

Secure Guest Access for Cisco IOS-XE SD-WAN Devices

Prescriptive Deployment Guide

May, 2020

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Introduction

About the Guide

This document provides the design and deployment of the Cisco SD-WAN security policy specific to secure guest access within remote sites running IOS-XE SD-WAN WAN Edge platforms. The security features leveraged within this guide include Enterprise Firewall with Application Awareness and URL Filtering (URLF).

The guide explains at length the platforms deployed, highlights the best practices and assists with the successful configuration and deployment of security features. However, the document is not meant to exhaustively cover all options.

This document assumes that the controllers are already deployed and integrated into vManage NMS, the WAN Edge devices are deployed and the SD-WAN overlay network is successfully established. Refer to the [Cisco SD-WAN Design Guide](#) for background information and the [Cisco SDWAN Deployment Guide](#) for information on deploying device templates to establish a Cisco SD-WAN overlay network. For the design and deployment of local Internet exit on remote site WAN Edge devices refer [Cisco SD-WAN Direct Internet Access Design and Deployment Guide](#). For details regarding the required licenses to deploy the Cisco SD-WAN security feature set, refer to [Cisco DNA Software for SD-WAN and Routing](#).

Figure 1. Implementation flow



This document contains four major sections:

- The Define section defines the shortcomings of a secure traditional WAN architecture, and then explains the benefits of deploying SD-WAN security policy on remote sites.
- The Design section includes the use case covered in the guide, along with the design components and considerations for the security features associated with the use case.
- The Deploy section discusses the automated deployment of the Cisco SD-WAN security features specific to the secure guest access use case using the vManage security policy dashboard. The section also includes the prerequisites to deploy this security solution.

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- The Operate section explains some of the monitoring and troubleshooting methods used when Cisco SD-WAN security features, Enterprise Firewall with Application Awareness and URL Filtering (URLF), is configured.

Refer to Appendix B for the hardware models and software versions used in this deployment guide, Appendix C for the feature and device templates, along with the CLI-equivalent configuration for one of the WAN Edge devices configured.

Audience

The audience for this document includes network design engineers, network operations personnel, and security operations personnel who wish to implement the Cisco SD-WAN security infrastructure to establish secure guest access within SD-WAN enabled remote sites.

Define

About the Solution

In traditional wide-area networking, Internet traffic from a branch or remote site is sent to a central location such as a data center or regional hub site. This allows for the traffic returning from the Internet to be scrubbed by a data center security stack before being sent back to the branch. This is traditionally done due to the prohibitive cost of deploying a security stack in every branch or remote site location. However, routing guest user traffic from remote site to data center poses extreme security risk for the entire organization. The solution is to enable local Internet exit for guest traffic at the remote site by deploying and maintaining Cisco SD-WAN within your WAN infrastructure. This allows you to manage your Cisco SD-WAN WAN network centrally via Cisco vManage GUI and leverage the security capabilities embedded natively in the Cisco SD-WAN single-pane-of management.

Benefits of Enabling Local Internet Exit within the Remote Site

Some of the benefits of enabling local Internet breakout within the remote-site include,

- Improved Internet experience by eliminating latency in backhauling traffic to a central site.
- Enhanced crypto throughput and better application performance for corporate applications due to reduced load on IPsec encrypted WAN links.
- Reduced bandwidth consumption at the central site, which thereby also reduces WAN costs.
- Controlled access to the Internet per VPN basis, by leveraging segmentation to allow for separation of employee and guest traffic.

Within an Internet exit enabled branch or remote-site, users and branch network can be secured by implementing Cisco SD-WAN security features within the remote-site devices via vManage GUI. The security capabilities available within the security policy dashboard on vManage include Enterprise Firewall with Application Awareness (Application Firewall), Intrusion Prevention System (IPS), URL Filtering (URLF), Advanced Malware Protection (AMP), and DNS/Web-layer Security. Based on common customer deployment scenarios, predefined workflows are added into vManage to facilitate ease of deployment for the following use cases, such as:

- **Compliance Use Case:** This use case caters to any organization that services customers, accepts credit card payment to be PCI compliant. In addition to the data being encrypted and sent over an IPsec tunnel, all packets are subjected to a stateful firewall and an IPS solution.

Security features leveraged in this use case include Enterprise Firewall with Application Awareness and Intrusion Prevention System (IPS).

- **Guest Access Use Case:** This use case caters to companies wherein guests bring in BYOD devices and connect to an open or password protected Internet connection. To avoid any litigation, companies are liable to inspect and provide a good content filtering solution.

Security features leveraged in this use case include Enterprise Firewall with Application Awareness and URL Filtering (URLF).

- **Direct Cloud Access (DCA):** This use case caters to customers who need to route some SaaS application traffic for optimal performance via local Internet exit and the rest of the Internet traffic via the HQ. The cloud traffic is inspected for malware.

Security features leveraged in this use case include Enterprise Firewall with Application Awareness, Intrusion Prevention System (IPS), Advanced Malware Protection (AMP) and DNS/Web-layer Security.






- Direct Internet Access (DIA): This use case caters to organizations wherein all Internet traffic from a remote site exit via the local branch Internet exit and is inspected for malware, along with content filtering etc.

Security features leveraged in this use case include Enterprise Firewall with Application Awareness, Intrusion Prevention System (IPS), URL Filtering (URLF), Advanced Malware Protection (AMP) and DNS/Web-layer Security.

In addition, you can also build your own custom policy by combining a custom variety of security features.

Figure 2. Intent-Based Use Cases

Choose a scenario that fits your use-case. Click Proceed to continue building your desired policies.

	Compliance Application Firewall Intrusion Prevention
	Guest Access Application Firewall URL Filtering
	Direct Cloud Access Application Firewall Intrusion Prevention Advanced Malware Protection DNS Security
	Direct Internet Access Application Firewall Intrusion Prevention URL Filtering Advanced Malware Protection DNS Security
	Custom Build your ala carte policy by combining a variety of security policy blocks

Within this solution, the security features available within the guest access use cases is explained.

