

Health

The following topics describe how to use health monitoring:

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Get started with health monitoring

Learn how health policies, modules, metrics, events, and alerts work together to monitor Firewall Management Center and its managed appliances.

Health monitoring in Firewall Management Center

Health monitoring tracks hardware, software, and critical system functions in Firewall Management Center and its managed appliances. Firewall Management Center runs health modules at configured intervals, evaluates the results, and presents health information for your deployment.

Health monitoring provides two related functions: collecting time series data for metric analysis, and monitoring system health and generating alerts. Use health monitoring to analyze health and performance trends, review health events, identify conditions that require attention, and send selected health notifications to external destinations.

These categories explain various elements of the Firewall Management Center health monitoring model and how they work together.

Configure health monitoring

- Health policy—Defines what Firewall Management Center monitors for an assigned appliance. A health policy contains enabled health modules and the settings that control how each module operates, such as module-specific criteria, thresholds, and run or collection intervals where applicable. Select modules according to the system conditions and operational outcomes that you need to monitor, and review module applicability before applying the policy. For more information, refer to Health policies, on page 5.

- Health module—Tests a specific system function or collects information about it. Alert modules report health status. Metrics modules collect time-series data, and some metrics modules also generate alerts when values cross configured thresholds. For more information, refer to Health modules, on page 29.

Health information produced by monitoring

- Health metrics—Time series data collected over time for a monitored system function. Firewall Management Center displays metrics in health monitor dashboards so that you can analyze changes, trends, and relationships between system conditions.
- Health status—Indicates the result of a health module test or the compiled condition of a monitored appliance. Health monitor status categories include **Error**, **Critical**, **Warning**, **Normal**, **Recovered**, and **Disabled** as applicable.
- Health event—A record that Firewall Management Center logs when a health module result meets the configured event conditions. The event contains information about the health module, monitored appliance, reported status, and condition. For more information, refer to Health event views, on page 21.
- Health monitor dashboards—Displays the compiled health status for Firewall Management Center and its managed appliances. It also provides an option to create custom dashboards to view specific health information. For more information, refer to About the health monitor, on page 13.

Respond to health information

- Alert response—Defines how Firewall Management Center sends information to an external destination.
- Health monitor alert—Associates a severity level, one or more health modules, and an alert response. When the selected severity occurs for a selected module, the health monitor alert triggers its associated alert response. For more information, refer to Health monitor alerts, on page 9.

Health monitoring scope and behavior

- Firewall Management Center automatically reports its own status using the modules configured in the default health policy. All appliances automatically report hardware status through the Hardware Alarms health module.

  Some health modules, such as the **Appliance Heartbeat** module, run on Firewall Management Center and report the status of managed devices. To provide managed-device status, health policies must be deployed to the devices.
- If a health policy enables a module that does not apply to the selected appliance, the health monitor reports that module as **Disabled**. Review module applicability before applying a policy.
- In a multidomain deployment, you can view a device's health summary in the domain where the device is located. Health event views allow you to search and analyze the events gathered by the health monitor.
- In a Firewall Management Center high availability deployment, the active peer creates a health monitor page that uses REST APIs to show detailed metric-based information. The standby peer creates the health monitor page that shows the alert information and provide a visual summary of the status of all appliances on your network using pie charts and status tables. The standby peer does not display the metric-based information.

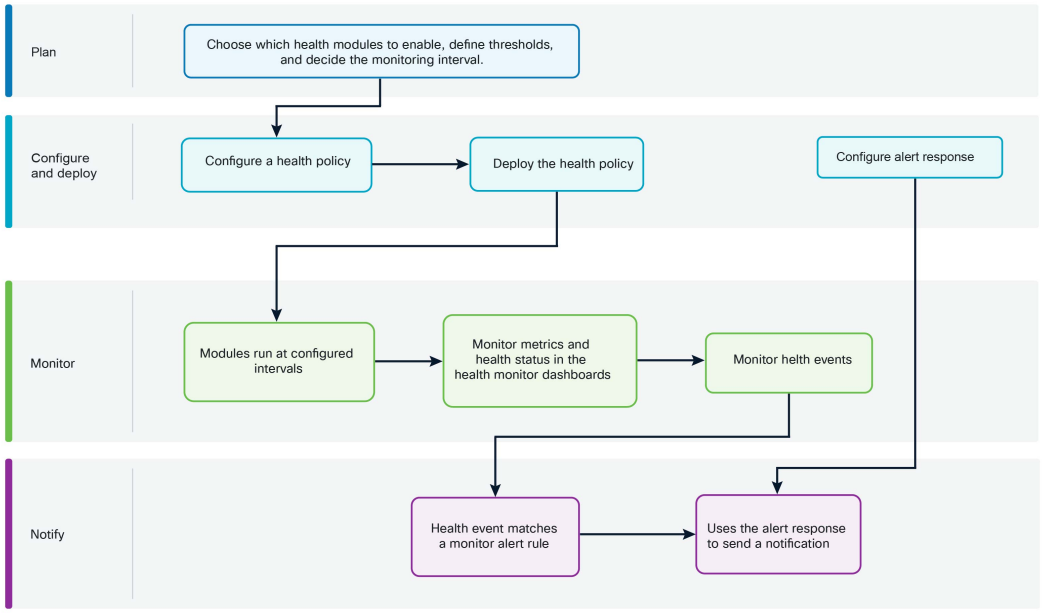
How health monitoring works

Summary

Health monitoring in Firewall Management Center enables you to track appliance health using policies, modules, metrics, events, and notifications, providing visibility and automated alerting for network conditions.

Workflow

Figure 1: Health monitoring workflow



These stages describe how health monitoring information flows from policy configuration to monitoring and notification.

1. Choose the health modules that provide the health metrics and alerts required for your monitoring goal. Check that each module supports your appliance type and review its configuration requirements, dependencies, and available thresholds. For more information, refer to Health modules, on page 29.
2. Create or modify a health policy. Enable the selected health modules and configure their settings, run intervals, and thresholds where needed. For more information, refer to Health policies, on page 5.
3. Deploy the health policy to the appropriate managed appliances. Monitoring begins after you successfully deploy the health policy.
4. The enabled health modules run at the intervals configured in the health policy. A module can collect metric data, report a health alert, or perform both functions, depending on the module.

5. Firewall Management Center displays health statuses and metrics in the health monitor dashboards. Metric data supports analysis over time; it does not necessarily produce a health event for every collected value. For more information, refer to About the health monitor, on page 13.
6. When a module result meets the conditions configured for event generation, Firewall Management Center logs a health event.

   Note that the health event logs the condition in Firewall Management Center and does not, by itself, send an external notification.
7. Firewall Management Center evaluates the health event against configured health monitor alerts. When the event's module and severity match a health monitor alert, Firewall Management Center invokes the alert response associated with that alert.
8. The alert response delivers the notification to its configured destination, such as an email server or webhook endpoint.

Result

During operation, you can run all health modules, or a specific module, on demand to investigate a condition. You can also exclude appliances or health modules if you do not want them to generate health information.

Your health policy determines what Firewall Management Center monitors and how often it evaluates the condition. The health monitor displays the results. The health event records a qualifying condition. The health monitor alert determines which conditions require notification, and the alert response determines how and where the notification is delivered.

Health event external notifications

Firewall Management Center uses separate configurations to detect a health condition and notify an external system about it.

A health policy defines what Firewall Management Center monitors and which conditions produce a health event. An alert response configuration defines how Firewall Management Center communicates with an external destination, such as an email server. The monitor alert rule configuration connects the health policy and alert response by specifying which health events should trigger a particular alert response.

How the configurations work together

These steps describe how you configure external notifications for health events and how Firewall Management Center processes the health event.

1. Configure and apply the health policy: A health policy enables health modules and defines the criteria used to assess appliance health.

   For example, a health policy can enable the **Memory Usage** module and define **Critical** thresholds.

   Apply the health policy to the appliance, including the Firewall Management Center when you want to monitor Firewall Management Center resources.
2. Configure the alert response: An alert response defines how and where Firewall Management Center sends the external notification. Depending on the response type, the alert response contains the destination address, server or endpoint information, and other communication settings.

   For example, an email alert response identifies the recipients, sender, and mail relay host that Firewall Management Center uses to send the message.

For more information about alert responses, refer to Configuring external alerts with alert responses.

3. Configure the monitor alert rule: A monitor alert rule associates a health-event severity and one or more health modules with an alert response.

   For example, a health monitor alert rule can specify:

   - Severity: **Critical**
   - Health module: **Memory Usage**
   - Alert response: **Critical memory email**

   This means that when Firewall Management Center generates a **Critical** event for the **Memory Usage** module, it invokes the associated alert response.

   For more information about health monitor alerts, refer toHealth monitor alerts, on page 9.

4. Firewall Management Center generates a health event: Firewall Management Center evaluates the enabled health modules according to the health policy and its configured run interval. When a health module evaluates an appliance and the result meets a configured condition, Firewall Management Center generates a health event.

   Note that a health event is an event log within Firewall Management Center; it does not send an external notification by itself.

5. Firewall Management Center matches the event and sends the notification: Firewall Management Center evaluates the generated event against the configured health monitor alerts. If the event's module and severity match a monitor alert rule, Firewall Management Center invokes the alert response associated with that rule and sends the notification to the configured external system.

Note Health alerts can take approximately 5–6 minutes to be generated after the corresponding health event occurs.

Health policies

A health policy is a configuration framework that

- enables you to define test criteria for monitoring the health of appliances,
- allows selective enabling of health modules and critical alert settings, and
- provides flexibility to apply, customize, or use default policies for each appliance.

