Pulse Secure and the Pulse Secure logo are trademarks of Pulse Secure, LLC in the United States. All other trademarks, service marks, registered trademarks, or registered service marks are the property of their respective owners.

Pulse Secure, LLC assumes no responsibility for any inaccuracies in this document. Pulse Secure, LLC reserves the right to change, modify, transfer, or otherwise revise this publication without notice.

Pulse Connect Secure/Pulse Policy Secure License Configuration for PSA-V: On-Premise and Public Clouds Deployment Guide
The information in this document is current as of the date on the title page.

END USER LICENSE AGREEMENT

The Pulse Secure product that is the subject of this technical documentation consists of (or is intended for use with) Pulse Secure software. Use of such software is subject to the terms and conditions of the End User License Agreement (“EULA”) posted at https://www.pulsesecure.net/support/eula. By downloading, installing or using such software, you agree to the terms and conditions of that EULA.”
TESTS .........................................................................................................................................................................................32
DIAGNOSTIC LOGS .....................................................................................................................................................................32
PROFILER LOGS ..........................................................................................................................................................................32

PROFILER DEPLOYMENT CASES..................................................................................................................................................35

STANDALONE PROFILER .............................................................................................................................................................35
REMOTE PROFILER ......................................................................................................................................................................35
PROFILING DEVICES IN BRANCH OFFICES ............................................................................................................................36
Using Profiler Forwarder ..................................................................................................................................................36
Using Linked Profiler (With PPS Functionality) ...................................................................................................................37
About This Document

This guide describes the feature configuration tasks and administrator tasks for the Profiler integrated with Pulse Policy Secure.

Document conventions

The document conventions describe text formatting conventions, command syntax conventions, and important notice formats used in technical documentation.

Notes, cautions, and warnings

Notes, cautions, and warning statements may be used in this document. They are listed in the order of increasing severity of potential hazards.

- A Note provides a tip, guidance, or advice, emphasizes valuable information, or provides a reference to related information.

- An Attention statement indicates a stronger note, for example, to alert you when traffic might be interrupted, or the device might reboot.

- A Caution statement alerts you to situations that can be potentially hazardous to you or cause damage to hardware, firmware, software, or data.

- A Danger statement indicates conditions or situations that can be potentially lethal or extremely hazardous to you. Safety labels are also attached directly to products to warn of these conditions or situations.

Text formatting conventions

Text formatting conventions such as boldface, italic, or Courier font may be used to highlight specific words or phrases.

<table>
<thead>
<tr>
<th>Format</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>bold text</td>
<td>Identifies command names.</td>
</tr>
<tr>
<td></td>
<td>Identifies keywords and operands.</td>
</tr>
<tr>
<td></td>
<td>Identifies the names of GUI elements.</td>
</tr>
<tr>
<td></td>
<td>Identifies text to enter in the GUI.</td>
</tr>
<tr>
<td>italic text</td>
<td>Identifies emphasis.</td>
</tr>
<tr>
<td></td>
<td>Identifies variables.</td>
</tr>
<tr>
<td></td>
<td>Identifies document titles.</td>
</tr>
<tr>
<td>Courier font</td>
<td>Identifies CLI output.</td>
</tr>
<tr>
<td></td>
<td>Identifies command syntax examples.</td>
</tr>
</tbody>
</table>

Command syntax conventions

Bold and italic text identify command syntax components. Delimiters and operators define groupings of parameters and their logical relationships.
### Self-Help Online Tools and Resources

For quick and easy problem resolution, Pulse Secure, LLC has designed an online self-service portal called the Customer Support Center (CSC) that provides you with the following features.

- **Find CSC offerings:** [https://support.pulsesecure.net](https://support.pulsesecure.net)
- **Search for known bugs:** [https://support.pulsesecure.net](https://support.pulsesecure.net)
- **Find product documentation:** [https://www.pulsesecure.net/techpubs](https://www.pulsesecure.net/techpubs)
- **Find solutions and answer questions using our Knowledge Base:** [https://support.pulsesecure.net/knowledge-base-and-security-advisories/](https://support.pulsesecure.net/knowledge-base-and-security-advisories/)
- **Download the latest versions of software and review release notes:** [https://support.pulsesecure.net](https://support.pulsesecure.net)
- **Open a case online in the CSC Case Management tool:** [https://support.pulsesecure.net](https://support.pulsesecure.net)

### Requesting Technical Support

Technical product support is available through the Pulse Secure Global Support Center (PSGSC). If you have a support contract, then file a ticket with PSGSC.

- **Product warranties**—For product warranty information, visit [https://www.pulsesecure.net](https://www.pulsesecure.net).

### Opening a Case with PSGSC

You can open a case with PSGSC on the Web or by telephone.

- **Use the Case Management tool in the PSGSC at** [https://support.pulsesecure.net](https://support.pulsesecure.net).
- **Call 1- 844-751-7629 (toll-free in the USA).**

For international or direct-dial options in countries without toll-free numbers, see [https://support.pulsesecure.net](https://support.pulsesecure.net).
Introduction

Pulse Policy Secure (PPS), an industry recognized Network Access Control (NAC) solution, authenticates users, ensures that endpoints meet security policies, and then dynamically provisions access through an enforcement point (such as a firewall or switch) based on the resulting user session information - including user identity, device type, IP address, and role.

The Pulse Secure Profiler dynamically identifies and classifies both managed and unmanaged endpoint devices, enabling control of access to networks and resources based on the type of the device.

Pulse Policy Secure integrates with the Profiler to provide visibility and control of endpoint devices. This document focuses on features of the Profiler in a network with an existing Policy Secure deployment already configured with the basic elements required to provide network access, including authentication servers, sign-in policies, roles, realms, and SNMP-based enforcement or RADIUS attributes policies for enforcement based on 802.1X / MAC authentication. Please refer to the PPS Administration Guide for details.
Deployment and License Requirements

From Profiler v1.3 onwards, new license SKUs are available on Pulse Secure license portal, for example, PS-PROFILER-LG SKU. The Profiler SKUs are device count based licenses. For more information, see PCS and PPS License Management Guide.

