

Encrypted Visibility Engine

Encrypted Visibility Engine (EVE) is used to identify client applications and processes utilizing Transport Layer Security (TLS) encryption. It enables visibility and allows administrators to take actions and enforce policy within their environments. The EVE technology can also be used to identify and stop malware.

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Encrypted Visibility Engine

The encrypted visibility engine (EVE) is used to provide more visibility into the encrypted sessions without the need to decrypt them. These insights into encrypted sessions are obtained by Cisco's open-source library that is packaged in Cisco's vulnerability database (VDB). The library fingerprints and analyzes incoming encrypted sessions and matches it against a set of known fingerprints. This database of known fingerprints is also available in the Cisco VDB.

Key capabilities

Important features of Encrypted Visibility Engine (EVE) include the following:

- Access control policy actions on traffic using information derived from EVE
- Vulnerability Database (VDB) integration with Cisco Secure Firewall for assigning applications to EVE-detected processes with high confidence values
- Custom application detector creation for mapping EVE-detected processes to user-defined applications and overriding built-in process confidence values
- Detection of the operating system type and version of clients that create Client Hello packets in encrypted traffic
- Quick UDP Internet Connections (QUIC) traffic fingerprinting and analysis with server name display in the URL field of the **Connection Events** page

For custom application detector configuration, see the **Configuring Custom Application Detectors** and **Specifying EVE Process Assignments** sections in the **Application Detection** chapter of the Cisco Secure Firewall Management Center Device Configuration Guide.

Note The encrypted visibility engine feature is supported only on Firewall Management Center-managed devices running Snort 3. This feature is not supported on Snort 2 devices and Firewall Device Manager-managed devices.

Attention To use EVE on Firewall Management Center, you must have a valid IPS license on your device. In the absence of a IPS license, the policy displays a warning and deployment is not allowed.

Note

- EVE can detect the operating system type and version of SSL sessions. Normal usage of the operating system, such as running applications and package management software, can trigger OS detection. To view client OS detection, in addition to enabling the EVE toggle button, you must enable **Hosts** under **Policies** > **Network Discovery**. To view a list of possible operating systems on the host IP address, click **Analysis** > **Hosts heading** > **Network Map**, and then choose the required host.
- After enabling EVE for your access control policy, ensure that you have turned on logging for the access control rules within that policy to display the expected results on the EVE dashboard whenever any specific rule conditions are met. For more information on how to turn on logging, see Create and Edit Access Control Rules.
- EVE will not provide visibility or insights for encapsulated traffic.

How EVE works

Encrypted Visibility Engine (EVE) provides the ability to identify and control applications without enabling TLS decryption. By using fingerprints of known malicious processes, EVE technology can also be used to identify and block encrypted malicious traffic without outbound decryption.

Summary

The key components involved in how EVE works are:

- Client Hello inspection: EVE examines the initial TLS handshake packet to create client fingerprints
- Fingerprint database: Contains over 5,000 identified client processes mapped to applications
- Machine learning technology: Processes over one billion TLS fingerprints and over 10,000 malware samples daily
- Cisco Vulnerability Database (VDB): Delivers updated fingerprints to customers

Workflow

These stages describe how EVE identifies and processes client applications:

1. EVE inspects the Client Hello portion of the TLS handshake to identify client processes. The Client Hello is the initial data packet that is sent to the server. This gives a good indication of the client process on the host.
2. The system combines the fingerprint with other data such as destination IP address to provide the basis for EVE's application identification. By identifying specific application fingerprints during the TLS session establishment, the system can identify the client process and take appropriate action, such as allowing or blocking it.
3. If EVE does not recognize a fingerprint, it identifies the client application and estimates the threat score of the first flow using the destination details, such as IP address, port, and server name. At this point, the status of the fingerprints are randomized and the status can be viewed in the debug logs. For subsequent flows with the same fingerprint, EVE skips reanalysis and marks the fingerprint status as unlabeled. If you intend to block traffic based on EVE's Low or Very Low score thresholds, the initial flow is blocked. Future flows are allowed once the application's fingerprint is cached.
4. Through machine learning (ML) technology, Cisco processes over one billion TLS fingerprints and over 10000 malware samples daily to create and update EVE fingerprints. These updates are then delivered to customers using Cisco Vulnerability Database (VDB) package.