Health policy configuration options

When you configure a health policy, you decide whether to enable each health module for that policy. You also select the criteria that control which health status each enabled module reports each time it assesses the health of a process.

You can create one health policy that can be applied to every appliance in your system, customize each health policy to the specific appliance where you plan to apply it, or use the default health policy provided for you.

Note When you register an appliance, the Firewall Management Center automatically assigns it the default health policy. To disassociate a health policy from an appliance, you must first associate a different health policy with it. An appliance must have at least one health policy assigned.

Default health policy

The Firewall Management Center setup process creates and applies an initial health policy, in which most—but not all—available health modules are enabled. The system also applies this initial policy to devices added to the Firewall Management Center.

This initial health policy is based on a default health policy. You cannot view or edit the default health policy, but you can copy it when creating a custom health policy.

Upgrades and the default health policy

When you upgrade the Firewall Management Center, any new health modules are added to all health policies, including the initial health policy, default health policy, and any other custom health policies. Usually, new health modules are added in an enabled state.

Note For a new health module to begin monitoring and alerting, reapply health policies after upgrade.

Requirements and prerequisites for health monitoring

This reference provides the requirements and prerequisites needed to implement health monitoring functionality.

Model support

Any

Supported domains

Any

User roles

Administrator: Full permissions (create, view, edit, delete, and deploy) for health policies, exclusions, alerts, and related health settings.

Maintenance User and Security Analyst: View-only permissions for health monitoring data (dashboards, status, and events); no create, edit, delete, or deploy permissions.

Configure health monitoring

Learn how to create, edit, assign, set as default, and delete health policies for managed appliances. Also, learn about health monitor alert severities and how to create, edit, and delete alerts that trigger responses when monitored conditions occur.

Create a health policy

If you want to customize a health policy to use with your appliances, you can create a new policy. The settings in the policy initially populate with the settings from the health policy you choose as a basis for the new policy. You can edit the policy to specify your preferences, such as enable or disable modules within the policy, change the alerting criteria for each module as needed, and specify the run time intervals.

Procedure

Step 1 Choose **System** (⚙) > **Health** > **Policy**.

Step 2 Click **Create Policy**.

Step 3 Enter a name for the policy.

Note that the following names are reserved for the default policies, and you cannot create a health policy using these names:

- Default Device Policy
- Default Health Policy

Step 4 Choose the existing policy that you want to use as the basis for the new policy from the **Base Policy** drop-down list.

Step 5 Enter a description for the policy.

Step 6 Choose **Save**.

What to do next

- Apply the health policy on devices as described in Apply a health policy, on page 12.
- Edit the policy to specify the module-level policy settings as described in Edit a health policy, on page 7.

Edit a health policy

Edit a health policy when you need to adjust which modules are monitored, change critical or warning thresholds, or reassign policies to different devices.

Before you begin

- Ensure you have access to Firewall Management Center.

- Identify the health policy you need to modify.

Follow these steps to edit a health policy:

Procedure

Step 1 Choose **System** (⚙) > **Health** > **Policy**.

Step 2 Click **Edit** (✎) next to the policy you want to modify.

Step 3 To edit the policy name and its description, click the **Edit** (✎) icon provided against the policy name.

Step 4 The **Health Modules** tab displays all the device modules and its attributes. Configure your health modules using the following actions:

- Click the toggle button that is provided against the module and its attributes—turn on () or turn off () to enable or disable testing of health status respectively.
- To execute a bulk enable or disable testing on the health modules, click the **Select All** toggle button



Note

- The modules and attributes are flagged with the supporting appliances—Firewall Threat Defense, Firewall Management Center, or both.
- You cannot choose to include or exclude the individual attributes of CPU and Memory modules.

For information on the modules, refer to Health modules, on page 29.

Step 5 Where appropriate, set the **Critical** and **Warning** threshold percentages.

Step 6 In the **Run Time Intervals** tab, enter the relevant values in the fields:

- **Health Module Run Interval**: The frequency for running the health modules. The minimum interval is 5 minutes.
- **Metric Collection Interval**: The frequency of collecting the time series data on the device and its health modules. The device monitor reports these metrics in several predefined health monitor dashboards by default. For detailed information on the dashboard, refer to View the device health monitor, on page 18. The metric data is collected for analysis and hence no alerting is associated with it.

Step 7 To view and modify the devices to which the policy is assigned, do the following:

a) Click **Policy Assignments & Deploy**.
b) From the **Available Devices** list, click the + icon next to the device to which you want to assign the health policy.
c) Click **Apply**.



Note The UI prompts you to save unsaved changes before continuing with assignment and deployment.

Alternatively, you can apply the health policy to your appliance as described in Apply a health policy, on page 12

Apply the health policy to each appliance where you want to track health status. When you apply the health policy to an appliance, all the modules you enabled in the policy monitor the health of the processes and hardware on the appliance, and forwards that data to the Firewall Management Center.

Step 8 Click **Save**.

Delete a health policy

You can delete health policies that you no longer need. However, an appliance must have at least one health policy assigned to it. If you delete a policy that is still applied to an appliance, the policy settings remain in effect until you apply a different policy. In addition, if you delete a health policy that is applied to a device, any health monitoring alerts in effect for the device remain active until you disable the underlying associated alert response.

Note To stop health monitoring for an appliance, create a health policy with all modules disabled, assign it to the appliance, and remove the appliance's other health policy assignments. The appliance retains one assigned health policy, but no health modules are monitored.

Procedure

Step 1 Choose **System** (⚙) > **Health** > **Policy**.

Step 2 Click **Delete** (🗑) next to the policy that you want to delete.

Step 3 Click **Delete health policy** to delete it.

Health monitor alerts

A health monitor alert is a notification mechanism that

- enables association of alert responses with health event levels to trigger notifications based on event severity, and
- allows customization to monitor specific system conditions such as disk space thresholds.

Disk space monitoring alert example

If you are concerned that your appliances may run out of hard disk space, you can automatically send an email to a system administrator when the remaining disk space reaches the warning level. If the hard drive continues to fill, you can send a second email when the hard drive reaches the critical level.

Health monitor alert information

The alerts generated by the health monitor contain specific information that helps identify issues and their severity.

Health monitor alerts include these attributes:

- Severity: Indicates the severity level of the alert.
- Module: Specifies the health module whose test results triggered the alert.
- Description: Includes the health test results that triggered the alert.

The table describes these severity levels.

Table 1: Alert severities

Severity	Description
Critical	The health test results met the criteria to trigger a Critical alert status.
Warning	The health test results met the criteria to trigger a Warning alert status.
Normal	The health test results met the criteria to trigger a Normal alert status.
Error	The health test did not run.
Recovered	The health test results met the criteria to return to a normal alert status, following a Critical or Warning alert status.

Create a health monitor alert

When you create a health monitor alert, you create an association between a severity level, a health module, and an alert response. You can use an existing alert or configure a new one specifically to report on system health. When the severity level occurs for the selected module, the alert triggers.

If you create or update a threshold in a way that duplicates an existing threshold, you are notified of the conflict. When duplicate thresholds exist, the health monitor uses the threshold that generates the fewest alerts and ignores the others. The timeout value for the threshold must be between 5 and 4,294,967,295 minutes.

Before you begin

- You must be an Admin user.
- Ensure that you have configured alert responses that govern the Firewall Management Center's communication with the SNMP, syslog, email server, or webhook where you send the health alert. For more information, refer to Configuring external alerts with alert responses.

Procedure

Step 1 Choose **System** (⚙) > **Health** > **Monitor Alerts**.

Step 2 Click **Add**.

Step 3 In the **Add Health Alert** dialog box, enter a name for the health alert in the **Health Alert Name** field.

Step 4 From the **Severity** drop-down list, choose the severity level you want to use to trigger the alert.

Step 5 From the **Alert** drop-down list, choose the alert response that you want to trigger when the specified severity level is reached. If you have not yet configured the alert responses, click **Alerts** to visit the **Alerts** page and set them.

Step 6 From the **Health Modules** list, choose the health policy modules for which you want the alert to apply.

Step 7 Optionally, in the **Threshold Timeout** field, enter the number of minutes that should elapse before each threshold period ends and the threshold count resets.

Even if the policy run time interval value is less than the threshold timeout value, the interval between two reported health events from a given module is always greater. For example, if you change the threshold timeout to 8 minutes and the policy run time interval is 5 minutes, there is a 10-minute interval (5 x 2) between reported events.

Step 8 Click **Save** to save the health alert.

Edit a health monitor alert

Administrators may need to update the alert parameters for health monitor alerts in order to adjust severity, change modules, or select different responses as requirements evolve.

Before you begin

You must be an Admin user to perform this task.

Follow these steps to edit health monitor alerts:

Procedure

Step 1 Choose **System** (⚙) > **Health** > **Monitor Alerts**.

Step 2 Click the **Edit** (✎) icon that is provided against the required health alert that you want to modify.

Step 3 In the **Edit Health Alert** dialog box, from the **Alert** drop-down list, select the required alert entry, or click **Alerts** link to configure a new alert entry.

Step 4 Click **Save**.

Delete health monitor alerts

Health monitor alerts notify you about system events, issues, or warnings. You may need to delete outdated or irrelevant alerts to streamline monitoring.

Procedure

Step 1 Choose **System** (⚙) > **Health** > **Monitor Alerts**.

Step 2 Click **Delete** (🗑) next to the health alert you want to delete.

Step 3 Click **Delete health alert** to delete it.