Benefits of Deploying SD-WAN Security

Some of the benefits of deploying Cisco SD-WAN security policy within the remote site include:

- Simple and automated security solution: The intent-based workflow is designed for ease of configuration and deployment of the SD-WAN security solution. The workflow allows you to fill out the template to include all of the security capabilities and deploy it to multiple WAN Edge devices at the same time.
- Incur no additional cost, as deploying the Cisco SD-WAN security solution eliminates the need to deploy any addition equipment within your SD-WAN network to enable security features.

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- Centralized management: Deploy, troubleshoot and monitor the SD-WAN overlay solution with security capabilities across the WAN Edge devices centrally via the Cisco vManage GUI.
 - Comprehensive SD-WAN security: With security capabilities enabled on your WAN Edge device, you can secure the remote site with:
 - Enterprise firewall with application awareness restricts access to certain Internet destinations based on IP address/ port/ application family and more for remote employees and guests, with improved application experience.
 - URL Filtering (URLF) enforces acceptable user control to block or allow web traffic based on 82+ different categories and web reputation scores, with the added option to blacklist/whitelist web traffic.

Design – Cisco SD-WAN Secure Guest Access

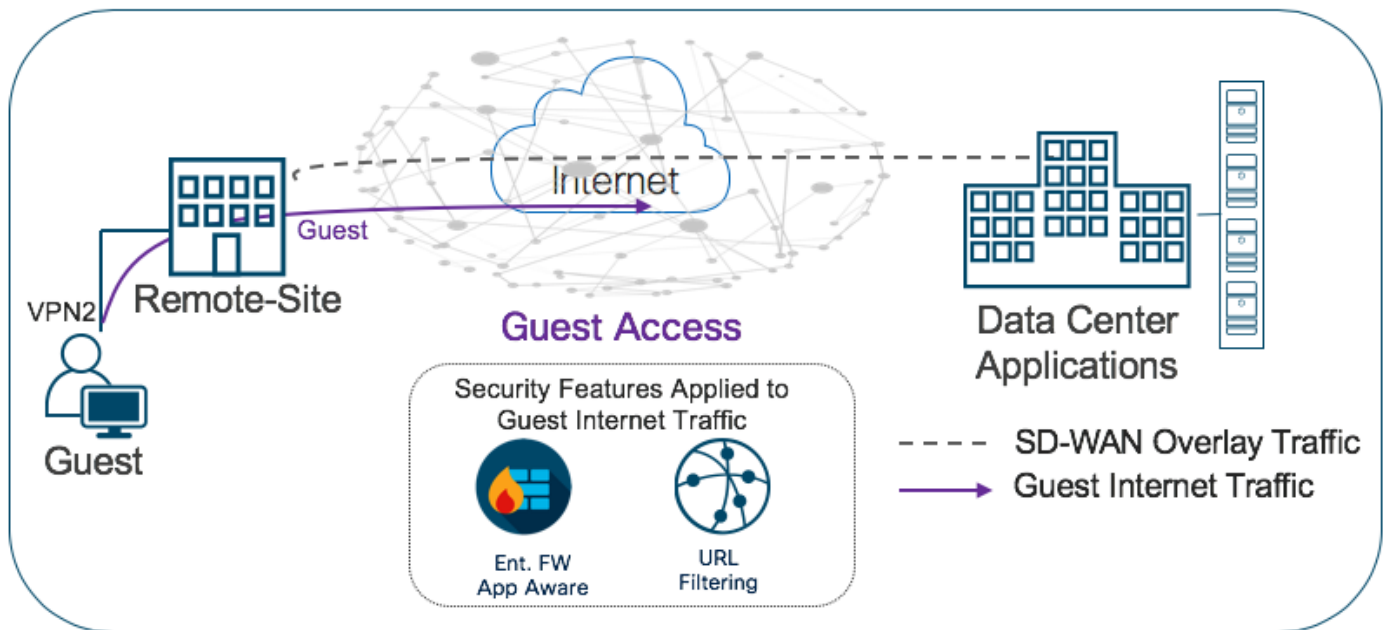
Out of the four intent-based use cases available within the vManage security policy, the use case discussed in this guide is secure guest access

Use Case - Secure Guest Access

Within the guest access use case, the primary requirement is to allow guest users to access Internet directly from the remote site, to offload Internet traffic from premium WAN connections and to improve application experience.

The second requirement is to secure the guest Internet traffic and branch network, by enabling advanced security features such as Enterprise Firewall with Application Awareness to inspect and limit traffic, and URL Filtering (URLF) for content filtering either directly on the WAN Edge router, or by routing Internet traffic through a cloud security provider.

Figure 3. Traffic Flow – Secure Guest Access Use Case



The Cisco SD-WAN features leveraged within this use case include:

- Secure Segmentation via VPN/Zone to segment guest traffic into zones and VPN/ VRF.
- NAT DIA route for local Internet exit of segmented guest Internet traffic. Optionally, you can also use centralized data policy to redirect some or all guest Internet traffic.
- Enterprise Firewall with Application Awareness and URL Filtering to maintain a secure guest access network.

Table 1. Cisco SD-WAN Features to Enable Secure Guest Access

Security Pillar	SD-WAN Security Feature
Segmentation	VPN and Zone

Security Pillar	SD-WAN Security Feature
Local Internet Exit	Centralized Data Policy/ NAT DIA Route
Perimeter Control	Enterprise Firewall with Application Awareness
Liability Protection	URL Filtering

Direct Internet Access Design and Deployment: For the design considerations and configuration of segmentation (VPN), centralized data policy and NAT DIA route on remote-site WAN Edge devices refer to the [Cisco SD-WAN: Enabling Direct Internet Access](#) design and deployment guide.

