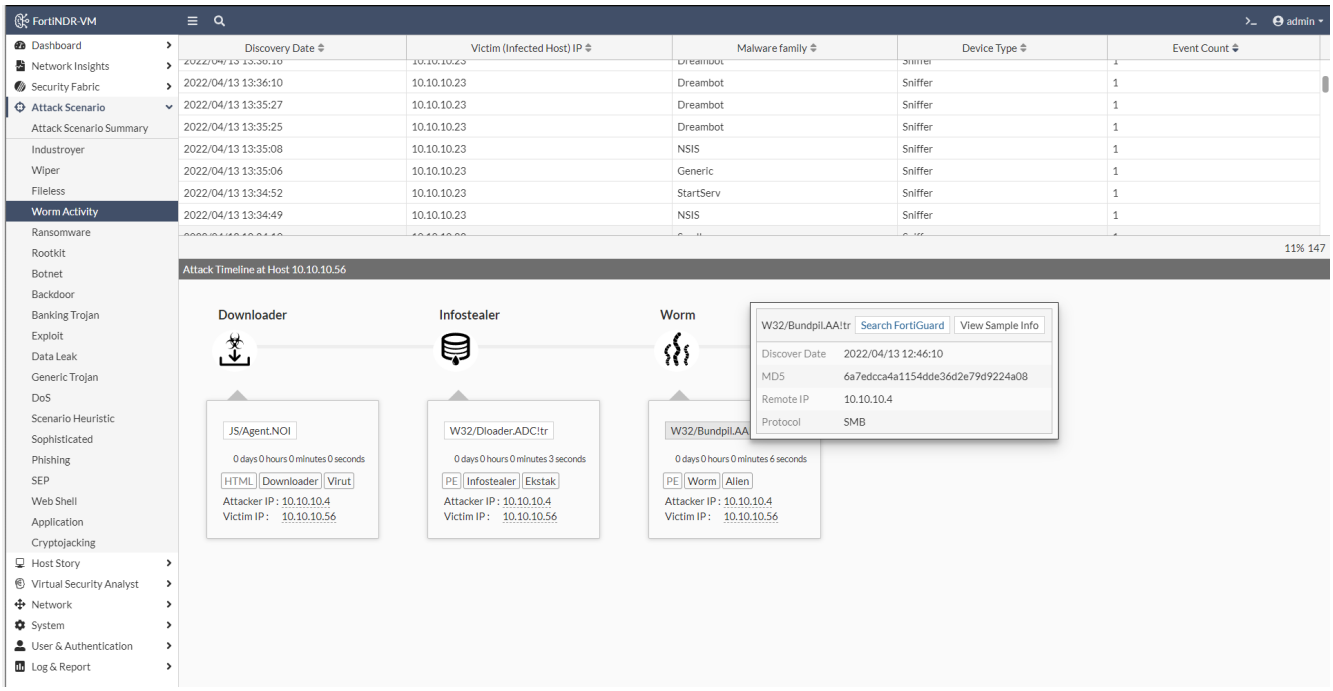
Attack scenario navigation and timeline

When there is an attack, infections often spread quickly and tracing the source (patient zero) can be very difficult for SOC analysts. FortiNDR Virtual Analyst is a scenario-based AI engine that can quickly locate the origin of the attack. This saves time during breach investigation, typically shortening it from days to seconds. FortiNDR helps analysts deal with the source of the problem in a timely manner.

Attack Scenario displays the victim IP addresses with the time of detection. Click the IP address to display the timeline of events as well as a graphical interpretation of an attack.

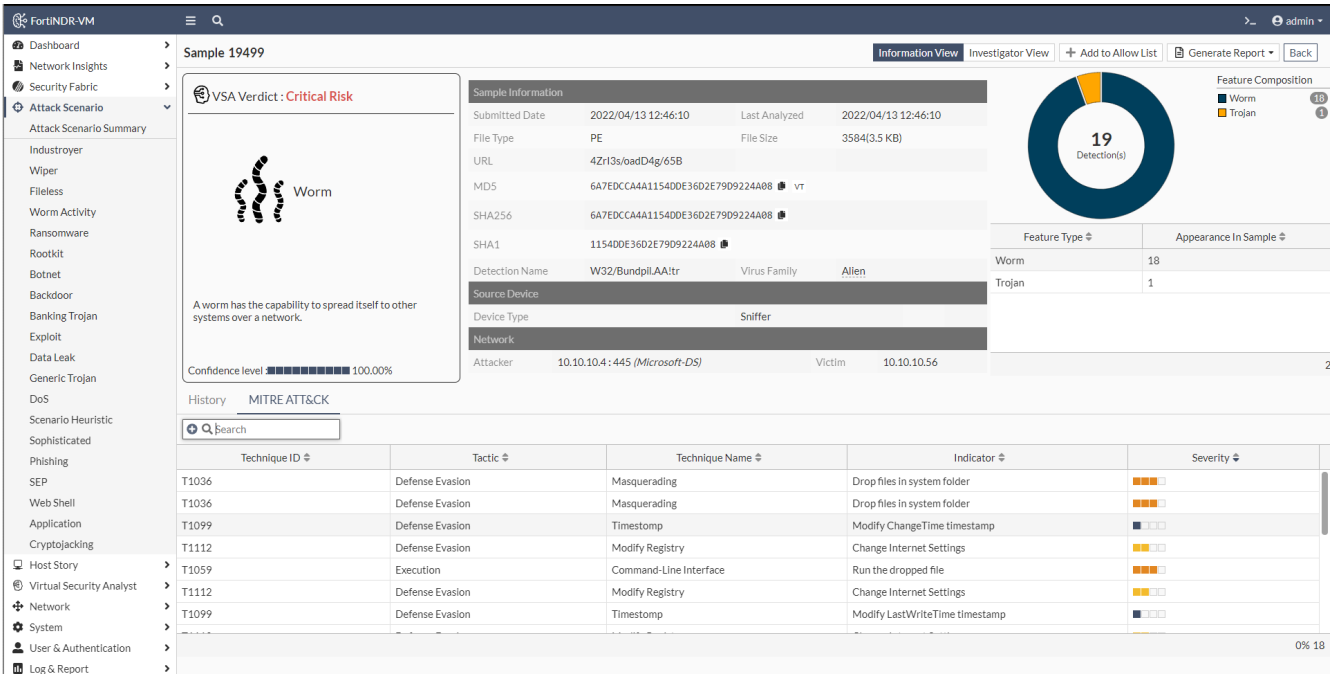
The following is an example of a worm infection. The virtual analyst shows the remote IP address where the attack originated, the timeline, and other malicious files discovered on the infected host, and the worm activity shows it is trying to spread.

In the *Attack Timeline* frame, hover over a detection name to view more information about the infection. Use the *Search FortiGuard* shortcut to look up the detection at FortiGuard's threat encyclopedia. Use the *View Sample Info* shortcut to view details of the detected file.



You might see the same IP address multiple times. This indicates that that IP address has been detected for the attack type multiple times, for example, ransomware.

The following example shows a Sample Information page of the W32/Bundpil.AA!tr captures in the attack timeline.



Understanding kill chain and scenario engine

One of the strengths of FortiNDR is the ability to trace the source of a malware attack. In all attack scenarios, especially with worm, ransomware, and sophisticated attacks, there are often timeline and multi-stage kill chain type graphics. When there is a detection, the scenario engine tries to form a multi-stage scenario based on time and similarity of attacks. The maximum trace-back period is five days.

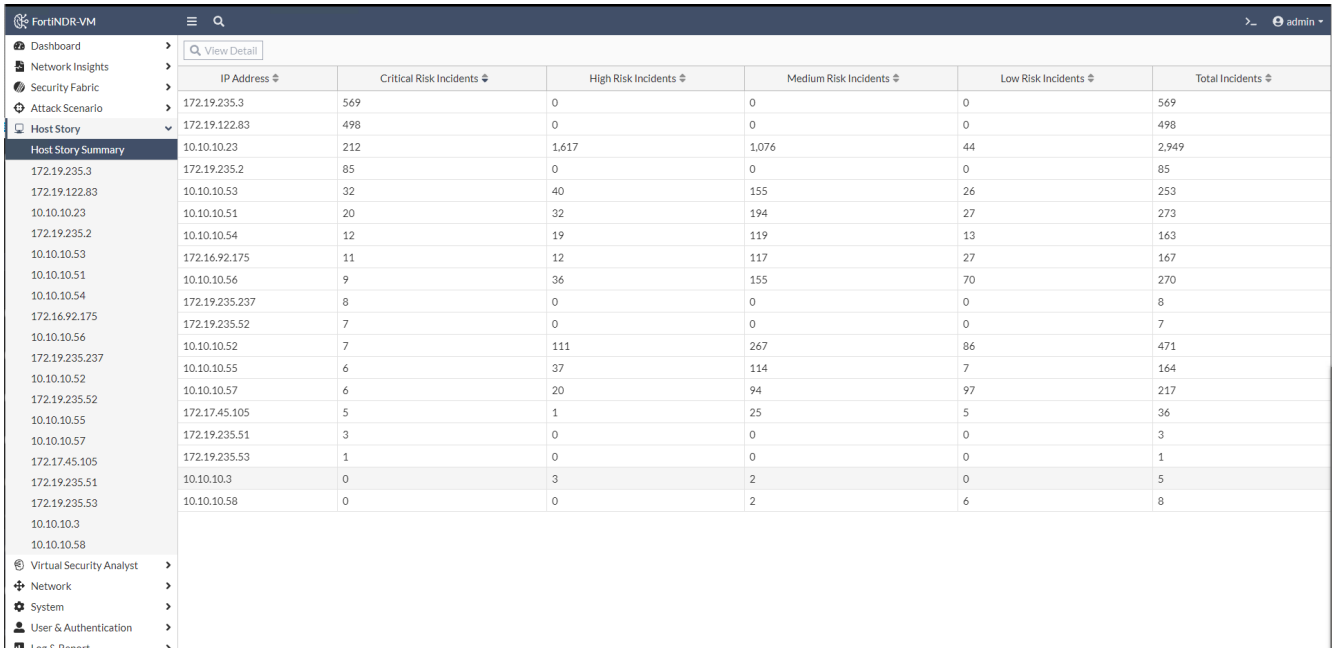
When ransomware is detected, the scenario engine goes back to see if there are other events such as dropper or downloader that happened before to the same victim. If the scenario engine cannot form a multi-stage attack, then it displays a single scenario.

Most attack scenario names are self explanatory as the sophisticated scenario engine searches for multiple payloads of the same attack. For attacks that do not fall under obvious scenarios, they are grouped under the attack scenario called *Scenario Heuristics*.

Host Story

Host Story organizes malware attacks by host IP address while *Attack Scenario* organizes malware attacks by attack type. The *Host Story* view helps you examine the host to see when the infections first took place. For example, a host might be obviously infected with ransomware because a ransomware note is displayed on the end user machine. However, many people might not know that the ransomware came from a dropper/downloader which can download malicious files to the same host. Providing a timetable based on host information allows SOC analysts to understand the attack by timeline, for example, a dropper might be sleeping in the PC for days until C&C kicks in to download other malicious code. Double-click each detection row to understand what was happening during this attack.

The *Host Story* summary page shows incident counts grouping by severities for each infected host.



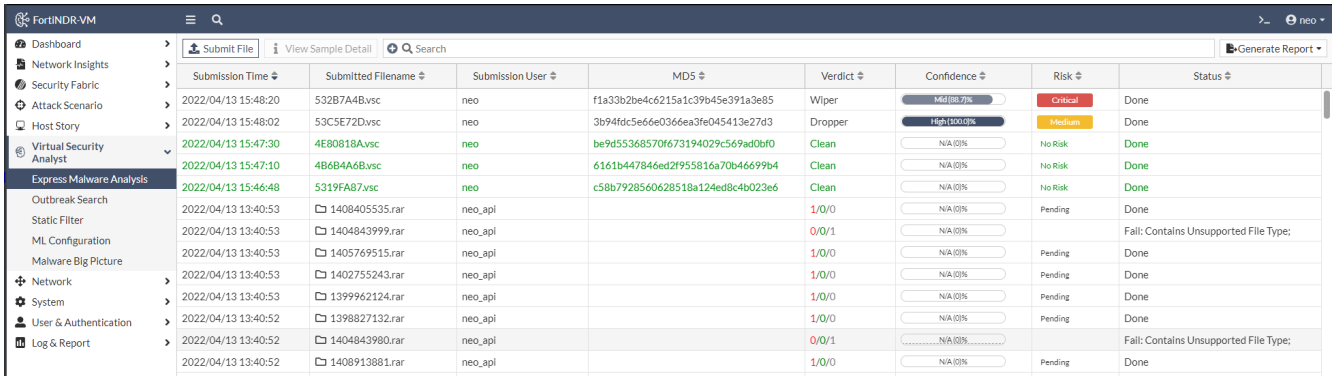
IP Address	Critical Risk Incidents	High Risk Incidents	Medium Risk Incidents	Low Risk Incidents	Total Incidents
172.19.235.3	569	0	0	0	569
172.19.122.83	498	0	0	0	498
10.10.10.23	212	1,617	1,076	44	2,949
172.19.235.2	85	0	0	0	85
10.10.10.53	32	40	155	26	253
10.10.10.51	20	32	194	27	273
10.10.10.54	12	19	119	13	163
172.16.92.175	11	12	117	27	167
10.10.10.56	9	36	155	70	270
172.19.235.237	8	0	0	0	8
172.19.235.52	7	0	0	0	7
10.10.10.52	7	111	267	86	471
10.10.10.55	6	37	114	7	164
10.10.10.57	6	20	94	97	217
172.17.45.105	5	1	25	5	36
172.19.235.51	3	0	0	0	3
172.19.235.53	1	0	0	0	1
10.10.10.3	0	3	2	0	5
10.10.10.58	0	0	2	6	8

Virtual Security Analyst

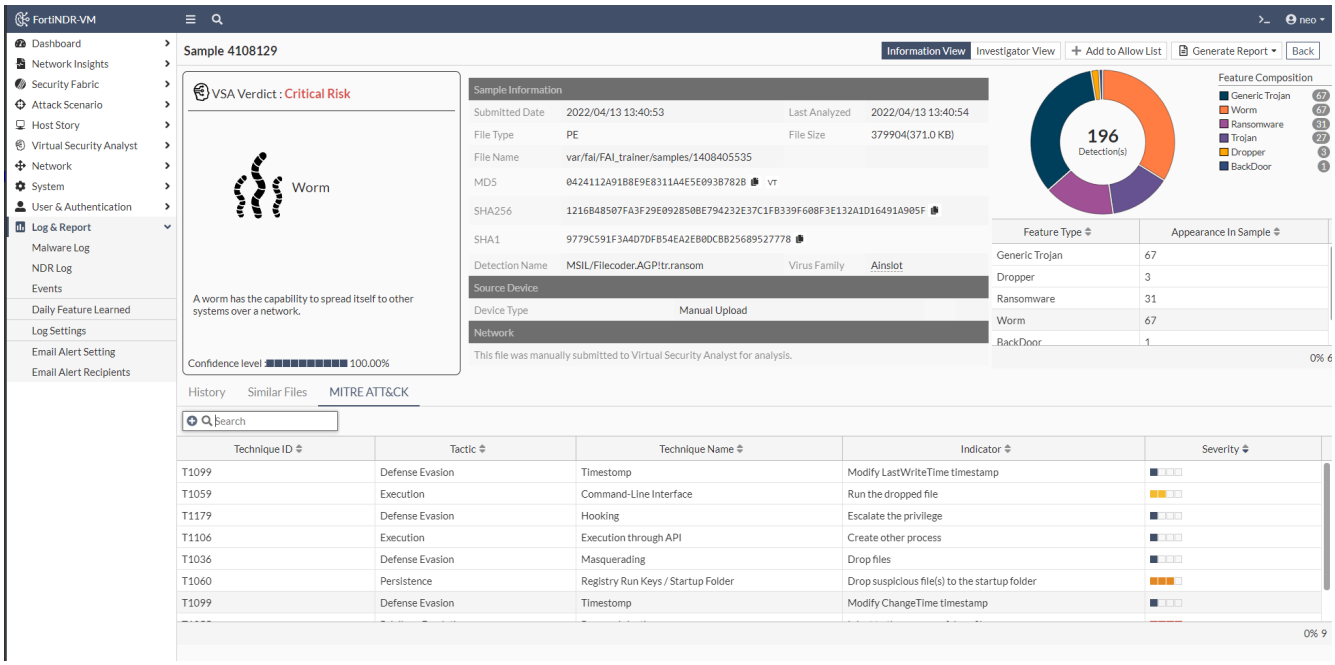
This section includes the following topics.

Express Malware Analysis

Express Malware Analysis offers a fast solution to provide the verdict of the file. You can submit the files up to 200MB in default via GUI or via API (Use CLI: `execute file-size-threshold` to change file size limit). Submitted files enter a queue in the system for analysis. Use *Virtual Security Analyst* > *Express Malware Analysis* to check the status of your submitted files and the verdict.



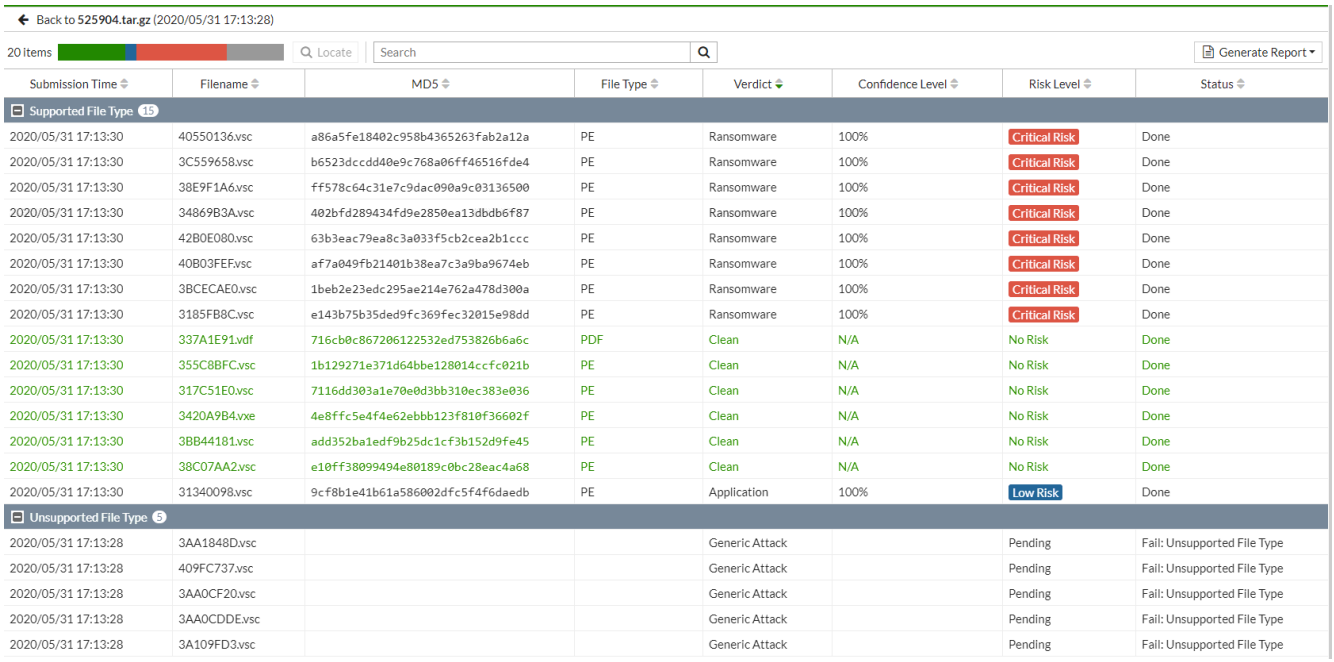
Click *View Sample Detail* to view its sample information. This page explains the verdict by showing the feature composition of the file. You can also find a list of related files with a similar score at the bottom of the page. To generate a report summary in PDF and JSON format, click *Generate Report* at the top right.



The VSA report has tabs at the bottom.

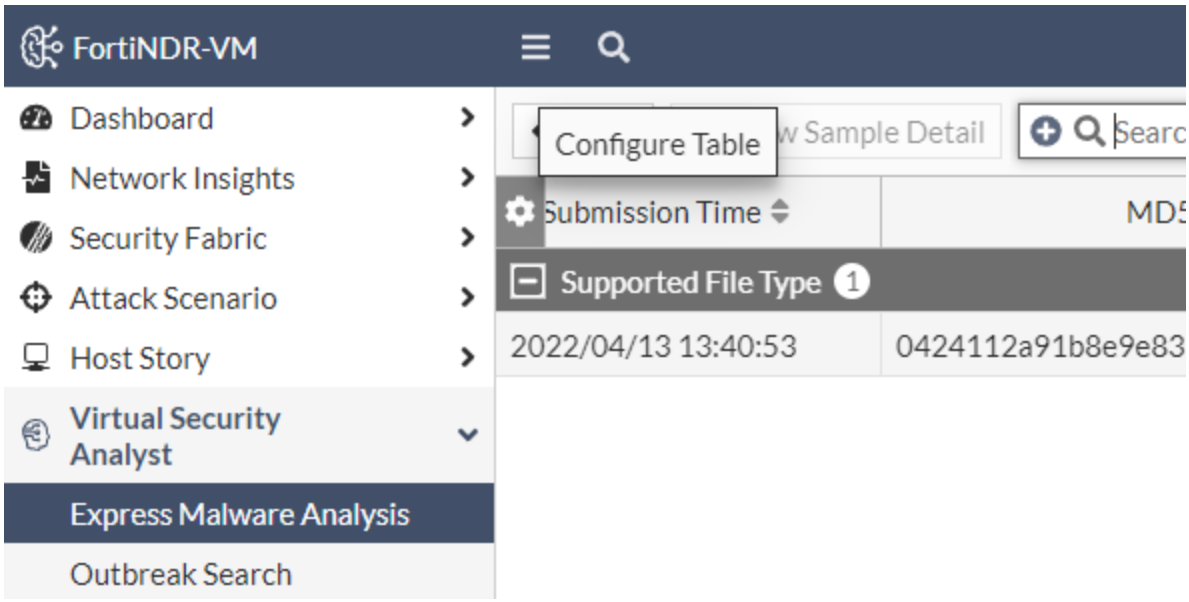
Tab	Description
History	Display the history of the same malware (by hash) on the network. FortiNDR does not go back and rescan files based on the previous verdict. If you want to rescan a file based on the latest ANN, use manual or API upload instead.
Similar files	FortiNDR has a similar engine based analysis based on features detected. This is good for detecting similar variants of the original malware.
MITRE information (and Investigator view)	For PE (portable executable) files, FortiNDR can optionally display a drill down the MITRE ATT&CK matrix displaying the TTPs used for a particular malware.
IOC (Indicators of Compromise)	For text-based malware, FortiNDR can optionally display more contextual information of malware, such as *file contain abnormal javascipt*, and so on. This helps users understand why FortiNDR determines it is malware.

When a zip file is uploaded, you can view the contents and verdict of the files in the zip file by double-clicking on the zip file entry.

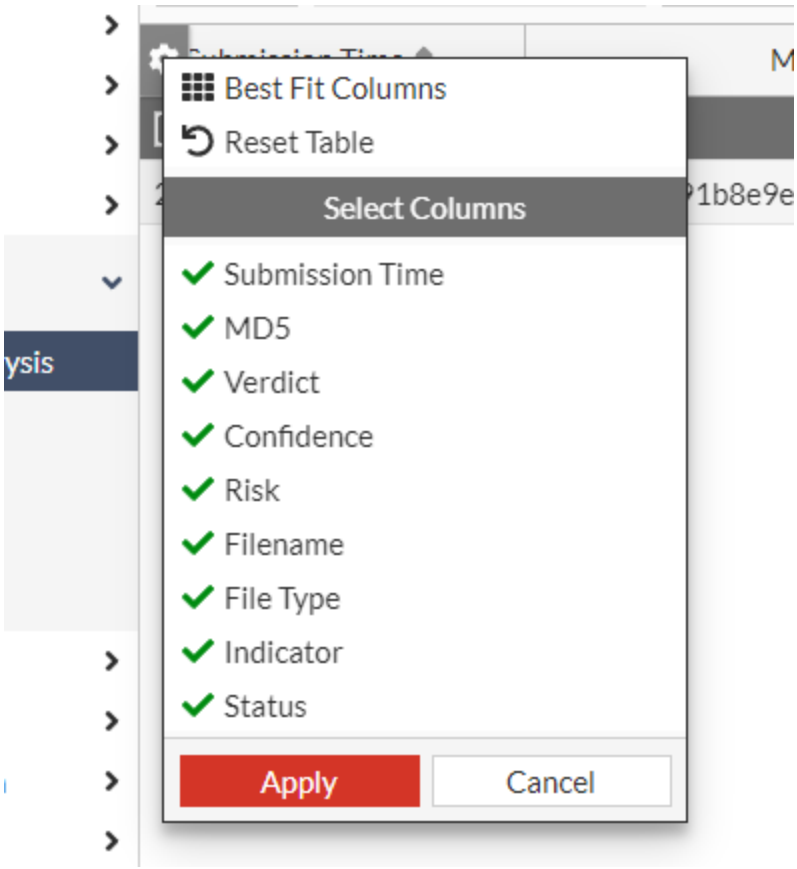


Configuring the table

You can show or hide columns by clicking the gear icon in the header.



Click Configure Table to select the columns you want to show or hide.



Upload files using API

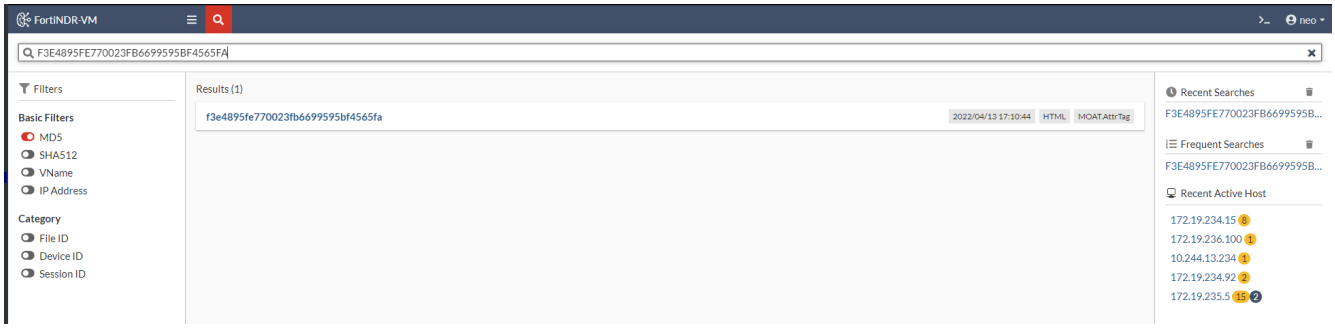
You can submit files for analysis using API with an API key. See Submit files on page 152.