Indications of compromise events

An Indication of Compromise (IoC) event is a security detection mechanism that

- identifies connection events with a very high malware confidence level, as reported by EVE,
- triggers for encrypted sessions generated from a host using a malicious client, and
- provides information such as the IP address, MAC address, operating system information of the malicious host, and timestamp of the suspicious activity.

A session with an Encrypted Visibility Threat Confidence score of 'Very High' as seen in connection events generates an IoC event. You must enable **Hosts** from **Policies** > **Network Discovery**. In the Firewall Management Center, view the IoC event existence from here:

- **Analysis** > **Hosts heading** > **Indications of Compromise**, and then **Analysis** > **Indications of Compromise**.
- **Analysis** > **Hosts heading** > **Network Map** > Choose the host that must be checked.

  You can view the process information of the session that generated the IoC on the **Connection Events** page. Click **Analysis** > **Connections** > **Events** to access the **Connection Events** page. Note that you must manually select the Encrypted Visibility fields and IoC field from the **Table View of Connection Events** tab.
- Click **Analysis** > **Unified Events** and choose the Encrypted Visibility fields and IoC field from the column picker option.

QUIC fingerprinting in EVE

QUIC fingerprinting in EVE is a Snort identification mechanism that

- detects applications over QUIC without enabling decryption,
- identifies malware without enabling decryption, and
- detects service applications for access control rule assignment based on the service detected over the QUIC protocol.

Configure EVE

Procedure

Step 1 Choose **Policies** > **Access Control heading** > **Access Control**.

Step 2 Click **Edit** ( ) next to the access control policy you want to edit.

Step 3 Choose **Advanced Settings** from the **More** drop-down arrow at the end of the packet flow line.

Step 4 Click **Edit** ( ) next to **Encrypted Visibility Engine**.

Step 5 On the **Encrypted Visibility Engine** page, enable the **Encrypted Visibility Engine (EVE)** toggle button.

Step 6 **Use EVE for Application Detection**—This toggle button is enabled by default, which means that EVE is allowed to assign client applications to processes.

EVE's fingerprint information is added in the **Encrypted Visibility Fingerprint** column header of the connection events or unified events. For further analysis of the EVE data collected, you can right-click the fingerprint information to open a dropdown menu. In the menu, click **View Encrypted Visibility Engine Process Analysis** to go to the Secure Firewall Application Detectors site and view details, such as the fingerprint, VDB version, and so on. Different rows with the same fingerprint string and potential process names associated with them and their prevalence are displayed. Prevalence indicates the frequency of a process associated with a particular fingerprint in the data collection system. You can choose the process names and click **Submit Request** to give feedback about any discrepancy in EVE's process detection. For example, you can submit requests if the process name that is detected does not match with the traffic that is being sent or if the process name is not detected at all for a particular fingerprint.

Access to view additional details on the Secure Firewall Application Detectors page is currently not available to users with non-Cisco email addresses.

If you disable the **Use EVE for Application Detection** toggle button:

- AppID-identified clients are assigned to processes and you can see the EVE process and score, but there is no mapping of EVE-detected processes to applications and no action is taken. You can see the details of the events under **Connection Events** or **Unified Events**. To see the difference in connection events (with and without application assignment), see the **Client Application** column header.
- The **Encrypted Visibility Fingerprint** field in the connection events or unified events is empty.

Step 7 Enable the **Block Malware Processes Based on Threat Confidence Level** toggle button to block malicious client processes with the prefix *malware_* based on EVE's threat confidence level.

The default block threshold is 99 percent, which means:

- If EVE detects the traffic to be malware with 99 percent confidence or more, the traffic is blocked.
- If EVE detects the traffic to be malware with less than 99 percent confidence, EVE takes no action.