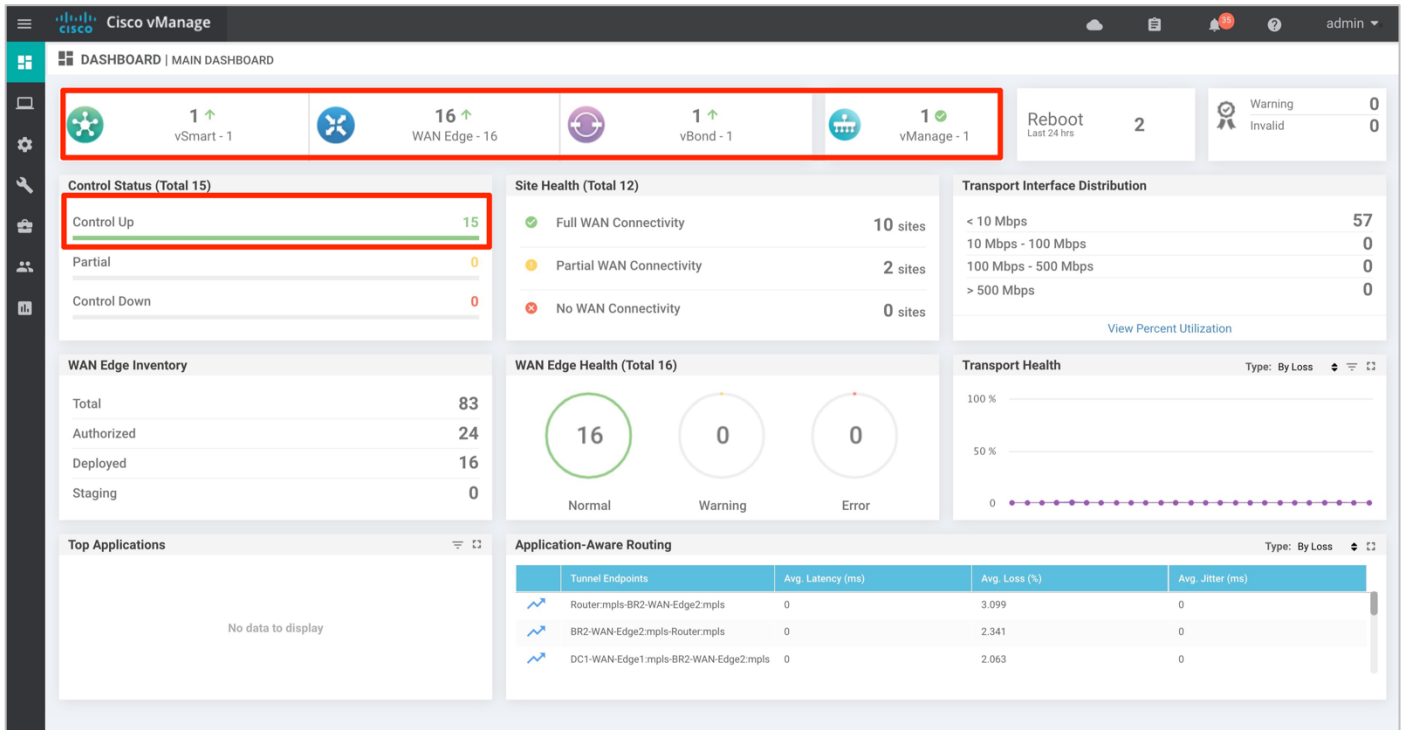
Security Policy Design: For the design components, workings and considerations of Cisco SD-WAN security features such as, Enterprise Firewall with Application Awareness (Application Firewall) and URL-Filtering, refer to the [Security Policy Design Guide for Cisco IOS-XE SD-WAN Devices](#).

Prerequisites - Cisco SD-WAN Secure Guest Access

This section covers the prerequisites specific to secure guest access.

Process 1: Successful Deployment of Controllers and WAN Edge Devices

Step 1. Make sure the controllers and WAN Edge devices are successfully deployed and operational.