Outbreak Search

Virtual Security Analyst > *Outbreak Search* contains tools to determine if there is an outbreak in the network. FortiNDR lets you deal with an outbreak from two directions.

1. Using a known hash in the FortiNDR database or a physical copy of a file that belongs to the outbreak, you can search for other captured files that share similarities. See Search lead type of hash or detection name on page 92.
2. Using a known outbreak name or known virus family identifier, you can search for captured files that were grouped under the same categories by FortiNDR. See Search lead type of outbreak name on page 93.

You can also use quick search in the button bar at the top to search for and access sample profile pages. You can search by hash (MD5 or SHA512) or by exact detection name. If the search returns more than 10 results, there is a *View More* button and you are redirected to *Advance Threat report* with the search criteria inserted.



Search lead type of hash or detection name

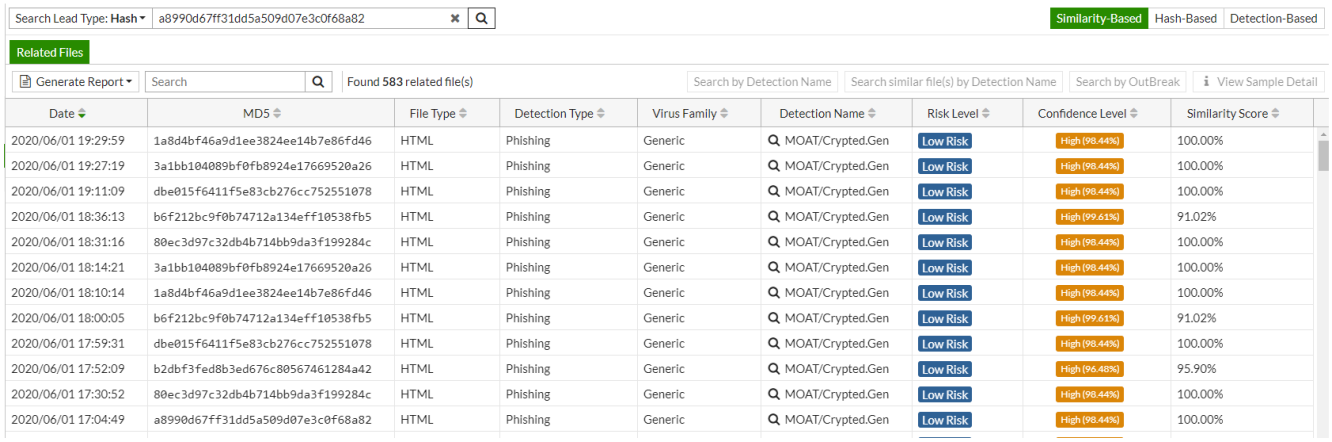
This search lead type accepts MD5 or SHA512 as a search value. You can submit the sample to FortiNDR in *Express Malware Analysis*. When the search lead type is detection name, the search value can be an exact detection name, such as W32/Phishing.DDS!tr, or a detection name with wildcards, such as W32/Phishing.%.

For these searches, you must choose one of these search methods: *Similarity-Based*, *Hash-Based*, or *Detection-Based*.

Similarity-Based search uses FortiNDR's similarity engine to search for files that have similar features to the input file. Outbreak search only returns samples with a similarity rate of over 77%.

Hash-Based search returns results based on hash matches. If search lead type is detection name and you select hash-detection, the search returns files that match the hashes of all the files with the input detection name. The result might include files from different detection names because the detection name can change over time.

Detection-Based search matches the input sample by detection name with or without wildcards. If search lead type is hash and you select *Detection-Based* search, the result returns files that share the same hash as the input detection name. Because detection names can change over time, this search lets you explore other detection names that are used to detect the same outbreak.

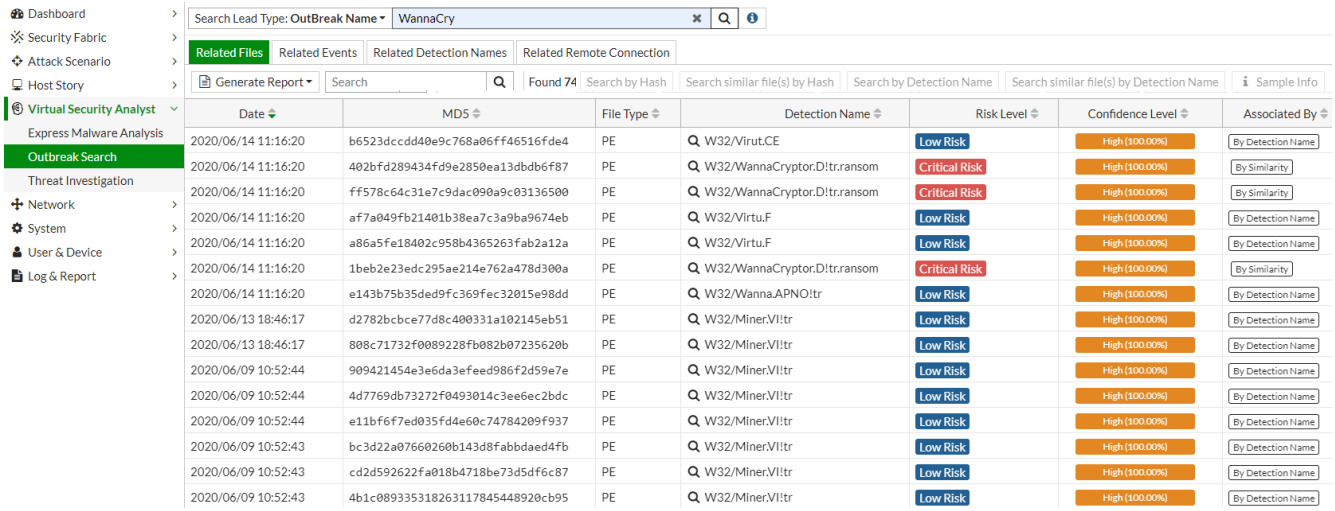


Search lead type of outbreak name

When you use outbreak name as a search lead time, FortiNDR returns the following:

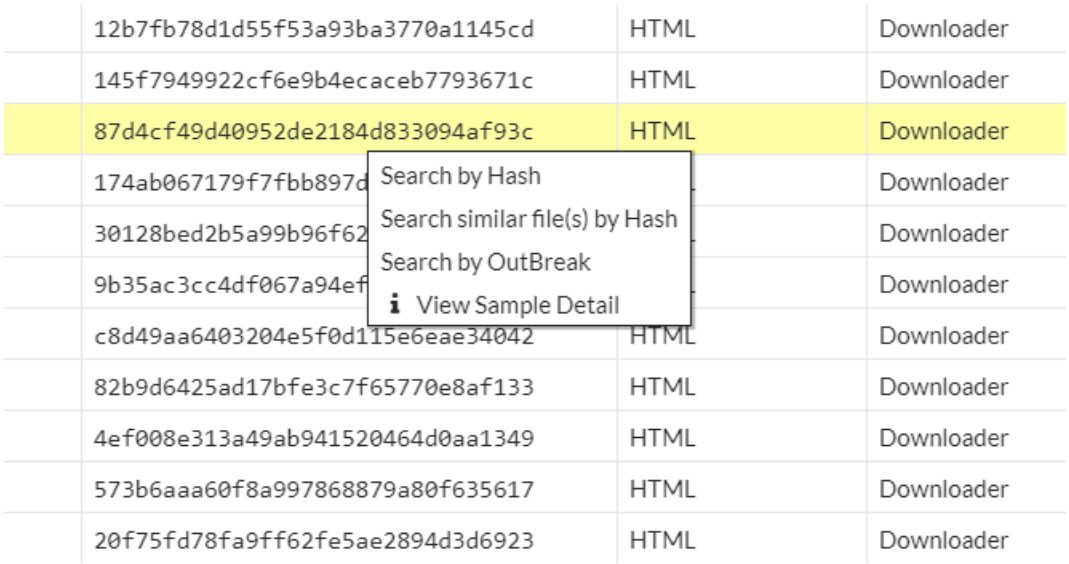
1. Any sample that matches FortiNDR's virus family classification (detection subtype).
2. Any sample that matches part of the detection name.
3. Any sample that shares any similarity with any of the files above.

These files are listed in the *Related Files* tab. Other tabs that have a summary of the detection name, remote connections, and attack scenarios events.



Recursive searches

You can right-click any file in the result and perform other types of searches. This feature lets you find more information that goes beyond the first degree of relationship in an outbreak.



Reports

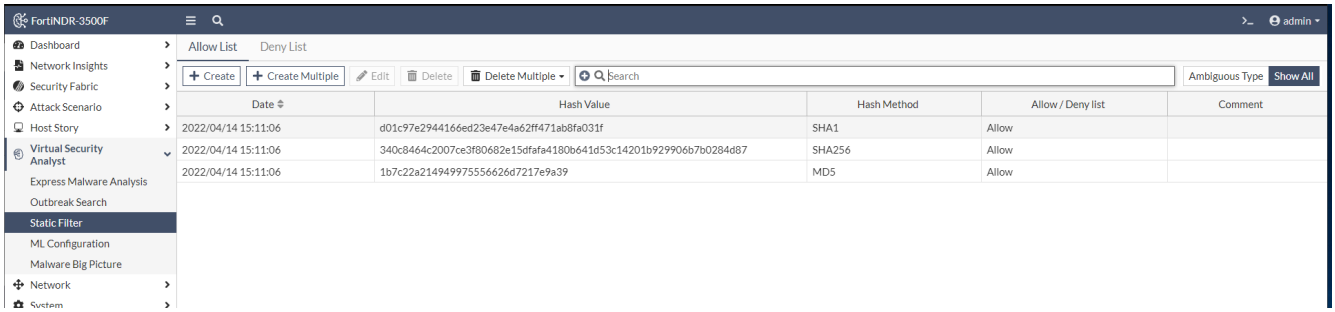
You can generate a PDF report of the verdict that includes the file's comprehensive information and analysis together with a list of similar files found on the system. Reports can be in PDF, CSV, JSON, or STIXv2 format.

Static Filter

Use the *Static Filter* to manage an allow hash list and a block hash list. This is useful when dealing with outbreaks, for example, inserting an outbreak malware hash for FortiNDR to identify as malicious. An example of the opposite use case is if there are certain files administrators determine are clean, hashes in the allowlist are not processed by ANN and AV, and FortiNDR marks them as clean.

The *Static Filter* contains two lists of file hashes, allowing input of MD5, SHA1, and SHA256 hashes that can alter the verdict of incoming samples.

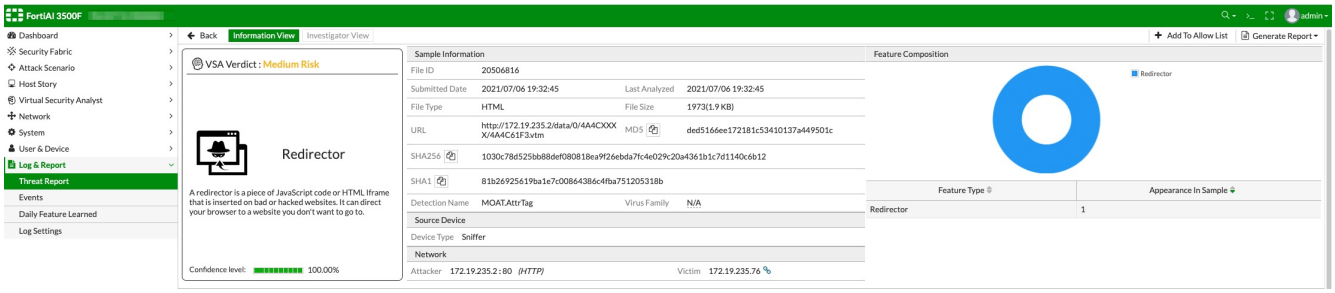
- Files with hashes in the *Allow List* are marked as *Clean*.
- Files with hashes in the *Deny List* are marked as *Malicious* and tagged with a *Detection Name* of `StaticFilter.AI.D`.



The effect of the static filter is prospective. It will only apply to samples received after the filter is added. Adding a duplicate hash entry updates the filter's timestamp to the current date.

For clashes, such as the same entry in both the *Allow List* and *Deny List*, FortiNDR flags the entry with *Ambigious type* filter so that you remove the conflicting entry.

Log & Report > *Threat Report* has a button for you to easily add or remove an entry to the *Allow List* or *Deny List*.



ML Configuration

Use the *ML Configuration* page to view and edit the machine learning baseline features for the traffic anomaly detection, as well as the status of the baseline training.

Key concepts

- **Baseline Status**: *Baselining* means the current training is still in progress.
- **Baseline ready**: Means the baseline training is done and is ready for anomaly detection.

The following features are enabled by default: *Source Device IP*, *Destination Device IP*, *Destination Device Geolocation*, *Transport Layer Protocol*, *Application Layer Protocol*, *Protocol/Application Behaviors/Action*, *Destination Port*.

We do not recommend editing these features, unless you have strong understanding of what they do.

ML Configuration contains the following settings:

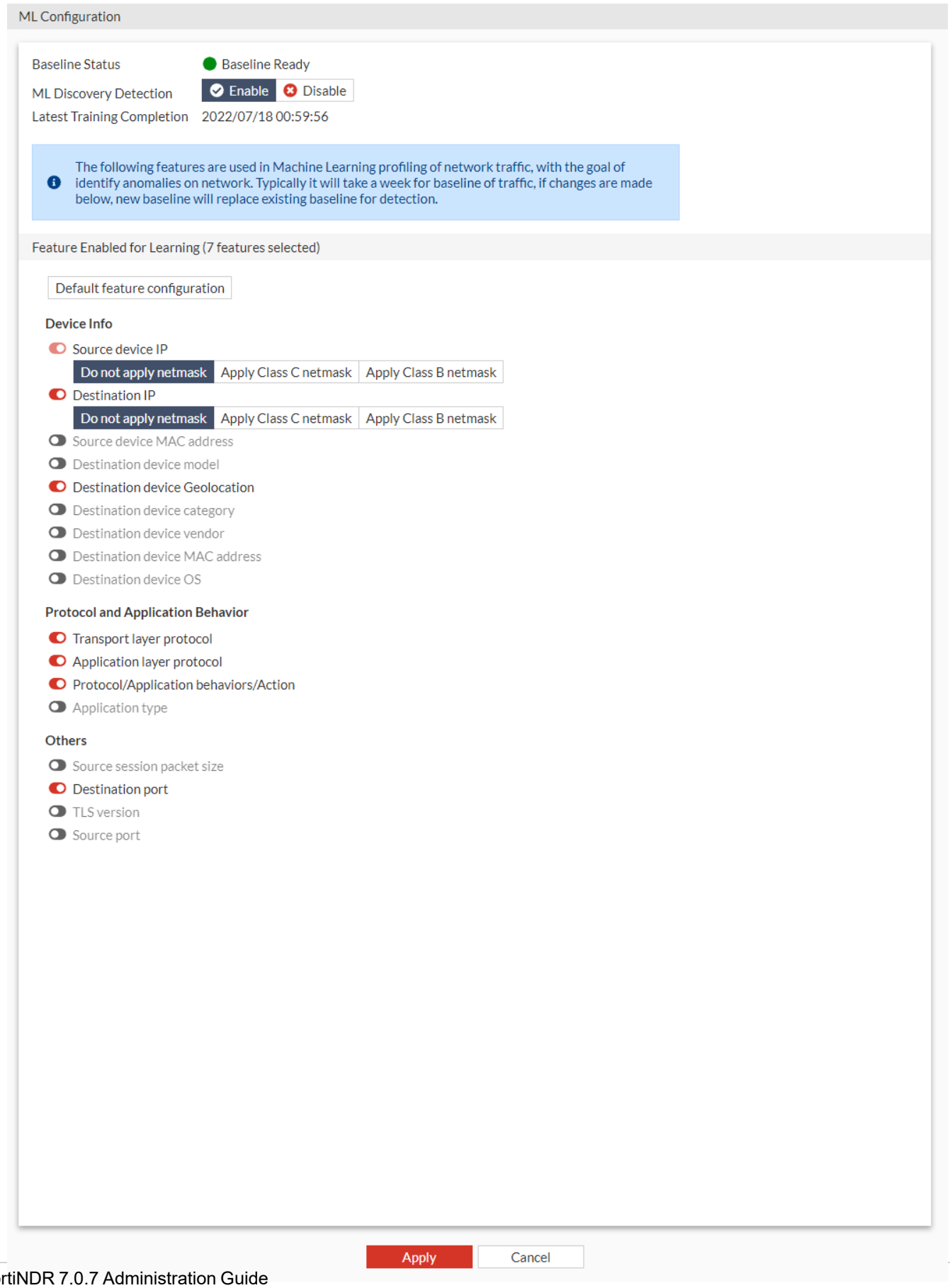
Device Info	
Source Device IP	The Source Device IP. Apply a netmask if you do not want to treat certain range changes in the IP as an anomaly.
Destination Device IP	The Destination Device IP. Apply netmask if you don't want to treat certain range change in the IP as anomaly
Destination MAC Address	Destination device MAC address.
Destination Device Model	Device model such as: *FortiGate*, *Workstation*, *IDRAC*, etc.
Destination Device Geolocation	Device geographical country such as *United States*.
Destination Device Category	Device category such as: *NAS*, *Virtual Machine, Firewall*, etc.
Destination Device Vendor	Device vendor such as *VMware*, *Dell*, *Synology*, etc.
Destination Device OS	Device Operating system such as *Windows*, *Linux*, etc.

Protocol and Application behavior	
Transport Layer Protocol	UPD, ICMP, TCP, etc
Application Layer Protocol	TLS, HTTP, SMB, etc
Protocol/Application Behaviors/Action	Specific application actions such as. *Adobe Reader form creation*, *WebDAV reload*, *Wasabi file upload*, etc

Others	
Session Packet Size	FortiNDR categorizes the packet size into 3 groups: • Small: Less than 100 bytes

Others	
	• Medium: 101- 99999 bytes • Larger: Equal to and greater than 100000 bytes
Destination Port	Port number such as, *22*, *445*, *none reserved port*, etc.
TLS Version	The TLS version if TLS is being used.

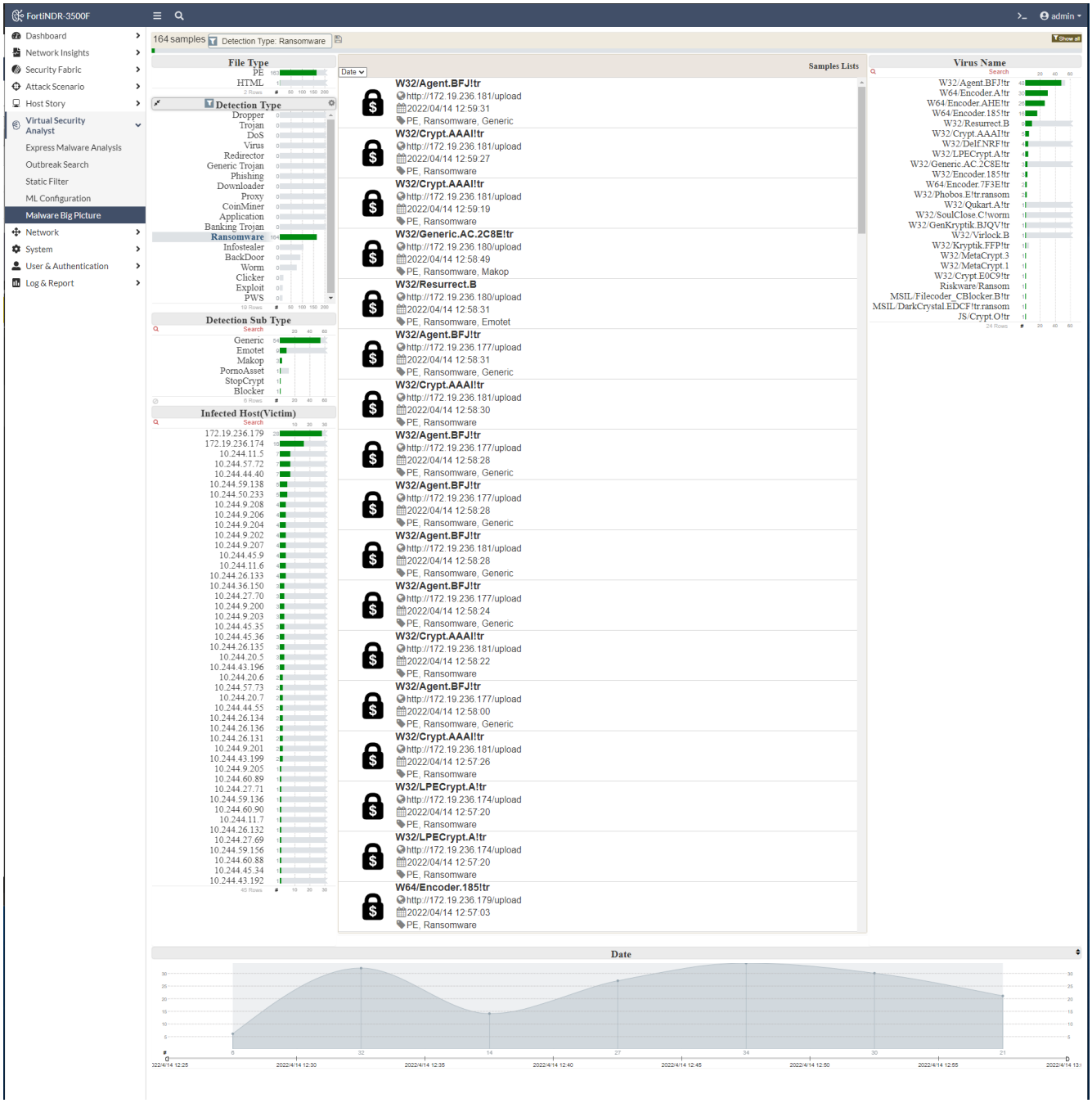
Typically, it will take 7 days for baseline of traffic. Choosing different features to train new baseline will cause the ML system start another 7 day training period. The old baseline is discarded during the re-training. You will not be able to get ML detection during that time.


ML Configuration
Baseline Status
Baseline Ready
ML Discovery Detection
Enable
Disable
Latest Training Completion
2022/07/18 00:59:56
The following features are used in Machine Learning profiling of network traffic, with the goal of identify anomalies on network. Typically it will take a week for baseline of traffic, if changes are made below, new baseline will replace existing baseline for detection.
Feature Enabled for Learning (7 features selected)
Default feature configuration
Device Info
Source device IP
Do not apply netmask
Apply Class C netmask
Apply Class B netmask
Destination IP
Do not apply netmask
Apply Class C netmask
Apply Class B netmask
Source device MAC address
Destination device model
Destination device Geolocation
Destination device category
Destination device vendor
Destination device MAC address
Destination device OS
Protocol and Application Behavior
Transport layer protocol
Application layer protocol
Protocol/Application behaviors/Action
Application type
Others
Source session packet size
Destination port
TLS version
Source port
Apply
Cancel

Malware Big Picture

Malware Big Picture proves useful for forensic analysis to assess damage to the network. This big picture view includes information such as detection time, =detection type and sub type. You can click a type to filter it.

The image below is an example a Ransomware filter. Infected IP addresses with Ransomware are highlighted. SOC analysts can view the infected hosts.



Network

Use the *Network* options to configure system settings such as configuring interfaces, DNS, and static routes.

Interface

FortiNDR has the following preset ports which cannot be changed.

Port (interface)	Type	Default open ports
Port1	10GE copper 10G	Management port. TCP 443 (HTTPS and GUI), TCP 22 SSH (CLI).
Port2	10GE copper 10G	Sniffer port (default).
Serial / Com1	Serial port	9600 baud, 8 data bits, 1 stop bit, no parity, XON/XOFF.
Port3 and Port4	1GE IPMI (Intelligent Platform Management Interface)	Disabled (default).

Only Super Admin users can access the CLI using SSH. For more information, see Administrator and Admin Profiles on page 100.

DNS and Static Routes

Use the *DNS* and *Static Routes* pages to configure DNS and routing entries.

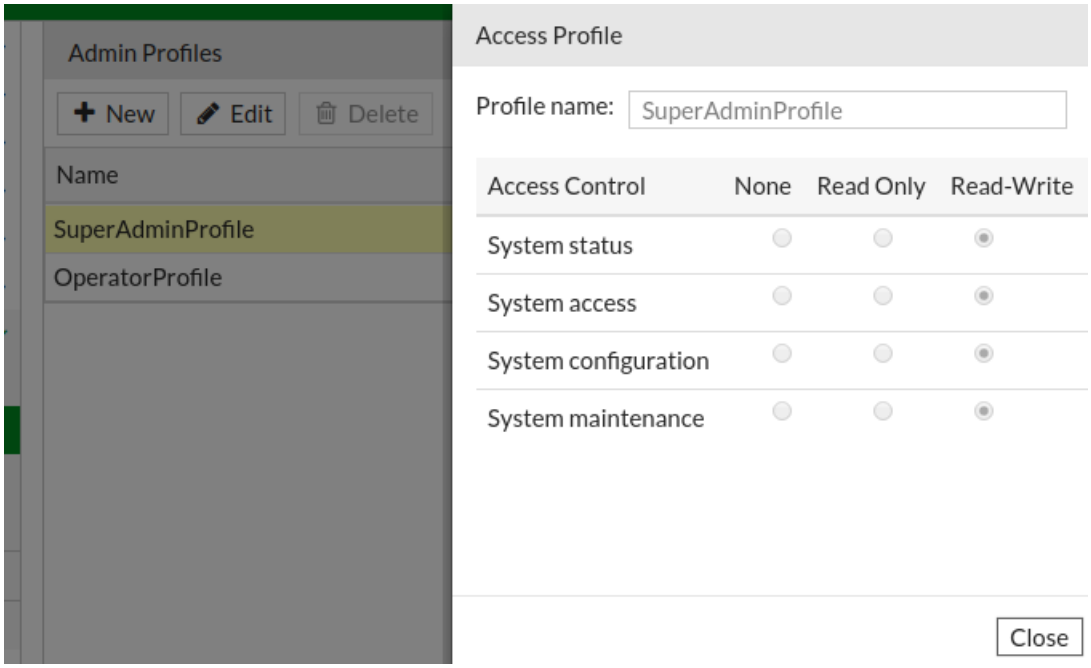
System

Use the *System* options to configure system settings.

Administrator and Admin Profiles

FortiNDR supports local and remote LDAP authentication for administrators via. You can create *Administrator* accounts with an *Admin Profile* that allows access to selected areas.

An *Admin Profile* has the following *Access Control* options.



Firmware

Use the Firmware page to update or restore the system firmware. Downgrading to previous firmware versions is not supported.