A high-level overview of the deployment steps needed to set up and run the Profiler is shown below. For detailed information, see Profiler Deployment Guide.

Figure 1: Profiler Deployment Process

- **Step 1: Download and Install Profiler License**
- **Step 2: Switch Configuration**
  - Set IP helpers or mirror DHCP port on switch
  - Switch Configuration for CDP/LLDP
  - Switch Configuration for SNMP Trap
- **Step 3: Wireless LAN Controller (WLC) Configuration**
  - Forward HTTP User Agent to PPS
- **Step 4: PPS Configuration (Local Profiler)**
  - Configure SNMP Devices
  - Configure the Profiler Authentication Server
  - View Discovered Devices
  - Configure Role-mapping Rules for Profiled Devices
- **(Optional) Step 5: PPS/PCS Configuration (Remote Profiler)**
  - Allow Access to PPS/Profiler Server
  - Configure the Profiler Authentication Server
  - Configure Role Mapping Rules for Profiled Devices
Discovering Endpoint Devices

The profiler uses a combination of active and passive scanning techniques to discover and collect information about all the endpoints on a network. Collectors are used to collect this information. Collectors are broadly classified into active and passive collectors.

Passive Collectors

Passive collectors are initiated based on network events or timer events. For example, a new DHCP packet is received from the network which triggers the DHCP collector to profile the device.

DHCP collector

The profiler uses DHCP fingerprinting for endpoint classification of the endpoints such as laptops and desktops that are configured to have a DHCP IP address. One or more switched or WLAN controllers must be configured to forward all DHCP packets for each VLAN to the internal interface of the PPS appliance. This enables the on-box Profiler to profile endpoints by parsing the DHCP packets arriving at the PPS appliance.

In some environments, it is easier to forward DHCP traffic to the Profiler using the SPAN/RSPAN configuration.

User Agent Collector

Some devices, like mobile phones, may not be profiled exactly with DHCP fingerprints. For example, an iPhone 6s phone is profiled as an iOS device or a Samsung Android 5.1 phone is profiled as Generic Android. The user agent information (contains granular information about the operating systems / OS versions) helps to profile these types of devices with more precision. The Profiler uses HTTP User Agent data that is captured from network traffic of the device to classify the devices.

Network Infrastructure Device Collector

While DHCP fingerprinting is useful for endpoints with a DHCP-assigned IP address, it cannot detect devices that are assigned static IP addresses. The Profiler can detect statically addressed endpoints by fetching the ARP/CAM table from Network Infrastructure Device using SNMP or SSH.

Note: The ARP/MAC tables are fetched from the Network Infrastructure Device periodically. The poll interval can be configured by the administrator.

CDP and LLDP collection methods is also supported by any other devices that send CDP or LLDP announcements. CDP and LLDP data provides more accurate version of OS, model, and category information. The discovery protocols are enabled by default in most of the network infrastructure devices.

Network Infrastructure Device Collector -- SNMP

Network Infrastructure Devices that support standard SNMP MIBs are queried through SNMP to get the list of endpoints connected to them. The list of managed or unmanaged devices is available by querying the MAC table and ARP tables.

Network Infrastructure Device Collector -- SSH

For Network Infrastructure Devices that do not support standard SNMP MIBs, the Profiler uses SSH sessions to read the ARP/CAM tables.

Note: In this release, this feature is supported for Palo Alto Network vendors only.
SNMP Trap

Profiler supports SNMP Trap based discovery which helps to accurately detect when the endpoint is connected to or disconnected from the switch using link down, link up and mac change notification SNMP traps. This specifically helps in detecting the endpoints that are connected to the switches for brief period of times that are in between Profiler Poll interval for Network Infrastructure Devices.

Active Collectors

Active collectors are initiated by Profiler. Once devices are discovered using DHCP, SNMP or other mechanisms, more granular profiling is done only for those devices using various active collectors.

Nmap Collector

Nmap scan runs on all endpoints that have an IP address that are in white listed subnets, as and when they have discovered by other collectors.

WMI Collector

The Profiler runs WMI scan to collect more accurate and detailed information of Windows endpoints.

SSH Collector

SSH is an active collection method that can be used to gather detailed information which would help to profile endpoints accurately.

Note: In this release, this mechanism is supported for MAC OSX endpoints only.

MDM Collector

Pulse Policy Secure can communicate with Mobile Device Management Platforms such as AirWatch and MobileIron to retrieve more information about managed mobile endpoints. As both an MDM server and the Profiler acts as a device attribute server, it is important to provide the administrator an aggregated view of the attributes. The attributes that are retrieved from the MDM are merged with the device attributes computed by the Profiler to offer better classification and manageability of those endpoints.

SNMP HOST Collector

SNMP-HOST Collector is a collection method that receives endpoint information where the endpoints are monitored through SNMP.

Note: In release 9.1R1, SNMP HOST collector is applicable for Windows and Pulse-Appliances only.

Configuring the Local Profiler Authentication Server

Ensure the following tasks are performed before proceeding with the Profiler Authentication server configuration.

- If you wish to use DHCP fingerprinting, you have configured the switch(s) to forward DHCP packets to the PPS.
- If you wish to use SNMP/SSH-based profiling from Network Infrastructure Devices, you have configured one or more switches in the Network Infrastructure Device page of the PPS Administrator User.
- You have downloaded the latest device fingerprints package from the support portal.
To create a new Local Profiler Authentication Server:

1. Select **Authentication > Auth. Servers**.
2. Select **Local Profiler** from the server type drop-down list and click **New Server**.