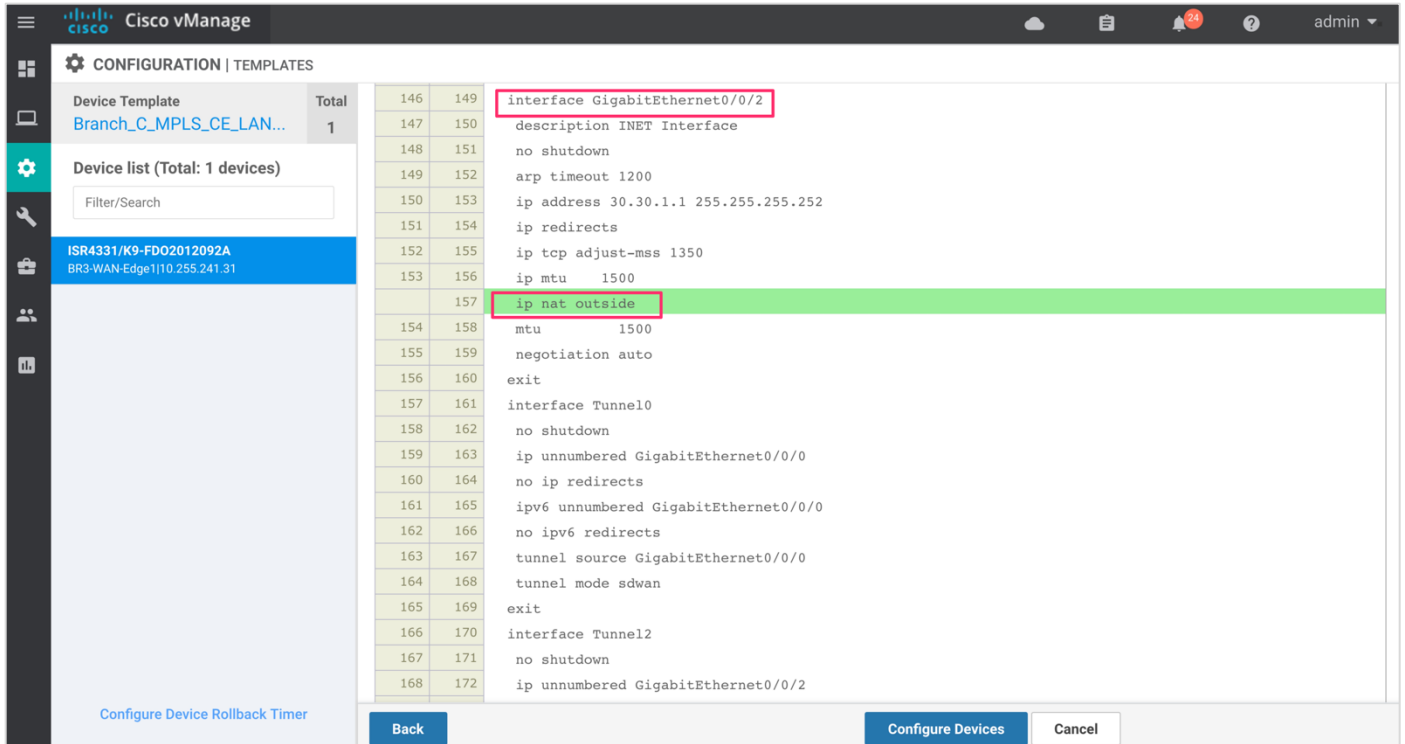


Technical Tip

Make sure to choose platforms that support the SD-WAN security features running the minimum required IOS-XE SD-WAN code with supported memory. For details refer to the design guide - [Security Policy for Cisco IOS-XE SD-WAN Devices](#).

Process 2: Enable Local Internet Exit for Guest Traffic using NAT DIA Route

Step 1. Make sure to enable the NAT feature on the Internet transport VPN 0 Interface. The NAT feature translates the user IP address to the Internet facing interface's IP address.



Step 2. Next, configure NAT VPN route. Following is the VPN feature template to redirect guest access traffic from service VPN 2 to transport VPN 0.

Section	Parameter	Type	Variable/Value
Basic Configuration	VPN	Global	2
	Name	Global	Service Guest VPN
IPv4 Route	Prefix	Device Specific	vpn1_br_static_nat_route_prefix maskbits**
	Gateway	Radio Button	VPN
	Enable VPN	Global	On

**vpn1_br_static_nat_route_prefix|maskbits = 0.0.0.0/0

Based on this configuration, when a packet hits an interface within Service VPN, VPN 2 (Guest VPN/VRF), it will be forwarded to the NAT enabled interface in transport VPN 0.

Technical Tip

If you have a routing protocol configured between the service side NAT and the LAN (core/distribution) device, redistribute the NAT DIA route into the routing protocol. For instance, if you have configured OSPF configured, make sure to redistribute NAT route within the OSPF feature template.

Note, you can also configure local Internet breakout using centralized data policy. For detailed step-by-step configuration of NAT DIA route or centralized data policy, refer to [Cisco SD-WAN: Enabling Direct Internet Access](#).

Process 3: Upload Software Virtual Image to Enable Snort

If you plan to deploy security features such as Intrusion Prevention/ Detection System (IPS/IDS), Advanced Malware Protection (AMP) or URL Filtering within the remote-site WAN Edge device, then begin by downloading the UTD Engine TAR file from the Cisco website to enable these features. Make sure to upload the downloaded TAR file to your vManage software repository prior to building the security policy.

Once the configured security policy is deployed in a WAN Edge router, then the TAR file is automatically downloaded from the vManage repository into the WAN Edge device to enable the required virtual services (IPS/ AMP/ URL Filtering).

Step 1. Upload the correct Cisco security virtual image (UTD Engine TAR File) to vManage. To make sure a compatible image is downloaded from the Cisco website, login to vManage GUI and navigate to **Monitor > Network**.

The screenshot shows the Cisco vManage GUI. The top navigation bar includes the Cisco logo, 'Cisco vManage', and a user profile 'admin'. The main dashboard is titled 'DASHBOARD | MAIN DASHBOARD'. A left sidebar contains navigation options: Monitor (highlighted with a red box and '1'), Geography, Network (highlighted with a blue box and '2'), Alarms, Events, Audit Log, and ACL Log. The main content area displays several widgets:

- WAN Edge - 16**: A widget showing 16 WAN Edge devices with an upward arrow.
- vBond - 1**: A widget showing 1 vBond device with an upward arrow.
- vManage - 1**: A widget showing 1 vManage device with a green checkmark.
- Reboot Last 24 hrs**: A widget showing 2 reboots.
- Warning/Invalid**: A widget showing 0 warnings and 0 invalid items.
- Site Health (Total 12)**: A widget showing 10 sites with Full WAN Connectivity, 2 sites with Partial WAN Connectivity, and 0 sites with No WAN Connectivity.
- Transport Interface Distribution**: A table showing interface utilization: < 10 Mbps (57), 10 Mbps - 100 Mbps (0), 100 Mbps - 500 Mbps (0), and > 500 Mbps (0).
- WAN Edge Health (Total 16)**: A widget showing 16 Normal, 0 Warning, and 0 Error devices.
- Transport Health**: A widget showing a line graph of transport health over time, with a 'Type: By Loss' dropdown.
- Application-Aware Routing**: A table showing routing metrics for three tunnel endpoints.
- Top Applications**: A widget showing 'No data to display'.

The URL at the bottom of the page is <https://100.119.118.21:8443/#/app/monitor/devices/grid>.

Step 2. Each router image supports a specific range of versions for a hosted application. You can find the range of supported versions (and the recommended version) for a device within its **Device Options** page. Click on the specific **WAN Edge** device to which the virtual image will be added.