What to do next

Disable or delete the underlying alert response to ensure that alerting does not continue. For more information, refer to Configuring external alerts with alert responses.

Apply and verify health monitoring

Learn how to apply a health policy so that its enabled modules automatically monitor appliance health, and how to run all health modules on demand for up-to-date device health information.

Apply a health policy

When you apply a health policy to an appliance, the health tests for all the modules you enabled in the policy automatically monitor the health of the processes and hardware on the appliance. Health tests then continue to run at the intervals you configured in the policy, collecting health data for the appliance and forwarding that data to the Firewall Management Center.

If you enable a module in a health policy and then apply the policy to an appliance that does not require that health test, the health monitor reports the status for that health module as disabled.

To stop health monitoring for an appliance, create a health policy with all modules disabled, assign it to the appliance, and remove the appliance's other health policy assignments. The appliance retains one assigned health policy, but no health modules are monitored.

When you apply a different policy to an appliance that already has a policy applied, expect some latency in the display of new data based on the newly applied tests.

Procedure

Step 1 Choose **System** (⚙) > **Health** > **Policy**.

Step 2 Click the **Deploy health policy** (📥) next to the policy you want to apply.

Step 3 Choose the appliances where you want to apply the health policy.

Note An appliance must have at least one health policy assigned to it. To stop health monitoring for an appliance, create a health policy with all modules disabled, assign it to the appliance, and remove the appliance's other health policy assignments. The appliance retains one assigned health policy, but no health modules are monitored. To disassociate a health policy from an appliance, you must first associate a different health policy with it.

Step 4 Click **Apply** to apply the policy to the appliances you chose.

The health policy is successfully applied to the selected appliances, and monitoring begins automatically.

What to do next

- Optionally, monitor the task status; see View task messages.

  Monitoring of the appliance starts when the policy is successfully applied.

Run all health modules for an appliance

Health module tests run automatically at the policy run time interval you configure when you create a health policy. You can also run all health module tests on demand to collect up-to-date health information for a device.

Procedure

Step 1 Choose **System** (⚙) > **Health** > **Monitor**.

Step 2 In the **Device** column of the **Health Status** table, click the expand button near to name of the device for which you want to run all health modules.

Step 3 Click **Run All**.
The health status for the device refreshes when all tests are complete.

Note When you manually run health modules, the first refresh that automatically occurs may not reflect the data from the manually run tests. If the value has not changed for a module that you just ran manually, wait a few seconds, then refresh the page by clicking the device name. You can also wait for the page to refresh again automatically.

Monitor health

Use health dashboards, metrics, and event views to assess device and management center status and investigate changes over time. Manage default policies and exclusions to control which conditions affect the health summary.

About the health monitor

The health monitor provides the compiled health status for all devices managed by the Firewall Management Center, plus the Firewall Management Center itself.

The health monitor is composed of:

- The Health Status summary page — Provides you with an at-a-glance view of the health of the Firewall Management Center and all of the devices that the Firewall Management Center manages. In a multi-domain deployment, you can view the health status summary for a device in the domain where the

device is located. Devices are listed individually, or grouped according to their geolocation, high availability, or cluster status where applicable.

- View the health summary of the Firewall Management Center and any device when you hover on the hexagon that represents the device health.
- The dot to the left of a device indicates its health:
  - Green — No alarms.
  - Orange — At least one health warning.
  - Red — At least one critical health alarm.

- The Monitoring navigation pane — Allows you to navigate the device hierarchy. You can view health monitors for individual devices from the navigation pane.

Procedure

Step 1 Choose **System** (⚙) > **Health** > **Monitor**.

Step 2 View the status of the Firewall Management Center and its managed devices in the **Health Status** landing page.

a) Hover your pointer over a hexagon to view the health summary of a device. The popup window shows a truncated summary of the top five health alerts. Click the popup to open a detailed view of the health alert summary.

b) In the device list, click **Expand**(>) and **Collapse** (⌄) to expand and collapse the list of health alerts for a device.

When you expand the row, all of the health alerts are listed, including the status, title, and details.

Note Health alerts are sorted by their severity level.

Step 3 Use the Monitoring navigation pane to access device-specific health monitors.

a) In the device list, click **Expand** (>) and **Collapse** (⌄) to expand and collapse the list of managed devices.

When you expand the row, all of the devices are listed.

b) Click a device to view a device-specific health monitor.

c) In the health monitor, hover over a graph to view all metrics and their respective values at that specific point on the graph. Click the graph to pin the metrics statistics box, allowing you to explore the metrics and their values in detail. To close the statistics box and move to another point on the graph, simply click the close button.

You have accessed the health monitor and can view the compiled health status for all managed devices. You can interact with the Health Status landing page and use the Monitoring navigation pane to access device-specific health information.

What to do next

- For information about the compiled health status and metrics for any device managed by the Firewall Management Center, refer to Device health monitors, on page 17.
- For information about the health status of the Firewall Management Center, refer to Using Health Monitor.

  To return to the **Health Status** landing page at any time, click **Home**.

View the Firewall Management Center health monitor dashboard

The Firewall Management Center monitor provides a detailed view of the health status of the Firewall Management Center. The health monitor is composed of:

- High Availability (if configured): The High Availability (HA) panel displays the current HA status, including the status of the Active and Standby units, the last sync time, and overall device health.
- Event Rate: The Event Rate panel shows the maximum event rate as a base line as well as the overall event rate received by the Firewall Management Center.
- Event Capacity: The Event Capacity panel shows the current consumption by event categories, including the retention time of events, the current vs. maximum event capacity, and a capacity overflow mechanism where you are alerted when events are stored beyond the configured maximum capacity of the Firewall Management Center.
- Process Health: The Process Health panel has an at-a-glance view of the critical processes as well as a tab that lets you see state of all processed, including the CPU and memory usage for each process.
- CPU: The CPU panel lets you toggle between the average CPU usage (default) and the CPU usage of all cores.
- Memory: The Memory panel shows the overall memory usage on the Firewall Management Center.
- Interface: The Interface panel shows average input and output rate of all interfaces.
- Disk Usage: The Disk Usage panel shows the use of entire disk, and the use of the critical partitions where Firewall Management Center data is stored.

Tip Your session normally logs you out after one hour of inactivity (or another configured interval). If you plan to passively monitor health status for long periods of time, consider exempting some users from session timeout, or changing the system timeout settings. For more information, refer to Add or edit an internal user and Configure session timeouts.

Procedure

Step 1 Choose **System** (⚙) > **Health** > **Monitor**.

Step 2 Use the **Monitoring** navigation pane to access the Firewall Management Center and device-specific health monitors.

- A standalone Firewall Management Center is shown as a single node; a high-availability Firewall Management Center is shown as a pair of nodes.
- The health monitor is available to both the active and standby Firewall Management Center in an HA pair, and the health alerts appear in both the units. However, you must resolve any health alerts from the active Firewall Management Center, as access to various pages can be restricted in the standby Firewall Management Center.

Step 3 Explore the Firewall Management Center dashboard.

The Firewall Management Center dashboard includes a summary view of the HA state of the Firewall Management Center (if configured), as well as at-a-glance views of Firewall Management Center processes and device metrics such as CPU, memory, and disk usage.

Generate health module alert graphs

Health module alert graphs help you track appliance performance and diagnose issues using historical alert data.

Before you begin

Confirm you have access to the desired appliance's health monitor.

Follow these steps to generate health module alert graphs.

Procedure

Step 1 View the health monitor for the appliance.

Step 2 In the **Module Status Summary** graph of the Health Monitor Appliance page, click the color for the health alert status category you want to view.

Step 3 In the **Alert Detail** row for the alert for which you want to view a list of events, click **Graph**.



Tip If no events appear, you may need to adjust the time range.

Device health monitors

The device health monitor provides the compiled health status for any device managed by the Firewall Management Center. The device health monitor collects health metrics for Secure Firewall devices in order to predict and respond to system events.

The device health monitor is comprised of these components:

- System Details: Displays information about the managed device, including the installed Secure Firewall version and other deployment details.
- Troubleshooting & Links: Provides convenient links to frequently used troubleshooting topics and procedures.
- Health alerts: A health alert monitor provides an at-a-glance view of the health of the device.
- Time range: An adjustable time window to constrain the information that appears in the various device metrics windows.
- Device metrics: An array of key firewall device health metrics categorized across predefined dashboards, including:
  - CPU: CPU utilization, including the CPU usage by process and by physical cores. The Firewall Threat Defense CPU core allocation dashboard shows core assignments for these categories:
    - **Data Plane**: Handles basic network functions, including core packet forwarding and network data processing.
    - **Snort**: Manages intrusion detection and deep packet inspection features.



Note Multi-threaded Snort processes are allocated across multiple Snort cores to improve device performance. The Snort core allocation shown in the **CPU** dashboard reflects the total number of Snort process threads assigned to Snort cores.

    - **System**: Includes all other system processes. While some processes may have dedicated CPU cores allocated, their usage is combined and displayed under the **System** category in the dashboard.

  - Memory: Device memory utilization, including data plane and Snort memory usage.
  - Interfaces: Interface status and aggregate traffic statistics.
  - Connections: Connection statistics (such as elephant flows, active connections, peak connections, and so on) and NAT translation counts.
  - Snort: Statistics related to the Snort process.
  - Disk Usage: Device disk usage, including the disk size and disk utilization per partition.
  - Critical Processes: Statistics related to managed processes, including process restarts and other select health monitors such as CPU and memory utilization.