   **Figure 2: Creating a Local Profiler Authentication Server**

   ![Authentication Servers](image1)

3. Enter a name for the Authentication server.

   **Figure 3: Naming a Local Profiler Authentication Server**

   ![New Local Profiler](image2)

4. Click **Browse** and upload the device fingerprints package.

   **Figure 4: Uploading Device Fingerprints Package**

   ![Fingerprint Database file](image3)

5. (Optional) The SNMP/SSH scan for Network Infrastructure Devices would trigger and look for connected endpoints after a predefined Poll interval.
   - Set SNMP Poll interval, if any Network Infrastructure Devices are configured. By default, the poll interval is set as 60 minutes.
   - Select the DHCP forward mode. RSPAN for external ports and DHCP Helper for internal ports.
   - Select the interval to purge older devices from the database periodically. By default, the interval is set to Never.

   **Figure 5: General Settings**

   ![General Settings](image4)
6. (Optional) Select device categories which trigger e-mail(s) to the administrator for approval. Also create a role-mapping rule based on status attribute to assign the device to the respective role before and after approval. For more information see, Device Sponsoring.

Select Use emails from General Settings to send e-mails to address specified in General Settings or select Custom and enter the e-mail addresses separated by semicolon.

Enter the Profiler hostname or IP address to fill the URL. This link in the e-mail notification allows to quickly access the Device Discovery Report and take appropriate action for devices that require approval.

Figure 6: Device Sponsoring

7. (Optional) Upon device discovery, using DHCP, SNMP or other mechanisms, granular profiling is performed on devices using various active collectors. Add one or more subnets which are included or excluded for collectors like SSH, WMI, SNMP (HOST), and NMAP. Maximum 100 subnets configuration are supported.

On-Demand Scan can be triggered anytime on the subnets for selected collectors.

Figure 7: Adding One or More Subnets
8. (Optional) In the SNMP (HOST) Profiling section, enter the possible names for the community list for the endpoints monitored through SNMP.

![Figure 8: Community List](image)

9. (Optional) In the WMI profiling section, select Configure WMI credentials and specify the domain administrator or user with administrator credentials to fetch accurate endpoint information from remote desktops running Microsoft Windows. Select Use Active Directory server credentials to use existing Active Directory server credentials.

Select Allow deep scan to control the level of information to fetch from the Endpoint remotely through WMI. This option is required if Agentless Host checker with Profiler policies are configured for endpoint posture assessment.

ℹ️ Note: If multiple antivirus software is installed on the remote desktops, WMI fetches information about only one of the antiviruses. WMI does not fetch information about Windows Defender.

![Figure 9: WMI Profiling](image)

10. (Optional) In the SSH Profiling section, select the Authentication Method and enter credentials as applicable. Enter the Endpoint IP or hostname to test the credentials.

![Figure 10: SSH Profiling](image)
11. (Optional) Specify the existing MDM authentication server for accurate profiling of mobile devices which are registered through MDM providers.

![MDM Server](image)

12. Click **Save Changes** to save the configuration settings.

Devices that are discovered are profiled and updated in the Device Discovery Table and an overall summary is shown in the **Device Profiles Dashboard**. The devices can be grouped based on group name and rules using device attributes. For more information see, **Profile Groups**.
Profiler Reports

Dashboard

Once the Profiler is configured, profiling starts in the background. Devices that are discovered are profiled and updated in the Device Discovery Table and an overall summary is shown in the Device Profiles Dashboard. Click on each chart or numbered panel to view detailed information in the device discovery report.

The upper part of the dashboard displays the number panels representing the number of devices for each of the following status:

- Devices waiting to be Profiled
- Devices for which the profile has changed
- Unmanaged devices
- Devices waiting for administrator approval
- Devices added in last 24 hours
- Devices added last week
- Devices added last month

The charts in the dashboard can be customized by the administrator by setting the following parameters:

- **Timeframe**: The charts display information for the specified timeframe. By default, the information for the last 24 hours is displayed. The timeframe can also be set to 7 days, 30 days, or All.
- **Refresh**: The refresh time interval to update the charts. By default, the charts refresh every 5 mins. The time interval can also be set to disabled, 10 minutes, 30 minutes, or 60 minutes.
- **Select list of charts**: List of charts to select to display in the dashboard.
- **Charts Per Row**: Number of charts to display in a row on the dashboard. By default, 3 charts are displayed in a row. 1 or 2 charts can be displayed in each row.
- **Profiler**: The profiler for which the information is displayed. By default, information for all profilers are displayed.

The following charts are displayed in the dashboard:

- **Device Profile State**: Represents the device classification based on Profile status such as Profiled devices, Unprofiled devices, Profile changed devices.
- **Manufacturer Types**: Represents the device classification based on the device manufacturer. For example, VMware. Inc, Apple. Inc
- **Device Categories**: Represents the device classification based on the device category such as smartphones, laptops, windows.
- **Device Types**: Represents the device classification based on device types. For example, Windows, Apple iPod, iPhone.
- **Managed vs Unmanaged**: Represent the device classification on the managed and unmanaged device status. Managed devices are detected by the MDM or a Pulse Client session is established on the device.
- **Active Sessions**: Represent the devices based on the device sessions such as Remote sessions and On-Premise session.
Figure 12: Dashboard View

The charts can be viewed on the dashboard or can be downloaded as a report in PDF format. The reports can be scheduled to be emailed as well.

**Profiler Report Scheduling**

The Profiler reporting can be scheduled, and the reports can be delivered in the e-mail notifications to the specified addresses.

1. Navigate to **System → Configuration → Notification → Email Notification**.
2. Choose **Use emails from General Settings** to send e-mails to address specified in General Settings or choose **Custom** and enter the e-mail addresses separated by semicolon.
3. Select the interval to generate and send the report e-mail notifications. The reports are sent daily, weekly or monthly.
4. Select **Generate Full Report** to generate and send complete report every time. If the option is not selected, the report with only the incremental changes are generated.
5. Click **Save Changes**.
Figure 13: Report Scheduling
Device Discovery Report Table

The Device Discovery Report Table contains the list of devices that are discovered in the network. This report allows to add, modify and delete the endpoints.