Cisco vManage MONITOR | NETWORK

WAN - Edge 1 Colocation Clusters

VPN GROUP: Select VPN Group | VPN SEGMENT: All segments

Device Group: All | Search Options | Total Rows: 18

Hostname*	System IP	Device Model	Chassis Number/ID	State	Reachability	Site ID	BFD	Control
vsmart	172.27.0.13	vSmart	c44d2744-de58-48f1-8e61-3d655...	✓	reachable	300	--	29
vmanage	172.27.0.14	vManage	b8a4fa09-bf86-4b1a-bb9e-9eb80f...	✓	reachable	400	--	16
vBond	172.27.0.12	vEdge Cloud (vBond)	28a77819-f63a-4a88-b90c-4d81b...	✓	reachable	600	--	--
Router	10.10.23.23	ASR1001-X	ASR1001-X-JAD23151HC8	✓	reachable	23	26	3
DC1-WAN-Edge2	10.255.241.101	vEdge 5000	193A1104180040	✓	reachable	112001	24	3
DC1-WAN-Edge1	10.255.241.102	vEdge 5000	193A1104180039	✓	reachable	112001	24	3
BR6-WAN-Edge1	192.168.1.1	C1111X-8P	C1111X-8P-FGL231613RW	✓	reachable	112010	18	2
BR4-WAN-Edge1	100.255.241.41	ISR4351	ISR4351/K9-FDO18351QNX	✓	reachable	112006	0	2
BR4-WAN-Edge-1	10.255.241.51	C1111X-8P	C1111X-8P-FGL231613RX	✓	reachable	112003	34	3
BR3-WAN-Edge1	10.255.211.11	ISR4431	ISR4431/K9-FOC22467A57	✓	reachable	111001	26	3
BR3-WAN-Edge1	10.255.241.31	ISR4331	ISR4331/K9-FDO2012092A	--	reachable	--	--	--
BR2-WAN-Edge2	10.255.241.22	ISR4331	ISR4331/K9-FDO20110MX6	✓	reachable	112007	7 (8)	2
BR2-WAN-Edge2	10.255.241.62	ISR4461	ISR4461/K9-FDO2316A220	✓	reachable	112005	24	3
BR2-WAN-Edge1	10.255.241.21	ISR4331	ISR4331/K9-FDO20110MX1	✓	reachable	112007	0	2

Step 3. Within Network, click on Real Time.

Cisco vManage MONITOR Network > Real Time

Select Device: BR3-WAN-Edge1 | 10.255.211.11 | Site ID: 111001 | Device Model: ISR4431

Device Options: System Information

Total Rows: 10

Property	Value
Device groups	["DC","ISR4331","Primary","UG3","US","West"]
Domain ID	1
Hostname	BR3-WAN-Edge1
Last Updated	18 Sep 2019 12:10:11 PM PDT
Latitude	37.409284
Longitude	-97.335
Personality	WAN Edge
Site ID	111001
Timezone	PDT-0700
Vbond	10.10.60.2

Real Time

Step 4. Within the Device Options, enter Security App Version Status. Within the Recommended Version, you will find the recommended UTD Image that must be downloaded for that specific device.

Device Options:

Last Updated	Recommended Version↑	Supported Regex	Installed Version	Supported
14 Nov 2019 10:53:06 AM PST	1.0.8_SV2.9.13.0_XE16.12	*1\.\0\.[(0-9)]+_SV(*)_XE16.12\$	1.0.8_SV2.9.13.0_XE16.12	true

Note: The third column displays the **Supported Regex** pattern. The supported regex is the range of compatible virtual image versions for the router image.

Step 5. From the [Software Download](#) page, locate the image “**UTD Engine for IOS XE SD-WAN**”. Click the download icon on the right-hand side of the window to download the UTD image file.

Software Download

Downloads Home / Routers / Branch Routers / 4000 Series Integrated Services Routers / 4431 Integrated Services Router / IOS XE SD-WAN Software- 16.12.1e

4431 Integrated Services Router

Release 16.12.1e

Related Links and Documentation
[Release Notes for 16.12.1e](#)

File Information	Release Date	Size
Cisco ISR 4400 Series IOS XE SD-WAN Software isr4400-ucmk9.16.12.1e.SPA.bin	12-Nov-2019	619.54 MB
UTD Engine for IOS XE SD-WAN secapp-ucmk9.16.12.01e.1.0.8_SV2.9.13.0_XE16.12.x86_64.tar	12-Nov-2019	51.84 MB

Step 6. Within the vManage dashboard, select **Maintenance > Software Repository**.

The screenshot shows the Cisco vManage Main Dashboard. The navigation menu on the left has 'Maintenance' highlighted in blue and 'Software Repository' highlighted in red. The dashboard content includes:

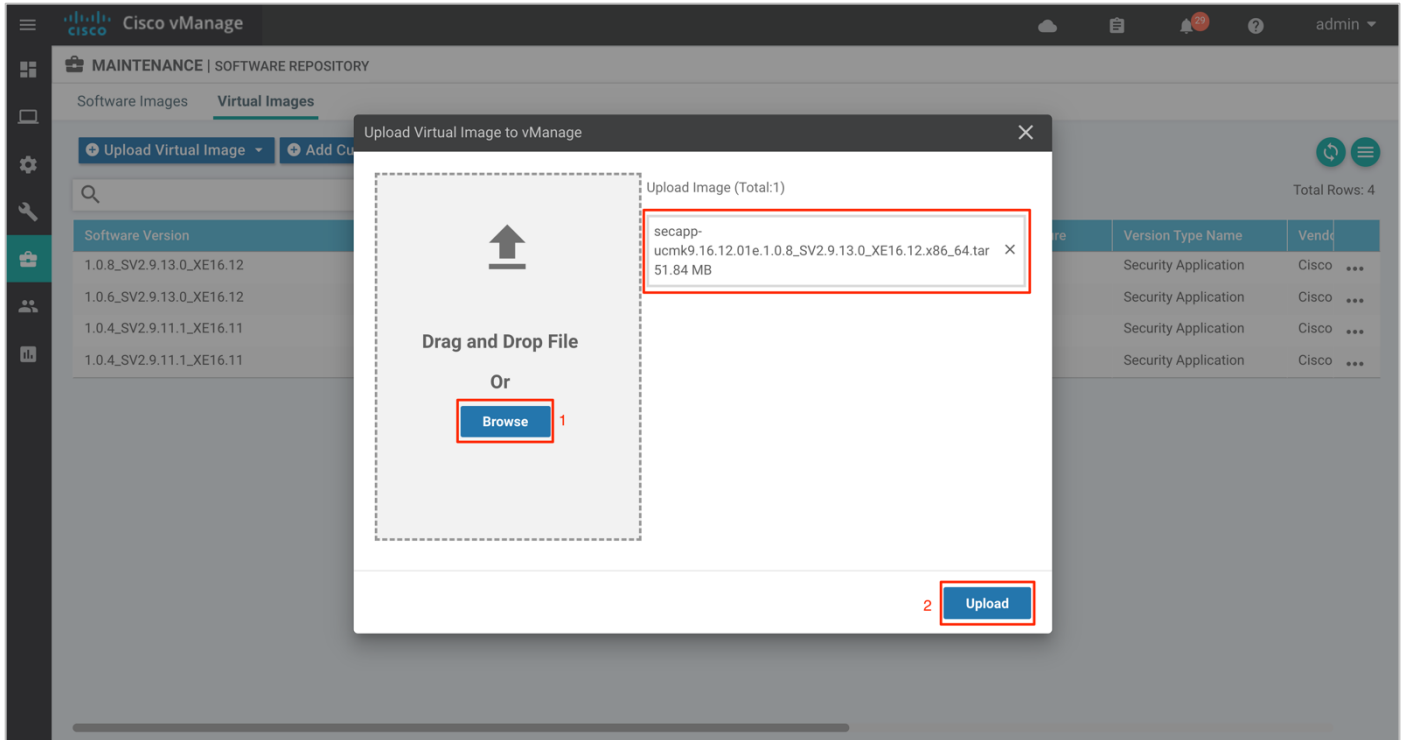
- Control Status (Total 15):** Maintenance (1), Software Repository (2), Software Upgrade (0), Device Reboot, Security (83), Authorized (24), Deployed (16), Staging (0).
- Site Health (Total 11):** Full WAN Connectivity (11 sites), Partial WAN Connectivity (0 sites), No WAN Connectivity (0 sites).
- WAN Edge Health (Total 16):** Normal (16), Warning (0), Error (0).
- Transport Interface Distribution:** < 10 Mbps (69), 10 Mbps - 100 Mbps (0), 100 Mbps - 500 Mbps (0), > 500 Mbps (0).
- Transport Health:** A line graph showing 0% utilization.
- Application-Aware Routing:** A table with columns: Tunnel Endpoints, Avg. Latency (ms), Avg. Loss (%), Avg. Jitter (ms). Rows include Router:mpls-BR2-WAN-Edge2:mpls, BR1-WAN-Edge2:bronze-BR2-WAN-Edge1.bi..., and BR2-WAN-Edge2:mpls-Router:mpls.

Step 7. To upload the UTD file to the vManage **Software Repository**, click on **Upload Virtual Image** tab and select **vManage**.

The screenshot shows the Cisco vManage Maintenance | Software Repository page. The 'Virtual Images' tab is highlighted in red. The 'Upload Virtual Image' button is highlighted in blue, and its dropdown menu is open, showing 'vManage' selected and highlighted in red. The table below shows the following data:

Software Version	Software Location	Network Function Type	Image Type	Architecture	Version Type Name	Vendor
1.0.6_SV2.9.13.0_XE16.12	vmmanage	App-Hosting	Lxc	x86_64	Security Application	Cisco Sys

Step 8. Next, click on **Browse** to upload the downloaded UTD image. The image will appear on the right, and Click on **Upload** to add the image into the **Software Repository**. In case you already have the same image uploaded a **notification** of possible overwrite will populate.



When the security policy is activated, the UTD image is automatically downloaded from the vManage virtual images software repository into the device's flash drive over a control plane connection.

Technical Tip

To delete the software image from your vManage software repository, select the software image, click on the three dots - **More** actions icon and click **Delete**. Also, note the UTD image can be upgraded via vManage to a later code as long as the latest code is uploaded to the **Software Repository**.

Process 4: (Optional) Create a Security App Hosting Profile Template

As explained in the design section on attaching a configured URL Filtering security policy within the device template, a sub-template titled **Container Profile** must be added. The container profile template allows you to enable/disable NAT for your virtual services (URL Filtering) and allocate resources for the virtual services.

The container profile template contains:

- **Resource Profile** that is set to **Default**, which allocates one core. For higher throughput, you may set the resource profile to **High**, which allocates two cores.
- **NAT** functionality can be enabled if virtual services must go out to the Internet for manual signature updates or if there is a need to send syslog's to an external syslog server that is not necessarily in the Data Center.

Note: If you do not wish to alter the values, skip building the template and use the default Security App Hosting Profile template wherein NAT is by default turned **ON** and the Resource Profile is set to **Default**.

To create a new template, proceed to the steps below,

Step 1. Navigate to **Configuration > Templates**.

The screenshot shows the Cisco vManage interface with the 'CONFIGURATION | TEMPLATES' page. The 'Configuration' menu is open, and 'Templates' is selected. A table of feature templates is visible.