For a comprehensive list of the supported device metrics, refer to Cisco Secure Firewall Threat Defense Health Metrics.

View the device health monitor

The device health monitor compiles device metrics and displays health status and trends using an array of dashboards.

Follow these steps to view the device health monitor.

Procedure

Step 1 Choose **System** (⚙) > **Health** > **Monitor**.

Use the Monitoring navigation pane to access device-specific health monitors.

Step 2 In the device list, click **Expand**(>) and **Collapse** (⌄) to expand and collapse the list of managed devices.

Step 3 View the **Health Alerts** for the device in the alert notification at the top of page, directly to the right of the device name.

Hover your pointer over the **Health Alerts** to view the health summary of the device. The pop-up window shows a truncated summary of the top five health alerts. Click the pop-up to open a detailed view of the health alert summary.

Step 4 Configure the time range from the drop-down in the upper-right corner.

The time range can reflect a period as short as the last hour (the default) or as long as two weeks. Select **Custom** from the drop-down to configure a custom start and end date.

Click the refresh icon to set auto refresh to 5 minutes or to toggle off auto refresh.

Step 5 Click the **Show Deployment Info** (🚀) icon for a deployment overlay on the trend graph, with respect to the selected time range.

The **Show Deployment Info** (🚀) icon indicates the number of deployments during the selected time-range. A vertical band indicates the deployment start and end time. In the case of multiple deployments, multiple bands/lines can appear. Click the icon on top of the dotted line to view the deployment details.

Step 6 View the device monitor reports health and performance metrics in several predefined dashboards by default.

The metrics dashboards include:

- Overview: Highlights key metrics from the other predefined dashboards, including CPU, memory, interfaces, connection statistics; plus disk usage and critical process information.
- CPU: CPU utilization, including the CPU usage by process and by physical cores.
- Memory: Device memory utilization, including data plane and Snort memory usage.
- Interfaces: Interface status and aggregate traffic statistics.
- Connections: Connection statistics (such as elephant flows, active connections, peak connections, and so on) and NAT translation counts.
- Snort: Statistics related to the Snort process.
- ASP Drops: Statistics related to the Accelerated Security Path (ASP) performance and behavior.

Note

- Multi-threaded Snort processes are allocated across multiple Snort cores to improve device performance. Note that the Snort core allocation shown in the **CPU**dashboard reflects the total number of Snort process threads assigned to Snort cores.
- The **Process Health** widget in Firewall Management Center displays the CPU% usage for each process. The CPU% metric reflects usage relative to the number of cores in the Firewall Threat Defense device, where 100% corresponds to full utilization of one core. For example, on an 8-core device, 200% indicates two fully utilized cores, leaving six available for other processes. To monitor overall system CPU usage, use the **CPU** widget instead of the **Process Health** widget.

You can navigate through the various metrics dashboards by clicking on the labels. For a comprehensive list of the supported device metrics, refer to Cisco Secure Firewall Threat Defense Health Metrics.

Step 7 Click the **Add New Dashboard**(+) to create a custom correlation dashboard by building your own variable set from the available metric groups.

For more information, refer to Correlating device metrics, on page 19.

Correlating device metrics

The device health monitor includes an array of key Firewall Threat Defense device metrics that serve to predict and respond to system events. The health of any Firewall Threat Defense device can be determined by these reported metrics.

The device monitor reports these metrics in several predefined dashboards by default. These dashboards include:

- Overview: Highlights key metrics from the other predefined dashboards, including CPU, memory, interfaces, connection statistics; plus disk usage and critical process information.
- CPU: CPU utilization, including the CPU usage by process and by physical cores.
- Memory: Device memory utilization, including data plane and Snort memory usage.
- Interfaces: Interface status and aggregate traffic statistics.
- Connections: Connection statistics (such as elephant flows, active connections, peak connections, and so on) and NAT translation counts.
- Snort: Statistics related to the Snort process.
- ASP Drops: Statistics related to the Accelerated Security Path (ASP) performance and behavior.

You can add custom dashboards to correlate metrics that are interrelated. Select from predefined correlation groups, such as CPU and Snort; or create a custom correlation dashboard by building your own variable set from the available metric groups. For a comprehensive list of the supported device metrics, refer to Cisco Secure Firewall Threat Defense Health Metrics.

Before you begin

- To view and correlate the time series data (device metrics) in the health monitor dashboard, enable REST API (**System** (⚙) > **Configuration** > **REST API Preferences**).

Note Correlating device metrics is available only for Firewall Threat Defense 6.7 and later versions. Hence, for Firewall Threat Defense versions earlier than 6.7, the health monitor dashboard does not display these metrics even if you enable REST API.

Follow these steps to correlate device metrics:

Procedure

Step 1 Choose **System** (⚙) > **Health** > **Monitor**.

Step 2 In the **Devices** list, click **Expand**(>) and **Collapse** (⌄) to expand and collapse the list of managed devices, and choose the device for which you want to modify the dashboard.

Use the Monitoring navigation pane to access device-specific health monitors.

Step 3 Click the **Add Dashboard** (+) icon in the upper right corner of the device monitor to add a new dashboard.

Step 4 From the **Select Correlation Group** drop-down, choose a predefined correlation group or to create a custom group. To create a dashboard from a predefined correlation group, choose the group and click **Add**.

Step 5 To create a custom correlation dashboard:

a) Choose **Custom**.
b) Enter a unique name in the **Dashboard Name** field or accept the default.
c) Choose a group from the **Select Metric Group** drop-down, then select corresponding metrics from the **Select Metrics** drop-down.

For a comprehensive list of the supported device metrics, refer to Cisco Secure Firewall Threat Defense Health Metrics.

Step 6 Click **Add Metrics** to add and select metrics from another group, and to remove an individual metric, click the Remove ✕ icon on the right side of the item. Click the delete icon to remove the entire group. Click **Add** to add the dashboard to the health monitor.

Step 7 You can **Edit** or **Delete** custom correlation dashboards.

View system details and generate troubleshooting files

Use this task to view system details and generate and download troubleshooting files when you need to monitor device health or initiate troubleshooting procedures on specific devices through the management center.

Procedure

Step 1 Choose **System** (⚙) > **Health** > **Monitor**.

Use the **Monitoring** navigation pane to access device-specific health monitors.

Step 2 In the device list, click **Expand**( ) and **Collapse** ( ) to expand and collapse the list of managed devices.

Step 3 Click a device to view a device-specific health monitor.

Step 4 Click the link for **View System & Troubleshoot Details …**

This panel is collapsed by default. Clicking the link expands the collapsed section to see **System Details** and **Troubleshooting & Links** for the device. The system details include:

- **Version:** The Secure Firewall software version.
- **Model:** The device model.
- **Mode:** The firewall mode. The Firewall Threat Defense device supports two firewall modes for regular firewall interfaces: Routed mode and Transparent mode.
- **VDB:** The Cisco vulnerability database (VDB) version.
- **SRU:** The intrusion rule set version.
- **Snort:** The Snort version.

Step 5 You have these choices:

- Generate troubleshooting files; refer to Generate troubleshooting files for specific system functions.
- Generate and download advanced troubleshooting files; refer to Download advanced troubleshooting files.
- Create and modify health policies; refer to Create a health policy, on page 7.
- Create and modify health monitor alerts; refer to Create a health monitor alert, on page 10.

Health event views

Health event views enable you to monitor health events logged by the health monitor in the Firewall Management Center. The views are fully customizable, allowing you to analyze health statuses efficiently and access related event data.

You can search event data to easily access other information that may be related to the events you are investigating. If you understand what conditions each health module tests for, you can more effectively configure alerting for health events.

You can perform many of the standard event view functions on the health event view pages.

View health events

Use this task when you need to monitor the health of your appliances and review any incidents or events recorded.

When you access health events from the **Health Monitor** page on your Firewall Management Center, you retrieve all health events for all managed appliances.

Tip You can bookmark this view to allow you to return to the page in the health events workflow containing the **Health Events** table of events. The bookmarked view retrieves events within the time range you are currently viewing, but you can then modify the time range to update the table with more recent information if needed.

Follow these steps to view health events.

Procedure

Choose **System** (⚙) > **Health** > **Events**.

Tip If you are using a custom workflow that does not include the table view of health events, click **(switch workflow)**. On the **Select Workflow** page, click **Health Events**.

Note If no events appear, you may need to adjust the time range.

View health events by module and appliance

This task helps you efficiently monitor appliance health by filtering health events based on module status and viewing detailed alerts for specified events.

Procedure

Step 1 View the health monitor for the appliance; refer to View the device health monitor, on page 18.

Step 2 In the **Module Status Summary** graph, click the color for the event status category you want to view.

The Alert Detail list toggles the display to show or hide events.

Step 3 In the **Alert Detail** row for the alert for which you want to view a list of events, click **Events**.

The Health Events page appears, containing results for a query with the name of the appliance and the name of the specified health alert module as constraints. If no events appear, you may need to adjust the time range.

Step 4 If you want to view all health events for the specified appliance, expand **Search Constraints**, and click the **Module Name** constraint to remove it.

View the health events table

The Health Events Table provides actionable insight into system health and allows users to organize, modify, and respond to health events.

Procedure

Step 1 Choose **System** (⚙) > **Health** > **Events**.