Due to some database changes, after upgrade from 7.0.0 to 7.0.2, users will need to execute a CLI to clean up historical NDR log entries. Note this will clear all NDR logs, but malware logs will remain.

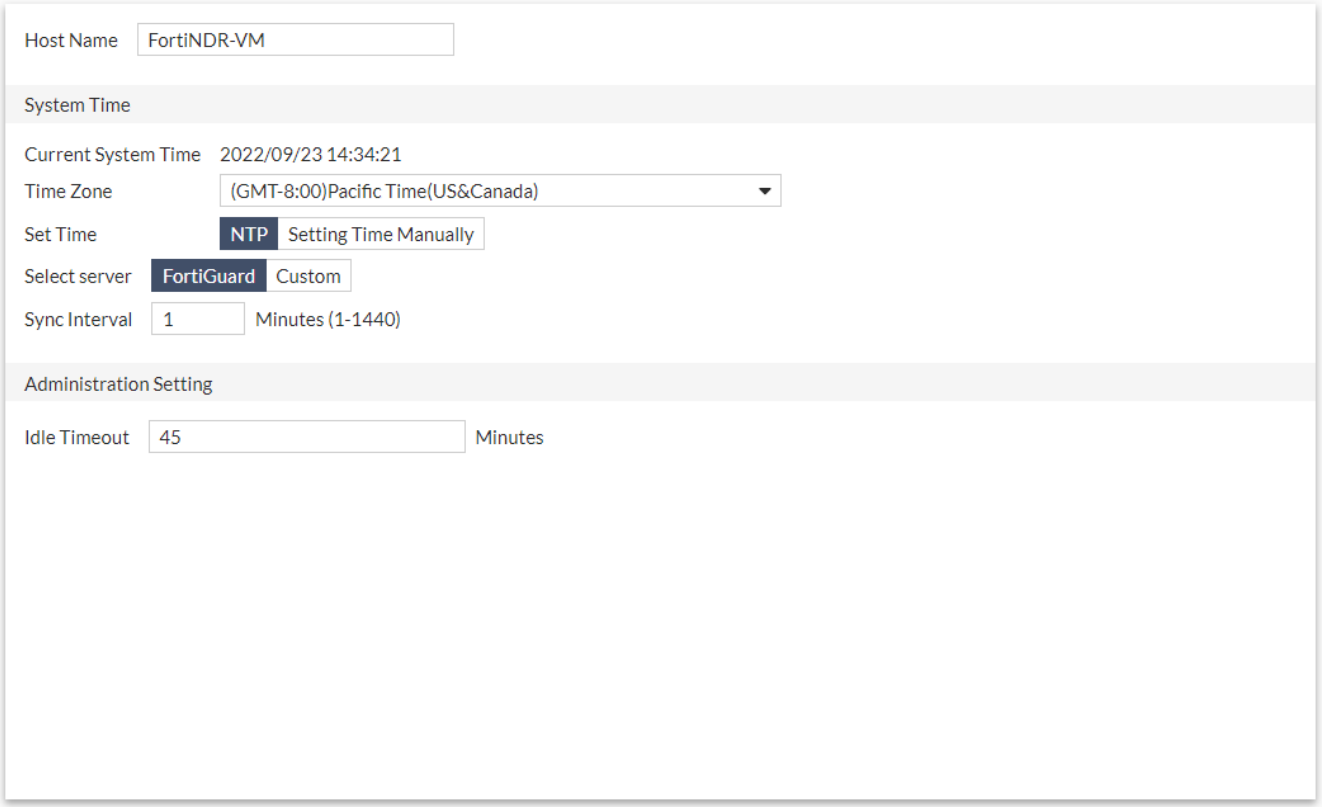
```
execute cleanup ndr
```

To update or restore the system firmware:

1. Locate and download the firmware file in the Fortinet support website.
2. Go to *System* > *Firmware*.
3. Click *Upload* and navigate to the firmware file on your computer and click *Open*.
4. Click *OK*.

Settings

Use *System* > *Settings* to configure the Host Name, set the system time and the idle timeout.



Host Name	The Host Name for the device.
System Time	
Current System Time	The current system time.
Time Zone	Select the time zone from the drop down list.
Set Time	Select *NTP* or select *Setting Time Manually* and then enter the *Date* and *Time*.
Select Server	Select *FortiGuard* or select *Custom* to add or remove the *Server*.

Sync Interval	Select a value between 1-1440 minutes.
Administration Setting	
Idle Timeout	Enter the idle timeout value in minutes.

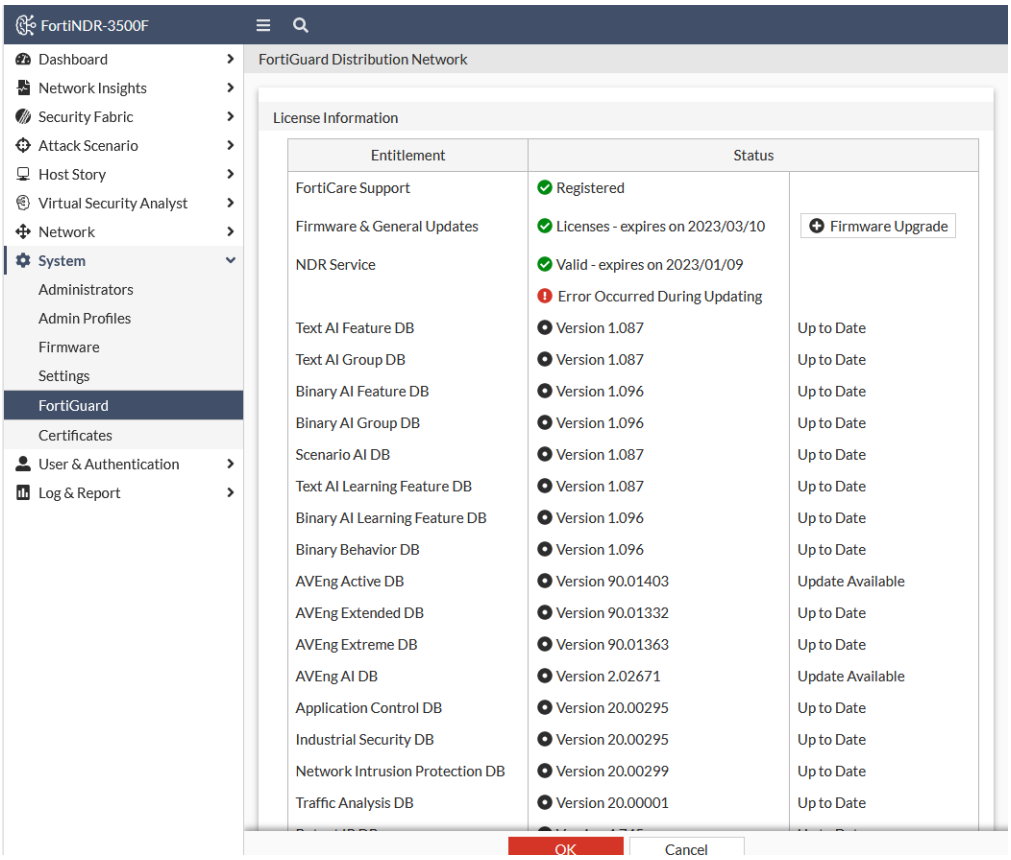
FortiGuard

FortiNDR relies on many local DB updates and some cloud lookups for detections to work. By default, the factory configuration of FortiNDR has local DB such as IPS and botnets loaded. Upon initial install it's important to get the most recent updates for accurate detection. The best way to get and install these updates is with an Internet connection. For offline deployments Please refer to Appendix D - FortiGuard Updates on page 165. To view a list of updates, go to *System* > *FortiGuard*.

The latest version of NDR packages can be offline updated using the following CLI commnad:

```
execute restore ipsdb / avdb/ kdb [disk/tftp/ftp] filename
```

Please refer to Appendix D - FortiGuard Updates on page 165 and CLI guide for more detail.



Use *System* > *FortiGuard* to view or update the version of *Entitlements* of your machine. You can update the version of entitlement using the GUI or CLI. For Malware detection using ANN (artificial neural network) is several GB in size, using the CLI to update the ANN database locally might be faster.

The latest version and updates of ANN are at FortiGuard service update at https://www.fortiguard.com/services/fortindr.

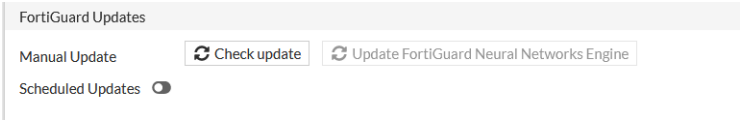
Currently, FortiNDR retrieves ANN updates from US and EMEA FortiGuard servers.

FortiNDR selects the update server based on proximity and location.

Besides ANN updates, FortiNDR also uses an AV engine for additional file scanning and accuracy, NDR and IPS engines for detecting network anomalies. Thus, regular updates to the AV/IPS/NDR databases are recommended. Note that AV signatures are used only when the ANN cannot determine if a file is malicious. If a file is determined to be malicious by ANN, then AV engine is not triggered.

To update the ANN database for malware detection using the GUI:

1. Go to *System* > *FortiGuard* and click *Check update*.



2. Click *Update FortiGuard Neural Networks Engine*.
   This triggers an install of the new ANN.
   Because the ANN update is several GB in size, this procedure might take several hours. You can log out of the GUI after the update has started.

To update the ANN database using the CLI:

1. Go to the Fortinet support website and download the ANN network database files.
   There are two ANN network databases: `pae_kdb` and `moat_kdb`. `pae_kdb` has about six to eight individual files that you have to download.
   There is only one `moat_kdb.tar.gz` because it is small and doesn't have to be split. After downloading them for the `pae_kdb`, unzip them into `pae_kdb.tar.gz`.
2. Unzip the downloaded files to `pae_kdb.tar.gz` and `moat_kdb.tar.gz`.
   In Windows:
   a. `copy /B pae_kdb.zip.* pae_kdb.zip`
   b. Right-click the `pae_kdb.zip` package and click *Extract All*.
   In Linux:
   a. `cat pae_kdb.zip.* > pae_kdb.zip`
   b. `unzip pae_kdb.zip`
3. Put `pae_kdb.tar.gz` and `moat_kdb.tar.gz` on a disk that FortiNDR can access, such as a TFTP or FTP server, or a USB drive.
   If you use a USB drive, ensure its format is ext3 compatible, has only one partition, and the file is in the root directory.
4. Use the CLI command `execute restore kdb` to update the kdbs. Run this command once for `pae_kdb.tar.gz` and once for `pae_kdb.tar.gz`.
   For example, if `pae_kdb.tar.gz` and `moat_kdb.tar.gz` are in the FTP (IP:2.2.2.2) home folder of `/home/user/pae_kdb.tar.gz` and `/home/user/moat_kdb.tar.gz`, then use these commands:

```
execute restore kdb ftp pae_kdb.tar.gz 2.2.2.2 user password
execute restore kdb ftp moat_kdb.tar.gz 2.2.2.2 user password
```

   This is an example of the output:

```
# execute restore kdb ftp pae_kdb.tar.gz 2.2.2.2 user password
This operation will first replace the current scanner db files and then restart the
```

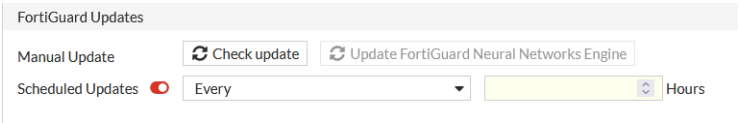
```
scanner!
Do you want to continue? (y/n)y
Connect to ftp server 2.2.2.2 ...
Please wait...
Get file from ftp server OK.
Get file OK.
MD5 verification succeed!
KDB files restoration completed
Scanner restart completed
```

5. Go to *System* > *FortiGuard* to verify the updated versions.

Entitlement	Version
Binary AI 5	
Binary AI Engine	Version 1.009
Binary AI Learning Engine	Version 1.000
Binary AI Feature DB	Version 1.030
Binary AI Group DB	Version 1.030
Binary AI Learning Feature DB	Version 1.030
Scenario AI 2	
Scenario AI Engine	Version 1.000
Scenario AI DB	Version 1.001
Text AI 5	
Text AI Engine	Version 1.000
Text AI Learning Engine	Version 1.000
Text AI Feature DB	Version 1.001
Text AI Group DB	Version 1.001
Text AI Learning Feature DB	Version 1.001

To schedule FortiGuard updates:

1. Go to *System* > *FortiGuard*.
2. In the *FortiGuard Updates* area, enable *Scheduled Updates*.



3. From the frequency dropdown, select *Daily* or *Weekly*.
4. In the *Hours* field a numeric fall for the frequency.
5. Click *OK*.

Certificates

Use *System* > *Certificates* to import, view, and delete certificates. Certificates are used for secure connection to an LDAP server, system HTTPS, or SSH services. FortiNDR installs one default certificate.

High Availability (HA)

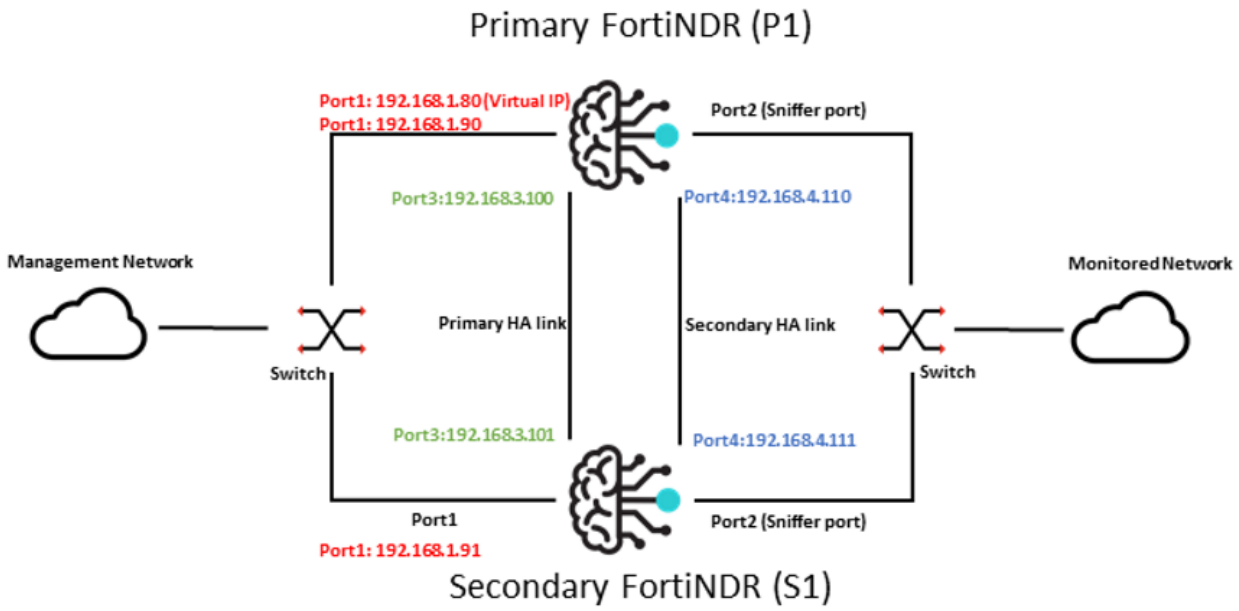
FortiNDR HA supports active-passive mode, in both hardware and virtual machines, which consists of two FortiNDR units in the HA group: the primary unit and the secondary unit. The primary unit will act as the active unit performing malware detection and verdict, as well as synchronize configurations and data to the secondary unit. The secondary unit will perform these functions if the primary unit fails.

HA setup requirements

Before configuring the HA group, the two FortiNDR units must meet the following requirements:

- Both units must have the same firmware version.
- Both FortiNDR units should have the default management interface port1 be accessible. Port1 will be used for HA configuration and checking HA status. Port1 management IPs for both units will be different, please see the example in Configuring an HA group on page 106.
- We recommend using Port3 and Port4 for HA heartbeat and synchronization. The heartbeat interfaces between the two units should be connected directly or through a dedicated switch and have IP addresses in the same subnet. While two heartbeat interfaces are recommended for fail-safe, one heartbeat link can also be used.

The following image is an example of active-passive HA topology:



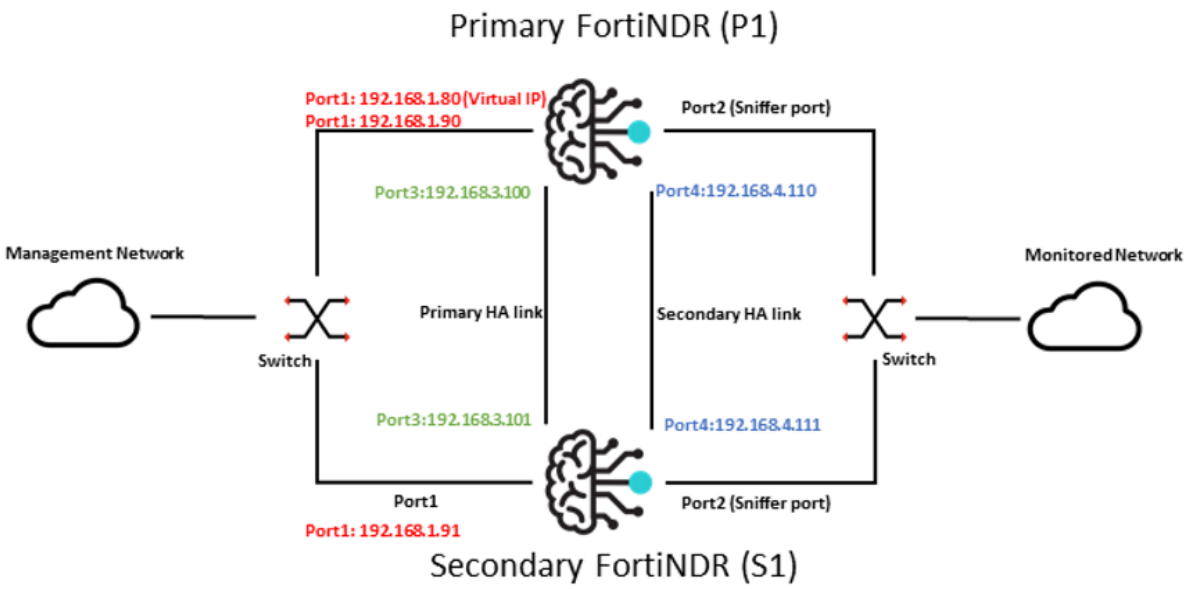
Configuring an HA group

Before configuring an HA group, we recommend performing a factory reset or restoring the database on both FortiNDR primary and secondary units.

If your FortiNDR unit is running, you can join a secondary unit to form the HA. However, you should allow more time to synchronize larger databases.

To configure an HA group:

1. Make all the necessary connections and network settings configuration. Individual interface settings for both units can be configured from the *Network* page or with the CLI.
   The following image shows an example network settings configuration:



2. Load the latest ANN database on both FortiNDR units. The ANN database can be updated from FDS (see, Updating the ANN database from FDS for malware detection on page 14) or with the CLI (see, Loading the ANN database to FortiNDR for malware detection on page 10).

- The ANN database is not synchronized.
- The ANN scheduled update settings are not synchronized. You will need to configure both units to enusre the latest ANN is used after failover.

3. On the primary unit, use the CLI to configure the HA for the network topology (see the example above):

```
config system ha
    set mode primary
    set password xxx
    config interface
        edit port1
            set virtual-ip 192.168.1.80/24
            set  action-on-primary use-vip
            set port-monitor enable
        end
        edit port3
            set heartbeat-status primary
            set peer-ip 192.168.3.101           << IP of secondary unit's port3
interface
        end
        edit port4
            set heartbeat-status secondary
            set peer-ip 192.168.4.111          << IP of secondary unit's port4 interface
    end
end
```

CLI option	Description
`mode`	Enables or disables HA, selects the initial configured role: • `Off`: disable HA. • `Primary`: configured as primary Unit. • `Secondary`: configured as secondary Unit.
`password`	Enter an HA password for the HA group. You must configure the same password value on both the primary and secondary units.
`heartbeat-status`	Specify if this interface will be used for HA heartbeat and synchronization: • `Disable`: The interface is not used for HA heartbeat and synchronization. • `Primary`: We recommend to using port3 as the primary HA interface. • `Secondary`: We recommend having a secondary HA interface to improve availability. Use port4 as the secondary HA interface.
`peer-ip`	When configuring primary HA interfaces: • When configuring the primary `unit`, enter the IP address of the secondary unit's `primary` HA interface. • When configuring the secondary `unit`, enter the IP address of the primary unit's `primary` HA interface. The same rule should be applied when configuring the secondary HA interface.
`virtual-ip`	Enter the virtual IP address and netmask for this interface. If configured, this virtual IP can serve as the external IP of the HA group. When failover occurs, this setting will take effect on the new Primary unit. For details, see Using Virtual IP on page 113.
`action-on-primary`	`ignore-vip [Default]`: Ignore the Virtual IP interface configuration on the new Primary unit after failover. `use-vip`: Add the specified Virtual IP address and netmask to the interface on the new Primary unit after failover.
`port-monitor`	Enable to monitor a network interface for failure on the Primary unit. If the interface failure is detected, the Primary unit will trigger a failover. This does not apply to heartbeat interfaces.

4. On the Secondary unit, configure the HA using the same CLI configuration except for the `ha mode` and `peer-ip` settings for the HA interface.

```
config system ha
    set mode secondary
    set password xxx    << password should be same as primary unit
    config interface
        edit port1                          << HA configuration for port1  should be same
as primary unit
            set virtual-ip 192.168.1.80/24
            set  action-on-primary use-vip
            set port-monitor enable
```

```
        end
        edit port3
            set heartbeat-status primary
            set peer-ip 192.168.3.100      << IP of primary unit's port3 interface
        end
        edit port4
            set heartbeat-status secondary
            set peer-ip 192.168.4.110      << IP of primary unit's port4 interface
    end
end
```

5. Check the HA status of both units.
   - Ensure the HA effective mode on both units has been updated successfully.
   - Check the HA status details. See, Check HA status on page 109.
   - Ensure no errors appear on the HA event log. See, HA Logs on page 113.

After the HA group is configured:

- The heartbeat check between the primary and secondary units will be done through the HA port.
  The default heartbeat check is 30 seconds. This is configurable via the CLI.
- Configuration changes will be synced from the primary unit to the secondary unit. See HA configuration settings synchronization on page 112.
- Data (Database and sample files) will be synced from the primary unit to the secondary unit.

The database on the primary unit is large. Database synchronization may take a while.

Check HA status

After HA is enabled, the HA status needs to be checked on both the Primary and Secondary units. Once HA has been configured, the effective operating mode is typically the same as the configured mode. However, the effective operating mode may diverge from the configured mode after HA failover is triggered.

HA Configured Mode	Displays the HA mode that you configured • *Primary*: Configured to be the primary unit. • *Secondary*: Configured to be the secondary unit.
HA Effective Mode	Displays the current operating mode • *Primary*: Acting as primary unit • *Secondary*: Acting as secondary unit • *Failed*: Occurs when network interface monitoring has detected a failure, failover is triggered afterward.

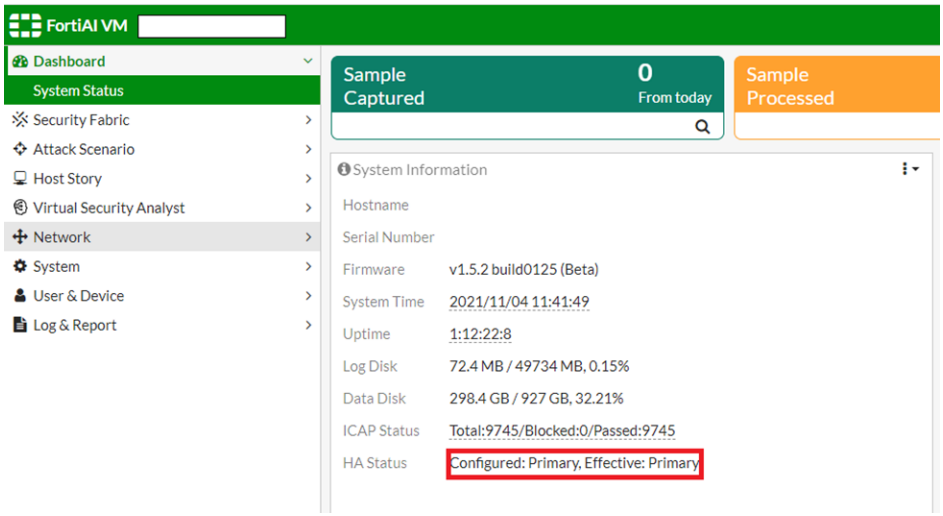
To check HA status with the CLI:

```
get system status
```

```
[redacted] # get system status
Version:                    FortiAI-VM v1.5.2,build120,211029 (Beta) (Debug)
Architecture:               64-bit
Serial-Number:              [redacted]
BIOS version:               n/a
Log disk:                   Capacity 48 GB, Used 71 MB (0.15%), Free 48 GB
Data disk:                  Capacity 926 GB, Used 434 GB (46.88%), Free 492 GB
Remote disk:                n/a
Memory:                     Capacity 31 GB, Used 27 GB (88.83%), Free 3590 MB
Swap Memory:                Capacity 31 GB, Used 12 GB (37.95%), Free 19 GB
Hostname:                   [redacted]
HA configured mode:         Primary
HA effective mode:          Primary
```

To check the HA status with the GUI:

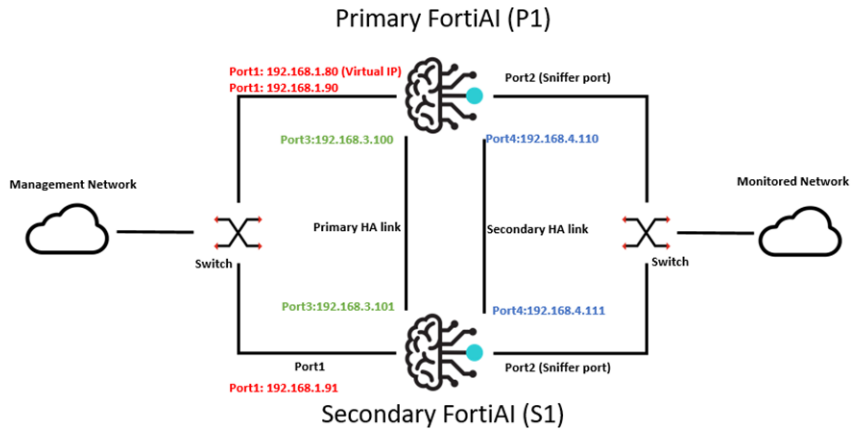
1. Go to *Dashboard* > *System Status* > *Network*.
2. In the *System Information* widget, go to *HA Status*.