Select System > Reports > Device Discovery to display the table.

Figure 14: Device Discovery Report Table

![Device Discovery Report Table](image)

Endpoint Information

All current and historical information for a device is displayed in an expanded view based on IP address, sessions (remote, local) or profiles changes.
Expand the required endpoint to display current Details and History.
Figure 15: History based on IP Address

Endpoint Filters

A list of filters is available for quick analysis of discovered devices. The filters are displayed to the left of the table.

- Filters based on time – Last 24 hours, Last week, Last month
- Filters based on sessions – Active sessions, Remote sessions, On-premise sessions
- Filters based on actions of the discovered devices – Managed devices, Unmanaged devices, Profiled devices, Approved and unapproved devices, Unprofiled devices, Profile changed devices. Manually edited devices, Devices with Notes

Note: If an endpoint is classified incorrectly, please see the Troubleshooting section to rectify the problem.

Report Operations

The Device Discovery Report Table allows the following operations on all the discovered devices.

- **Records per page**: Allows to customize the number of records displayed in the page.
- **Head row**: Lists the main attributes for the devices such as IP Address, MAC Address etc. Click the column head to sort the table with respect to the column. Double click to sort in reverse order.
- **Search**: Allows to search devices based on the MAC Address, IP Address, or other device attributes. Click ? for help.
  - **Basic Search** allows to search the device discovery report with any text or keyword.
  - **Advanced Search** allows to enter the expression with operators and wildcards to obtain specific search results. For example, (snmp.switch_ip = "10.204.58.??" and manufacturer != "*juniper*") or (os != "*juniper*" and ip = "10.204*").
- **Actions**: Allows the following functions:
  - **Approve/Unapprove selected devices**: Allows to manually approve or unapproved the selected devices.
  - **Add Device**: Allows to add new devices. Enter important attributes like MAC Address, Manufacturer, Operating system, category, IP Address, and Profiler Name. Allows to override the automatic updates by the profiler and retain the details.
  - **Download Report**: Allows to download and save the report in CSV format.
  - **Delete Selected**: Allows to delete the selected devices.
  - **Purge Aged Out Devices**: Allows to manually purge devices older than the specified interval in the server configuration. Scheduled purging of the devices happens automatically.
Device Operations

The Device Discovery Report Table allows the following operations for each of the listed devices.

- **Approve/Unapprove**: Each endpoint has an attribute called status and allows to manually approve or unapprove a specific device. See Device Sponsoring for more information.

- **Edit**: Allows to edit Manufacturer, Category and Operating System fields. Manually Added or Edited device attributes are auto updated when the classifier updates its attributes. If you want to avoid updates from classifier, select Override any updates by the profiler and use this profile always for the device.

- **Edit all similar devices**: Allows to edit all similar devices which have same fingerprint. When similar devices are added, the updated fingerprint is used for profiling.

- **Submit a ticket**: The Profiler uses Fingerbank database to classify devices. It is possible that some devices are not correctly classified in this process. In such cases, the administrator can use the Copy Fingerprint option to copy the fingerprint and send the relevant information about the wrongly classified device to the Pulse Secure using an E-mail. This information is verified before updating the Custom Fingerprint database.

**Figure 16: Submit a ticket**

- **Delete**: Allows to delete a device. If the deleted devices are rediscovered by the Profiler, they are again included in the list.
Access Control

After creating the Local Profiler Authorization Server, you can use device attributes from the Profiler in the role mapping rules for both MAC Authorization and 802.1X realms for policy enforcement.

Spoof Detection

The profiler allows a mechanism to suspect MAC address spoofing, provided MAC spoofing results in a profile change of the device. Profile change would be indicated by the previous_os and previous_category fields.

For example, MAC address spoofing can be detected if an endpoint was a printer in the stored profile and the latest profile indicates the same device as a Linux endpoint.

To detect spoof for a specific device, use the following regexp in role mapping rule:

```
deviceAttr.previous_os != ''  AND (deviceAttr.previous_os = 'Cisco VoIP' AND deviceAttr.os != 'Cisco VoIP')
```

Use the following regexp, which is common for all Operating Systems:

```
deviceAttr.previous_os != ''  AND (deviceAttr.previous_os != deviceAttr.os)
```

**Note:** This feature works only when the actual device is profiled with information of OS and categories before spoofed device connects and is profiled. Mac spoof suspect may not work when same OS or Category information is identified for original and spoofed device. Mac spoof suspect may not work when two different collectors collect valid information, but there is no classification change because of priority order of the collectors. The Priority of the collectors in order follows, MDM, WMI, SSH, SNMP/TRAP, DHCP, NMAP.

Device Sponsoring

This feature allows an administrator to manually approve devices that belong to a specific category on a production network. The administrator can configure categories that need approval and the profiler to identify the devices that belong to these categories. The profiler notifies the administrator when new devices are detected. The administrator can approve so that the role of the newly detected device changes according to the role mapping rules.

Profile Groups

The devices can be grouped based on group name and rules for easy access and identification. Group names can be used in role mapping rules, resource policies, filtering etc.

1. Select the Profiler server under Authentication ➔ Auth. Servers.
2. Select Profile Groups tab, select the New Profile Group and enter the Group Name and Rule.: The rules can be written with device attributes and suggested operators can be chosen from the list.
   To create rules for all values including null, use the format: rule: category ="*" or category ="

3. **(Optional)** Enable Needs manual approval option to approve the devices added to the profile group manually by the administrator. The devices in the group are Unapproved by default.
4. **(Optional)** Email notifications can be enabled to notify when new devices are added to the group.
5. Select the interval from the list to purge the older devices in the group automatically.
6. Click Save.