Note If EVE has blocked the traffic, the **Reason** column header on the **Connection Events** page displays **Encrypted Visiblity Block**.

Step 8 Use the slider to adjust the threshold for blocking based on EVE's threat confidence, which ranges from **Very Low** to **Very High**.

Step 9 For further granular control, enable the **Advanced Mode** toggle button. Now, you can assign a specific EVE Threat Confidence Level for blocking traffic. The default block threshold is 99 percent.

Caution We recommend that you do not set a threshold below 50 percent to ensure optimal performance.

Step 10 Click **OK**.

Step 11 Click **Save**.

What to do next

Deploy configuration changes.

View Encrypted Visibility Engine events

This task allows you to access and view connection events generated by the Encrypted Visibility Engine (EVE) in the Firewall Management Center.

After enabling the **Encrypted Visibility Engine** and deploying your access control policy, you can start sending live traffic through your system. You can view the logged connection events in the **Unified Events** page.

Perform this procedure to access the connection events in the Firewall Management Center.

Procedure

Step 1 Click **Analysis** > **Unified Events**.

Additionally, you can use the **Security-Related Connection Events** page (**Analysis** > **Connections** > **Security-Related Events**) to view the connections that are blocked by Encrypted Visibility Engine, as well as malicious connections with medium, high, and very high threat confidence levels.

The Encrypted Visibility Engine can identify the client process that initiated a connection and the operating system in the client, and indicate if the process contains malware or not.

Step 2 In the **Unified Events** page, explicitly enable these columns that are added for the Encrypted Visibility Engine:

- **Encrypted Visibility Fingerprint**
- **Encrypted Visibility Process Name**
- **Encrypted Visibility Process Confidence Score**
- **Encrypted Visibility Threat Confidence**
- **Encrypted Visibility Threat Confidence Score**
- **Detection Type**

For information about these fields, refer to Connection and Security-Related Connection Event Fields in the *Cisco Secure Firewall Management Center Administration Guide*.



Note On the **Connection Events** page, if processes are assigned applications, the **Detection Type** column displays **Encrypted Visibility Engine**, indicating that the client application was identified by the Encrypted Visibility Engine. Without application assignments to process names, the **Detection Type** column displays **AppID**, indicating that the engine that identified the client application was AppID.

View EVE dashboard

You can use the EVE dashboard to monitor encrypted visibility data, view threat confidence levels, and analyze process identification results across your network.

Before you begin

- In an access control policy, the **Encrypted Visibility Engine (EVE)** must be enabled under **Advanced Settings**.

Follow these steps to view the EVE dashboards:

Procedure

Step 1 Go to **Overview** > **Dashboards heading** > **Dashboard**.

Step 2 In the **Summary Dashboard** window, click the **switch dashboard** link and choose **Application Statistics** from the dropdown box.

Step 3 Choose the **Encrypted Visibility Engine** tab to view the following two dashboards:

- **Top Encrypted Visibility Engine Discovered Processes**—Displays top client processes used in your network and the connection count. Click the process name in the table to view the **Connection Events** page, filtered by the process name.

- **Connections by Encrypted Visibility Engine Threat Confidence**—Displays connections by the confidence levels (Very High, Very Low, and so on). Click the Threat confidence level in the table to view the **Connection Events** page, filtered by the confidence level.

Configure EVE Exception Rules

You can create an encrypted visibility engine (EVE) exception rule to ensure the continuity of trusted connections and services by bypassing the EVE's block action. You can add attributes such as process names and destination IP address to the exception rule. For example, you may want to bypass EVE's block verdict for trusted networks. All the connections in the bypassed networks are exempted from EVE's block verdict based on the threat confidence level.

Procedure

Step 1 Choose **Policies** > **Access Control heading** > **Access Control**.

Step 2 Click **Edit** ( ) next to the access control policy you want to edit.

Step 3 From the **More** drop-down arrow at the end of the packet flow line, choose **Advanced Settings**.

Step 4 Next to **Encrypted Visibility Engine (EVE)**, click **Edit** ( ).