Step 2 You have the following choices:

- Bookmark: To bookmark the current page so that you can quickly return to it, click **Bookmark This Page**, provide a name for the bookmark, and click **Save**.
- Change Workflow: To choose another health events workflow, click **(switch workflow)**.
- Delete Events: To delete health events, check the check box next to the events you want to delete, and click **Delete**. To delete all the events in the current constrained view, click **Delete All**, then confirm you want to delete all the events.
- Generate Reports: Generate a report based on data in the table view — click **Report Designer**.
- Modify: Modify the time and date range for events listed in the Health table view. Note that events that were generated outside the appliance's configured time window (whether global or event-specific) may appear in an event view if you constrain the event view by time. This may occur even if you configured a sliding time window for the appliance.
- Navigate: Navigate through event view pages.
- Navigate Bookmark: To navigate to the bookmark management page, click **View Bookmarks** from any event view.
- Navigate Other: Navigate to other event tables to view associated events.
- Sort: Sort the events that appear, change what columns display in the table of events, or constrain the events that appear
- View All: To view event details for all events in the view, click **View All**.
- View Details: To view the details associated with a single health event, click the down arrow link on the left side of the event.
- View Multiple: To view event details for multiple health events, choose the check box next to the rows that correspond with the events you want to view details for and then click **View**.
- View Status: To view all events of a particular status, click status in the Status column for an event with that status.
- Search: Search for specific health events or health metrics recorded within your deployment. Customize your search query to analyze health events and other monitored data and save the search constraints for quick access. For more information, refer to Event searches.

Health event fields

The health monitor modules you enable in your health policy run tests to determine appliance health status. When the health status meets specified criteria, a health event is generated. The health event table includes fields that are searchable and viewable for monitoring appliance health.

Table 2: Health event fields

Field	Description
Module Name	Specify the name of the module which generated the health events you want to view. For example, to view events that measure CPU performance, type **CPU**. The search should retrieve applicable CPU Usage and CPU temperature events.
Test Name (Search only)	The name of the health module that generated the event.
Time (Search only)	The timestamp for the health event.
Description	The description of the health module that generated the event. For example, health events generated when a process was unable to execute are labeled **Unable to Execute**.
Value	The value (number of units) of the result obtained by the health test that generated the event. For example, if the Firewall Management Center generates a health event whenever a device it is monitoring is using 80 percent or more of its CPU resources, the value could be a number from 80 to 100.
Units	The units descriptor for the result. You can use the asterisk (*) to create wildcard searches. For example, if the Firewall Management Center generates a health event when a device it is monitoring is using 80 percent or more of its CPU resources, the units descriptor is a percentage sign (%).
Status	The status (Error, Critical, Warning, Normal, Recovered, or Disabled) reported for the appliance.
Device	The appliance where the health event was reported.

Health monitor status categories

The table summarizes the available health monitor status categories, their severity levels, icons, associated colors in pie charts, and descriptions.

Table 3: Health status indicator

Status Level	Status Icon	Status Color in Pie Chart	Description
Error	**Error** (✖)	Black	Indicates that at least one health monitoring module has failed on the appliance and has not been successfully re-run since the failure occurred. Contact your technical support representative to obtain an update to the health monitoring module.

Status Level	Status Icon	Status Color in Pie Chart	Description
Critical	**Critical** ()	Red	Indicates that the critical limits have been exceeded for at least one health module on the appliance and the problem has not been corrected.
Warning	**Warning** ()	Yellow	Indicates that warning limits have been exceeded for at least one health module on the appliance and the problem has not been corrected. This status also indicates a transitionary state, where, the required data is temporarily unavailable or could not be processed because of changes in the device configuration. Depending on the monitoring cycle, this transitionary state is auto-corrected.
Normal	**Normal** ()	Green	Indicates that all health modules on the appliance are running within the limits configured in the health policy applied to the appliance.
Recovered	**Recovered** ()	Green	Indicates that all health modules on the appliance are running within the limits configured in the health policy applied to the appliance, including modules that were in a Critical or Warning state.
Disabled	**Disabled** ()	Blue	Indicates that an appliance is disabled or excluded, that the appliance does not have a health policy applied to it, or that the appliance is currently unreachable.

Device exclusion in health monitoring

A device exclusion is a health monitoring configuration that

- prevents deliberate device or module outages from affecting the overall health summary,
- allows administrators to temporarily disable health monitoring for selected devices, Firewall Management Center where supported, or specific health modules, and
- ensures health events generated during exclusion are marked as disabled and do not affect health calculations.

Device exclusion behavior

In the course of normal network maintenance, you may disable managed devices or make them temporarily unavailable. In Firewall Management Center, you can also exclude Firewall Management Center health monitoring where applicable. Because those outages or expected conditions are deliberate, you may not want their health status to affect the overall health summary.

When you disable health monitoring status, health events are still generated, but they have a disabled status and do not affect the health status for the health monitor. If you remove the device or module from the excluded list, the events that were generated during the exclusion continue to show a status of disabled.

Note If all health modules or a device are added to the exclusion list, the device's health status will be set to disabled. This status refers only to health monitoring and should not be interpreted as the device being offline or disconnected.

You can also disable an individual health module. For example, when you reach the host limit on the Firewall Management Center, you can disable Host Limit status messages. Excluding health modules for individual interfaces is not supported on devices operating in transparent mode.

Note that on the main Health Monitor page you can distinguish between devices that are excluded if you expand to view the list of devices with a particular status by clicking the arrow in that status row.

Note On Firewall Management Center, Health Monitor exclusion settings are local configuration settings. Therefore, if you exclude a device, then delete it and later re-register it with the Firewall Management Center, the exclusion settings remain persistent. The newly re-registered device remains excluded.

Temporary device exclusion scenario

You can use the health monitor exclude feature to disable health monitoring status reporting for a device, Firewall Management Center where applicable, or specific health modules. For example, if you know that a segment of your network will be unavailable, you can temporarily disable health monitoring for a managed device on that segment to prevent the health status on the Firewall Management Center from displaying a warning or critical state because of the lapsed connection to the device.

To temporarily disable health events from a managed device, or from Firewall Management Center where supported, go to the exclusion configuration page and add the target to the exclusion list. After the setting takes effect, the system no longer considers the excluded device when calculating the overall health status. The Health Monitor Appliance Status Summary lists the device as disabled.

Exclude devices from health monitoring

Exclude devices from health monitoring to disable their events and health status when needed for maintenance or troubleshooting purposes.

You can exclude managed devices individually or by group, model, associated health policy, or other supported scope. In Firewall Management Center exclusion can also apply to Firewall Management Center where supported.

If you need to set the events and health status for an individual managed device to disabled, you can exclude the device from health monitoring. Where supported, you can also exclude Firewall Management Center health monitoring. After the exclusion settings take effect, the device shows as disabled in the Health Monitor Appliance Module Summary, and health events for the device have a status of disabled.

Procedure

Step 1 Choose **System** (⚙) > **Health** > **Exclude**.

Step 2 Click **Add Device**.

Step 3 In the **Device Exclusion** dialog box, under **Available Devices**, click **Add** (⊕) against the device that you want to exclude from health monitoring.

Step 4 Click **Exclude**.

The selected device is displayed in the exclusion main page.

Step 5 To remove the device from the exclusion list, click **Delete** (🗑).

Step 6 Click **Apply**.

Exclude health policy modules on a device

Excluding health policy modules is useful when certain modules produce irrelevant or temporary health alerts, which you do not want to affect the overall device status. Exclusion settings indicate the number of modules excluded from health monitoring.

Note Excluding health modules for individual interfaces is not supported on devices operating in transparent mode.

Tip Make sure that you keep track of individually excluded modules so you can reactivate them when you need them. You may miss essential warning or critical messages if you accidentally leave a module disabled.

Procedure

Step 1 Choose **System** (⚙) > **Health** > **Exclude**.

Step 2 Click **Edit** (✎) next to the Firewall Threat Defense device you want to modify.

Step 3 In the **Exclude Health Modules** dialog box, by default, all the modules of the device are excluded from health monitoring.

Certain modules are applicable to a specific device only; for more information, refer to Health modules, on page 29.

Step 4 To choose modules to be excluded from health monitoring, click the **Enable Module Level Exclusion** link.

The **Exclude Health Modules** dialog box displays all the modules of the device. The modules that are not applicable for the associated health policies are disabled by default. To exclude a module, perform these steps:

a. Click the **Slider** ( ) button next to the desired module.

b. To specify the duration of the exclusion for the selected modules, from the **Exclude Period** drop-down list, select the duration.

Step 5 If you select an **Exclude Period** other than **Permanent**, for your exclusion configuration, you can choose to automatically delete the configuration when it expires. To enable this setting, check the **Auto-delete expired configurations** check box.

Step 6 Click **OK**.

Step 7 Click **Apply**.

Note Interface exclusion differs from other module exclusions because you can exclude selected physical interfaces while still monitoring associated subinterfaces, depending on the UI options available in your version.

Exclude interface health monitoring

Use interface exclusion when you want to suppress health status updates for selected physical interfaces without suppressing health monitoring for the entire device. Interface exclusion is useful when interface state is expected during maintenance or when you want to focus on subinterface health instead of physical interface status.

When you configure interface exclusion, select the physical interfaces that you want to exclude from the list of available interfaces. Depending on the available UI options in your version, selecting a physical interface can also exclude its subinterfaces. If subinterface controls are available, you can continue monitoring subinterfaces while excluding only the physical interface.

Use this option to reduce unnecessary health alerts when traffic loss or interface state changes are expected on a physical interface.

Manage expired health monitor exclusions

When monitoring device or module health, some items may have temporary exclusions. Once these exclusion periods lapse, you need to decide whether to renew the exclusion or clear the device/module from exclusion so alerts resume.

Procedure

Step 1 Choose **System** ( ) > **Health** > **Exclude**.