**Note:** Updating the profile groups for existing devices may take time if a rule covers more devices. Navigating away from the page cancels the update for the existing devices. But, the group names are updated when the device receive updates during regular profiling.
Configuring Role-Mapping Rules for Profiled Devices

To configure role-mapping rules:

1. Select Endpoint Policy > MAC Address Realms (for MAC Authorization realms) or Users > User Realms (for 802.1X realms)
2. Select the realm name.
3. Select the Local Profiler Auth. Server as the Device Attributes Server as shown below.

4. Click the Role Mapping tab.
5. Click New Rule.
6. Set Rule based on to “Device Attribute” and then click the Update button.
Figure 19: Rule based on attribute

Note: If a rule exists, then the Rule based on drop-down will not appear.

7. Enter a name for the rule (if creating a new one).

8. Create the new role mapping rule based on the new device attributes that are now available in the attributes drop-down field. When setting the attribute value, make sure the value you enter is an exact match for the value displayed in the Device Discovery Report table. Wildcards (* and ?) can be used in the attribute value.

Figure 20: Creating New Role Mapping Rule

9. After assigning the roles, click Save Changes.

Note: Role mapping rules in the MAC authorization realm apply to both MAC-RADIUS enforcements in an 802.1X environment and SNMP-based enforcement.

The Profiler can also work as a device attribute server for authentication. Wildcards (*) and (?) can be used in the attribute value.

The following table lists the device attributes based on which you can create rules and assign to the user roles.

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Description</th>
<th>Values/Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>antivirus_name</td>
<td>The name of the antivirus running on the device</td>
<td>MacAfee, Symantec Endpoint Protection, etc.</td>
</tr>
<tr>
<td>antivirus_status</td>
<td>The status of the antivirus running on the device</td>
<td>Enabled or Disabled</td>
</tr>
<tr>
<td>antivirus_version</td>
<td>A check on the antivirus version running on the system is up to date or not</td>
<td>Outdated or Current</td>
</tr>
<tr>
<td>Category</td>
<td>The category of the device. All devices are broadly classified into 30+ different categories.</td>
<td>Windows, Linux, Android, etc.</td>
</tr>
<tr>
<td>Custom</td>
<td>The administrator defined value(s) for the device.</td>
<td>Administrator defined values</td>
</tr>
<tr>
<td>domain</td>
<td>The domain name of the device</td>
<td>Administrator defined values</td>
</tr>
<tr>
<td>first_seen</td>
<td>The timestamp of the device discovery</td>
<td>2018-04-04</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
<td>Value</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Groups</td>
<td>The list of groups and rules associated to the device</td>
<td>Administor defined values</td>
</tr>
<tr>
<td>Hostname</td>
<td>The hostname of the device</td>
<td>Admin-PC</td>
</tr>
<tr>
<td>last_seen</td>
<td>The timestamp when the device was last updated</td>
<td>2018-04-06 05:38:43.877617+00:00</td>
</tr>
<tr>
<td>Macaddr</td>
<td>The unique hardware address of the device</td>
<td>78:9c:57:4f:2c:**</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>The device manufacturer name</td>
<td>Lenovo*, HP*, etc</td>
</tr>
<tr>
<td>Os</td>
<td>The Operating system running on the device or the type of the device.</td>
<td>Windows 7.x, AC OS X, Ruckus, Wireless AP, etc</td>
</tr>
<tr>
<td>os_patch</td>
<td>The patch information of the operating system installed on the device</td>
<td>“Service Pack **”</td>
</tr>
<tr>
<td>previous_category</td>
<td>When a device category is changed, the device can be listed using the previous category of the device.</td>
<td>N/A</td>
</tr>
<tr>
<td>previous_os</td>
<td>When a device operating system is changed, the device can be listed using the previous category of the device.</td>
<td>N/A</td>
</tr>
<tr>
<td>profiler_name</td>
<td>The name of the profiler used to profile the device</td>
<td>Local Profiler</td>
</tr>
<tr>
<td>Status</td>
<td>The administrator approval status of the device</td>
<td>Approved or Unapproved</td>
</tr>
<tr>
<td>tcp_open_ports</td>
<td>The open TCP ports on the device</td>
<td>List of port values</td>
</tr>
<tr>
<td>udp_open_ports</td>
<td>The open UDP ports on the device</td>
<td>List of port values</td>
</tr>
<tr>
<td>userName</td>
<td>The username used to access the device</td>
<td>administrator</td>
</tr>
</tbody>
</table>
Agentless Host Checker with Profiler

Profiler allows to authorize users based on the user device attributes without the need to install agents on their machines.
Agentless Host checker allows to configure policies to check device compliance. Each policy consists of a set of rules to qualify the device to be compliant.
The user realms are configured with role mapping rules based on the policies and the users are assigned appropriate role based on device compliance.
The following rule types are supported for the Agentless Host Checker with Profiler on Windows devices:
Agentless Host Checker with Profiler is supported on Windows devices only. The following is the list of supported rule types.
- Antivirus
- Firewall
- Antispyware
- Operating System
- Ports
- Process
- NetBIOS
- Mac address

Note: Agentless Host Checker is supported on ESAP package 3.4.0.

Configuring Agentless Host Checker with Profiler

To configure Agentless Host Checker mode, perform the following steps.

3. Enter a name for the policy, select Agentless mode with Profiler and click Continue.

Figure 21: Host Checker Policy Creation for Agentless mode

Note: Host checker Policies configured for Agentless Mode are listed and indicated as (Agentless Mode with Profiler), in the policies table under Authentication > Endpoint Security > Host Checker.
4. Click on the policy name to associate the rules to the policy, select the rule type under Rule Settings and click Add.
Figure 22: Host Checker Rule Types for Agentless mode

a. If you select **Predefined: Antivirus**, the rule requires endpoint to have specific antivirus installed and running.

Enter the **Rule Name**, select required **Criteria**, **Optional** rules and click **Save Changes**.

Figure 23: Antivirus Rule Type for Agentless mode

b. If you select **Predefined: Firewall**, the rule requires the endpoint to have a specific firewall installed and running.