Step 5 On the **Encrypted Visibility Engine** page, click the **Encrypted Visibility Engine (EVE)** toggle button to enable EVE.

Step 6 Enable the **Block Traffic Based on EVE Score** toggle button to block traffic based on EVE's threat confidence level.

Step 7 Click **Add Exception Rule** and add one or more of the following attributes.

a) Under the **Process Name** tab, enter an EVE-identified process name, and click **Add to Process** on the right side of the window.

You can add multiple process names to the same exception rule. EVE exception list based on process names works only with EVE-identified process names, which are case- and space-sensitive.

b) Under the **Network Objects** tab, perform one of the following:

- Choose one or more IP addresses from the list and add to the **Selected Networks** list.
- Under **Selected Networks**, manually enter the IP address and click the **+** icon to add it to the list of selected networks.

c) (Optional) In the **Comment** field available on all the tabs, you can enter a reason for adding the required attributes to the EVE exception rule.

Step 8 Click **Save** to save the EVE exception rule.

Step 9 Save and deploy the access control policy on the devices.

Note When a connection matches an exception rule, it bypasses the EVE's block verdict. You can view EVE's action in the **Connection Events** or **Unified Events** page. The **Reason** column header displays **EVE Exempted** for identification of such EVE-bypassed traffic.

Add exception rule from unified events

Add exception rules for connections that are blocked by EVE using the information in the Unified Events page.

Use the **Unified Events** page to add exception rules for connections that are blocked by EVE.

Before you begin

Exception list is supported only from threat defense version 7.6.0 or later.

Follow these steps to add exception rules for connections that are blocked by EVE:

Procedure

Step 1 Click **Analysis** > **Unified Events**.

Step 2 In the **Reason** column with **Encrypted Visibility Block** as the reason, click the **Ellipsis**(⋮) icon inside the cell.

Step 3 Choose **Add EVE Exception Rule** from the drop-down list.

Step 4 In the **Encrypted Visibility Engine** window that is displayed, the rule is automatically added to the bottom of the exception list. You can review and make changes to the added rule before saving and deploying the configuration.

Event enrichment

Event enrichment is a security analysis feature that

- provides context enrichment for MITRE ATT&CK from the Talos taxonomy and the Encrypted Visibility Engine (EVE),
- communicates both Talos and EVE enrichments using the Talos taxonomy, and
- requires EVE to be enabled for EVE enrichment to work.

For more information about enabling EVE, see Configure EVE, on page 4.

On the **Connection Events** page, you can view these column headers that are added as part of enriched eventing content. You must explicitly enable these columns:

- **MITRE ATT&CK**
- **Other Enrichment**

For information about these fields, see *Connection and Security-Related Connection Event Fields* in *Cisco Secure Firewall Management Center Administration Guide*.

Use case - Block Traffic Based on the EVE Threat Confidence Score

About Encrypted Visibility Engine

You can use the Encrypted Visibility Engine (EVE) to identify client applications and processes using Transport Layer Security (TLS) encryption. EVE provides more visibility into the encrypted sessions without decryption. Based on EVE's findings, administrators can enforce policy actions on the traffic within their environments. You can also use the EVE to identify and stop malware.

Benefits

Administrators can leverage and adjust EVE's threat score to block malicious encrypted traffic. If the probability that the incoming traffic is malicious, then based on the threat score, you can configure EVE to block the connection.

Sample Business Scenario

A large corporate network uses Snort 3 as its primary intrusion detection and prevention system. In a rapidly evolving threat landscape, adoption of robust network security measures is necessary and important. The security team uses EVE to enhance encrypted traffic inspection without the need to implement full man-in-the-middle (MITM) decryption. The EVE technology uses fingerprints of known malicious processes to identify and stop malware. Network administrators must have the flexibility to configure EVE's block traffic thresholds to block potentially malicious connections, which are based on their configured block thresholds.

Prerequisites

- You must be running management center 7.4.0 or later, and the managed threat defense must also be 7.4.0 or later.
- Ensure that you have a valid Intrusion Prevention System (IPS) license and Snort 3 is the detection engine.