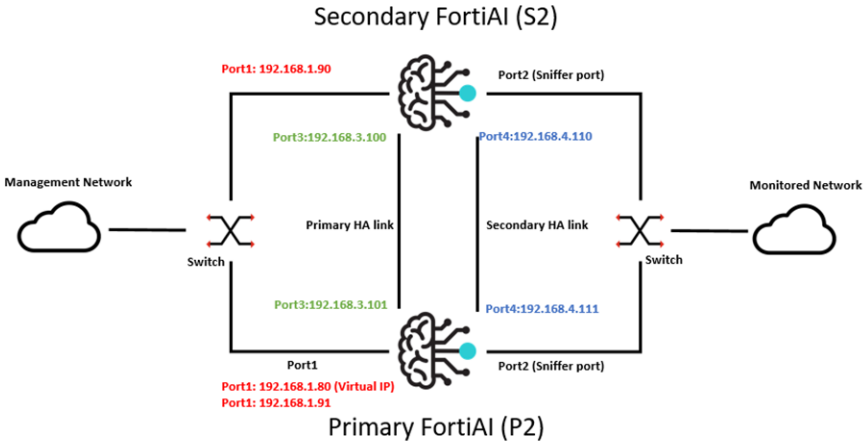
HA Failover

When an HA Failover occurs, the primary and secondary units switch roles.

Network topology before failover:



Network topology after failover:



Failover scenario 1: Temporary failure of the primary unit

Temporary failure of the Primary unit when the primary unit's:

- System is down due to a sudden loss of power.
- Monitored port link has failed.

When any of the two scenarios above occurs on the primary unit:

- The FortiNDR HA group is operating normally. *P1* is the primary unit and *S2* is the secondary unit.
- *P1* runs into failure which could be a sudden loss of power, or the monitored port link has been detected as failed.
- The effective HA operating mode of *S2* changes to *primary*.
- When the monitored port link fails, the effective HA operating mode of *P1* changes to *fail*.
- The effective HA operating mode of *P1* changes to *secondary* when the system is back or the monitored port link is up again.

The failover time in this scenario will depend on the heartbeat settings.

Failover scenario 2: System reboot or reload of the primary unit

System reboot or reload of the primary unit occurs when you trigger a system reboot or reload on the primary FortiNDR:

1. *P1* will send a `HOLDOFF` command to *S2* so that *S2* will not take over the primary role during *P1*'s reboot/reload.
2. *S2* will hold off checking the heartbeat with *P1*.

S2 will only hold off for about 15 minutes. This is not configurable.

3. If *P1* reboot/reloads successfully within 15 minutes, *P1* will stay in primary mode and *S2* will go back to secondary from hold off.
4. Otherwise, *S2* will take over the primary role, and *P1* will change to secondary role when it is back.

Failover scenario 3: Heartbeat links fail

This occurs when the primary heartbeat link fails, and no secondary heartbeat link is configured or secondary heartbeat failed as well:

- The FortiNDR HA group is operating normally. Then the heartbeat link fails between the Primary unit and Secondary unit.
- The effective HA mode of *S2* changes to *primary*. At this time both units are acting as Primary units.
- When the heartbeat link is reconnected, one of the units will be picked to switch back to Secondary unit, while the other will stay as Primary unit.

Trigger HA failover using CLI

You can also trigger and HA failover by running the CLI on the primary unit:

- The FortiNDR HA group is operating normally. Then on the primary unit, run the failover testing CLI: `execute ha test-failover`.
- The effective HA mode of the secondary unit changes to primary. The effective HA mode of the primary unit changes to secondary. The secondary unit will act as primary and take over operation.
- If you want to restore the effective mode to be same as the configured mode, run the failover testing CLI again on the new primary unit.

HA configuration settings synchronization

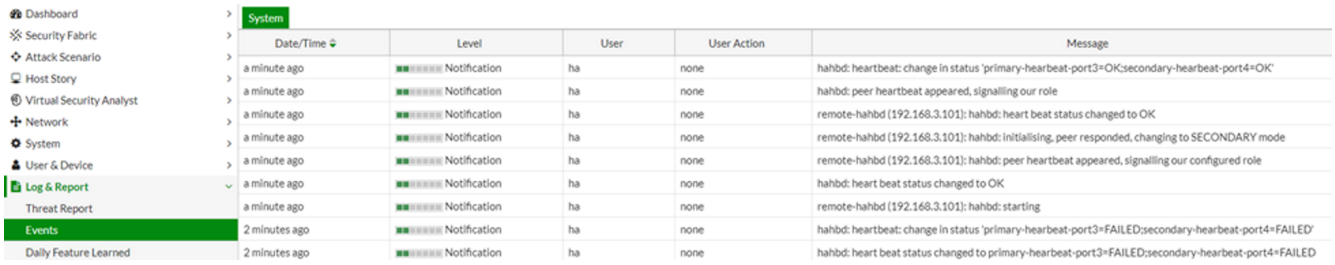
All configuration settings on the primary unit are synchronized to the secondary unit once the HA group has been configured successfully, with the excepting the following settings:

Configuration Settings	Description
HA Settings	HA related configurations
Network Settings	System network settings including: • System interface settings • System DNS settings • System Route settings
Host name	The host name distinguishes members of the HA group.
Default certificates	The default certificates.
FortiGuard update settings	The FortiGuard update settings are not synchronized. To keep up-to-date with the latest ANN database on the Secondary unit, you will need to manually trigger the update or enable scheduled updates on Secondary unit.
System Appearance	The appearance settings such as web GUI theme.

HA Logs

To view the HA event logs go to *Log & Report* > *Events*.

Once the HA group has been configured, the log data will be synchronized from the Primary unit to the Secondary unit.



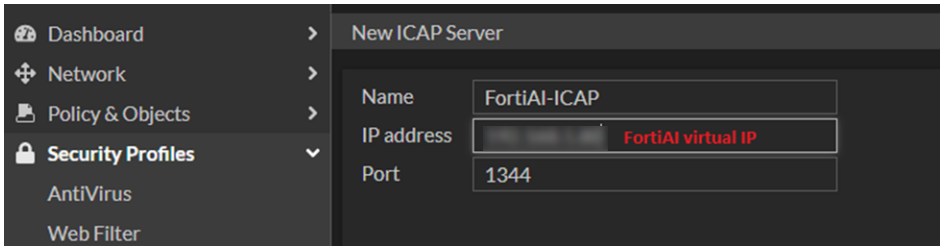
Using Virtual IP

Virtual IP serves as the external IP of the HA group used by other services in order to improve the handling of a single FortiNDR unit failure. When failover occurs, the new primary unit will replace that IP.

To use Virtual IP, you will need to configure and enable both the primary and secondary units with the same Virtual IP and netmask. To see an example of configuring a Virtual IP on interface port1, see Configuring an HA group on page 106.

Example: Configure FortiGate ICAP server with FortiNDR virtual IP

Instead of using the actual IP, you will need to provide the Virtual IP of the HA group when creating an ICAP server profile on FortiGate. For detailed ICAP configuration information, seeFortiNDR and FortiGate ICAP configuration example on page 41.

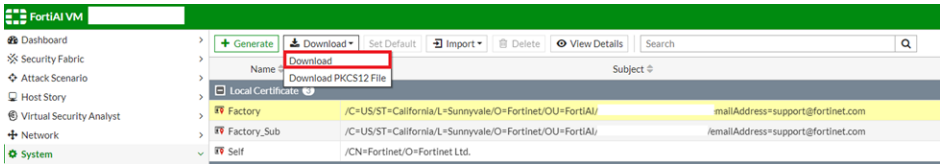


Example: Configure FortiGate Security fabric settings for inline blocking

FortiGate inline blocking requires FortiGate and FortiNDR Security Fabric pairing using the Security Fabric Connector. In order to allow a new primary unit pairing with FortiGate, both the certificate of the two FortiNDR units need to be added to the *Device authorization* list beforehand.

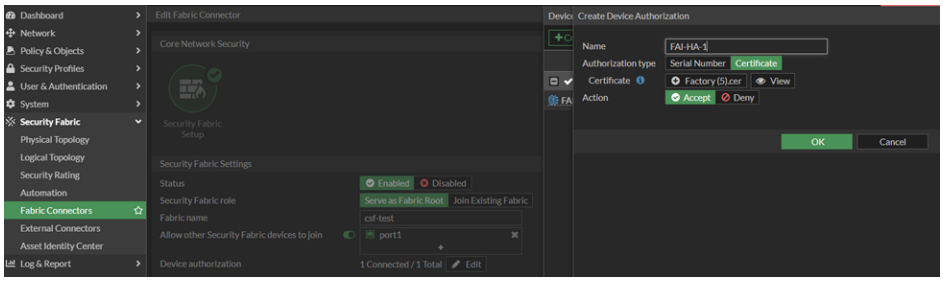
To configure FortiGate for inline blocking:

1. On the FortiNDR go to *System* > *Certificate.*
2. Under *Local Certificate*, select *Factory* .
3. In the toolbar click *Download* , to download the certificate.



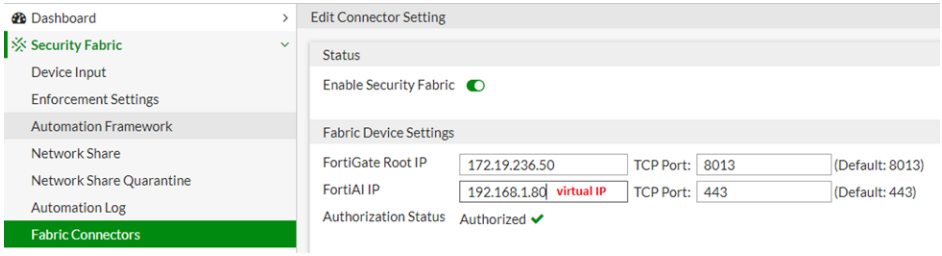
To add the certificate to FortiGate

1. On the FortiGate, go to *Security Fabric* > *Fabric Connectors*, and double-click *Security Fabric Setup*.
2. Double-click *Edit* in *Device authorization* and click *Create new*.



To enable FortiGate inline blocking:

1. On the Primary FortiNDR, go to *Security Fabric* > *Fabric Connectors*.
2. In the *FortiNDR IP* field, enter the Virtual IP.



You are not required to configure inline blocking on the secondary unit since the configuration will be synchronized.

For detailed information about inline blocking configuration, see FortiGate inline blocking (FOS 7.0.1 and higher) on page 25.

User & Device

FortiNDR supports remote authentication for administrators using RADIUS or LDAP servers. To use remote authentication, configure the server entries in FortiNDR for each authentication server in your network.

If you have configured RADIUS or LDAP support, FortiNDR contacts the RADIUS or LDAP server for authentication. When you enter a username and password in FortiNDR, FortiNDR sends this username and password to the authentication server. If the server can authenticate the user, FortiNDR authenticates the user. If the server cannot authenticate the user, FortiNDR refuses the connection.

Log & Report

On rare occasions, after upgrading to a new version or running the CLI command, `execute cleanup (ndr)`, the pages in this section may still show older history browser cache. Please refresh the pages (F5) to trigger the reload.

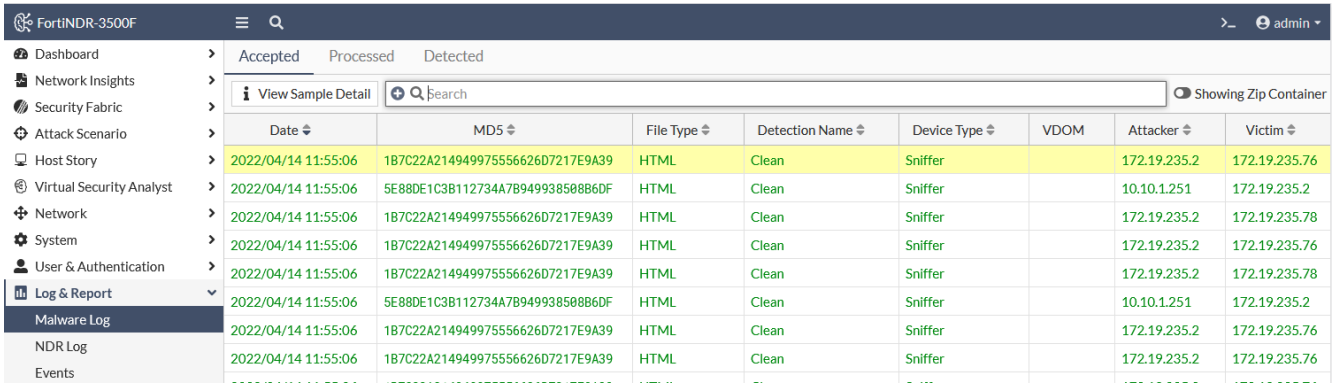
Malware Log

Malware Log reports provide administrators with a detailed view of malicious malware detected.

Details include *Date*, *MD5 checksum*, *File Type* such as portable executable, HTML, and so on. *Detection Name* is the unique name of the malware. *Device Type* is the source device from which the sample file is, eg. Sniffer, ICAP, etc.

The *Malware Log* also shows the *Confidence Level* as a percentage and as well as a Risk verdict of *High*, *Medium*, *Low* or *No Risk*.

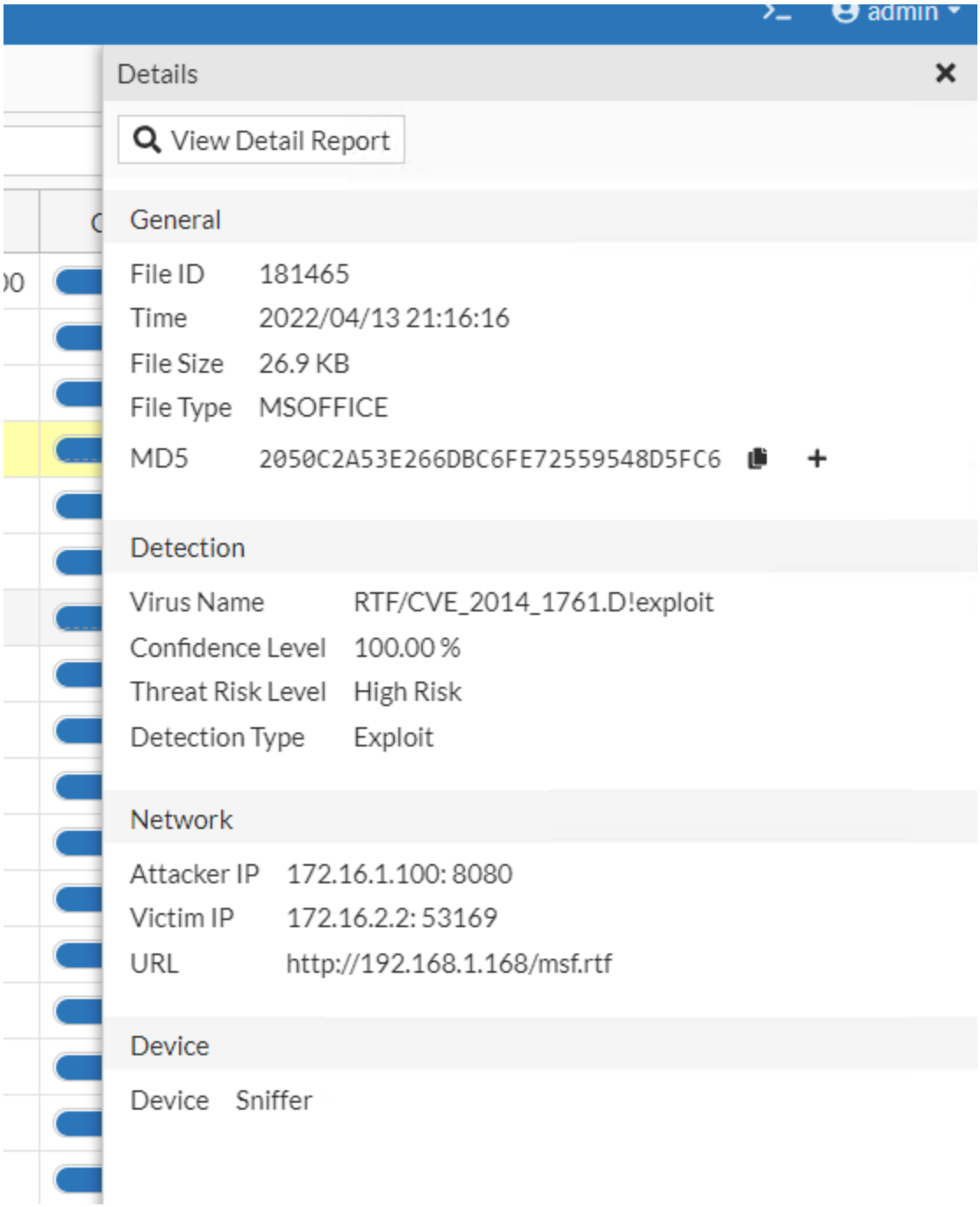
The *Indicator* displays icons if the detection has IOC detail. *Feature Detection* shows the detection feature type of the malware.



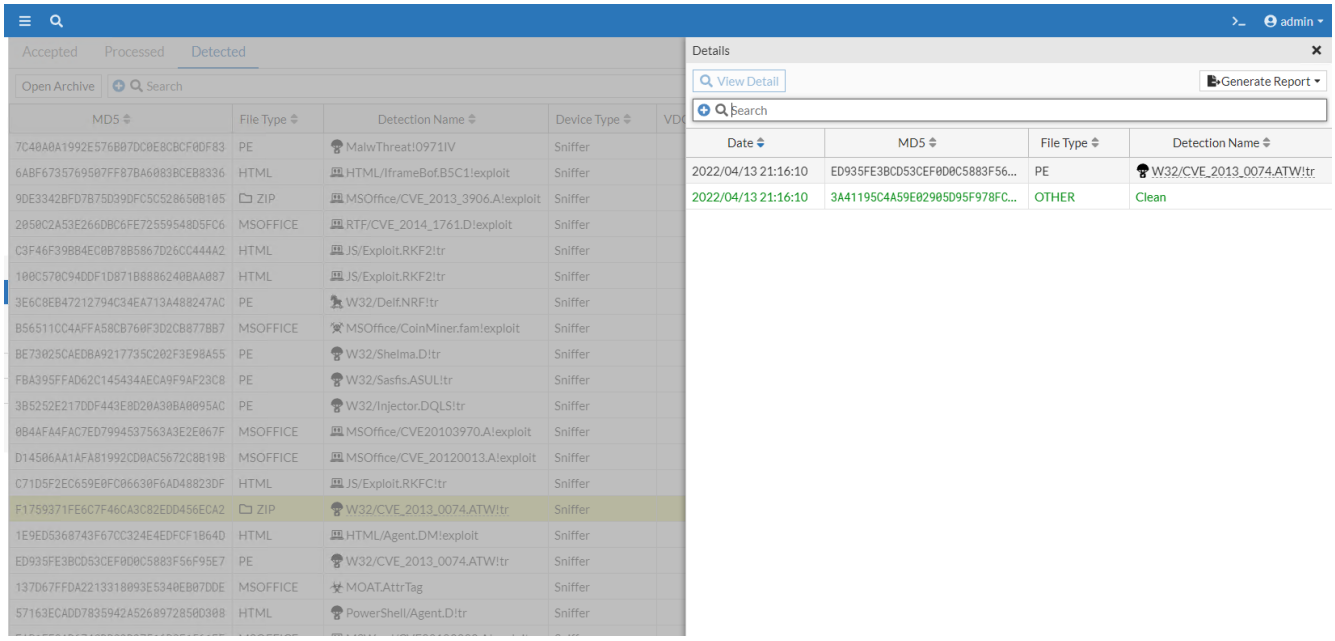
Threat Report has the following pages.

Accepted	Files accepted by FortiNDR parsers.
Processed	Both clean and malicious files processed by FortiNDR engines.
Detected	Malicious files processed by FortiNDR engines.

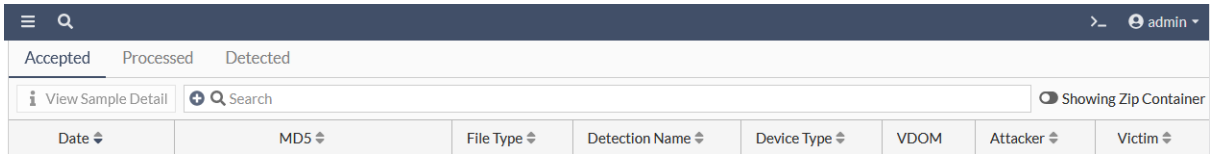
Double-click an entry to view a summary of the log entry


admin
Details
View Detail Report
General
File ID 181465
Time 2022/04/13 21:16:16
File Size 26.9 KB
File Type MSOFFICE
MD5 2050C2A53E266DBC6FE72559548D5FC6
Detection
Virus Name RTF/CVE_2014_1761.D!exploit
Confidence Level 100.00 %
Threat Risk Level High Risk
Detection Type Exploit
Network
Attacker IP 172.16.1.100: 8080
Victim IP 172.16.2.2: 53169
URL http://192.168.1.168/msf.rtf
Device
Device Sniffer

Double-click a zip folder to view what is inside the folder.

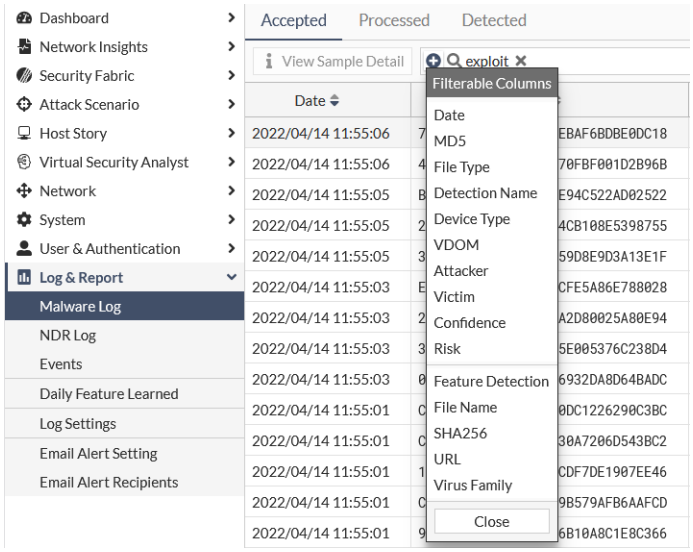


Enable *Showing Zip Container* to view the extracted files in the page.

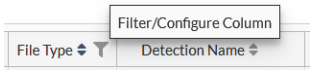


Advanced search

When you type a key words into the search field it will display partial results. Click the plus sign (+) to include filterable columns in your search. The *Search* function only supports exact matches. Wildcards are not supported.

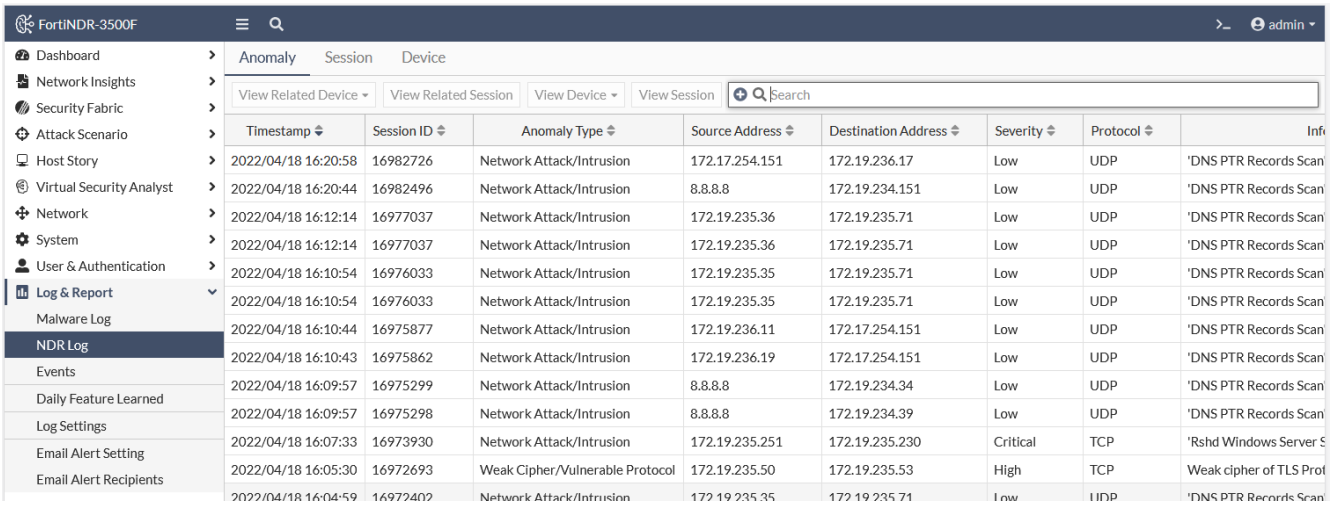


You can also filter the logs by clicking the filter icon in the column heading.



NDR Log

The NDR Log view displays information anomalies detected on the network, traffic sources and destinations, as well as devices discovered and detected by FortiNDR. Users are welcomed to use NDR Anomaly Type column to narrow and investigate the anomalies, by session or by device view.

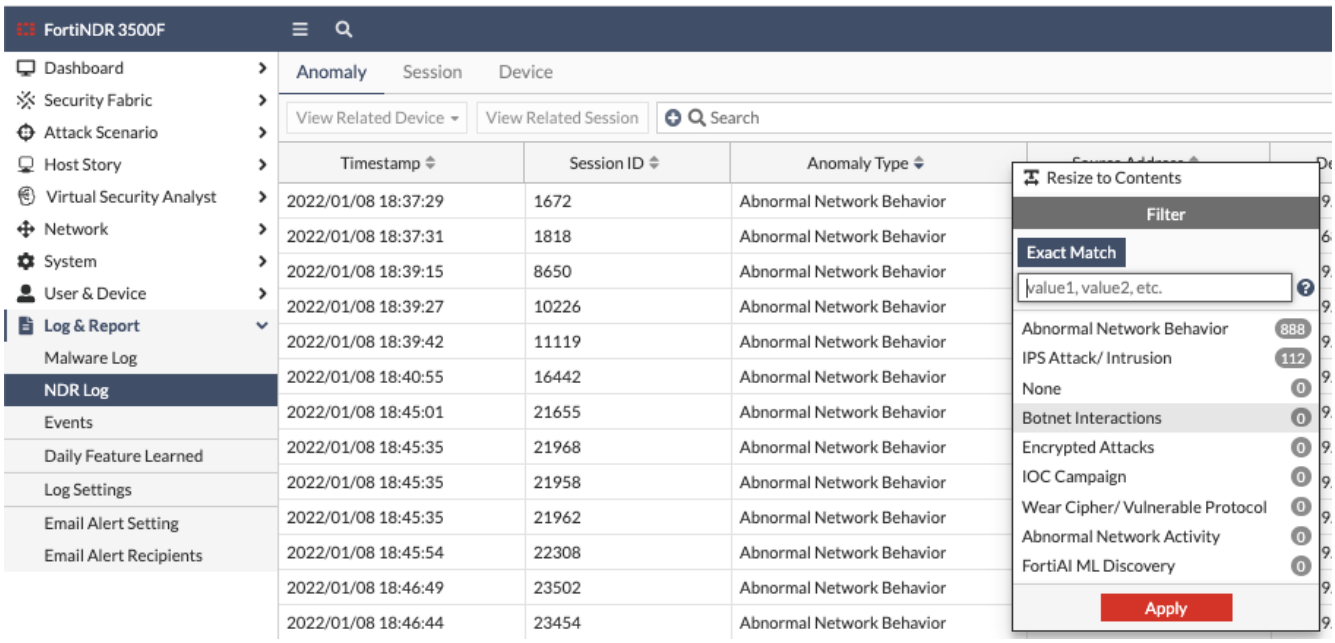


Anomaly tab

This *Anomaly* tab displays anomalies detected on the network. In a normal network, only a small percentage of network traffic are anomalies. The FortiNDR engine records both normal and anomaly traffic.