The **Warning** ( ) icon is displayed against the device indicating the expiry of the duration of exclusion of the device or the modules from alerting.

Step 2 To renew the exclusion of the device, click **Edit** ( ) next to the device. In the **Exclude Health Modules** dialog box, click the **Renew** link. The exclusion period of the device is extended with the current value.

Step 3 To clear the device from being excluded, click **Delete** ( ) next to the device, click **Remove the device from exclusion**, and then click **Apply**.

Step 4 To renew or clear the modules from exclusion, click **Edit** ( ) next to the device. In the **Exclude Health Modules** dialog box, click the **Enable Module Level Exclusion** link, and then click the **Renew** or **Clear** link against the modules. When you click **Renew**, the exclusion period is extended on the module with the current value.

Reference

Look up health modules and their monitored conditions, and review health event options.

Health modules

Describes health modules that monitor system conditions and provide alerts or metrics for managing device health and performance.

Health modules, or *health tests,* test for the conditions that you specify in a health policy.

Health monitoring includes both health alerts or tests and metric or time series data collection. The two types of health modules are alert modules and metrics modules. Alerts modules (sometimes called *legacy* modules) monitor system infrastructure and report only the health status. When the conditions specified in the health policy for these monitored systems are met, these modules raise health alerts. Metrics modules (sometimes called *telegraf* modules) collect statistics (sometimes called *time series data*) that you can view on the health monitoring dashboard. Some alerts are also generated from metric values when they cross the thresholds specified in the health policy. You can create custom dashboards with your preferred health metrics, allowing you to monitor statistics or troubleshoot appliance health issues.

Table 4: Device Health Modules

Module	Type	Description
AMP Connection Status	Metrics	The module alerts if the device cannot connect to the AMP cloud or Cisco AMP Private Cloud after an initial successful connection, or if the private cloud cannot contact the public AMP cloud. Disabled by default.
AMP Threat Grid Connectivity	Metrics	The module alerts if the device cannot connect to the AMP Threat Grid cloud after an initial successful connection.
ASP Drop	Alert	Monitors the connections dropped by the data plane accelerated security path.
Automatic Application Bypass	Alert	Monitors bypassed detection applications.
Chassis Environment Status	Alert	Monitors chassis parameters such as fan speed and chassis temperature, and enables you to set a warning threshold and critical threshold for temperature. The **Critical Chassis Temperature (Celsius)** default value is `85`. The **Warning Chassis Temperature (Celsius)** default value is `75`.
Cluster/HA Failover Status	Alert	For threat defense clusters, alerts when a unit joins, leaves, or is elected primary.

Module	Type	Description
Configuration Resource Utilization	Alert	Alerts if the size of your deployed configurations puts a device at risk of running out of memory. The alert shows you how much memory your configurations require, and by how much this exceeds the available memory. If this happens, reevaluate your configurations. You may be able to reduce the number or complexity of access control rules or intrusion policies.
Connection Statistics	Metrics	Monitors connection statistics and NAT translation counts. For standby Firewall Threat Defense devices in a high availability pair, this widget reflects only the statistics of connections replicated from the active device.
CPU Usage (per core)	Metrics	Alerts when CPU core use exceeds a configurable threshold.
Critical Process Statistics	Metrics	Monitors the state of critical processes, their resource consumption, and the restart counts.
CPU Usage Date Plane	Metrics	Alerts when data plane CPU use exceeds a configurable threshold.
Memory Usage Data Plane	Metrics	Alerts when data plane memory use exceeds a configurable threshold.
Deployed Configuration Statistics	Metrics	Monitors statistics about the deployed configuration, such as the number of ACEs and IPS rules.
Disk Status	Alert	Alerts if there is an issue with the hard disk or RAID controller. If this module alerts, contact Cisco TAC. This will prevent upgrade.
Disk Usage	Metrics	This module compares disk usage on the appliance's hard drive to the limits configured for the module and alerts when usage exceeds the thresholds configured for the module. This module also alerts when the system excessively deletes files in monitored disk usage categories, or when disk usage excluding those categories reaches excessive levels, based on module thresholds. For more information, refer to Disk usage and drain of events health monitor alerts for information about troubleshooting scenarios for Disk Usage alerts. The Disk Usage module sends a health alert if the size of device configuration history files exceeds the allowed limit. For more information, refer to Disk Usage for Device Configuration History Files Health Monitoring Alert for information about troubleshooting scenarios for the disk usage alerts. This health alert is not supported on Secure Firewall Management Center Versions 7.2.0-7.2.5, 7.3.x, and 7.4.0. Use the Disk Usage health status module to monitor disk usage for the `/` and `/volume` partitions on the appliance and track draining frequency. Although the disk usage module lists the `/boot` partition as a monitored partition, the size of the partition is static so the module does not alert on the boot partition. **Attention** If you receive alerts for high unmanaged disk usage for the partition `/volume` although the usage is below the critical or warning threshold specified in the health policy, this could indicate that there are files which must be deleted manually from the system. Contact TAC if you receive these alerts.

Module	Type	Description
File System Integrity Check	Alert	This module performs a file system integrity check and runs if the system has CC mode or UCAPL mode enabled, or if the system runs an image signed with a DEV key.
Firewall Threat Defense HA	Alert	Alerts if a threat defense high availability pair is split brain.
Firewall Threat Defense Platform Faults	Alert	Monitors Secure Firewall 1000 /2100 /3100 platform faults and generate health alerts for the faults. A platform fault represents a failure in the Firewall Threat Defense instance or an alarm threshold that has been raised. During the lifecycle of a platform fault, it can change from one state or severity to another. Each fault includes information about the operational state of the affected object at the time the fault was raised. If the fault is transitional and the failure is resolved, then the object transitions to a functional state. For more information, refer to *Cisco Firepower 1000/2100 FXOS Faults and Error Messages Guide*.
Flow Offload Statistics	Metrics	Monitors hardware flow offload.
Hardware Alarms	Alert	This module determines if hardware needs to be replaced on a physical managed device and alerts based on the hardware status. It also reports on the status of hardware-related daemons.
Inline Link Mismatch Alarms	Alert	Alerts if inline pair interfaces negotiate different speeds.

Module	Type	Description
Interface Status	Alert	Determines if the device currently collects traffic and alerts based on the traffic status of physical interfaces and aggregate interfaces. For physical interfaces, the information includes interface name, link state, and bandwidth. For aggregate interfaces, the information includes interface name, number of active links, and total aggregate bandwidth. For subinterfaces, this module reports health alerts in aggregate rather than generating separate alerts for each affected subinterface. If multiple subinterfaces on the same parent interface experience health issues, Firewall Management Center generates a single summarized alert indicating the number of affected subinterfaces for that parent interface. To view the specific status of individual subinterfaces, refer to the **Interfaces** tab. **Note** • This module also monitors the high availability standby device traffic flow. Though it is known that the standby device would not be receiving any traffic yet, the Firewall Management Center alerts that the interface is not receiving any traffic. The same alerting principle is applied when traffic is not received by some of the subinterfaces on a port channel. • This module displays the traffic rates according to the values from Lina. However, if you use the **show interface** CLI command to know the interface statistics of your device, the input and output rates in the CLI command result can be different from the traffic rates that appear in the **Interface** widget. The sampling intervals of Lina and the Firewall Management Center interface statistics are different. Due to the difference in sampling interval, throughput values in the Firewall Management Center GUI can be different from the throughput values appears in the device CLI result. • Note that traffic rates in the **Interface Traffic Rate** widget (**Overview** > **Dashboards heading** > **Dashboard** page) can be different as it displays the input and output rates from Snort.
Intrusion and File Event Rate	Alert	Alerts if intrusion events per second exceed a configurable threshold. We recommend a warning threshold of 1.5 times your average intrusion event rate, and a critical threshold of 2.5 times. For example, for an average event rate on network segment of 20 events per second, we recommend a warning value of 30 and a critical value of 50. The critical limit must be lower than 1000, and higher than the warning limit. Event rates for your devices are available on **System** (⚙) > **Monitoring** > **Statistics**. If the rate is zero, the Snort process may be down or the device may not be sending events.
Link State Propagation	Alert	For the ISA 3000, alerts when an interface in a inline set fails.

Module	Type	Description
Memory Usage	Alert	Alerts when memory use exceeds configurable thresholds. For appliances with more than 4 GB of memory, the preset alert thresholds are based on a formula that accounts for proportions of available memory likely to cause system problems. On >4 GB appliances, because the interval between Warning and Critical thresholds may be very narrow, it is recommended that you manually set the **Warning Threshold %** value to `50`. This will further ensure that you receive memory alerts for your appliance in time to address the issue. For more information, refer to Memory usage thresholds for health monitor alerts for additional information about how thresholds are calculated. Complex access control policies and rules can command significant resources and negatively affect performance.
Network Card Reset	Alert	Alerts when a network card restarts due to hardware failure.
NTP Statistics	Metrics	Monitors NTP synchronization status. Disabled by default.
Firewall Management Center Access Configuration Changes	Alert	Monitors configuration changes made on the Firewall Management Center directly using the **configure network management-data-interface** command. This module alerts when there is a conflict between the existing Firewall Management Center configuration and the out of band configuration changes made.
Process Status	Alert	Alerts when processes on the appliance exit or terminate outside of the process manager. If a process is deliberately exited outside of the process manager, the module status changes to Warning and the health event message indicates which process exited, until the module runs again and the process has restarted. If a process terminates abnormally or crashes outside of the process manager, the module status changes to Critical and the health event message indicates the terminated process, until the module runs again and the process has restarted.
Routing Statistics	Metrics	Monitors the current state of routing table.
Snort 3 Statistics	Metrics	Collects Snort 3 statistics for events, flows, and packets.
CPU Usage Snort	Metrics	This module checks that the average CPU usage of the Snort processes on the device is not overloaded and alerts when CPU usage exceeds the percentages configured for the module. The **Warning Threshold %** default value is `80`. The **Critical Threshold %** default value is `90`.
Snort Identity Memory Usage	Alert	Enables you to set a warning threshold for Snort identity processing and alerts when memory usage exceeds the level configured for the module. The **Critical Threshold %** default value is `80`. This health module specifically keeps track of the total space used for the user identity information in Snort. It displays the current memory usage details, the total number of user-to-IP bindings, and user-group mapping details. Snort records these details in a file. If the memory usage file is not available, the Health Alert for this module displays *Waiting for data*. This could happen during a Snort restart due to a new install or a major update, switch from Snort 2 to Snort 3 or back, or major policy deployment. Depending on the health monitoring cycle, and when the file is available, the warning disappears, and the health monitor displays the details for this module with its status turned Green.