High-Level Workflow

1. EVE analyzes the incoming traffic and gives a verdict on the probability of incoming traffic being malware or not.
2. If EVE detects incoming traffic to be malware with a certain level of confidence, you can configure EVE to block that traffic.

3. The packets are first checked for malware probability or threat score, and the threat score is compared with the block threshold that you have set.
4. If the threat score is higher than the configured threshold, EVE blocks the traffic.
5. If the threat score is lesser than the configured threshold, EVE takes no action.

Configure Block Thresholds in EVE

This procedure shows how to block potentially malicious traffic, based on the EVE threat confidence score of 90 percent or higher.

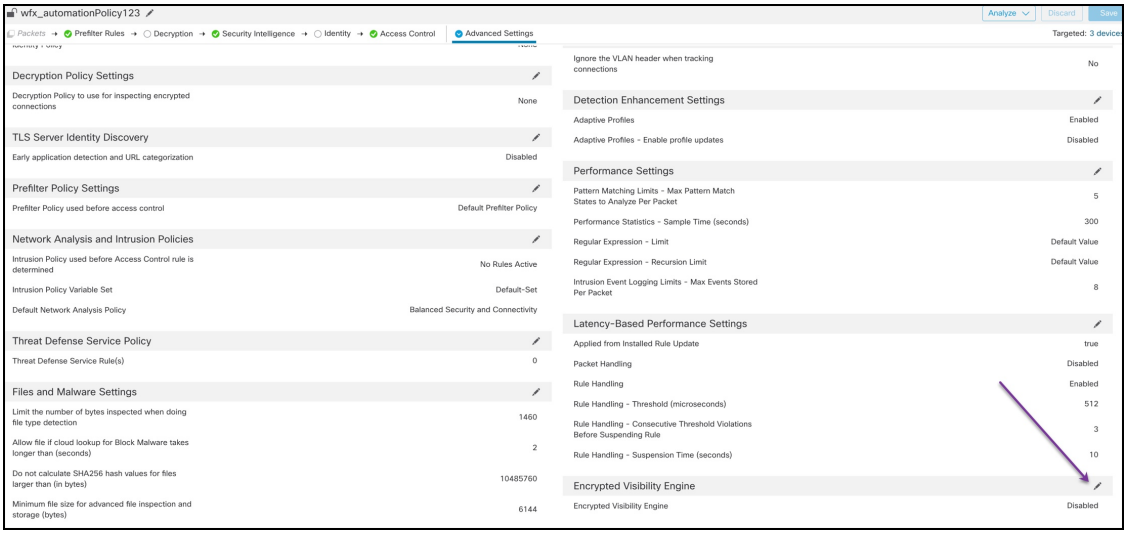
Procedure

Step 1 Choose **Policies** > **Access Control heading** > **Access Control**.

Step 2 Click **Edit** ( ) next to the access control policy you want to edit.