You can filter the logs by Anomaly Type but clicking the Filter icon in the column heading.

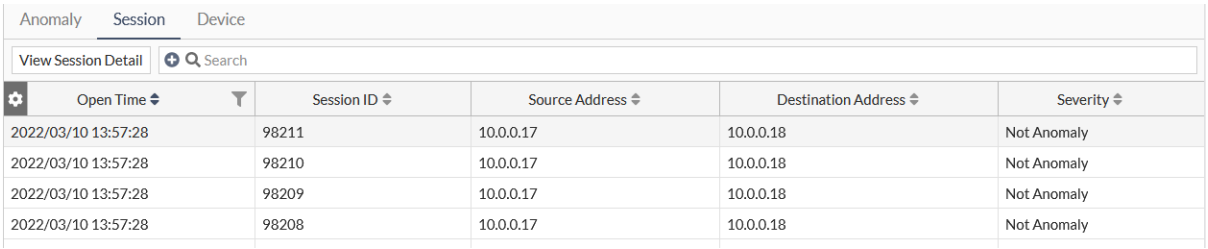
When filtering the Anomaly Type column, you can use `!=<type>` to filter out the types you don't want to see.



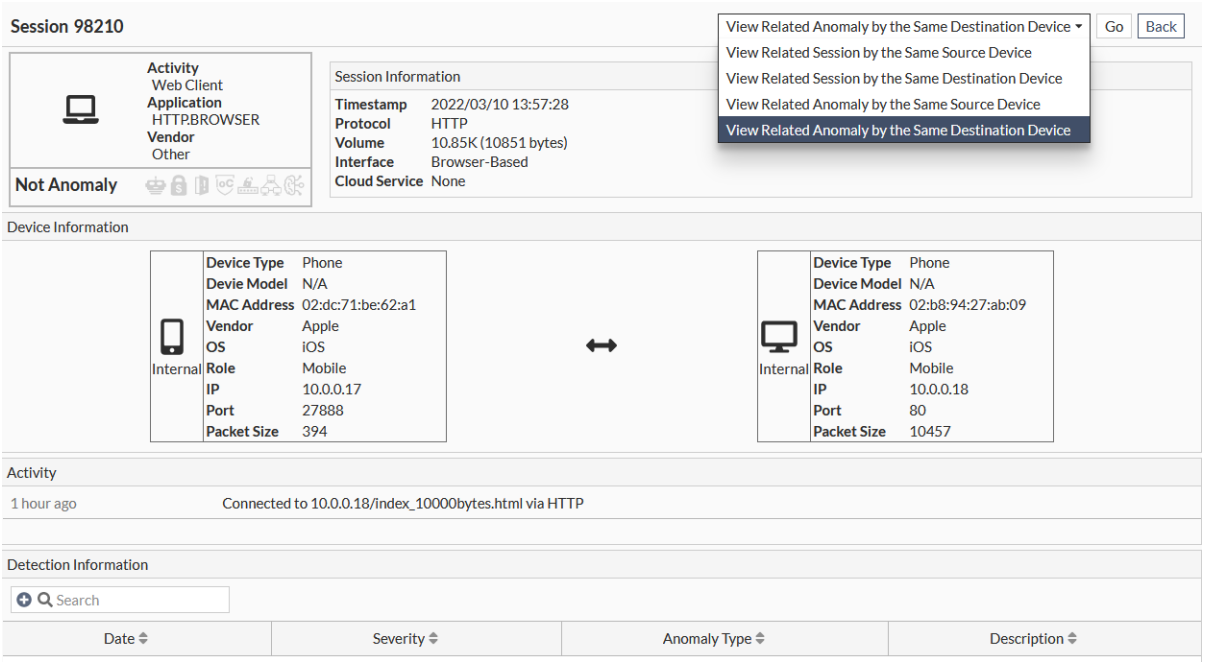
Session Tab

Use the *Sessions* tab to understand the relationship between sessions and anomalies. There could be multiple behaviors within a session and some connections within a session could be an anomaly. For example, a user accessing the Internet browses both Facebook normally and hits an IOC campaign Emotet within same session. You can also view the traffic *Source* and *Destination*, to determine whether the connection is internal or external.

To filter the sessions in the view, hover a column heading and click the filter icon.

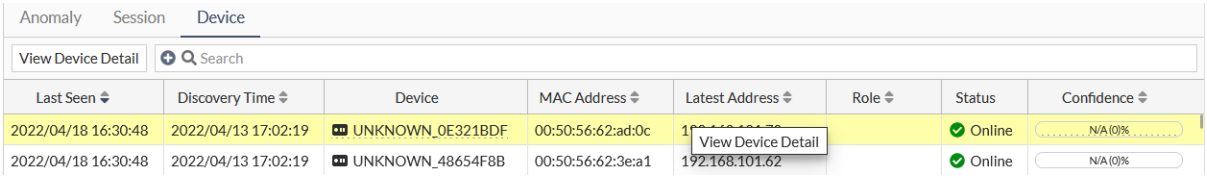


To drill down on the session information, click *View Session Detail*. Click the *Action* menu to view related information.



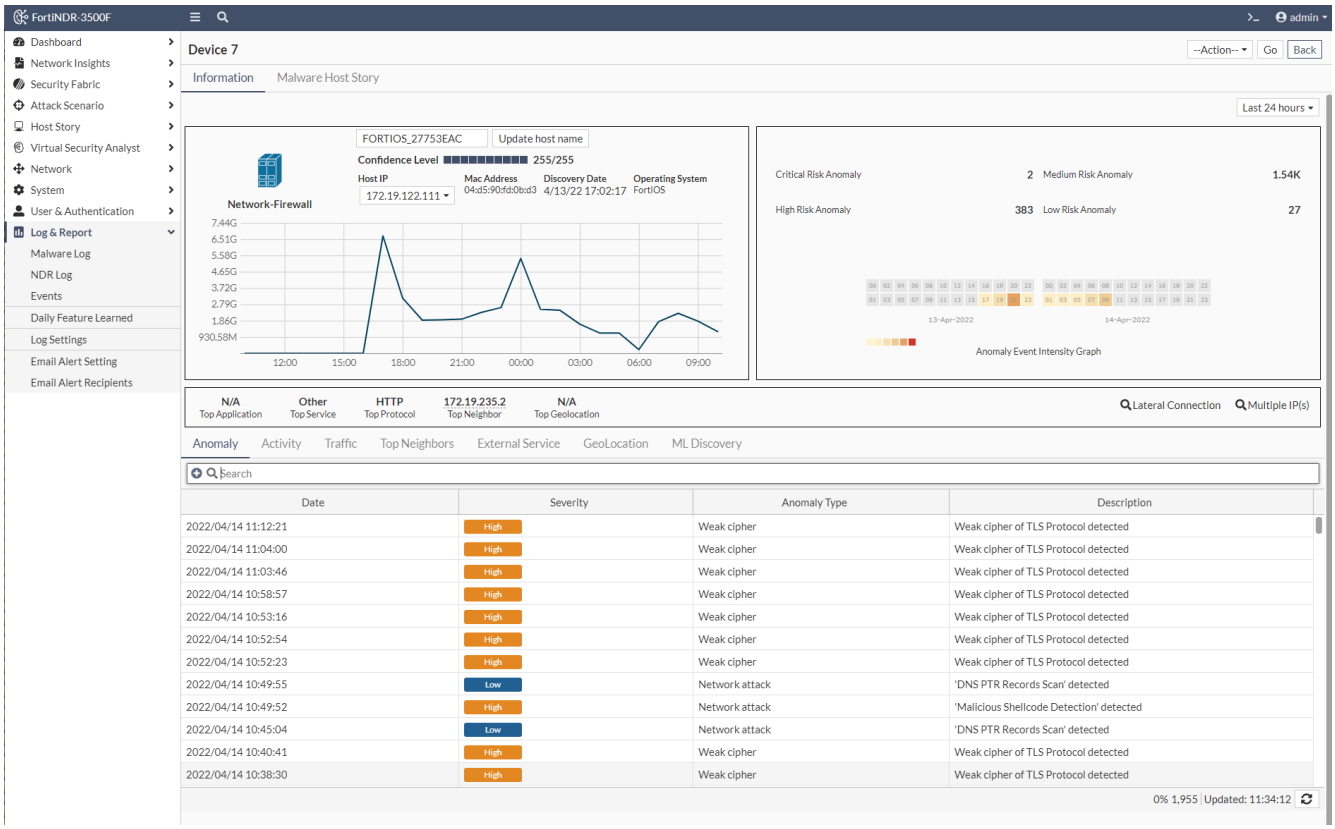
Device Tab

The Device tab the devices detected by FortiNDR. The FortiGuard IOT service is used to identify device information based on the MAC address. You can drill down to the devices page by clicking *View Device Detail* details.

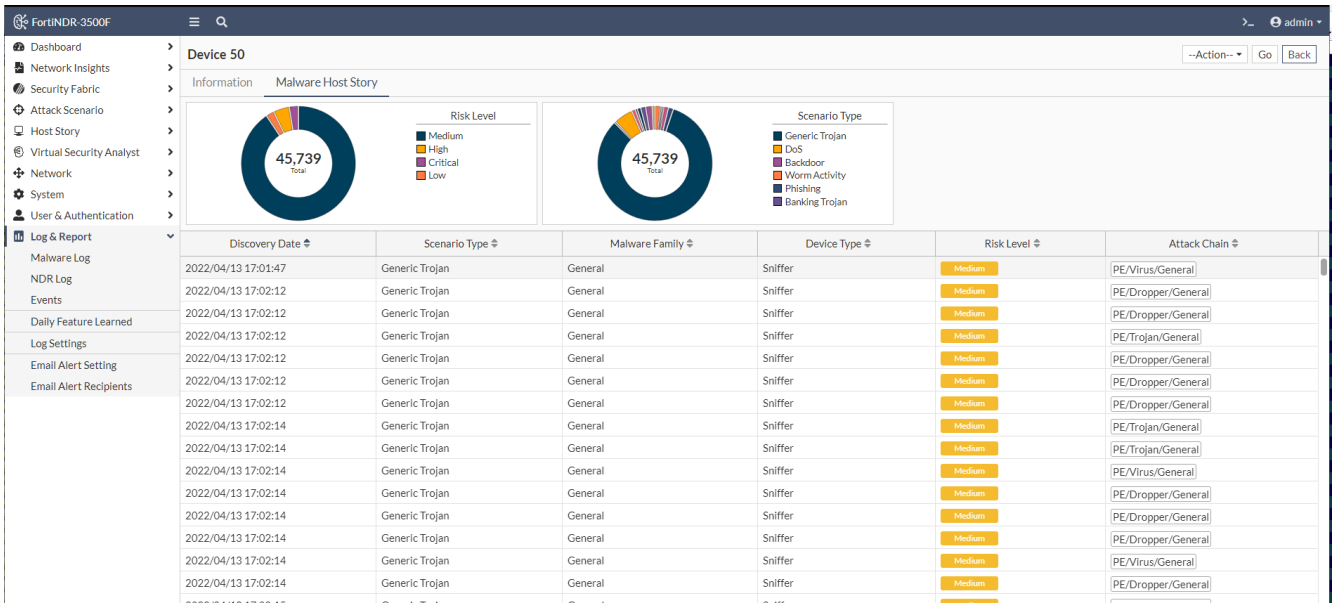


The *Device* page shows information about the device activity (both anomaly and normal events), as well as a heatmap for anomalies over the selected time period. A line graph shows the device traffic (inbound and outbound bandwidth combined). The *Confidence Level* indicates our confidence in identifying the device category.

In this following image, the device is identified as *Network Firewall*. The window at the bottom of the page shows the top anomalies, activities, traffic, neighbors, external services, a geolocation map of the device traffic and machine learning discovery.

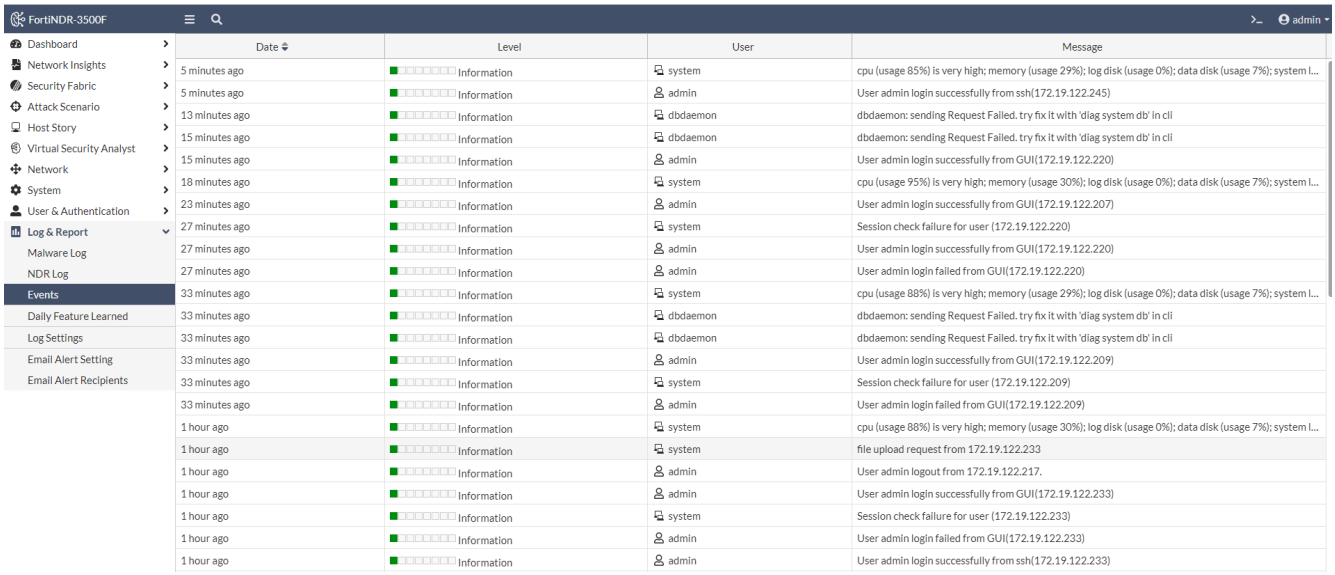


The Malware Host Story shows information about the malware *Risk Level* and *Scenario Type*.



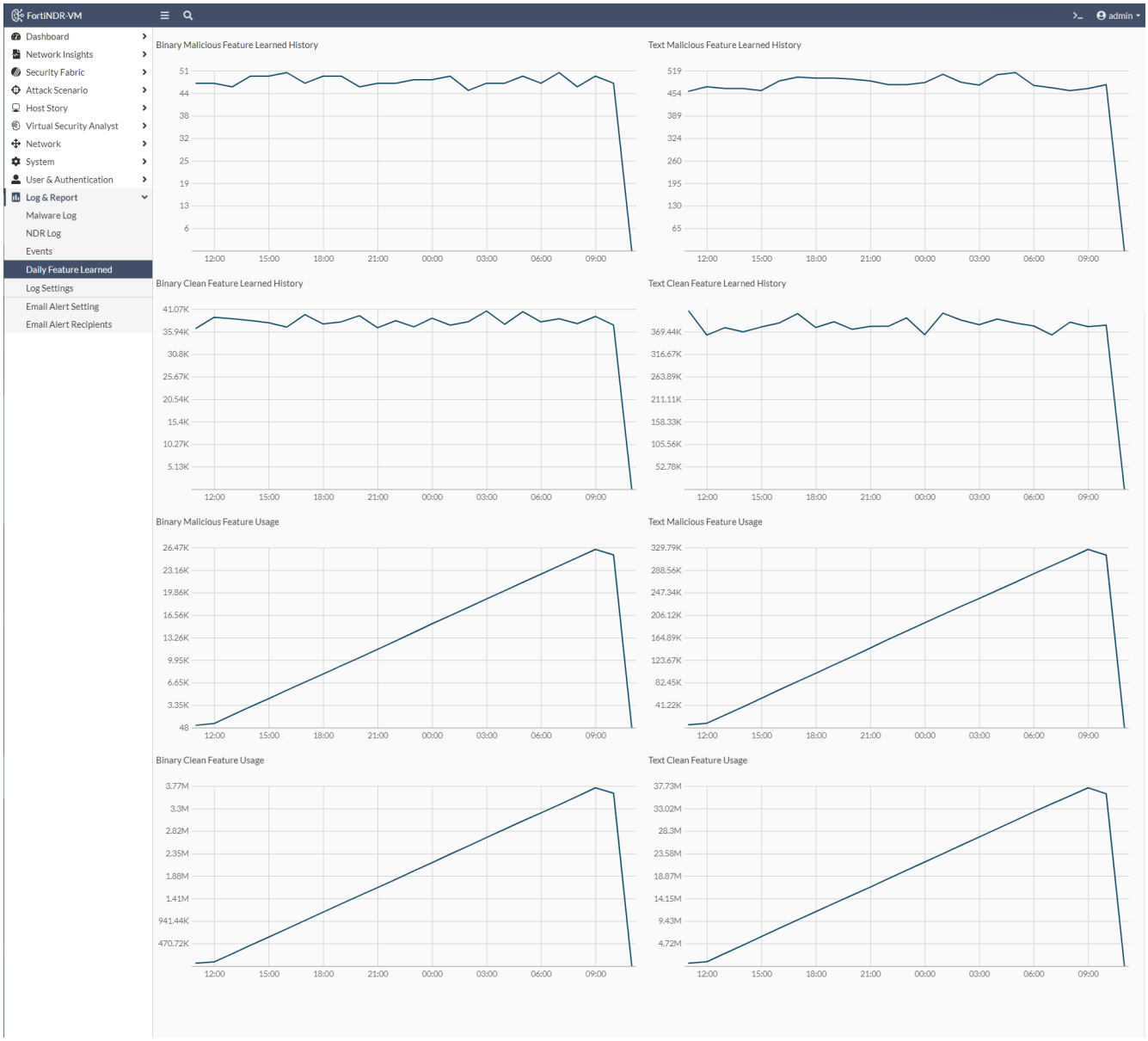
Events

FortiNDR logs and displays system events such as CPU and memory usage, and attack kill chain.



Daily Feature Learned

This page in FortiNDR shows a graphical count of the features learned and used. The display includes the text and binary engines.

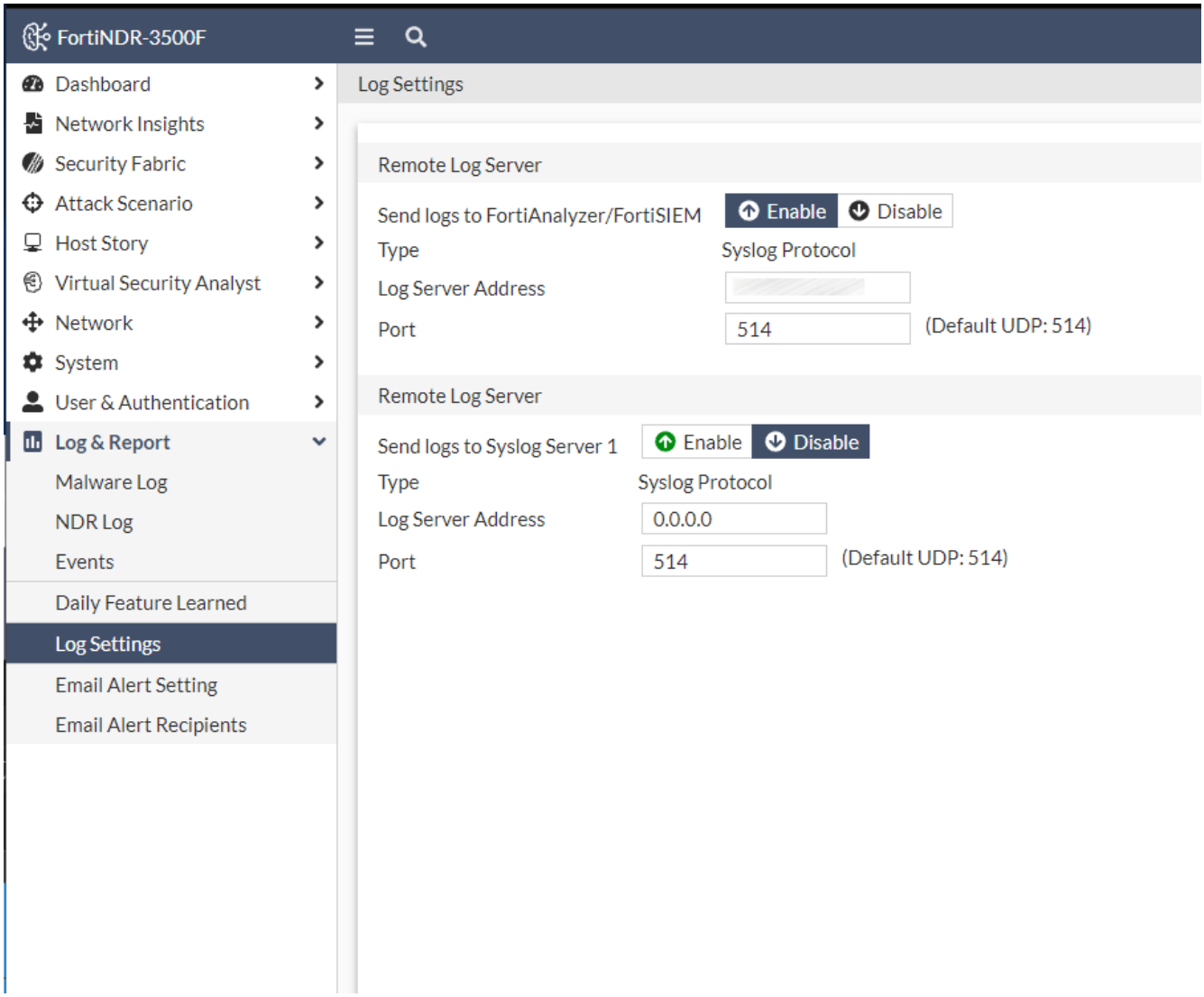


Log Settings

Use the *Log Settings* page to configure Syslog settings for FortiAnalyzer (7.0.1 and higher) and FortiSIEM (6.3.0 and higher). You can use the secondary Syslog field to send the same logs to different Syslog servers. You can configure both fields to send to both FortiAnalyzer and FortiSIEM.

Log Settings send Syslog messages about the *Attack Scenario* to other devices such as FortiAnalyzer or FortiSIEM.

- Upload file and Network share file detection will not send Syslog upon detection because they do not trigger Attack Scenario since they do not have flows of virus, meaning the sample flows from attacker to victim.
- Inline, ICAP, Sniffer and OFTP detections will trigger Syslog being sent to FortiAnalyzer or FortiSIEM, since they have this information.



NDR logs samples

Botnet

```
date="2022-02-09" time="16:43:13" tz="PST" logid="0602000001" devid="FAIVMSTM21000033"
type="ndr" subtype="Botnet" severity="high" sessionid=63313 alproto="DNS" tlproto="UDP"
srcip="18.1.2.2" srcport=10000 dstip="18.1.1.100" dstport=53 behavior="CONN" botname="botnet
Andromeda" hostname="orrisbirth.com"
```

```
date="2022-02-09" time="16:43:13" tz="PST" logid="0602000001" devid="FAIVMSTM21000033"
type="ndr" subtype="Botnet" severity="high" sessionid=63313 alproto="DNS" tlproto="UDP"
srcip="18.1.2.2" srcport=10000 dstip="18.1.1.100" dstport=53 behavior="RESP" botname="botnet
Other"  hostname="cdn12-web-security.com"
```

Fields

behavior	User activity. For example, CONN, RESP, VISIT, GET etc.
botname	The name for this botnet
hostname	Hostname

Encrypted

```
date="2022-02-11" time="10:19:03" tz="PST" logid="0603000001" devid="FAI35FT321000001"
type="ndr" subtype="Encrypted" severity="critical" sessionid=11554817 alproto="TLS"
tlproto="TCP" srcip="172.19.236.140" srcport=5326 dstip="173.245.59.98" dstport=443
behavior="CONN" vers="7" cipher="TLS_AES_256_GCM_SHA384"
md5="f436b9416f37d134cadd04886327d3e8"
```

Fields

behavior	User activity, e.g. CONN, RESP, VISIT, GET etc.
vers	The version of alproto, str
cipher	The encryption algorithm.
md5	md5/hash of ja3 fingerprint

IOC

```
date="2022-02-14" time="07:36:13" tz="PST" logid="0605000001" devid="FAI35FT321000001"
type="ndr" subtype="IOC" severity="critical" sessionid=19906026 alproto="HTTP" tlproto="TCP"
srcip="172.19.235.198" srcport=49304 dstip="178.63.120.205" dstport=443 behavior="CONN"
vers="7" cipher="TLS_AES_128_GCM_SHA256" md5="52bea59cf17d9fd5dedd2835fd8e1afe"
campaign="CoinMiner" hostname="s3.amazonaws.com" url="/"
```

Fields

behavior	User activity. For example, CONN, RESP, VISIT, GET etc
vers	The version of alproto
cipher	The encryption algorithm.
md5	md5/hash of ja3 fingerprint
campaign	IOC campaign
hostname	The hostname
url	The URL visited

IPS attack

```
date="2022-02-10" time="19:16:56" tz="PST" logid="0604000001" devid="FAI35FT321000001"
type="ndr" subtype="IPS attack" severity="low" sessionid=9237954 alproto="OTHER"
tlproto="UDP" srcip="172.19.236.145" srcport=57325 dstip="194.69.172.33" dstport=53
behavior="CONN" vname="DNS.Amplification.Detection" vulntype="Anomaly"

date="2022-02-10" time="18:32:54" tz="PST" logid="0604000001" devid="FAI35FT321000001"
type="ndr" subtype="IPS attack" severity="medium" sessionid=9092973 alproto="OTHER"
tlproto="ICMP" srcip="172.19.235.62" srcport=0 dstip="172.19.236.50" dstport=771
behavior="CONN" vname="BlackNurse.ICMP.Type.3.Code.3.Flood.DoS" vulntype="DoS"
```

Fields

behavior	User activity. For example, CONN, RESP, VISIT, GET etc.
vname	The virus name
vulntype	Vulnerability type

Weak cipher

```
date="2022-02-07" time="14:18:57" tz="PST" logid="0606000001" devid="FAIVMSTM21000033"
type="ndr" subtype="Weak cipher" severity="medium" sessionid=569705 alproto="IMAP"
tlproto="TCP" srcip="17.1.6.20" srcport=63310 dstip="18.2.1.114" dstport=443 behavior="CONN"
vers="2" cipher="TLS_NULL_WITH_NULL_NULL" ciphername="weak cipher"

date="2022-02-07" time="14:18:57" tz="PST" logid="0606000001" devid="FAIVMSTM21000033"
type="ndr" subtype="Weak cipher" severity="medium" sessionid=570387 alproto="SMB"
tlproto="TCP" srcip="17.2.12.171" srcport=10001 dstip="17.1.1.119" dstport=443
behavior="CONN" vers="1" cipher="TLS_RSA_WITH_AES_256_GCM_SHA384"
md5="9a157673907688965992b40304f50a1e"  ciphername="weak version"
```

Fields

behavior	User activity. For example, CONN, RESP, VISIT, GET etc. str

vers	The version of alproto
cipher	The encryption algorithm.
md5	md5/hash of ja3 fingerprint
ciphername	The type name of weak cipher or vulnerable protocols

ML

```
date="2022-02-18" time="15:54:39" tz="PST" logid="0608000001" devid="FAIVMSTM21000033"
type="ndr" subtype="ML" severity="low" sessionid=1135774 alproto="DNS" tlproto="TCP"
srcip="17.1.10.185" srcport=35546 dstip="17.1.1.119" dstport=389 reasons="Device IP,Device
MAC address,Session packet size,Transport layer protocol,Application layer protocol,Source
port number,TLS version,Id of nta_dev_ip,Protocol or application behaviors or action"
```

Fields

reasons	A list of reasons leading to a ML anomaly detection, separated by a comma.