Module	Type	Description
Memory Usage Snort	Metrics	This module checks the percentage of allocated memory used by the Snort process and alerts when memory usage exceeds the percentages configured for the module. The **Warning Threshold %** default value is `80`. The **Critical Threshold %** default value is `90`.
Snort Reconfiguring Detection	Metrics	Alerts if a device reconfiguration has failed. This module detects reconfiguration failure for both Snort 2 and Snort 3 instances.
Snort Statistics	Metrics	Monitors Snort statistics for events, flows, and packets.
SSE Connection Status	Metrics	The module alerts if the device cannot connect to the security services exchange cloud after an initial successful connection. Disabled by default.
CPU Usage System	Metrics	This module checks that the average CPU usage of all system processes on the device is not overloaded and alerts when CPU usage exceeds the percentages configured for the module. The **Warning Threshold %** default value is `80`. The **Critical Threshold %** default value is `90`.

Module	Type	Description
Threat Data Updates on Devices	Alert	Certain intelligence data and configurations that devices use to detect threats are updated on the Firewall Management Center from the cloud every 30 minutes. This module alerts you if this information has not been updated on the devices within the time period you have specified. Monitored updates include: • Local URL category and reputation data • Security Intelligence URL lists and feeds, including global Block and Do Not Block lists and URLs from Threat Intelligence Director • Security Intelligence network lists and feeds (IP addresses), including global Block and Do Not Block lists and IP addresses from Threat Intelligence Director • Security Intelligence DNS lists and feeds, including global Block and Do Not Block lists and domains from Threat Intelligence Director • Local malware analysis signatures (from ClamAV) • SHA lists from Threat Intelligence Director, as listed on the **Objects > Object Management > Security Intelligence > Network Lists and Feeds** page • Dynamic analysis settings configured on the **Integration** > **Dynamic Attributes Connector** page • Threat Configuration settings related to expiration of cached URLs, including the Cached URLs Expire setting on the **Integration** > **Other Integrations** > **Cloud Services** page. (Updates to the URL cache are not monitored by this module.) • Communication issues with the Cisco cloud for sending events. Refer to **Cisco Cloud** box on the **Integration** > **Other Integrations > Cloud Services** page. **Note** Threat Intelligence Director updates are included only if TID is configured on your system and you have feeds. By default, this module sends a warning after 1 hour and a critical alert after 24 hours. If this module indicates failure on the Firewall Management Center or on any devices, verify that the Firewall Management Center can reach the devices.
VPN Statistics	Metrics	Monitors site-to-site and remote access VPN tunnels between Firewall Threat Defense devices.
XTLS Counters	Metrics	Monitors XTLS/SSL flows, memory and cache effectiveness. Disabled by default.

Table 5: Management Center Health Modules

Module	Type	Description
Certificate Monitoring	Alert	Alerts when service authentication certificates are near expiration or have expired, based on a configurable threshold (in days). To avoid service disruption, renew certificates before they expire.
CPU Usage (per core)	Metrics	This module checks that the CPU usage on all the cores is not overloaded and alerts when CPU usage exceeds the thresholds configured for the module. The **Warning Threshold %** default value is `80`. The **Critical Threshold %** default value is `90`.
Critical Process Statistics	Metrics	Monitors the state of critical processes, their resource consumption, and the restart counts.
Database Size	Alert	Alerts if the configuration database size is too big. If this module alerts, contact Cisco TAC. This will prevent upgrade.
Discovery Host Limit	Alert	This module determines if the number of hosts the Firewall Management Center can monitor is approaching the limit and alerts based on the warning level configured for the module. For more information, refer to Host limits.
Disk Status	Alert	This module examines the performance of the hard disk and storage pack (if installed) on the appliance. The disk status health module generates a critical alert (red) if either of the following conditions is detected: • One or more disks may have failed or are experiencing errors. • An installed storage pack cannot be detected or unrecognized. All other disk health conditions generate a warning alert (yellow). For further diagnosis of warning conditions, contact Cisco Technical Assistance Center.

Module	Type	Description
Disk Usage	Metrics	This module compares disk usage on the appliance's hard drive and malware storage pack to the limits configured for the module and alerts when usage exceeds the thresholds configured for the module. This module also alerts when the system excessively deletes files in monitored disk usage categories, or when disk usage excluding those categories reaches excessive levels, based on module thresholds. Refer to Disk usage and drain of events health monitor alerts for information about troubleshooting scenarios for Disk Usage alerts. The Disk Usage module sends a health alert if the size of device configuration history files exceeds the allowed limit. Refer to Disk Usage for Device Configuration History Files Health Monitoring Alert for information about troubleshooting scenarios for the disk usage alerts. This health alert is not supported on Secure Firewall Management Center Versions 7.2.0-7.2.5, 7.3.x, and 7.4.0. Use the Disk Usage health status module to monitor disk usage for the `/` and `/volume` partitions on the appliance and track draining frequency. Although the disk usage module lists the `/boot` partition as a monitored partition, the size of the partition is static so the module does not alert on the boot partition. **Attention** If you receive alerts for high unmanaged disk usage for the partition `/volume` although the usage is below the critical or warning threshold specified in the health policy, this could indicate that there are files which must be deleted manually from the system. Contact TAC if you receive these alerts.
eStream Status	Alert	Monitors connections to third-party client applications that use the Event Streamer on the Firewall Management Center.
Event Backlog Status	Alert	Alerts if the backlog of event data awaiting transmission from the device to the Firewall Management Center has grown continuously for more than 30 minutes. To reduce the backlog, evaluate your bandwidth and consider logging fewer events.
Event Monitor	Metrics	This module monitors overall incoming event rate to Firewall Management Center.
File System Integrity Check	Alert	This module performs a file system integrity check and runs if the system has CC mode or UCAPL mode enabled, or if the system runs an image signed with a DEV key. This module is enabled by default.
Firewall Management Center HA Status	Alert	Monitors Firewall Management Center high availability. This module generates alerts if the HA pairs are not synchronized and if there is a discrepancy in the number of managed devices between the active and standby units.
Hardware Statistics	Metrics	Monitors Firewall Management Center hardware: fan speed, temperature, and power supply. Alerts when values exceed configurable thresholds.
License Monitor	Alert	This module monitors expiration of Classic licenses.

Module	Type	Description
Memory Usage	Alert	This module compares memory usage on the appliance to the limits configured for the module and alerts when usage exceeds the levels configured for the module. For appliances with more than 4 GB of memory, the preset alert thresholds are based on a formula that accounts for proportions of available memory likely to cause system problems. On >4 GB appliances, because the interval between Warning and Critical thresholds may be very narrow, it is recommended that you manually set the **Warning Threshold %** value to `50`. This will further ensure that you receive memory alerts for your appliance in time to address the issue. For additional information about how thresholds are calculated, refer to Memory usage thresholds for health monitor alerts. Beginning with Version 6.6.0, the minimum required RAM for Firewall Management Center Virtual upgrades to Version 6.6.0+ is 28 GB, and the recommended RAM for Firewall Management Center Virtual deployments is 32 GB. We recommend you do not decrease the default settings: 32 GB RAM for most Firewall Management Center Virtual instances, 64 GB for the Firewall Management Center Virtual 300 (VMware only). **Attention** A critical alert is generated by the health monitor when insufficient RAM is allocated to a Firewall Management Center Virtual deployment. Complex access control policies and rules can command significant resources and negatively affect performance.
MySQL Statistics	Metrics	Monitors the status of the MySQL database, including the database size, number of active connections, and memory use.
MonetDB Statistics	Metrics	MonetDB is the database for firewall events and related data, such as connection summaries. This health module monitors the status of the MonetDB, including its size, the number of active connections, and memory usage. Additionally, it enables you to monitor the number of data requests being processed, and identify any slow-running requests. You can access these metrics and create custom dashboard to monitor MonetDB's health.
RabbitMQ Status	Metrics	Monitors and collects RabbitMQ statistics.