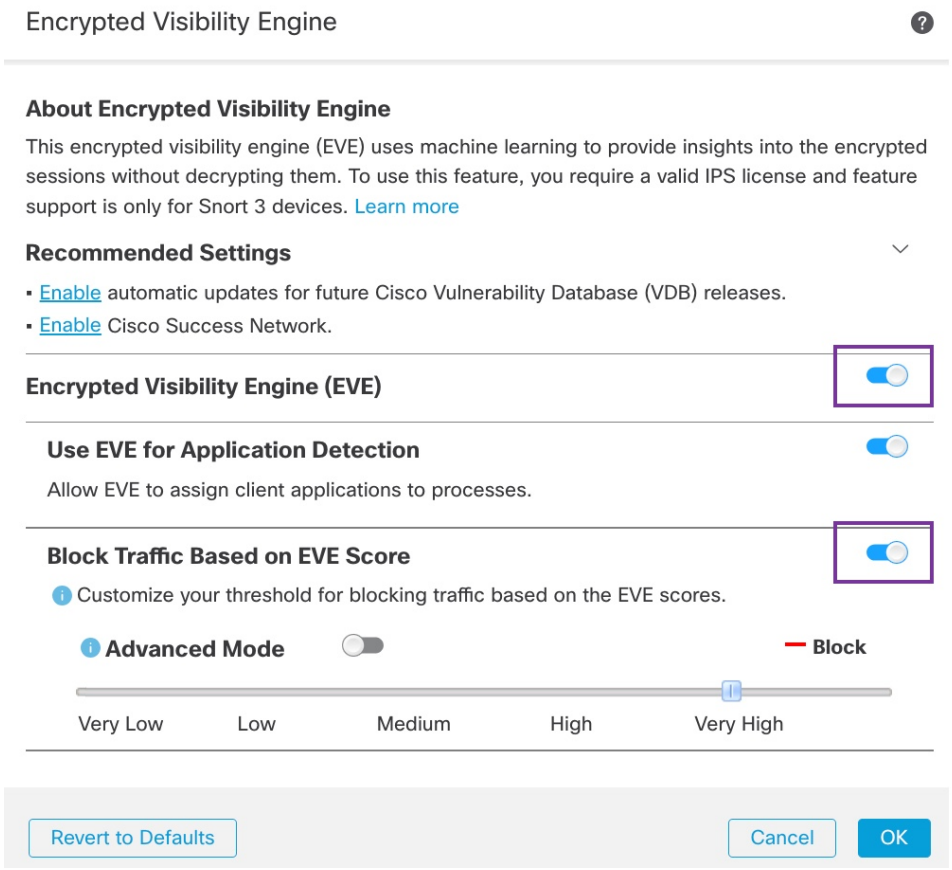
Step 3 Choose **Advanced Settings** from the **More** drop-down arrow at the end of the packet flow line.

Step 4 Click **Edit** ( ) next to **Encrypted Visibility Engine**.



Step 5 In the **Encrypted Visibility Engine** page, enable the **Encrypted Visibility Engine (EVE)** toggle button.

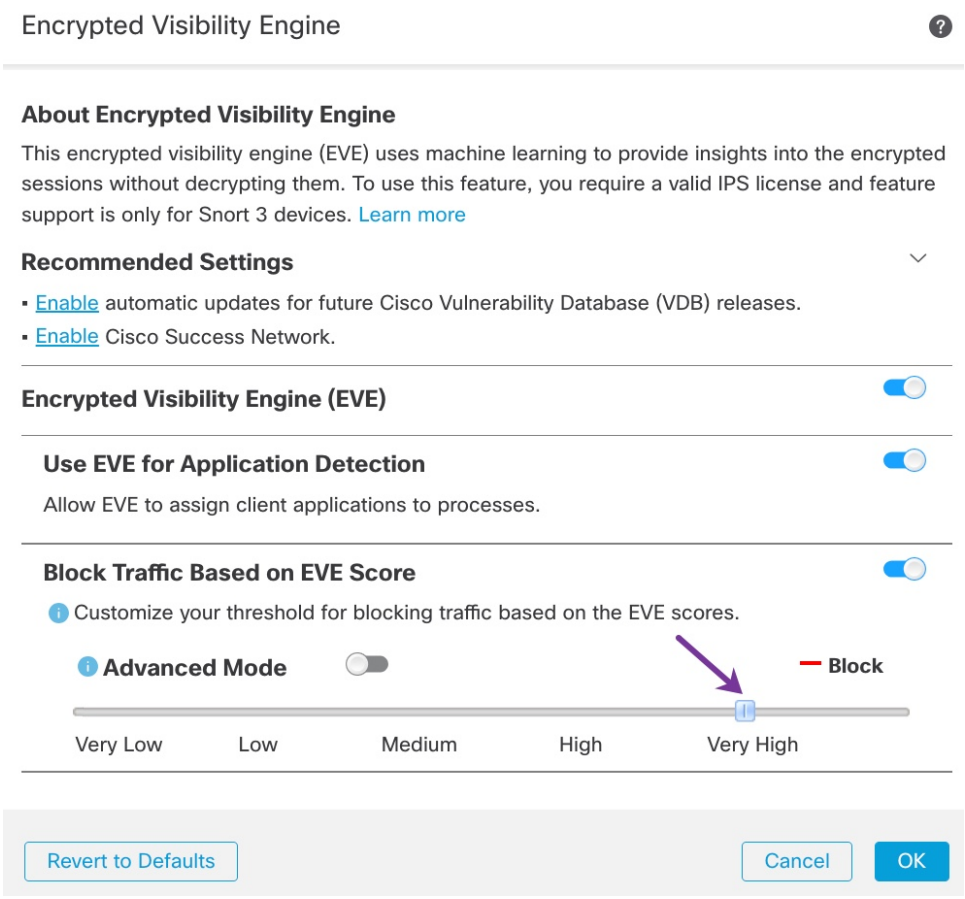
Step 6 Enable the **Block Traffic Based on EVE Score** toggle button. Any incoming traffic that is a potential threat is blocked by default.