Common Fields

date	The date the log was sent in the format xxxx-xx-xx
time	The time the log was sent in the format hh:mm:ss
tz	System timezone
logid	The ID generated by log type and log subtype
devid	Device serial number
type	ndr, str (fixed)
subtype	The anomaly type by category
severity	The severity of the traffic, defined by NDR
sessionid	The session ID referring to NDR LOG in FortiNDR
alproto	Application layer protocols
tlproto	Transport layer protocols
srcip	Source IP
srcport	Source port
dstip	Destination IP
dstport	Destination port

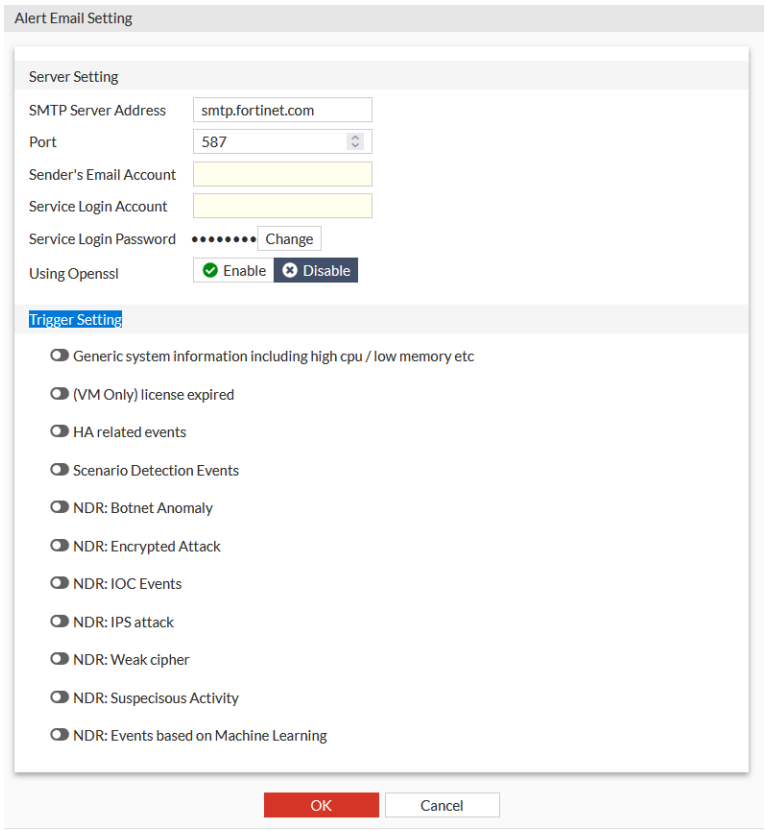
Alert Email Setting

Receive email alerts with malware and system event threats are detected.

To configure email alerts:

1. Go to *Log & Report* > *Email Alert Setting*.
2. Configure the server settings.

SMTP Server Address	Enter the STMP server address.
Port	Enter the port number.
Sender's Email Account	Enter the sender's email account
Service Login Account	Enter the service login account.
Service Login Password	Enter the service login password.
Using Openssl	Enable or disable open SSL
Trigger Setting	Select an option(s) from the list and enter the email message text. Select the *Trigger Sensitivty* where required.



3. Click *OK*.
4. Add email addresses to the email recipient list. See, Email Alert Recipients on page 132.

Email Alert Recipients

Create a distribution list for email alerts.

To add email recipients to recipient list:

1. Go to *Log & Report* > *Email Alert Recipients*.
2. Click *Add Recipient*. The *Add Recipient* pane opens.
3. In the *Email* field, enter the recipient's email address and click *OK*.
4. (Optional) Click *Send Verification Email* to send a test notification to the distribution list.
5. (Optional) Select an email(s) and click Remove Selected Recipient to delete an address ffromm the list.

Troubleshooting

FortiNDR health checks

When FortiNDR is set up, use the CLI command `diag sys top` to check that the following key FortiNDR processes are running. For NDR to function correctly the following processes are required to run: `ndrd`, `isniff4ndr`

`sniffer`	Sniffer daemon.
`ndrd`	NDR daemon.
`isniff4ndr`	Second Sniffer daemon.
`fdigestd`	Upload file daejmon
`oftpd`	OFTP daemon that receives files from FortiGate.
`pae2`	Portable executable AI engine.
`pae_learn`	Portable executable AI learner. If no features have been learned, this process does not appear.
`moat_engine`	Script AI engine.
`moat_learn`	Script AI learner.

To turn network traffic detection on and off:

Run the following command:

```
exec ndrd <on/off>
```

802.1Q encapsulation for VLAN is not supported in network traffic detection.

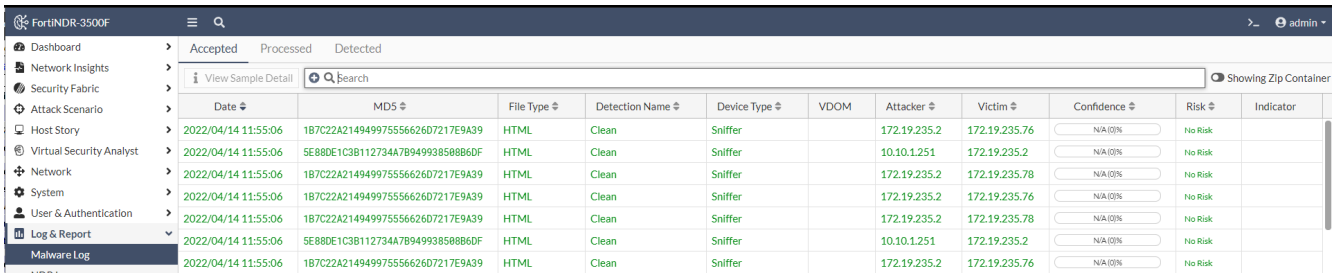
To turn sniffer malware detection on and off for troubleshooting:

Run the following command:

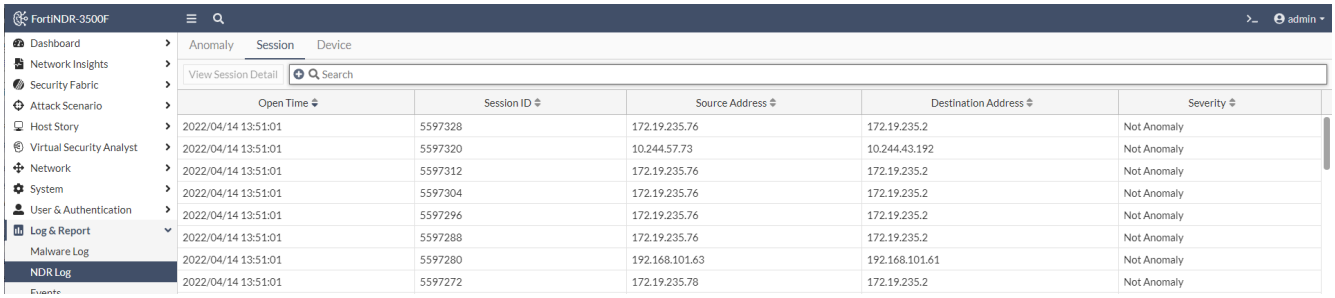
```
exec snifferd <on/off>
```

The current version of the Malware sniffer only sniffs traffic on Port2.

When FortiNDR sniffer malware detection feature is operating normally, *Log & Report* > *Malware Log* > *Accepted* shows the following accepted traffic:



Log & Report > *NDR Log* > *Session* shows the incoming sessions.



Sniffer diagnosis

Use the CLI command `diag sniffer file ?` to show sniffer output for port2. The TFTP server is required to store sniffer output.

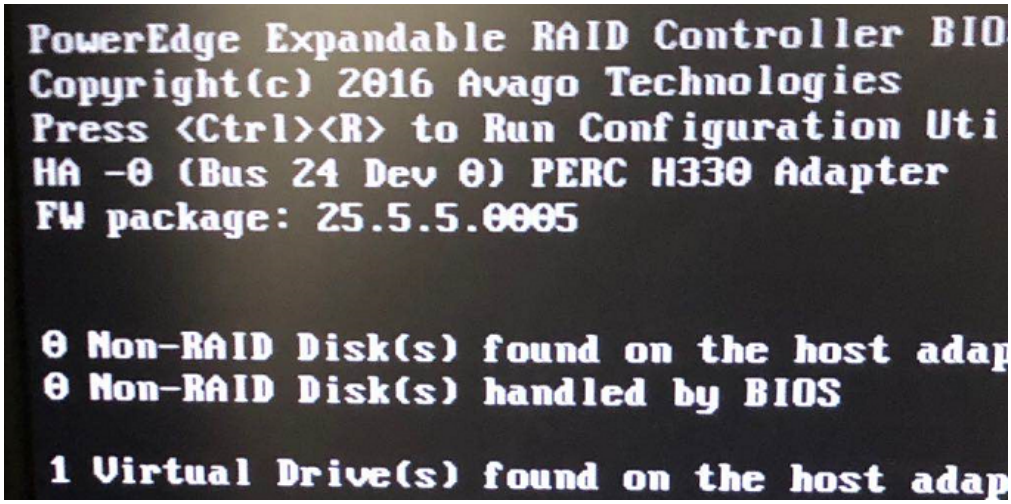
Rebuild RAID disk

If you need to rebuild the data disk and configure FortiNDR-3500F from scratch, follow this procedure.

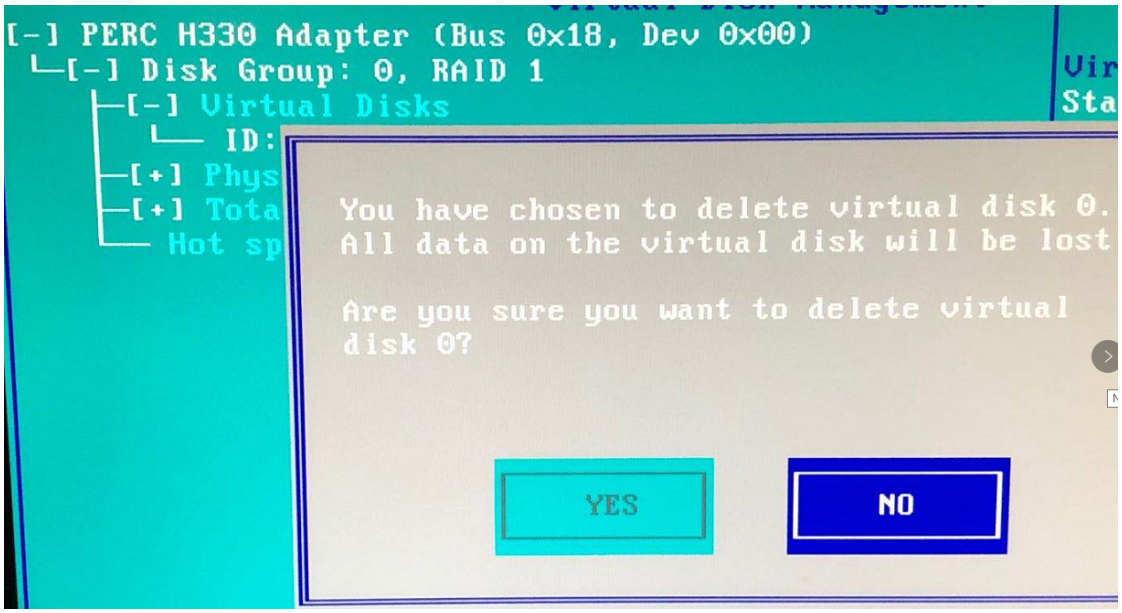
To rebuild the RAID disk:

1. Plug the monitor and keyboard directly into FortiNDR.

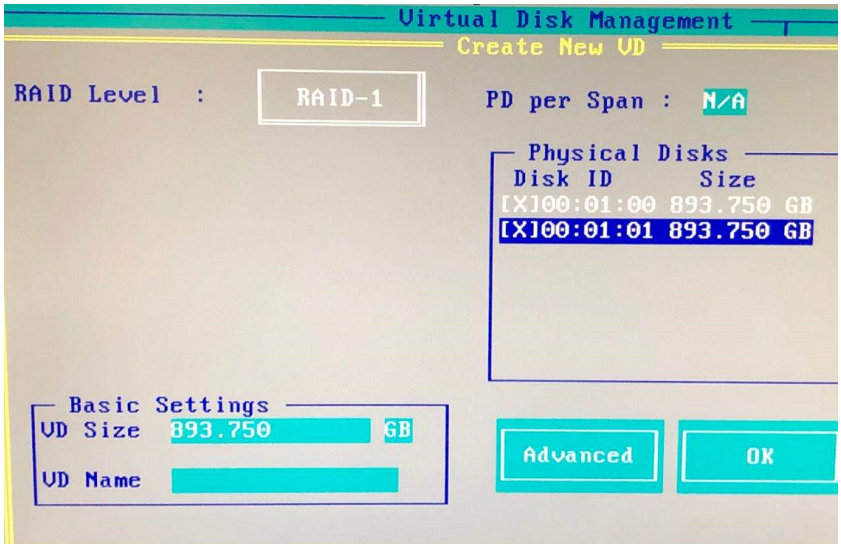
2. Boot FortiNDR and keep pressing `Ctrl R` when FortiNDR is booting.



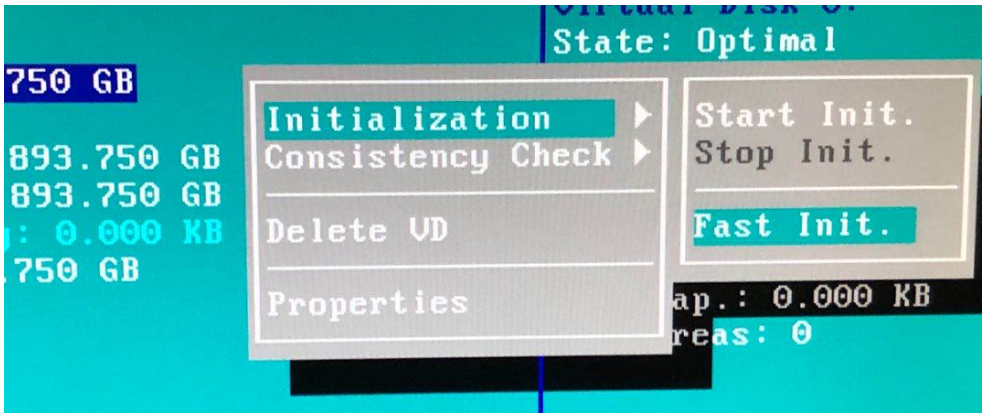
3. Delete virtual disk 0.



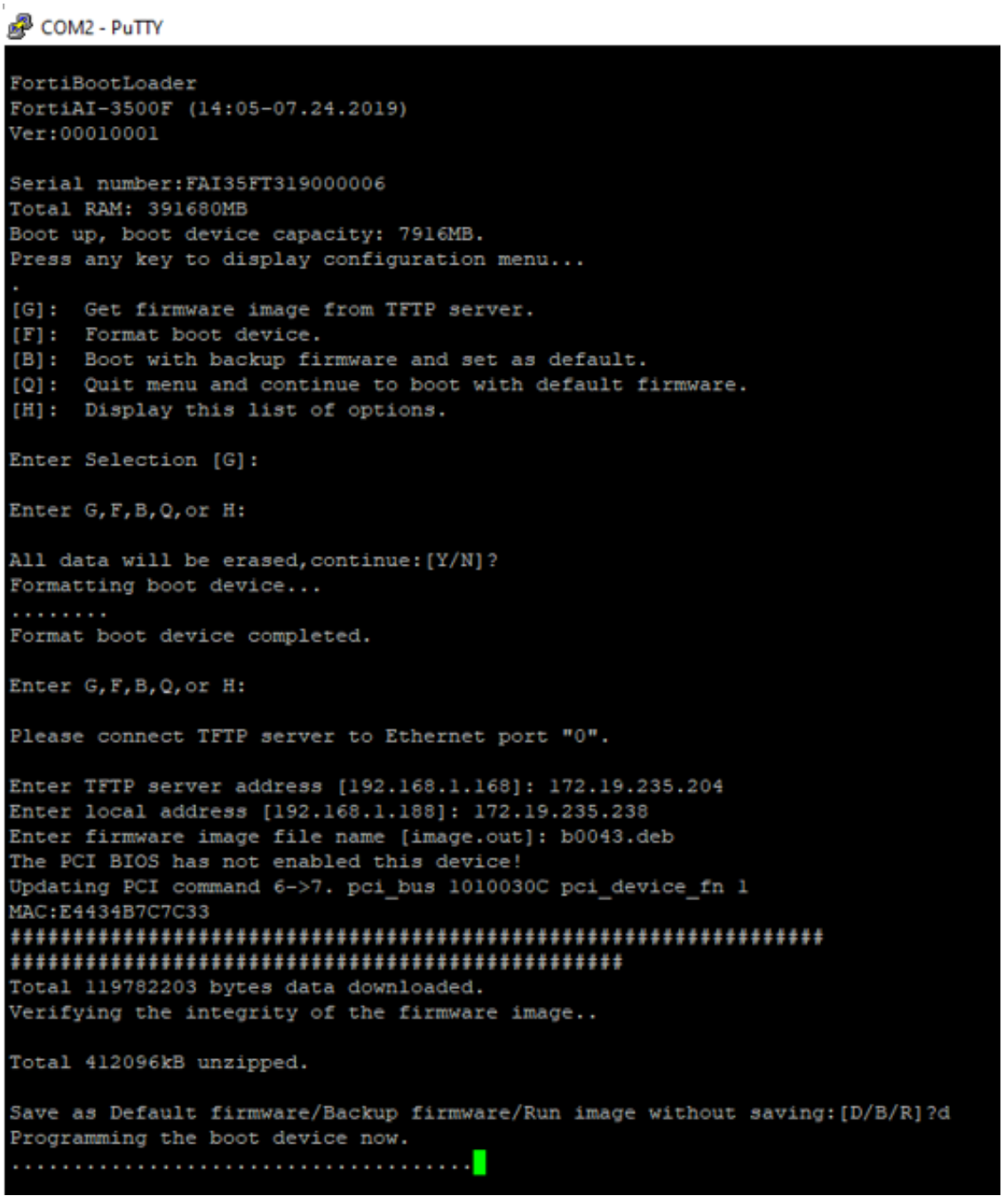
4. Create a virtual disk at *RAID Level 1*.



5. Fast init the new virtual disk.



6. When the initialization is finished, reboot FortiNDR.
7. During reboot, press any key to enter bootloader.
   Ensure the keyboard is not plugged directly into FortiNDR as that might prevent you from entering into the bootloader menu.



8. Plug the monitor and keyboard back into the machine with the COM1 connection.
9. Enter F to format the boot drive.
10. Enter G to get the firmware image from the TFTP server.
    Getting firmware from TFTP server requires connecting to the TFTP server using port4 (1G port).

11. When booting is complete, use the command `execute factoryreset` or `execute partitiondisk` to make partitions.
12. Copy the ANN database to FortiNDR since rebuilding RAID deletes the ANN database.

Managing FortiNDR disk usage

FortiNDR analyzes files and packets 'on the fly' and requires plenty of disk space to store attacks. FortiNDR-3500F comes with two SSD drives by default and can add up to 16 SSD in total.

By default FortiNDR stores all detected events (network anomalies, sessions and malware detection). When the disk reaches:

Disc Usage	Description
50%	FortiNDR will start deleting older clean files and detections. Malicious and anomalies detection will remain. This process will stop if the free storage space goes below 50%.
90%	FortiNDR will stop the services (including logging, detection, sniffer, network share scanning, file uploading, oftp, icap and NDR) if it is operating at bandwidth capacity and inserting events faster than the deletion rate at the same time. The GUI and CLI console will still operate in this scenario.

Tip 1: Daemons will auto-restart when the disk falls below the above percentage thresholds.

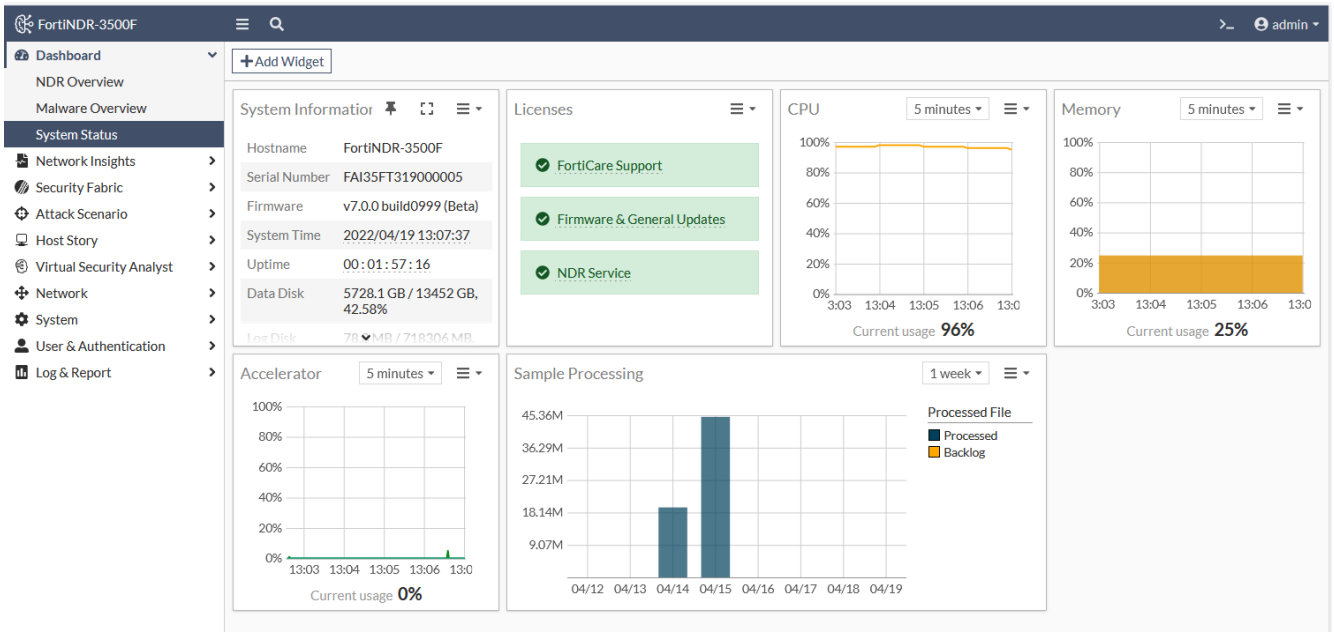
Tip 2: With FortiAI and FortiNDR 3500F, users can purchase more SSDs. Please see the data sheet and ordering guide for details.

Tip 3: Users should consider using CLIs to clean up the DB:

- `exec cleanup` to clear the log history to free up space.
- `exec db restore` to clean all the data (including some of the AI db updated from FortiGuard).

To view the disk usage:

Go to *Dashboard* > *System Status*.



To expand FortiNDR VM storage with the CLI:

```
execute expandspooldisk.
```

For more information, see the *FortiNDR CLI Reference Guide*.

Exporting detected malware files

You can export detected malware files with the CLI or with the GUI under *Attack Scenario* or *Log & Report* as a PDF, JSON and STIX2 file.