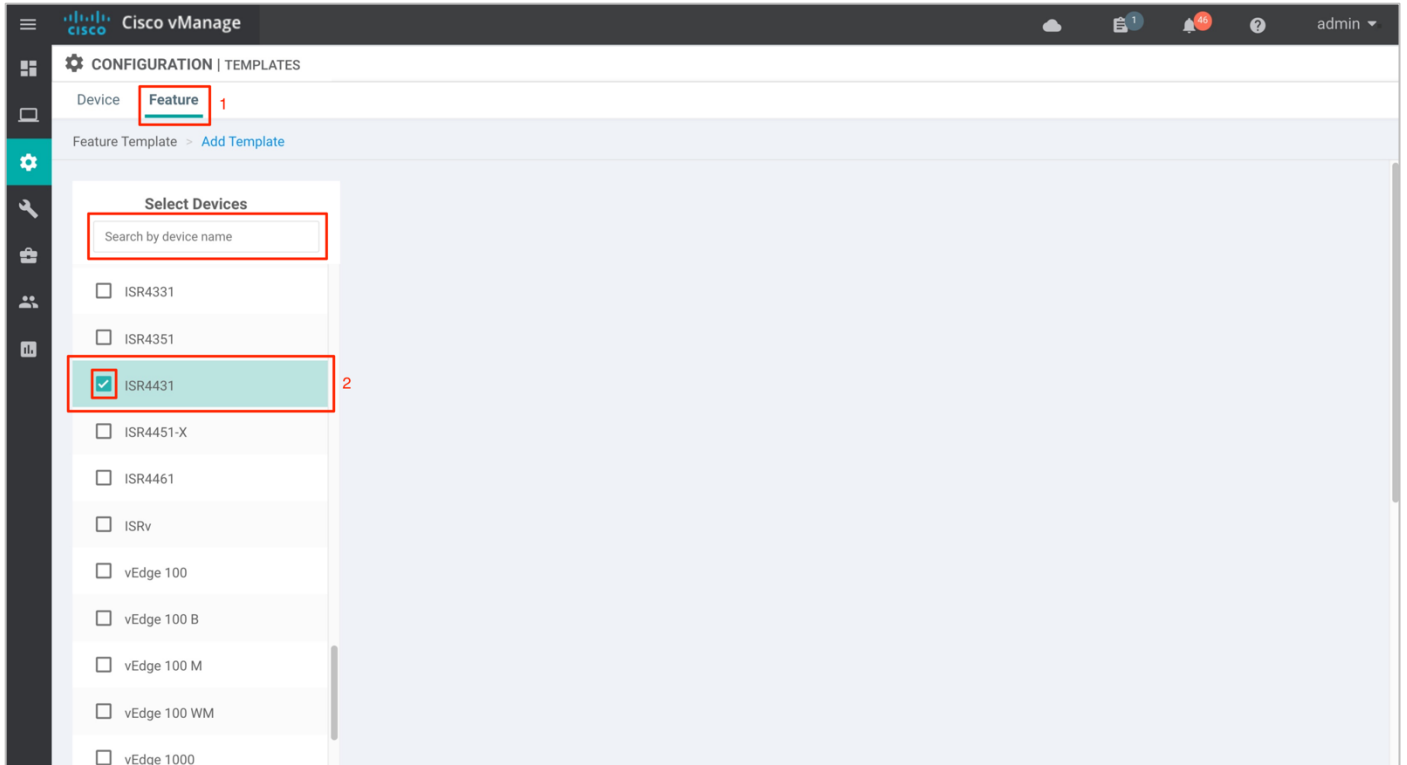
Name	Description	Type	Device Model	Feature Templates	Devices Attached	Updated By	Last Updated
Branch Dual vEdge Hybrid TLOC with INET and LAN-side A...	Branch Dual vEdge Hybrid TLOC with INET and LAN-side A...	Feature	ISR4331	18	1	admin	17: ...
Branch with Dual WAN with Hybrid transport and DIA exit	Branch with Dual WAN with Hybrid transport and DIA exit	Feature	ISR4331	19	1	admin	17: ...
Branch Dual vEdge Hybrid TLOC with MPLS BGP and LAN...	Branch Dual vEdge Hybrid TLOC with MPLS BGP and LAN...	Feature	ISR4331	19	1	admin	24: ...
Direct Internet Access in hybrid transport branch with TLO...	Direct Internet Access in hybrid transport branch with TLO...	Feature	ISR4461	19	1	admin	16: ...
Branch Dual vEdge Hybrid TLOC Sublnts with INET and LA...	Branch Dual vEdge Hybrid TLOC Sublnts with INET and LA...	Feature	vEdge 1000	20	1	admin	26: ...
Branch Dual vEdge Hybrid TLOC Sublnts with MPLS BGP a...	Branch Dual vEdge Hybrid TLOC Sublnts with MPLS BGP a...	Feature	vEdge 1000	20	1	admin	26: ...
vSmart	vSmart	Feature	vSmart	9	1	admin	14: ...
Branch A with OSPF on the LAN side with MPLS and Intern...	Branch A with OSPF on the LAN side with MPLS and Intern...	Feature	ISR4431	20	1	admin	09: ...
Branch Dual vEdge Hybrid TLOC Sublnts with INET and LA...	Branch Dual vEdge Hybrid TLOC Sublnts with INET and LA...	Feature	C1111X-8P	10	1	admin	07: ...
Direct Internet Access in hybrid transport branch	Direct Internet Access in hybrid transport branch	Feature	ISR4461	19	1	admin	17: ...
Branch Dual WAN Edge router with Dual Internet transport ...	Branch Dual WAN Edge router with Dual Internet transport ...	Feature	ISR4351	18	1	admin	17: ...
DC MPLS and INET - Static to CE and BGP to LAN	DC MPLS and INET - Static to CE and BGP to LAN	Feature	vEdge 5000	16	2	admin	19: ...

Step 2. Select **Feature** and click on **Add Template** to create a new feature template.