Enter the **Rule Name**, select required **Criteria** and click **Save Changes**.
c. If you select **Predefined: AntiSpyware**, the rule checks for installed AntiSpyware on endpoints. Enter the **Rule Name**, select required **Criteria** and click **Save Changes**.

![Figure 25: AntiSpyware Rule Type for Agentless mode](image)

d. If you select **Predefined: OS Checks**, the rule checks the operating systems and minimum service pack versions listed. Enter the **Rule Name**, select required **Criteria** and click **Save Changes**.
e. If you select **Custom Rule: Ports**, the rule controls the network connections that a client can generate during a session. This rule type checks if restricted ports are open or required ports are not open, then endpoint gets limited connectivity to the network.

Enter the **Rule Name**, enter port numbers to allow or deny under **Criteria** and click **Save Changes**.

Figure 27: Ports Rule Type for Agentless mode

f. If you select **Custom Rule: Process**, the rule controls the software that a client may run during a session.

Enter the **Rule Name**, enter Process Name to allow or deny under **Criteria** and click **Save**
Changes.

Figure 28: Process Rule Type for Agentless mode

If you select **Custom Rule: NetBIOS**, the rule checks the NetBIOS name of the client machine. Enter the **Rule Name**, enter NetBIOS Names to allow or deny under **Criteria** and click **Save Changes**.

Figure 29: NetBIOS Rule Type for Agentless mode

If you select **Custom Rule: MAC Address**, the rule checks the MAC Address of the client machine. Enter the **Rule Name**, enter MAC Addresses to allow or deny under **Criteria** and click **Save Changes**.

Figure 30: MAC Address Rule Type for Agentless mode

5. On adding the Rule Types, select the required option for rules, **Remediation** and **Dashboard Reporting** options and click **Save Changes**.
6. Enforce the policies for Agentless Mode with Profiler and implement the policy at the realm level. Navigate to Users > User Realms > Select Realm > Authentication Policy > Host Checker. Select Agentless mode with Profiler. Select the applicable policies from the list and click Save Changes.

   **Note:** Pre-authentication compliance check is not supported for agentless mode with Profiler. The Require and Enforce option is disabled for agentless policies.

   ![Policy enforcement for Agentless mode with Profiler on User Realm](image)

7. Allow access to devices that comply with Agentless Host Checker policies. Navigate to Users > User Roles > Select Role > General > Restrictions > Host Checker add or remove the policies from the list and click Save Changes.

   ![Policy enforcement for Agentless mode with Profiler on User Role](image)
Import/Export Profiler Database

Profiler allows administrator to download the profiled data in CSV or CFG (binary import/export) format for readability or reporting purpose. The administrators can use this data to analyze and troubleshoot the configurations of devices. The file can be password protected for security reasons.

The Profiler supports Import / Export of Profiler Device Database in Binary or CSV formats. The database files can be used to troubleshoot, backup database, or restore the database in case of any crash or data loss.

Import / Export Profiler Device Data in Binary format

To avoid accidental loss of database due to Appliance Hardware failures, software upgrade or accidental deletion (if backed up), it is required to back up the database and restore whenever required. Profiler device database can be exported and imported in Binary format.

**Binary Export**

On export, profiler device data is encrypted and downloaded with filename `Profiler*.cfg`.

**Binary Import**

The device database import in Binary format erases the existing database completely. The endpoint session information is invalidated.

Import / Export Profiler Device Data in CSV format:

The CSV format allows the administrator to add additional endpoints into the profiler device database. The CSV format also allows to import some custom information into the database.

**CSV Export**

On export, the complete device data information is exported into a CSV file. This is the same behavior as the Download Report in the Profiler DDR.

**CSV Import**

- The CSV import to the profiler device database, appends the existing database. It does not erase the existing database completely.
- The CSV format allows to import only essential endpoint information such as Macaddr, IP, hostname, manufacturer, os, category, previous_os, previous_category, notes, first_seen, last_seen, profiler_name, groups and custom.
- For existing devices, the data is overwritten for the supported fields from CSV. Remaining data remains as is.
- For devices that are marked as Manually Edited Devices, no further classification is performed on the imported endpoints.
- To avoid the Operating and Category changes to the devices received by the classifier on importing the CSV file, include or edit the column `override` and set the value to TRUE for each device in the CSV file.
- Custom field can be provided in the CSV for import. This column is visible in the DDR only if customer has imported custom data. Custom field is available for role mapping rules.

Import/ Export of Profile Modifications database in Binary format

This functionality is used when the administrator performs profile modifications and wants the same modifications to reflect in other profilers (Standalone or forwarders). The profile modifications are appended to existing modifications on import.
Troubleshooting

Tests

The following tests help to identify and solve basic problems associated with configurations of the Profiler.

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>DHCP Test</td>
<td>• Verify if ports are receiving the DHCP packets.</td>
</tr>
<tr>
<td></td>
<td>• Detect a device when connected to network during the diagnostic run.</td>
</tr>
<tr>
<td>Switch Diagnostics</td>
<td>• Verify switches are enabled</td>
</tr>
<tr>
<td></td>
<td>• Check if SNMP walk is successful or not</td>
</tr>
<tr>
<td></td>
<td>• Check if Profiler can successfully read ARP table, CAM table, and SSID information</td>
</tr>
<tr>
<td>SNMP (Host) Test</td>
<td>• Check if the Profiler is able to fetch the Endpoint information through SNMP.</td>
</tr>
<tr>
<td>NMAP Scan Test</td>
<td>• Check if NMAP scan is working for an IP address, which is prompted during diagnostic run</td>
</tr>
<tr>
<td>Trap Test</td>
<td>• Verify if trap is collected or not for a switch event.</td>
</tr>
<tr>
<td></td>
<td>• Detect a device when connected to network during the diagnostic run.</td>
</tr>
<tr>
<td>SMTP Test</td>
<td>• Troubleshoot any problem in configuration/reachability of SMTP server.</td>
</tr>
<tr>
<td></td>
<td>• Device sponsoring is available with email notification feature. It sends an email through configured SMTP server and displays the status.</td>
</tr>
</tbody>
</table>

To execute the tests, perform the following steps:

1. Select **Authentication > Auth Servers > <Profiler page>** and select the **Troubleshooting** tab.
2. From the drop-down list, select the required test and click **Run diagnostics**.