Note By default, the threshold at which malware is blocked is 99 percent, which means:

- If EVE detects the traffic to be malware with 99 percent confidence or higher, EVE blocks the traffic.
- If EVE detects the traffic to be malware with less than 99 percent confidence, EVE takes no action.

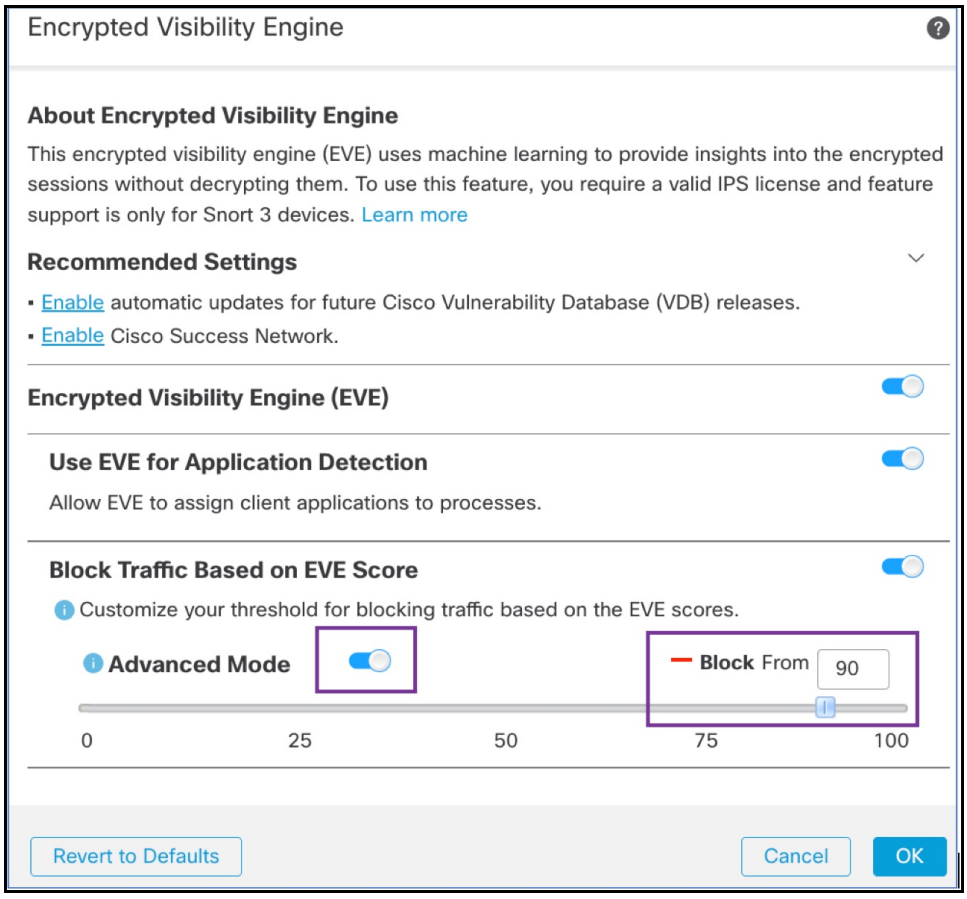
Step 7 Use the slider to adjust the threshold for blocking based on EVE threat confidence. This ranges from **Very Low** to **Very High**. In this example, the slider is set to **Very High**.