Module	Type	Description
Realm	Alert	Allows you to set a warning threshold for realm or user mismatches, which are: • User mismatch: A user is reported to the Secure Firewall Management Center without being downloaded. A typical reason for a user mismatch is that the user belongs to a group you have excluded from being downloaded to the Secure Firewall Management Center. Review the information discussed in *Cisco Secure Firewall Management Center Device Configuration Guide*. • Realm mismatch: A user logs into a domain that corresponds to a realm not known to the Firewall Management Center. For more information, *Cisco Secure Firewall Management Center Device Configuration Guide*. This module also displays health alerts when you try to download more users than the maximum number of downloaded users supported per realm. The maximum number of downloaded users for a single realm depends on your management center model. For more information, refer to *User Limit* in the *Cisco Secure Firewall Management Center Device Configuration Guide*.
RRD Server Process	Alert	Alerts if the round robin data (RRD) server that stores time series data has restarted since the last time it updated. You can configure additional warning and critical thresholds for consecutive restarts.
Sybase Statistics	Metrics	Monitors the status of the Sybase database, including the database size, number of active connections, and memory use.
Time Series Data (RRD) Monitor	Alert	This module tracks the presence of corrupt files in the directory where time series data (such as correlation event counts) are stored and alerts when files are flagged as corrupt and removed.
Time Server Status	Alert	This module monitors the configuration of the NTP servers and alerts when the NTP server is unavailable or if the NTP server configuration is invalid. If you receive critical alert from this module, choose **System** (⚙) > **Configuration** > **Time Synchronization** and check the configuration of the NTP server specified in the alert. Requires Version 7.2.6.
URL Filtering Monitor	Alert	Monitors connectivity with the Cisco cloud, which is required for downloading URL filtering data and doing URL filtering lookups.
VPN Tunnel Status	Alert	Alerts when VPN tunnels are down. Supported for both remote access and site-to-site VPN .
Web Server Connection Statistics	Metric	Alerts you when a single IP address exceeds the configurable limit of concurrent HTTP or HTTPS connections to the management center web server. It warns you when maximum number of browser tabs are opened to connect to management center from single IP address, ensuring optimal performance.

History for health monitoring

Provides the history of health monitoring features and enhancements for each release of Secure Firewall Management Center.

Table 6: History for health monitoring

Feature	Minimum Firewall Management Center	Minimum Firewall Threat Defense	Details
Health alerts for NTP server sync issues.		Any	Introduced the **Time Server Status** module in the Secure Firewall Management Center Health Policy. When enabled, this module monitors the configuration of the NTP servers and alerts when the NTP server is unavailable or if the NTP server configuration is invalid. New/modified screens: **System** > **Health** > **Policy** > **Firewall Management Center Health Policy** > **Health Modules** > **Time Synchronization**.
Health alert for device configuration history files size	7.2.6	Any	The Disk Usage module sends health alert when the size of device configuration history files on the Firewall Management Center exceeds the allowed limit. This alert is enabled by default. Health alert for exceeding the configuration versions size is not supported on the Secure Firewall Management Center versions 7.3.0 and 7.4.0.
Health monitor usability enhancements.	7.1	Any	Following UI page were improved for better usability and presentation of data: • Policy • Exclude • Monitor Alerts New/modified screens: • **System** > **Health** > **Policy**. • **System** > **Health** > **Exclude**. • **System** > **Health** > **Monitor Alerts**.
Elephant flow detection.	7.1	Any	The health monitor includes the following enhancements: • The Connection statistics includes active elephant flows. • The Connection Group Metrics includes the number of active elephant flows. The Elephant Flow Detection feature is not supported on the Cisco Firepower 2100 series.

Feature	Minimum Firewall Management Center	Minimum Firewall Threat Defense	Details
Discontinued `high unmanaged disk usage` alerts.	7.0.6	Any	The Disk Usage health module no longer alerts with `high unmanaged disk usage`. After upgrade, you may continue to see these alerts until you either deploy health policies to managed devices (stops the display of alerts) or upgrade the devices (stops the sending of alerts). **Note** Versions 7.0–7.0.5, 7.1.x, 7.2.0–7.2.3, and 7.3.x continue to support these alerts. If your Firewall Management Center is running any of these versions, you may also continue to see alerts.

Feature	Minimum Firewall Management Center	Minimum Firewall Threat Defense	Details
New health modules.	7.0	Any	

Feature	Minimum Firewall Management Center	Minimum Firewall Threat Defense	Details
			We added the following health modules: • AMP connectivity and cloud status • AMP Connection Status: Monitors AMP cloud connectivity from the Firewall Threat Defense. • AMP Threat Grid Status: Monitors AMP Threat Grid cloud connectivity from the Firewall Threat Defense. • Security Services Exchange Connection Status: Monitors security services exchange cloud connectivity from the Firewall Threat Defense. • Firewall Threat Defense and Firewall Management Center status • FMC Access Configuration Changes: Monitors access configuration changes made directly on the Firewall Management Center. • FTD HA Status: Monitors the active and standby Firewall Threat Defense HA pair and the sync status between the devices. • FMC HA Status: Monitors the active and standby Firewall Management Center and the sync status between the devices. Replaces the HA Status module. • Network and traffic monitoring • ASP Drop: Monitors the connections dropped by the data plane accelerated security path. • Flow Offload: Monitors hardware flow offload statistics on the Firepower 9300 and 4100 platforms. • Routing Statistics: Monitors both IPv4 and IPv6 route information from the Firewall Threat Defense. • VPN Statistics: Monitors site-to-site and remote access VPN tunnel statistics. • Snort and intrusion detection statistics • Advanced Snort Statistics: Monitors Snort statistics related to packet performance, flow counters, and flow events. • Hit Count: Monitors the number of times a particular rule is hit on the access control policy. • xTLS Counters: Monitors xTLS/SSL flows, memory and cache effectiveness.

Feature	Minimum Firewall Management Center	Minimum Firewall Threat Defense	Details

			• System and hardware health
			  • File System Integrity Check: Performs a file system integrity check if the system has CC mode or UCAPL mode enabled.
			  • MySQL Status: Monitors the status of the MySQL database.
			  • RabbitMQ Status: Monitors the status of the RabbitMQ messaging broker.
			  • Sybase Status: Monitors the status of the Sybase database.
			  • NTP Status FTD: Monitors the NTP clock synchronization status of the managed device.
			• Event and policy monitoring
			  • Event Stream Status: Monitors connections to third-party client applications that use the Event Streamer.
			  • Unresolved Groups Monitor: Monitors the unresolved groups used in access control policies.

Health monitor enhancements.	7.0	Any	The health monitor adds the following enhancements:
			• Enhanced Firewall Management Center dashboard with summary views of:
			  • High Availability
			  • Event Rate & Capacity
			  • Process Health
			  • CPU thresholds
			  • Memory
			  • Interface rates
			  • Disk Usage
			• Enhanced Firewall Threat Defense dashboard:
			  • Health alert for split brain scenario
			  • Additional health metrics available from new Health Modules

Feature	Minimum Firewall Management Center	Minimum Firewall Threat Defense	Details
New health modules.	6.7	Any	The CPU Usage module is no longer used. Instead, see the following modules for CPU usage: • CPU Usage (per core): Monitors the CPU usage on all of the cores. • CPU Usage Data Plane: Monitors the average CPU usage of all data plane processes on the device. • CPU Usage Snort: Monitors the average CPU usage of the Snort processes on the device. • CPU Usage System: Monitors the average CPU usage of all system processes on the device. The following modules were added to track statistics: • Connection Statistics: Monitors the connection statistics and NAT translation counts. • Critical Process Statistics: Monitors the state of critical processes, their resource consumption, and the restart counts. • Deployed Configuration Statistics: Monitors statistics about the deployed configuration, such as the number of ACEs and IPS rules. • Snort Statistics: Monitors the Snort statistics for events, flows, and packets. The following modules were added to track memory usage: • Memory Usage Data Plane: Monitors the percentage of allocated memory used by the Data Plane processes. • Memory Usage Snort: Monitors the percentage of allocated memory used by the Snort process.

Feature	Minimum Firewall Management Center	Minimum Firewall Threat Defense	Details
Health monitor enhancements.	6.7	Any	The health monitor adds the following enhancements: • Health Status summary page that provides an at-a-glance view of the health of the Firepower Management Center and all of the devices that the Firewall Management Center manages. • The Monitoring navigation pane allows you to navigate the device hierarchy. • Managed devices are listed individually, or grouped according to their geolocation, high availability, or cluster status where applicable. • You can view health monitors for individual devices from the navigation pane. • Custom dashboards to correlate interrelated metrics. Select from predefined correlation groups, such as CPU and Snort; or create a custom correlation dashboard by building your own variable set from the available metric groups.
Functionality moved to the Threat Data Updates on Devices module.	6.7	Any	The Local Malware Analysis module is no longer used. Instead, refer to the Threat Data Updates on Devices module for this information. Some information formerly provided by the Security Intelligence module and the URL Filtering Module is now provided by the Threat Data Updates on Devices module.
New health module: Configuration Memory Allocation.	7.0 6.6.3	Any	Version 6.6.3 improves device memory management and introduces a new health module: Configuration Memory Allocation. This module alerts when the size of your deployed configurations puts a device at risk of running out of memory. The alert shows you how much memory your configurations require, and by how much this exceeds the available memory. If this happens, re-evaluate your configurations. Most often you can reduce the number or complexity of access control rules or intrusion policies.
URL Filtering Monitor improvements.	6.5	Any	The URL Filtering Monitor module now alerts if the Firewall Management Center fails to register to the Cisco cloud.
URL Filtering Monitor improvements.	6.4	Any	You can now configure time thresholds for URL Filtering Monitor alerts.
New health module: Threat Data Updates on Devices.	6.3	Any	A new module, **Threat Data Updates on Devices**, was added. This module alerts you if certain intelligence data and configurations that devices use to detect threats has not been updated on the devices within the time period you specify.