**Figure 33: Troubleshooting**

Diagnostic Logs

The Profiler Diagnostic logs include detailed information about endpoints on uploading the endpoint information to Pulse One. Event IDs PRO31748 and PRO31749 represent the diagnostic log messages.

To enable Diagnostic logs, navigate to **Maintenance > Troubleshooting > Monitoring > Diagnostic Logs** and select **Profiler Diagnostic Logging On**.

Profiler Logs

The Profiler logs all its activities to the Event Log and Administrator Access Logs.

To see the Profiler logs in the Event log, navigate to **Log/Monitoring > Events > Log Settings** and select **Profiler Events**.
**Figure 34: List of Events to Log**

![Select Events to Log]

**Table 1: Profiler logs**

<table>
<thead>
<tr>
<th>Event ID</th>
<th>Description</th>
<th>Log Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADM31405</td>
<td>Network Infrastructure Device Poll Interval Updated</td>
<td>Admin logs</td>
</tr>
<tr>
<td>ADM31444</td>
<td>WMI User added</td>
<td>Admin logs</td>
</tr>
<tr>
<td>ADM31445</td>
<td>WMI User modified</td>
<td>Admin logs</td>
</tr>
<tr>
<td>ADM31446</td>
<td>WMI User deleted</td>
<td>Admin logs</td>
</tr>
<tr>
<td>ADM31458</td>
<td>Profiler API keys retrieved Success/Failure</td>
<td>Admin logs</td>
</tr>
<tr>
<td>ADM31573</td>
<td>Device(s) are deleted from Device Discovery Report</td>
<td>Admin logs</td>
</tr>
<tr>
<td>ADM31591</td>
<td>Device updated in Device Discovery report.</td>
<td>Admin logs</td>
</tr>
<tr>
<td>ADM31595</td>
<td>Device added in Device Discovery report.</td>
<td>Admin Logs</td>
</tr>
<tr>
<td>ADM31631</td>
<td>Device addition failed in Device Discovery Report.</td>
<td>Admin Logs</td>
</tr>
<tr>
<td>ADM31634</td>
<td>Profile modified successfully</td>
<td>Admin logs</td>
</tr>
<tr>
<td>ADM31635</td>
<td>Profile modification is deleted successfully</td>
<td>Admin logs</td>
</tr>
<tr>
<td>ADM31636</td>
<td>Import from CSV succeeded</td>
<td>Admin logs</td>
</tr>
<tr>
<td>ADM31637</td>
<td>Import from CSV failed</td>
<td>Admin logs</td>
</tr>
<tr>
<td>ADM31701</td>
<td>On-Demand Subnet Scan triggered by admin [With subnet and collector details]</td>
<td>Admin logs</td>
</tr>
<tr>
<td>ADM31702</td>
<td>On-Demand Subnet Scan stopped by admin</td>
<td>Admin logs</td>
</tr>
<tr>
<td>ADM31730</td>
<td>Profile Group created</td>
<td>Admin logs</td>
</tr>
<tr>
<td>ADM31731</td>
<td>Profile Group updated</td>
<td>Admin logs</td>
</tr>
<tr>
<td>ADM31732</td>
<td>Profile Group deleted</td>
<td>Admin logs</td>
</tr>
<tr>
<td>ADM31759</td>
<td>Purge Initiated! Device(s) will be aged out from Device Discovery Report.</td>
<td>Admin logs</td>
</tr>
<tr>
<td>PRO31368</td>
<td>New Device discovered and profiled by Profiler</td>
<td>Event logs</td>
</tr>
<tr>
<td>PRO31369</td>
<td>Device Profile (OS/Category) changed and detected by Profiler</td>
<td>Event Logs</td>
</tr>
<tr>
<td>PRO31385</td>
<td>Start and End Indication of Network Infrastructure device scan</td>
<td>Event logs</td>
</tr>
<tr>
<td>PRO31386</td>
<td>Details of Network Infrastructure Device which is undergoing the scan</td>
<td>Event Logs</td>
</tr>
<tr>
<td>PRO31387</td>
<td>Total Number of devices scanned on the Network Infrastructure Device during polling</td>
<td>Event Logs</td>
</tr>
<tr>
<td>PRO31387</td>
<td>SNMP polling completion message for a particular table (ARP/CAM/CDP/LLDP).</td>
<td>Event Logs</td>
</tr>
<tr>
<td>PRO31388</td>
<td>No Network Infrastructure Devices are configured for polling</td>
<td>Event Logs</td>
</tr>
<tr>
<td>PRO31443</td>
<td>Password Decryption Failure</td>
<td>Event logs</td>
</tr>
<tr>
<td>PRO31447</td>
<td>WMI connection failed</td>
<td>Event Logs</td>
</tr>
<tr>
<td>PRO31448</td>
<td>WMI Query Failed</td>
<td>Event logs</td>
</tr>
<tr>
<td>PRO31449</td>
<td>WMI Scanning a device</td>
<td>Event Logs</td>
</tr>
<tr>
<td>PRO31457</td>
<td>Device attributes are retrieved from profiler</td>
<td>Event logs</td>
</tr>
<tr>
<td>PRO31459</td>
<td>Device attributes got updated</td>
<td>Event logs</td>
</tr>
<tr>
<td>PRO31461</td>
<td>Encryption or decryption failed for config parameters</td>
<td>Admin logs</td>
</tr>
<tr>
<td>PRO31476</td>
<td>Fingerprint Database Initialization Failed</td>
<td>Event logs</td>
</tr>
<tr>
<td>PRO31479</td>
<td>Failed to download fingerprint from peer</td>
<td>Event logs</td>
</tr>
<tr>
<td>PRO31480</td>
<td>Fingerprint download Started from peer</td>
<td>Event logs</td>
</tr>
<tr>
<td>Event Code</td>
<td>Description</td>
<td>Event Logs</td>
</tr>
<tr>
<td>------------</td>
<td>------------------------------------------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>PRO31481</td>
<td>Successfully downloaded fingerprint from peer</td>
<td>Event logs</td>
</tr>
<tr>
<td>PRO31523</td>
<td>Performing Full Sync with the configured appliance</td>
<td>Event Logs</td>
</tr>
<tr>
<td>PRO31524</td>
<td>Successfully uploaded device(s) to Pulse One / Standalone Profiler</td>
<td>Event logs</td>
</tr>
<tr>
<td>PRO31525</td>
<td>Upload of device(s) to Pulse One / Standalone Profiler failed</td>
<td>Event logs</td>
</tr>
<tr>
<td>PRO31557</td>
<td>Profiler has exceeded the licensed device count including the grace count</td>
<td>Event Logs</td>
</tr>
<tr>
<td>PRO31572</td>
<td>Profiler has exceeded the licensed device count excluding the grace count</td>
<td>Event Logs</td>
</tr>
<tr>
<td>PRO31592</td>
<td>Device(s) Email Notification sent for Approval</td>
<td>Event logs</td>
</tr>
<tr>
<td>PRO31605</td>
<td>Performing a SSH scan on a device</td>
<td>Event logs</td>
</tr>
<tr>
<td>PRO31606</td>
<td>SSH Connection failed, while performing SSH scan</td>
<td>Event logs</td>
</tr>
<tr>
<td>PRO31607</td>
<td>SSH Command Failed, while performing SSH scan</td>
<td>Event logs</td>
</tr>
<tr>
<td>PRO31638</td>
<td>The registered Pulse One server is not capable to receive profiler endpoints</td>
<td>Event logs</td>
</tr>
<tr>
<td>PRO31638</td>
<td>The registered Pulse One server is not capable to receive profiler endpoints</td>
<td>Event logs</td>
</tr>
<tr>
<td>PRO31697</td>
<td>On-Demand Subnet Scan started (With Collector details)</td>
<td>Event logs</td>
</tr>
<tr>
<td>PRO31698</td>
<td>On-Demand Subnet Scan completed for a particular subnet and collector</td>
<td>Event logs</td>
</tr>
<tr>
<td>PRO31699</td>
<td>On-Demand Subnet Scan completed by a specific collector</td>
<td>Event logs</td>
</tr>
<tr>
<td>PRO31700</td>
<td>On-Demand subnet failed due to an error</td>
<td>Event logs</td>
</tr>
<tr>
<td>PRO31754</td>
<td>Purge Successful! 82 aged out device(s)(older than 1 days) deleted from Profiler database</td>
<td>Event logs</td>
</tr>
<tr>
<td>PRO31755</td>
<td>Purge Failed! No aged out devices deleted from Profiler Database.</td>
<td>Event logs</td>
</tr>
<tr>
<td>SYS31660</td>
<td>SMTP error</td>
<td>Event logs</td>
</tr>
<tr>
<td>SYS31686</td>
<td>Error while generating notification</td>
<td>Event logs</td>
</tr>
<tr>
<td>SYS31687</td>
<td>Notification generated successfully</td>
<td>Event logs</td>
</tr>
</tbody>
</table>
Profiler Deployment Cases