Step 8 For further granular control, enable the **Advanced Mode** toggle button. Now, you can assign a specific EVE Threat Confidence Score for blocking traffic. The default threshold is 99 percent.

Step 9 In this example, change the block threshold to **90** percent.

Attention As a best practice, we recommend that you do not set the block threshold to below 50 percent to ensure optimum performance.



Step 10 Click **OK**.

Step 11 Click **Save**.

What to do next

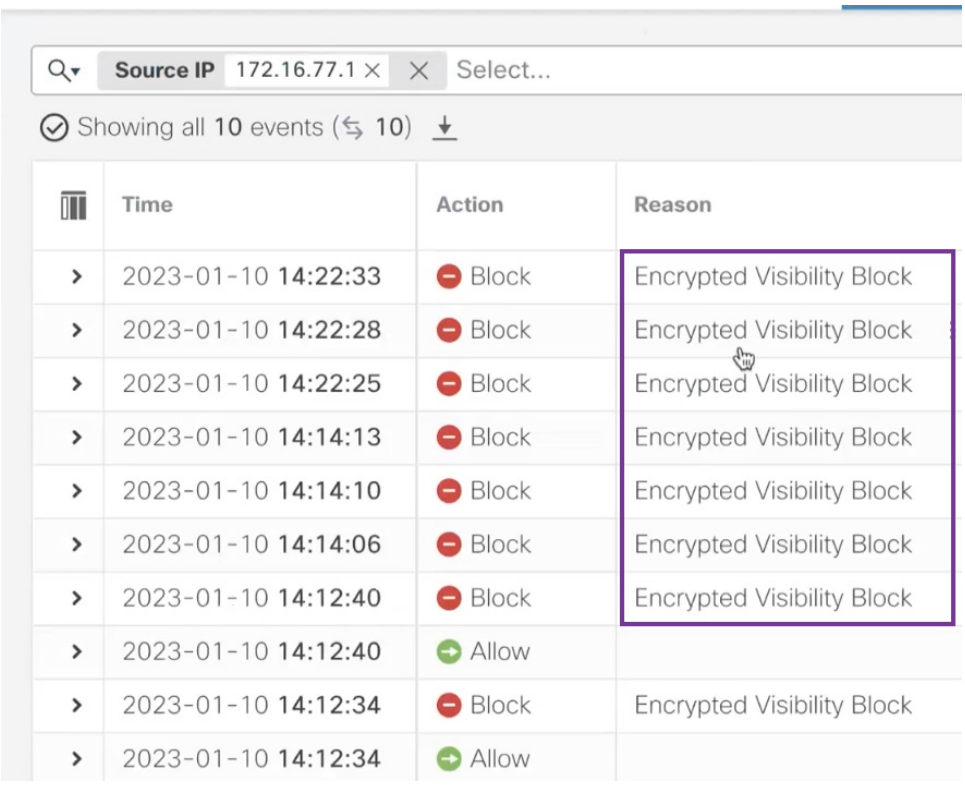
Deploy configuration changes.

View EVE Events

Procedure

Step 1 To verify the block action, choose **Analysis** > **Connections** > **Events**. You can also view the events from the **Unified Events** viewer.

Step 2 If you have configured EVE to block traffic, the **Reason** field shows **Encrypted Visibility Block**.



Step 3 The following is an example of the **Encrypted Visibility Process Name** as **test_malware**, **Encrypted Visibility Threat Confidence** as **Very High**, and **Encrypted Visibility Threat Confidence Score** as **90** percent.



Additional References

For detailed conceptual information, see the Encrypted Visibility Engine for Snort 3 chapter in this guide or the content in the following link:

Encrypted Visibility Engine