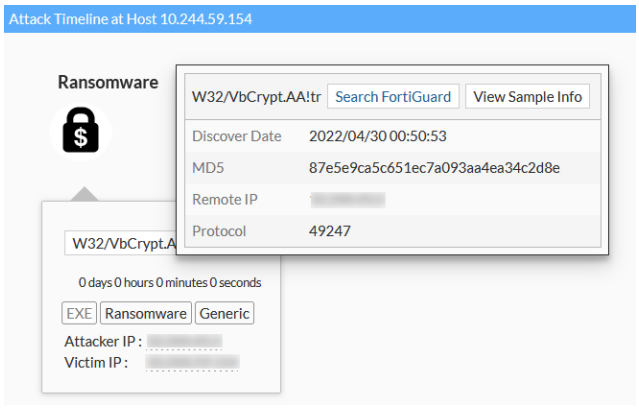
To export detected malware files with the CLI:

```
execute export file-report
```

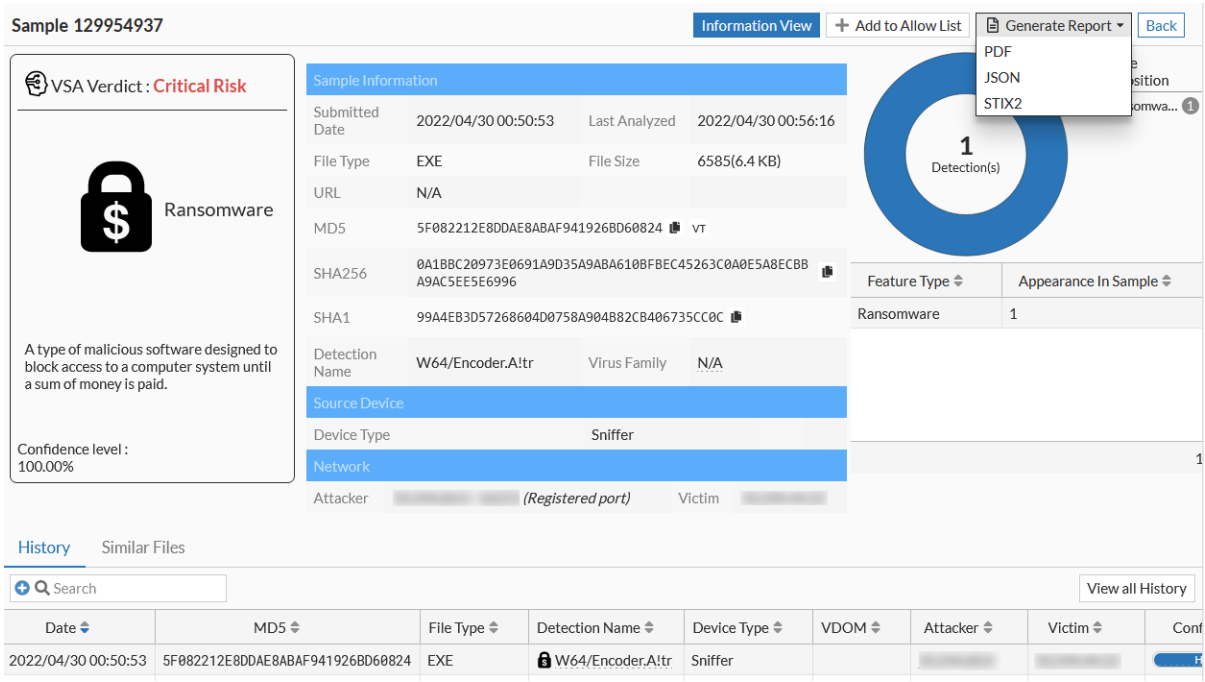
For more information, see the *FortiNDR CLI Reference Guide*.

To export detected malware files with the GUI:

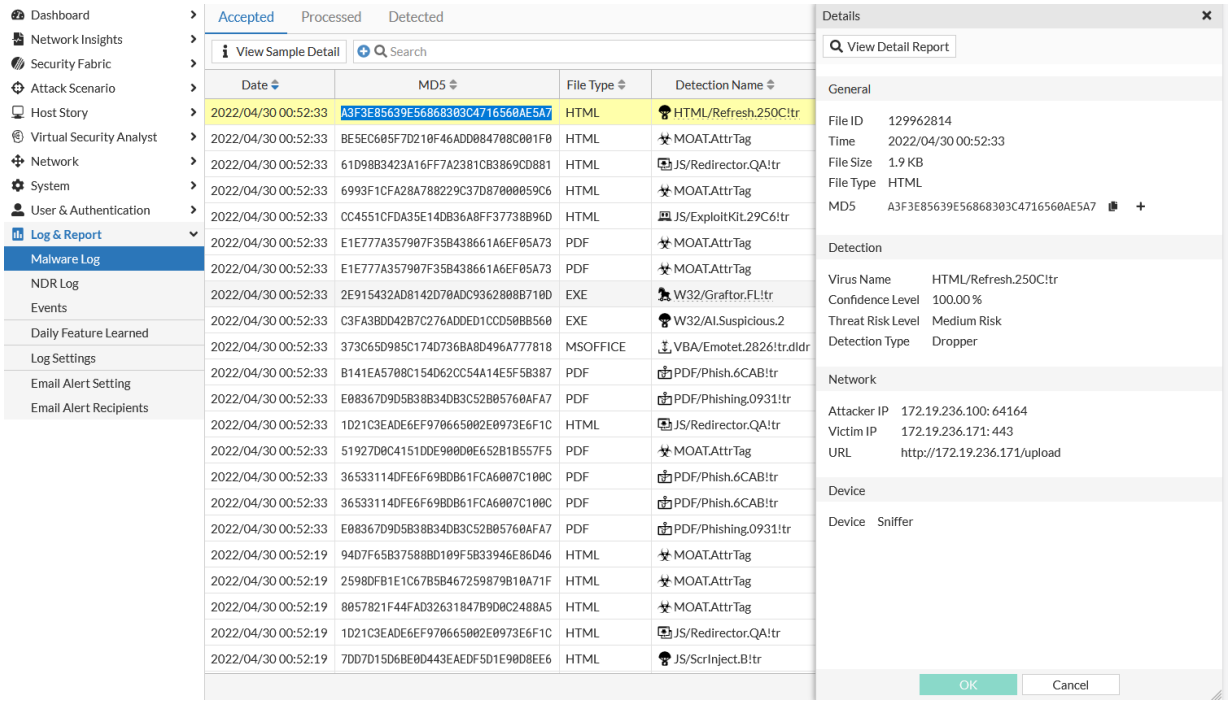
1. To export detected files under *Attack Scenario*:
   a. Go to *Attack Scenario* and click an attack type such as *Ransomware*.
   b. Select an infected host and then in the timeline, hover over the detection name until the dialog appears.



   c. Click *View Sample Info*. The sample information is displayed.
   d. Click *Generate Report* and select *PDF*, *JSON*, or *STIX2* format.



2. To export detected files under *Log & Report* :
   a. Go to *Log & Report* > *Malware Log*.
   b. Double-click a log in the list. The *Details* pane opens.



   c. Click *View Detail Report*. The sample information is displayed.
   d. Click *Generate Report* and select *PDF*, *JSON*, or *STIX2* format.

Formatting the database

To format the database with the CLI:

```
execute db restore
```

Using `execute db restore` will format and delete the entire database.
Use caution when executing this command and backup detection beforehand if required.

Export malware

In v1.3 and higher, you can export detected malware and history logs.

To export the FortiNDR detection history as a .csv file:

```
execute export {disk|scp|ftp|tftp} <filenmame-to-be-saved> <server>[:ftp port] <user-name>
     <password>
```

To export the detected files by FortiNDR as a zip file with password:

```
execute export detected-files {disk|scp|ftp|tftp} <filenmame-to-be-saved> <server>[:ftp
     port] <user-name> <password>
```

The zip file default password is `infected`.

Working with false positives and false negatives

Every technology encounters false positives and false negatives, and expectations need to be realistic.

For example, when there is a lot of HTTP traffic from sniffer, you might have some false positive files among thousands of files. If there are five false positive samples out of 2000 files, the false positive rate is: 0.25%.

False negative is when FortiNDR does not detect a malware.

Ensure you are using the latest ANN. Check the latest version of FortiNDR ANN at https://www.fortiguard.com/services/fortindr.

Troubleshoot ICAP and OFTP connection issues

To check ICAP traffic in port1:

Use the CLI command:

```
diagnose sniffer packet port1 'port 1344 or port 11344' 6 0
```

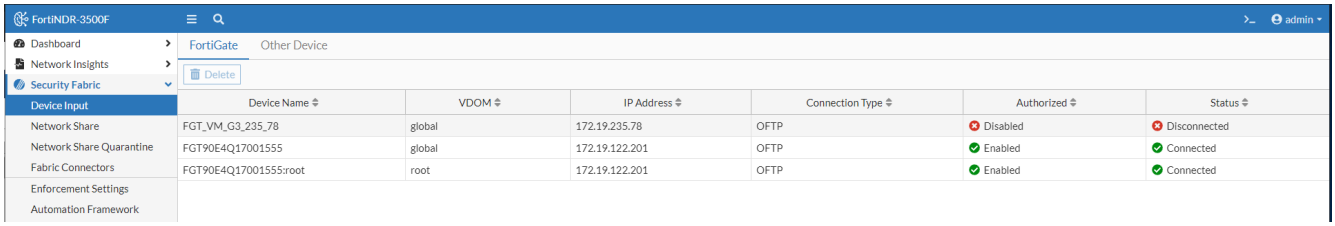
To check OFTP traffic in port1:

Use the CLI command:

```
diagnose sniffer packet port1 'port 514' 6 0
```

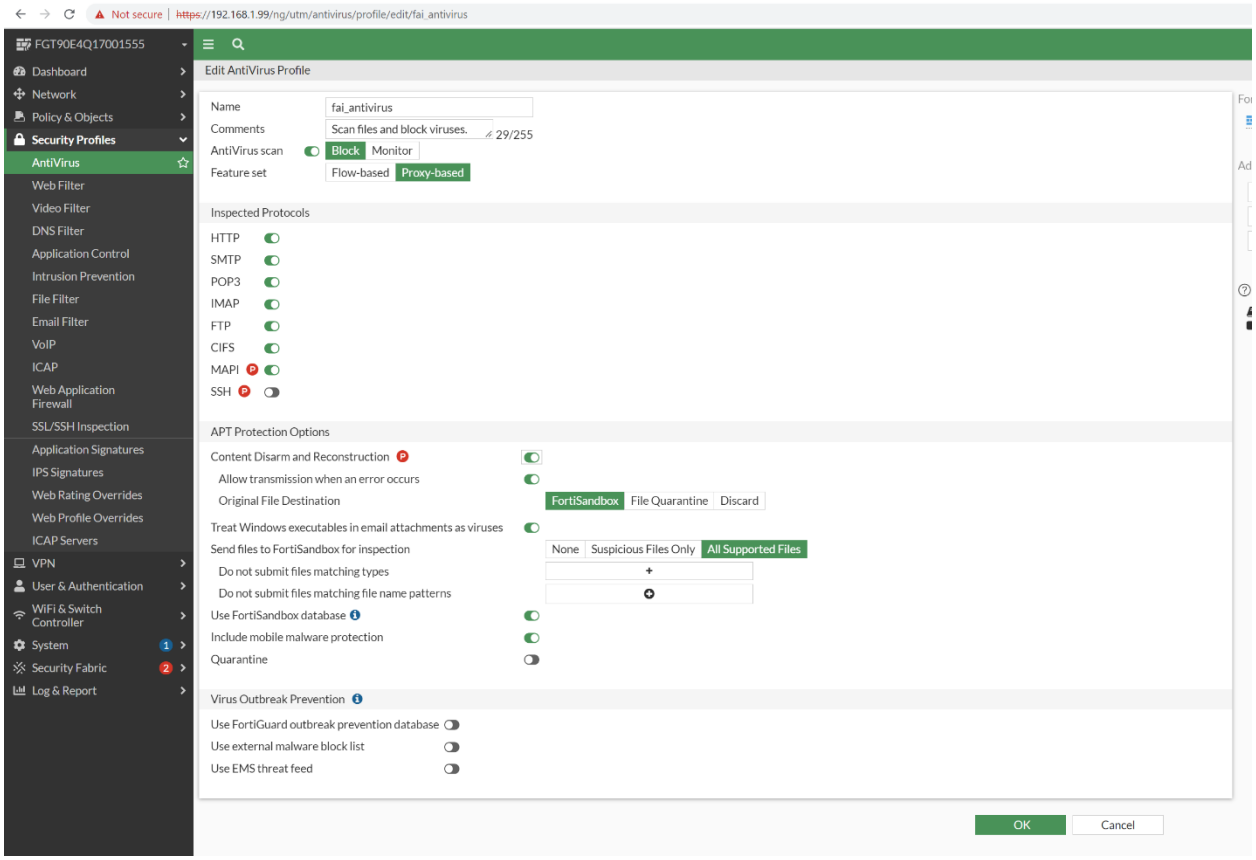
To verify a device is authorized:

Go to *Security Fabric* > *Device Input* and check the Authorized column.



To verify All Supported Files are enabled in FortiGate:

Go to *Security Profiles* > *AntiVirus* and verify *Send files to FortiSandbox for inspection* is set to *All Supported Files*.



To verify the firewall policy is not blocking the connection:

Check if firewall policy is blocking ICAP port 1344, 11344 and OFTP port 514.

Troubleshoot Log Settings

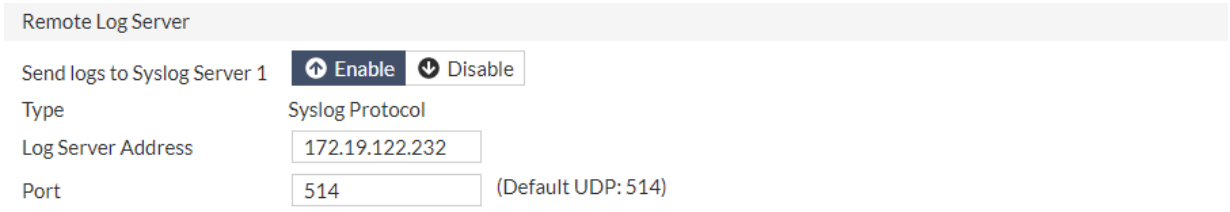
To troubleshoot the Client:

- Enable *Send logs* to your syslog server
- Verify you are using a valid remote server address

- Check if the GUI settings match CMDB settings:
  - Send logs to FortiAnalyzer/FortiSIEM


```
FortiNDR-3500F # config system syslog fortianalyzer settings

FortiNDR-3500F (settings) # get
Last Update Time     : 2022-04-13 19:22:13
ipaddr               : 172.19.235.98
port                 : 514
status               : enable
type                 : event malware ndr
ndr-severity         : low medium high critical
```

  - Send logs to Syslog Server 1




```
FortiNDR-3500F # config system syslog1 settings

FortiNDR-3500F (settings) # get
Last Update Time     : 2022-04-14 15:21:48
ipaddr               : 172.19.122.232
port                 : 514
status               : enable
type                 : event malware ndr
ndr-severity         : low medium high critical
```

- An extra remote server setting which only set via CLI command

```
FortiNDR-3500F # config system syslog2 settings

FortiNDR-3500F (settings) # get
Last Update Time     :
ipaddr               : 0.0.0.0
port                 : 514
status               : disable
type                 : event malware ndr
ndr-severity         : low medium high critical

FortiNDR-3500F (settings) #
```

To view the traffic with the CLI:

```
diag sniffer packet any "udp and port 514" 3 0 a
```

To troubleshoot the server:

- Verify the sever has rsyslog installed.
- Make sure udp port 514 is open

  ```
  sudo ss -tulnp | grep "rsyslog"
  ```

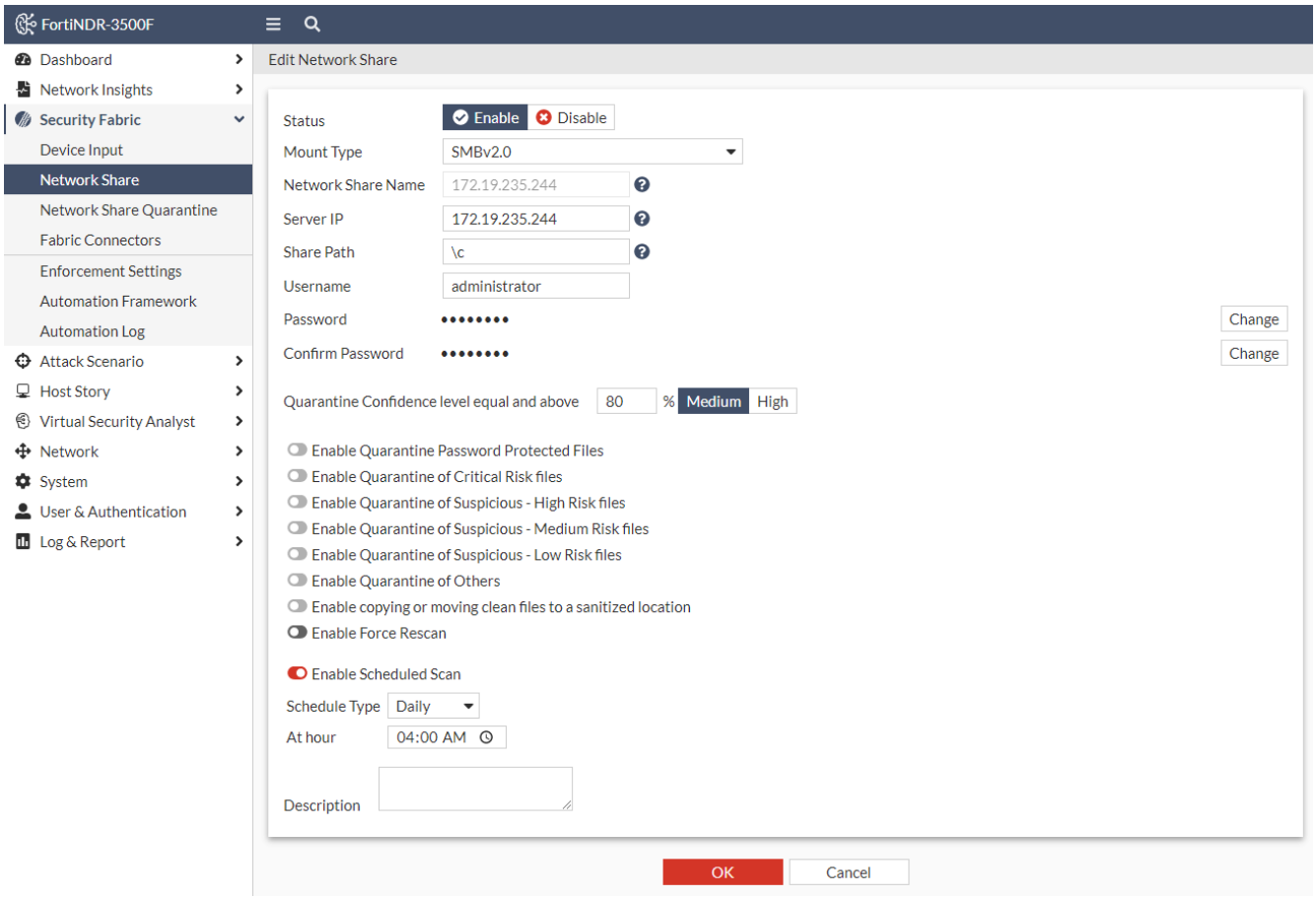
Troubleshoot Network Share

Test the Network Share Connection

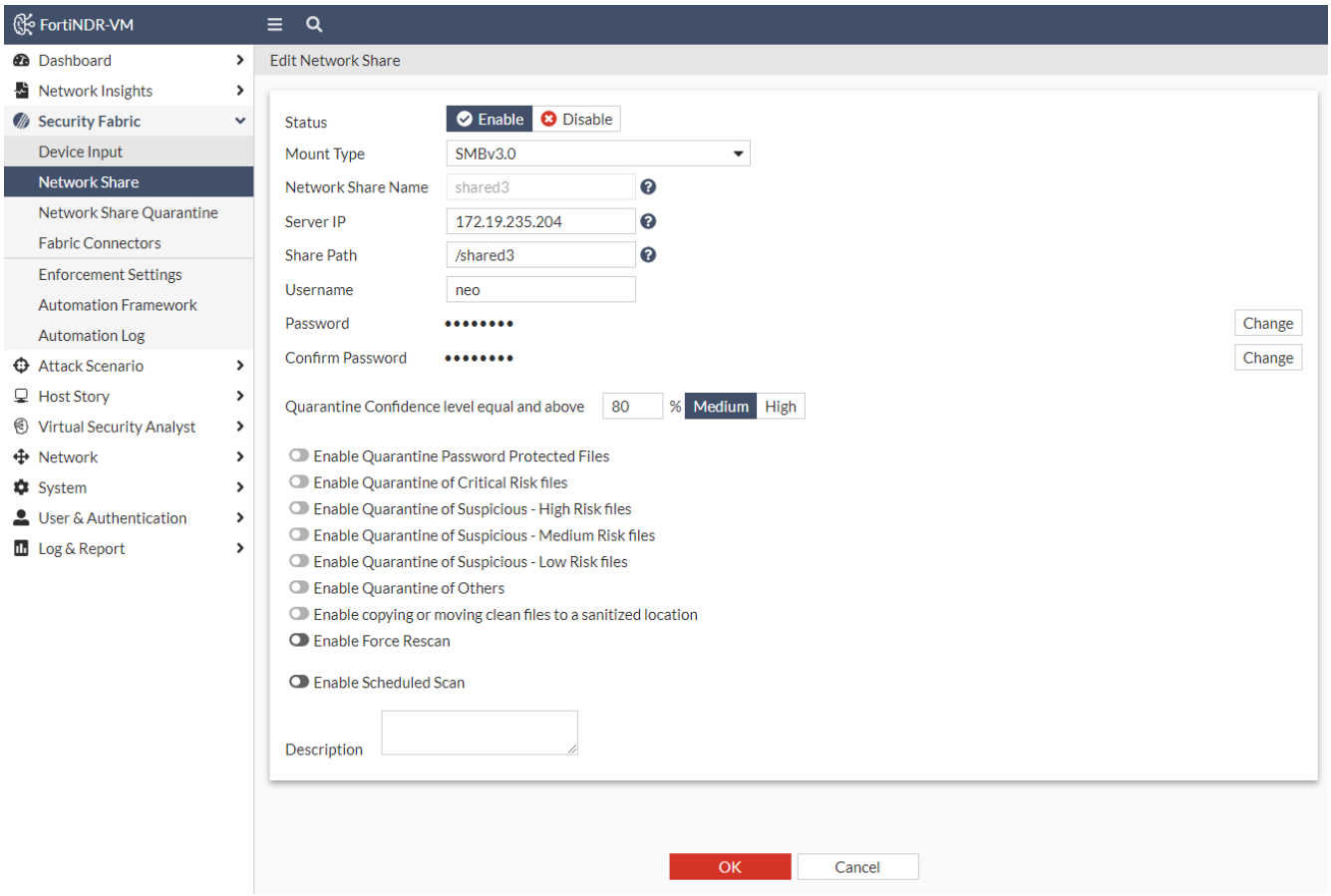
To test the Network Share Connection:

- Verify the Remote Sever is connectable
- Verify the folder to mount is shareable
- Verify the current user has read and write permissions to the shared folder.
- Verify you have chose the correct mount type, e.g. Windows 10 will not support SMB1.0 if SMB 1.0/CIFS File Sharing Support isn't turned on
- Verify the Share Path is using a backslash (\) for Windows Folders while forward (/) slash for Linux Folders

The following images shows the Network Share configuration for Windows.



The following images shows the Network Share configuration for Linux.



Diagnosing Network Share Errors

To diagnose Network Share scanning errors:

Run the following CLI commands:

```
diagnose debug application sdigestd DEBUG_LEVEL <1,2,4,7>
diagnose debug enable
```

A `DEBUG_LEVEL` is a bit mask consisting of four bits.

DEBUG_LEVEL	Will show:
1	Only the error. For example, `memory allocation error`.
2	The warning messages. For example, `connection warning`, `job scheduling warning` etc. A `DEBUG_LEVEL` of `2` is a good start to find an issue.
4	The information. For example, `job creation`, `file scanned` etc.
7	All events and errors.

To troubleshoot mounting problems:

If you still have mounting problems which are not indicated by the CLI above, try running the following CLI command:

```
diagnose debug kernel display
```

Keep an eye for any message about `CIFS`. For example:

```
[280041.880696] CIFS VFS: Free previous auth_key.response = ffff881c78591200
```

You will see the error code if the mounting failed.

To troubleshoot a Network Share scan that it is stuck:

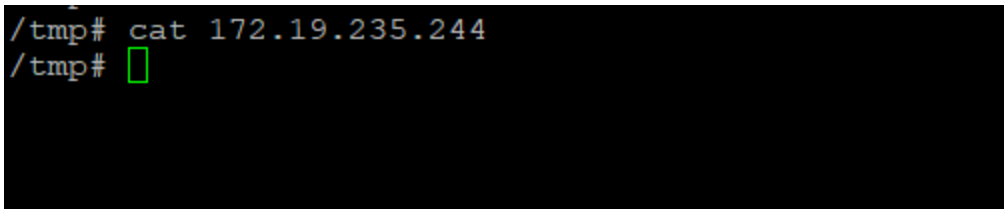
A scanning job may get stuck for the following issues:

Issue	Recommendation
Mounting issue	See To troubleshoot mounting problems above.
Daemon crashed	Run the following CLI command to see if there are any `sdigestd` related crashes: `diagnose debug crashlog xxxx-xx-xx`
Data disk usage over 90%	Clean up the data disk. See, Managing FortiNDR disk usage on page 138.

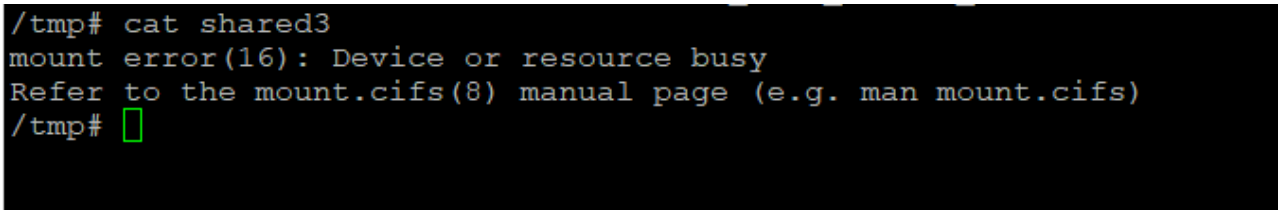
Debug version image

If you are using debug version image, check the `/tmp/NETWORK_SHARE_NAME` for mounting message

- If the message is empty, there is no mounting issue detected



- Otherwise, refer to *mount.cifs*, *mount.nfs* documents



- Double-check, the direct mounting path `/tmp/mnt/SHAREID` and see if the files exist.

Check Crash Log

Go to '`/var/spool/crashlog/DATE` and check for any crash logs about *sdigest*.

Troubleshooting the VM License

To view the status of the VM license:

```
diagnose system vm
```

When using a VM with a new UUID with an existing license (for example, if you have to respawn a new VM due to disk failure and reuse the existing VM license), it will take 90 mins before the FDS server will accept/validate the new license.

Troubleshooting Updater

FDS Authorization Failed

Go to the *System* > *FortiGuard*.

If the following databases show *FDS Authorization Failed*, that means the FortiNDR unit is using a Fortiguard License that does not include FortiNDR entitlements (for example, a machine that was upgraded from FortiAI v1.5.3 GA to FortiNDR v7.0 GA).

Although some functions will still work, important new features in v7.0 such as web filtering cannot be used and any NDR-related databases cannot be downloaded. Please contact sales for information about updating the existing FortiGuard support license.