The Profiler can be deployed on a standalone, remote, or distributed networks.

Standalone Profiler

Standalone Profiler can be deployed as an independent appliance. All PPS and PCS appliances communicate with this Standalone Profiler for authorization.

A Standalone Profiler is useful in the following cases:
- You want to profile devices that are outside the enterprise network and connected via PCS.
- You have an active/active cluster (or multiple un-clustered set) of PPS appliances.

<i>Note:</i> The Profiler can be deployed in Active/Passive clusters or without clustering.

![Figure 35: Example of a Standalone Profiler deployed in a typical PPS Active/Active cluster](image)

When user connects to a PCS or PPS and starts a session:
- Information such as hostname and IP address, device IP address and MAC address, session identifier, user-agent are retrieved by the session and sent to the Profiler.
- The Profiler returns Device OS, Device Manufacturer, Device Category and Session Identifier to PPS/PCS.
- The Profiler updates the PCS/PPS session with the device attributes and triggers role re-evaluation.

Remote Profiler

A Remote Profiler can be configured on a PCS/PPS appliance to profile devices that are connected to them. To configure the remote profiler, the IP address of the standalone Profiler is configured on the PCS/PPS. The remote profiler is configured as device attribute server and used in role mapping rules.

A Remote Profiler is useful to view all endpoints inside and outside the network.
Figure 36: Example of a Remote Profiler

Profiling devices in branch offices

Using Profiler Forwarder

The Profiler forwarder without PPS functionality deployment scenario is useful in following cases:

- You want to profile devices spread across WAN links.
- You have PPS appliances clustered in one or more data centers.

Figure 37: Example of a Profiler and Forwarder deployed across WAN

The Profiler Forwarder is a physical or virtual appliance with distinctive feature license called Profiler Forwarder license. The Profiler Forwarder enables the Profiler to run locally, profile the endpoints, and send the profiled information to the central Standalone Profiler periodically (default: 5 minutes). The profiler forwarder can be configured to include the branch name in the Device Discovery Report.
Using Linked Profiler (With PPS Functionality)

Figure 38: Example of a Profiler with PPS functionality deployed across WAN

The Profiler running along with the PPS in a branch, allows to profile the devices and edit attributes on the devices. PPS sends the information to the central Standalone Profiler periodically. It enables to have a consolidated view of all endpoints and maintain a history of the endpoints when moved across branches.