Application Control DB	Version 18.00072	FDS Authorization Failed
Industrial Security DB	Version 18.00187	FDS Authorization Failed
Network Intrusion Protection DB	Version 18.00072	FDS Authorization Failed
Traffic Analysis DB	Version 20.00001	Up to Date
Botnet IP DB	Version 4.728	FDS Authorization Failed
GeoIP DB	Version 2.001	Update Available
Botnet Domain DB	Version 2.007	Update Available
JA3 DB	Version 1.000	FDS Authorization Failed
JA3S DB	Version 1.000	FDS Authorization Failed

For other FDS Authorization Failed errors, this is most likely due to an expired FortiGuard support license or a network configuration problem such as a DNS setting that is directing the updater to the wrong FDS servers.

Clearing updater cache files

Normally, after triggering an update through the CLI with `exec update now` or through the GUI with the *Update FortiGuard Neural Network Engine* button, the status will change to *Downloading* or *Installing*:

	Downloading..	
Text AI Feature DB	Version 1.087	Up to Date
Text AI Group DB	Version 1.087	Up to Date

Sometimes an update will not go through due to failed FDS connection during a download and the cache will need to be cleared.

Running the command and then try updating again:

```
exec update clean-up
```

Thius should solve that problem. Rebooting the machine will also trigger a FDS download cache-cleanup operation upon startup.

Diagnosing Other FDS Errors

To further diagnose updating errors, please run the CLI commands:

```
diagnose debug application updated DEBUG_LEVEL
diagnose debug enable
```

A DEBUG_LEVEL is a bit mask consisting of 3 bits.

- A `DEBUG_LEVEL` of 1 will show only the error. Usually a `DEBUG_LEVEL` of 1 is enough to pinpoint the problem.
- A `DEBUG_LEVEL` of 3 will show all major events and errors.
- A `DEBUG_LEVEL` of 7 will show all events and errors.

Appendix A - API guide

This section shows how to use the FortiNDR API.

Get an administrator API key

You can submit files for analysis using API with an API key. You can generate an API key using the GUI or CLI. The API key has all access privileges of the admin user.

The token is only displayed once. If you lose the token, you must generate a new one.

Upload files using API

You can use API to upload files for *Express Malware Analysis*. The maximum upload file size is 200MB.

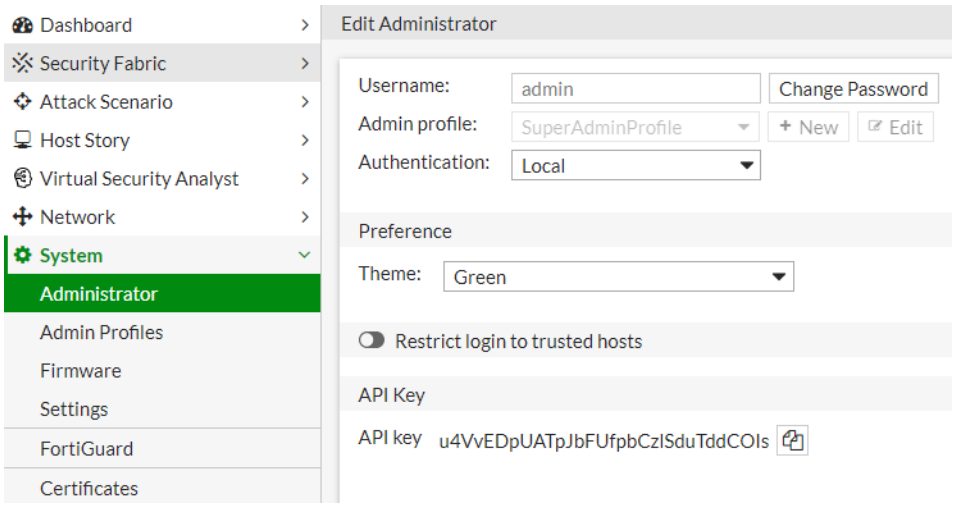
To use API to upload files, generate a token. The token is only displayed once. If you lose the token, generate a new one.

To generate a token using CLI:

```
execute api-key <user-name>
```

To generate a token using GUI:

1. Go to *System* > *Administrator* and edit an administrator.
2. In the *API Key* section, click *Generate*.



Use an API key

When making API calls, the API key is required in the request. You can include the API key in the API request header or URL parameter.

To pass the API token by request header, explicitly add the following field to the request header.

```
Authorization: Bearer <YOUR-API-TOKEN>
```

To pass the API token by URL parameter, explicitly include the following field in the request URL parameter.

```
access_token=<YOUR-API-TOKEN>
```

Submit files

/api/v1/files

You can submit files for analysis through the `/api/v1/files` endpoint with an administrator API key.

For a list of supported file types and formats, see Operating mode, protocols, and file type support on page 15.

Submit a file using one of the following methods.

Method	Description
JSON data	The JSON data must be encoded in base64 format. Encode the file directly into the HTTP body as JSON data using the `file_content` field.
Multi-part file	The multi-part file does not need to be encoded in base64 format. Include the file in the HTTP body as a multi-part file.

In both methods, you can use the API key as a URI parameter or the Authorization field in the header. Passwords for zip files are optional. You can view the verdict of submitted files in *Virtual Security Analyst > Express Malware Analysis*.

Example 1 of submitting a file or zip file via JSON data using the Python Requests module:

```
self.session.post(url='/api/v1/files?access_token=***API-KEY HERE***',
     data={" file_name": " b64encode(FILENAME)",
       "file_content": b64encode(open(PATH_TO_FILE, "rb").read())},
       "password":" ***ZIP FILE PASSWORD HERE(OPTIONAL)***")
```

Example 2 of submitting a file or zip file via JSON data using the Python Requests module:

```
self.session.post(url='/api/v1/files',
     headers={'Authorization': 'Bearer ***API-KEY HERE***'}
     data={" file_name": " b64encode(FILENAME)",
       "file_content": b64encode(open(PATH_TO_FILE, "rb").read())},
        "password":" ***ZIP FILE PASSWORD HERE(OPTIONAL)***")
```

Example 1 of submitting a file or zip file as a multi-part file using the Python Requests module:

```
self.session.post(url='/api/v1/files? access_token=***API-KEY HERE***'',
     data={"password":"***ZIP FILE PASSWORD HERE(OPTIONAL)***"},
     files={"file":( os.path.basename(PATH_TO_FILE),open(PATH_TO_FILE,"rb"))})
```

Example 2 of submitting a file or zip file as a multi-part file using the Python Requests module:

```
self.session.post(url='/api/v1/files',
     headers={'Authorization': 'Bearer ***API-KEY HERE***'},
```

```
    data={"password":"***ZIP FILE PASSWORD HERE(OPTIONAL)***"},
    files={"file":( os.path.basename(PATH_TO_FILE),open(PATH_TO_FILE,"rb"))})
```

Upload file by JSON data

Encode the file name into the HTTP body as JSON data using the `file_name` field.

Encode the file contents into the HTTP body as JSON data using the `file_content` field. The maximum file size is 200MB.

You have the option to include the password in the HTTP body as JSON data using the `password` field where a password is needed to extract an archived file.

The following is an example of Python request module by JSON data.

```
requests.post(url='/api/v1/files',
   params={'access_token': 'u4VvEDpUATpJbFUfpbCzlSduTddCOIs'},
   data={ 'file_name': b64encode('samples.zip'),
   ' file_content': b64encode(open('samples.zip', 'rb').read()),
   ' password': 'xxxxxxxx'})
```

Upload file by multi-part file

The following is an example of Python request module by multi-part file.

```
requests.post(url='/api/v1/files',
   params={'access_token': 'u4VvEDpUATpJbFUfpbCzlSduTddCOIs'},
   files={'samples.zip':open('samples.zip', 'rb')})
```

Retrieve file verdict results

/api/v1/verdict

Supported search query parameters	Description
`sid`	Get file IDs from a submission ID we got after uploading a file.
`fileid`	Get verdict result from file ID.
`md5`	Get the latest verdict result from MD5 checksum of the file.

The query string can only have one search query parameter.

Examples

```
GET /api/v1/verdict?sid= ***submission_id***
```

```
{
  "results": {
    "fileids": [
      8068321
    ],
    "total_fileids": 1
```

```
  }
}
```

Field	Description
fileids	File IDs in one file submission. If the file is an archived or compressed file, only files supported by FortiNDR after extraction are accepted and only file IDs of supported files appear.
total_fileids	Total number of file IDs.

```
GET /api/v1/verdict?fileid= ***file_id***
```

```
{
  "results": {
    "file_id": 5742600,
    "virus_name": "W32/Miner.VI!tr",
    "md5": "bbd72472f8d729f4c262d6fe2d9f2c8c",
    "sha512":
"cce8e67772f19bcfe5861e4c1b8eec87016bb7cf298735db633490243bc0391a017c7d6b805f225775405598614
be48c5479cb7f1c54d957e6129effbf9cca37",
    "file_size": 1141544,
    "source": "http://172.16.77.46/api/sample_download/1106042791/",
    "severity": "High",
    "category": "Trojan",
    "family":"Emotet",
    "feature_composition": [
      {
        "feature_type": "Trojan",
        "appearance_in_sample": 986
      },
      {
        "feature_type": "Application",
        "appearance_in_sample": 95
      }
    ],
    "create_date": "2020-07-31",
    "confidence": "High",
    "file_type": "PE",
    "victim_ip": "172.19.235.225",
    "attacker_ip": "172.16.77.46",
    "victim_port": 35400,
    "attacker_port": 80,
    "engine_version": 1.013,
    "kdb_version": 1.037,
    "tmfc": 0,
    "pbit": 3
  }
}
```

Field	Description
file_id	ID of the file.
virus_name	FortiNDR virus name.
source	For file uploaded by API or GUI, `source` is *manual upload*, otherwise it is an URL.

Field	Description
severity	*No Risk*, *Low*, *Medium*, *High*, or *Critical*.
category	For clean file: *Clean*. For malicious file, one of the following: *Generic Attack*, *Downloader*, *Redirector*, *Dropper*, *Ransomware*, *Worm*, *PWS*, *Rootkit*, *Banking Trojan*, *Infostealer*, *Exploit*, *Virus*, *Application*, *Multi*, *CoinMiner*, *DoS*, *BackDoor*, *WebShell*, *SEP*, *Proxy*, *Trojan*, *Phishing*, *Fileless*, *Wiper*, or *Industroyer*.
family	FortiNDR virus family name.
Feature_ composition	JSON objects containing feature composition data for malicious file. feature_type is the category which the detected feature belongs to. appearance_in_ sample is the number of appearances that the feature FortiNDR has detected.
confidence	For clean file: *N/A*. For other file: *Low*, *Medium*, or *High*.
file_type	*PE*, *PDF*, *MSOFFICE*, *HTML*, *ELF*, *VBS*, *VBA*, *JS*.
tmfc	Reserved.
pbit	Debug only.

Example of problems retrieving results

```
{
  "http_code": 400,
  "message": "INVALID_PARAM"
}
```

Field	Description
http_code	See HTTP status table on page 157.
message	Messages include: DATA_NOT_EXIST when result data cannot be found given the search query parameter. DATA_IN_PROCESS when result data is still under process, such as after one submission, the accepted files have not been assigned file IDs. This might happen when uploading a big archive or compressed file. *INVALID_PARAM_NUMBER* when zero or more than one search query parameters exist. INVALID_PARAM when search query value is not valid.

Submitted file errors explanation:

When using /ap1/v1/verdict?sid=xxx to retrieve the file verdict in the following two cases:

- Oversized file
- Oversized archive contents

You will get reply: {"http_code": 400, "message":"OVERSIZED_FILE"}

In the other following cases:

- Unsupported file type
- Unextractable archive
- File is still in queue
- File is still scanned

You will get successful reply with only supported file ids in the fileids list:

```
{

"results": {

    "fileids": [xx],

    "total_fileids": x

}

}
```

Once you get the `fileid` from submit id, using `/ap1/v1/verdict?fileid=xxx`

In the following two cases:

- File is still in queue
- File is still scanned

You will get reply: `{"http_code": 200, "message":"DATA_IN_PROCESS"}`

Get file stix2 report

/api/v1/report

Supported search query parameters	Description
`fileid`	Get report from file ID.
`md5`	Get report of the latest file with the MD5 checksum of the file.

The query string can only have one search query parameter.

Examples

```
GET /api/v1/report?fileid= ***file_id***

{
  "results": {
    *** STIX2 report content ***
  }
}
```

Example of problems retrieving report

```
{
  "http_code": 400,
```

```
  "message": "INVALID_PARAM_NUMBER"
}
```

Field	Description
`http_code`	See HTTP status table on page 157.
`message`	Messages include: `DATA_NOT_EXIST` when result data cannot be found given the search query parameter. *INVALID_PARAM_NUMBER* when zero or more than one search query parameters exist. `INVALID_PARAM` when search query value is not valid.

HTTP status table

HTTP code	Description
200	OK: API request successful.
400	Bad Request.
403	Forbidden: Request is missing authentication token, invalid authentication token, or administrator is missing access profile permissions.
404	Resource Not Found: Unable to find the specified resource.
405	Method Not Allowed: Specified HTTP method is not allowed for this resource.
413	Request Entity Too Large.
424	Failed Dependency.
500	Internal Server Error.

Appendix B - Sample script to submit files

This is a sample script in python to submit files and retrieve results from FortiNDR.

```
#!/usr/bin/python3

# Version 1.0
# par Fortinet
# Jan 2021

import os
import requests
import getopt
import argparse
import simplejson as json
from base64 import b64encode, b64decode
import urllib3
import sys
import gzip
import subprocess
import urllib.request
import validators
from fake_useragent import UserAgent
import locale
from bs4 import BeautifulSoup
import requests


host = "IP"
AI_api_key = "API_KEY"

# Please be careful when regenerate api token. Once new token has been generated, old one will be
invalid.


class FAIApiClient_file():

       def __init__(self, url):
              self.url = 'https://' + url + '/api/v1/files?access_token=' + AI_api_key
              self.body = {"file_name": "",
                           "file_content": "",
                           "password": ""}

       def _handle_post(self, data):
              """
              POST JSON request..

              @type data: dict
              @param data: JSON request data.
              @rtype: HttpResponse
              @return: JSON response data.
              """
              response = requests.post(self.url, data=json.dumps(data), verify=False)

              return response
```

```
def _load_file_for_upload(self, path_to_file, test_input, filename=''):
        """
        Load file contents into input mapping.

        @type path_to_file: basestring
        @param path_to_file: files absolute path.
        @type test_input: dict
        @param test_input: JSON request data.
        @type filename: basestring
        @param filename: filename override optional param.
        @rtype: dict
        @return: updated JSON request dict.
        """
        with open(path_to_file, 'rb') as f:
                data = f.read()
        filename = os.path.basename(path_to_file) if not filename else filename
        test_input['file_name'] = b64encode(filename.encode('utf-8'))
        test_input['file_content'] = b64encode(data)
        test_input['password'] = "1"
        return test_input

def send_file(self, OVERRIDE_FILE = '../Resources/samples.zip'):
        # NOTE: 'OVERRIDE_FILE' should be the absolute path to the file.
        #       When submitting a file via API the noted file ('OVERRIDE_FILE')
        #       will be used as an OVERRIDE.
        test_input = self.body
        test_input = self._load_file_for_upload(OVERRIDE_FILE, test_input)
        response = self._handle_post(test_input)
        return response

def _load_memory_for_upload(self, text_data, test_input, filename=''):
        """
        Load file contents into input mapping.

        @type path_to_file: basestring
        @param path_to_file: files absolute path.
        @type test_input: dict
        @param test_input: JSON request data.
        @type filename: basestring
        @param filename: filename override optional param.
        @rtype: dict
        @return: updated JSON request dict.
        """

        tmp_str = ""

        data = b64encode(text_data)

        test_input['file_name'] = b64encode(filename.encode('utf-8'))
        test_input['file_content'] = data
        test_input['password'] = "1"
        return test_input

def send_url(self, url_page,filename):
        # NOTE: 'OVERRIDE_FILE' should be the absolute path to the file.
        #       When submitting a file via API the noted file ('OVERRIDE_FILE')
        #       will be used as an OVERRIDE.
        test_input = self.body
        test_input = self._load_memory_for_upload(url_page, test_input,filename)
        response = self._handle_post(test_input)
```

```
                return response

def crawl(url,depth):

        count = 3  # amount of urls in each level
        url_list_depth = [[] for i in range(0, depth + 1)]
        url_list_depth[0].append(url)
        for depth_i in range(0, depth):
                for links in url_list_depth[depth_i]:
                        valid = True
                        try:
                                response = requests.get(links,verify=False)

                        except
(requests.exceptions.InvalidSchema,requests.exceptions.MissingSchema,requests.exceptions.SSLError) as
e:
                                valid = False

                        if (valid):
                                soup = BeautifulSoup(response.text, 'html.parser')
                                tags = soup.find_all('a')
                                for link in tags:
                                        url_new = link.get('href')
                                        flag = False
                                        for item in url_list_depth:
                                                for l in item:
                                                        if url_new == l:
                                                                flag = True

                                        if url_new is not None and "http" in url_new and flag is False:
                                                url_list_depth[depth_i + 1].append(url_new)
                                                #print(links, "->", url_new)

                        else:
                                parse_url (links)


        return (url_list_depth)

def load_file_for_upload(path_to_file):

        with open(path_to_file, 'rb') as f:
                data = f.read()

        return gzip.compress(data)

def check_file_id(host, file_id):
        data = ""
        results_output  = ""

        tmp_url = "https://" + str(host) + "/api/v1/verdict?access_token=" + str(AI_api_key) + "&fileid=" +
str(file_id)
        command= "curl -k -X GET \""+ tmp_url  + "\"  -H \"Content-Type: application/json\" "

        try:
                results_output = subprocess.check_output(command, shell=True)
                data =  json.loads(results_output)

        except subprocess.CalledProcessError as e:
```

```
                print(e)
                sys.exit(0)

        return (data)

def check_submission_results (submit_id,filename):
        data = ""
        results_output  = ""

        tmp_url = "https://" + str(host) + "/api/v1/verdict?access_token=" + str(AI_api_key) + "&sid=" + str
(submit_id)
        command= "curl -k -X GET \""+ tmp_url  + "\"  -H \"Content-Type: application/json\" "

        try:
                results_output = subprocess.check_output(command, shell=True)
                data =  json.loads(results_output)

                if (len(data) > 0):
                        for key in data:
                                if (key == "results"):
                                   tmp_data = data[key]
                                   for key, value in tmp_data.items():
                                        if (key == "fileids"):
                                                if (len(value) > 0):
                                                   for i in range(0,len(value)):
                                                        file_id = value[i]
                                                        new_data  = "DATA_IN_PROCESS"
                                                        stop = True
                                                        i = 1
                                                        while stop:
                                                           new_data = check_file_id(host, file_id)
                                                           tmp_check = str(new_data)
                                                           i = i + 1

                                                           if (not ("DATA_IN_PROCESS" in tmp_check)):
                                                              stop = False
                                                           elif (i == 50 ):
                                                              stop = False
                                                              break


                                                        results_metadata = "filename:" + str(filename)
                                                        if (len(new_data) > 0):
                                                           for key in data:
                                                              if (key == "results"):
                                                                 try:
                                                                    tmp_data = new_data[key]
                                                                    for key, value in tmp_data.items():
                                                                       results_metadata = results_metadata + ","
+ str(key) + ":" + str(value)
                                                                 except KeyError as e:
                                                                    next

                                                        print (results_metadata)

                                                        else:
                                                                print ("filename:" + str(filename)  + ",NO RESULTS")
        except subprocess.CalledProcessError as e:

                sys.exit(0)
```

```
def parse_url (tmp_url):

        client = FAIApiClient_file(host)

        if (validators.url(tmp_url)):
                ua = UserAgent()
                the_page = ""

                try:
                        request = urllib.request.Request(tmp_url, data=None, headers={'User-Agent':  str(ua)})
                        response = urllib.request.urlopen(request)

                        with urllib.request.urlopen(request) as response:
                                try:
                                        the_page = response.read()

                                except Exception  as e:
                                        pass

                except (urllib.error.URLError,urllib.error.ContentTooShortError,urllib.error.HTTPError) as e:
                                print ("CANNOT GET  URL:"  + str(tmp_url))
                                sys.exit(0)

                if (len(the_page) > 1):
                        filename = tmp_url.replace(",","_")
                        tmp_data = json.loads(client.send_url(the_page,"url").text)
                        if ("submit_id" in tmp_data):
                                submit_id = tmp_data['submit_id']
                                if (submit_id > 0) :
                                        filename = tmp_url.replace(",","_")
                                        check_submission_results (submit_id,filename)
                                else:
                                        print ("url:" + str(tmp_url) , "NO RESULTS")
                else:
                        print ("url:" + str(tmp_url) , "NO RESULTS")

        else:
                the_page = str.encode(tmp_url)
                if (len(the_page) > 1):
                        filename = tmp_url.replace(",","_")
                        tmp_data = json.loads(client.send_url(the_page,"url").text)
                        if ("submit_id" in tmp_data):
                                submit_id = tmp_data['submit_id']
                                if (submit_id > 0) :
                                        filename = tmp_url.replace(",","_")
                                        check_submission_results (submit_id,"url")
                                else:
                                        print ("url:" + str(tmp_url) , "NO RESULTS")
                else:
                        print ("url:" + str(tmp_url) , "NO RESULTS")


def getpreferredencoding(do_setlocale = True):
        return "utf-8"

def main(argv):
        locale.getpreferredencoding = getpreferredencoding

        urllib3.disable_warnings()
```

```
        parser = argparse.ArgumentParser(description='Test upload files to FortiAi and fortisandbox tool')

        parser.add_argument("-f","--file",   type=str, help="Filename to submit")
        parser.add_argument("-u","--url",   type=str, help="Filename to submit")
        parser.add_argument("-d","--depth",  type=int, help="Depth for url analysis, default 0 (just the url
page), if depth not defined, maxdepth 3")

        args = parser.parse_args()

        if ( not (args.file or args.url)):
                parser.print_help()
                sys.exit(0)

        if (args.depth):
                depth = args.depth
        else:
                depth = 0

        if (depth > 3):
                depth = 3

        if (args.file):
                client = FAIApiClient_file(host)
                tmp_data = json.loads(client.send_file(args.file).text)
                if ("submit_id" in tmp_data):
                        submit_id = tmp_data['submit_id']
                        if (submit_id > 0) :
                                check_submission_results (submit_id,args.file)
                        else:
                                print ("filename:" + str(args.file) , "NO RESULTS")

        if (args.url):

                if (depth == 0):

                        parse_url (args.url)
                else:

                        list_of_url_to_parse = ""
                        list_url = crawl (args.url,depth)

                        for i in list_url:
                                tmp_list = i
                                for j in tmp_list:
                                        parse_url(j)


# Example command: python FAI_Client.py <fai_ip> <api key> <sample file path>
if __name__ == '__main__':
    main(sys.argv)
```

Appendix C - FortiNDR ports

FortiNDR requires the following ports.

Item	Protocol and port number	Direction
API submission, such as FortiSandbox	TCP 443	Inbound
Checksum synchronization	TCP 20004	Inbound and outbound between FortiNDR units in an HA group.
CLI	TCP 22	Inbound SSH
Data synchronization	TCP 20003	Inbound and outbound between FortiNDR units in an HA group.
DB synchronization	TCP 5432	Inbound and outbound between FortiNDR units in an HA group.
File synchronization	TCP 20002	Inbound and outbound between FortiNDR units in an HA group.
FortiGate quarantine	TCP 443	Outbound to FortiGate
FortiGuard update	TCP 443	Outbound
IOC lookup	TCP 443	Outbound to productapi.fortinet.com
IOT lookup	TCP 443	Outbound to globalguardservice.fortinet.net
GUI	TCP 443	Inbound web browser
HA heartbeat signal	UDP 20000	Inbound and outbound between FortiNDR units in an HA group.
ICAP	TCP 1344, 11344	Inbound
Network File Share	TCP 139, 445, 2049 (NFS)	Outbound to file server
OFTP server	TCP 514	Inbound
Security Fabric with FortiGate	TCP 443	Outbound to root FortiGate for Security Fabric communication
Security Fabric with FortiGate	TCP 8013	Outbound to root FortiGate in Security Fabric
Synchronization control	UDP 20001	Inbound and outbound between FortiNDR units in an HA group.
Web Filter query	UDP 53	Outbound to service.fortiguard.net

Appendix D - FortiGuard Updates

For deployments that have Internet connections, FortiNDR by default relies on the Internet to get updates via the FortiGuard Distribution Network. In the occasions where FortiNDR cannot reach the Internet, you have the following options:

Malware artificial neural network (ANN) updates: You can update the ANN manually. These updates (in several GB) can be obtained via support website (https://support.fortinet.com) with a registered support contract. The latest ANN version can be viewed at: https://www.fortiguard.com/services/fortindr

For v7.0.1 and later, the offline package files have more data compared to the v1.0 and v7.0 packages. The number of packages has increased as well.

The v7.0.1 packages have additional data and they will fail to load in previous firmware versions. However, the v1.0/v7.0 ANN packages can be loaded in v7.0.1 and later firmware versions. Please download the corresponding packages according to the firmware version on the support website.

For more information about loading offline packages , see the `exec restore kdb`, `exec restore avdb`, and `exec restore ipsdb` commands in the CLI Reference Guide. IPSDB offline packages includes 3 DB (network attacks, botnet and JA3 encrypted attacks).

Other detection techniques:

The following table summarises whether detection will work on/off line (no internet access). All of the detection techniques below can be updated via FortiGuard Distribution Network (Internet).

Detection Techniques	Supports offline manual update	Comments
Malware via ANN	Yes	Can be updated manually via GUI or with an offline package via CLI.
AV engine	Yes	Shipped by default. Can be updated with internet via GUI or with an offline package via CLI.
Botnet detection	Yes	Has DB by default. Can be updated with internet via GUI or with an offline package via CLI.
Network Attacks / Application control	Yes	Has DB by default. Can be updated with internet via GUI or with an offline package via CLI.
Encrypted attacks (via JA3)	Yes	Has DB by default. Can be updated with internet via GUI or with an offline package via CLI.
Weak cipher/vulnerable protocol detection	NA	Comes with firmware, no updates required.
Device inventory	No	Lookup IOT services to determine device role/type/OS

Detection Techniques	Supports offline manual update	Comments
FortiGuard IOC	No	Requires Internet to lookup URLs and IP for web campaigns associated.
ML Discovery	NA	Local ML algorithm updates via firmware.
Geo DB	No	Comes with firmware, does not update often, supports FortiGuard Update via internet.

Appendix E - Event severity level by category

Event Category	NDR Detection Severity Level
Botnet Detection	Critical
Encryption Attack Detection	Critical
Network Attack Detection	Low|Medium|High|Critical
Indication of Compromise Detection	Critical
Weak Cipher and Vulnerable Protocol Detection	Low|Medium|High|Critical
Malware Detection	Low

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