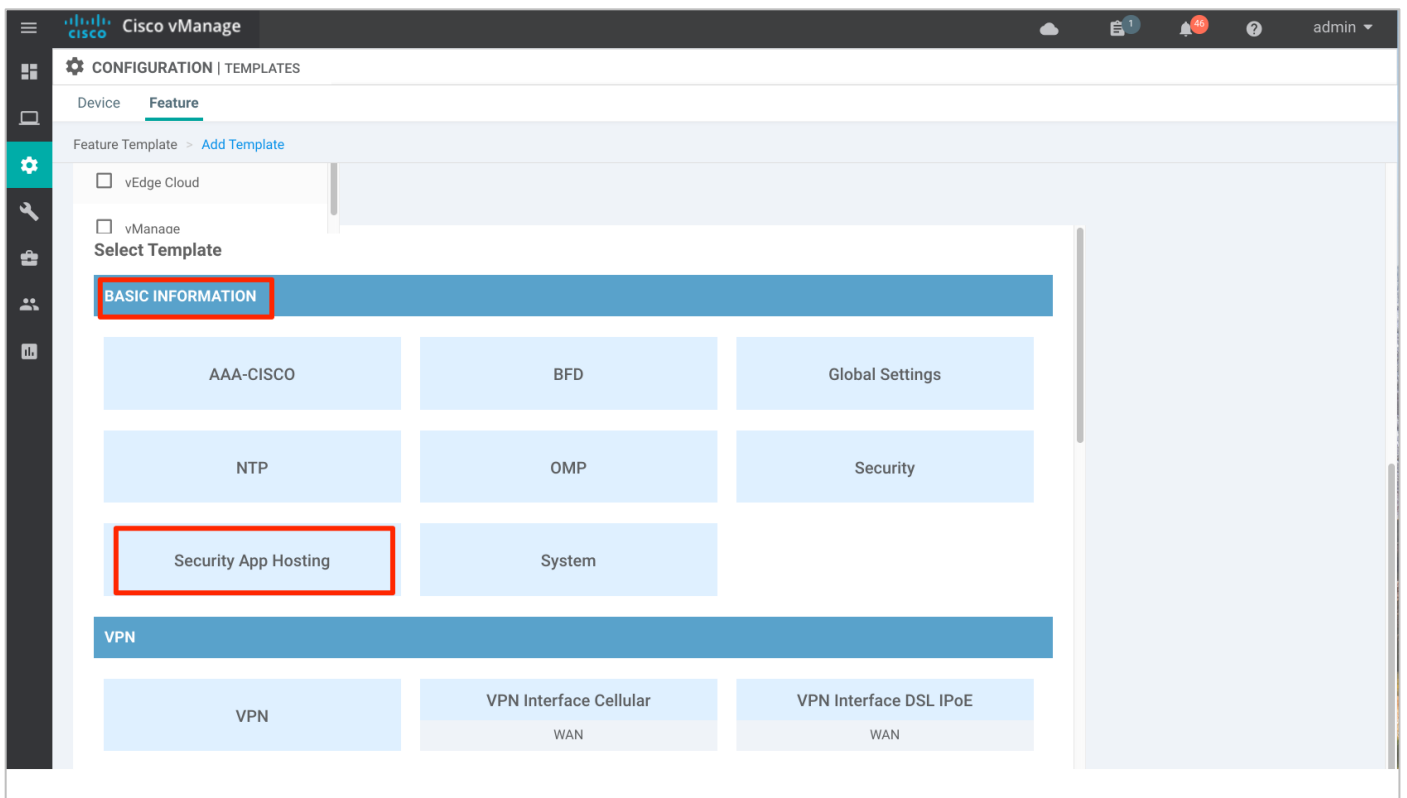
The screenshot shows the Cisco vManage interface with the 'CONFIGURATION | TEMPLATES' page. The 'Feature' tab is selected, and the 'Add Template' button is highlighted. A table of feature templates is visible.

Name	Description	Type	Device Model	Device Templates	Devices Attached	Updated By	Last Updated
DC_VPN0	DC Transport VPN 0	WAN Edge VPN	C1111-4PLTEEA C11...	1	2	admin	23 Jul 2019 11:58:4...
Banner_Template	Banner Template	Banner	ISR4331 ISR4321 IS...	2	3	admin	19 Nov 2018 1:58:5...
BR_WAN_Parent_INT...	Branch WAN Parent Interfa...	WAN Edge Interface	ISR4331 ASR1001-X ...	0	0	admin	29 Jan 2019 4:56:27...
ISR4321InterfaceVP...	ISR4321InterfaceVPN0	WAN Edge Interface	ISR4321	0	0	admin	19 Nov 2018 8:58:4...
BR_INT2_SHUT	Branch LAN Interfaces to r...	WAN Edge Interface	ISR4331 ISR4321 IS...	0	0	admin	11 Dec 2018 12:30:...
VPN0InterfacecvSm...	VPN0InterfacecvSmart	vSmart Interface	vSmart	1	1	admin	14 Nov 2018 10:33:...
vEdgeIntTest	vEdgeIntTest	WAN Edge Interface	vEdge 1000	0	0	admin	01 Nov 2018 1:53:1...
BR_LAN_INT2_VRRP	Branch LAN Interface 2 VR...	WAN Edge Interface	C1111-4PLTEEA C11...	4	4	admin	24 Jul 2019 3:42:36...
BR_WAN_Parent_INT	Branch WAN Parent Interface	WAN Edge Interface	C1111-4PLTEEA C11...	3	3	admin	07 Aug 2019 11:47:...
DC_VPN1_BGP	DC VPN1 BGP Template	BGP	C1111-4PLTEEA ISR4...	1	2	admin	23 Jul 2019 11:56:2...
BR_LAN_INT1_VRRP	Branch LAN Interface 1 VR...	WAN Edge Interface	C1111-4PLTEEA C11...	4	4	admin	24 Jul 2019 3:40:50...
System_Tracker_Te...	System Template with Tran...	WAN Edge System	ISR4331 ISRV CSR10...	0	0	admin	09 Jan 2019 1:40:32...
test1	test1	Security Policy: UTD	ISR4431	1	1	admin	07 Aug 2019 3:15:0...
vBondVPNZero	test	WAN Edge VPN	vEdge Cloud	0	0	admin	06 Aug 2018 2:09:1...
VPN512_Template	VPN 512 Out-of-Band Man...	WAN Edge VPN	C1111-4PLTEEA C11...	11	12	admin	24 Jul 2019 4:05:45 ...
Security_Template	Security Template	WAN Edge Security	C1111-4PLTEEA C11...	11	12	admin	23 Jul 2019 12:00:2...

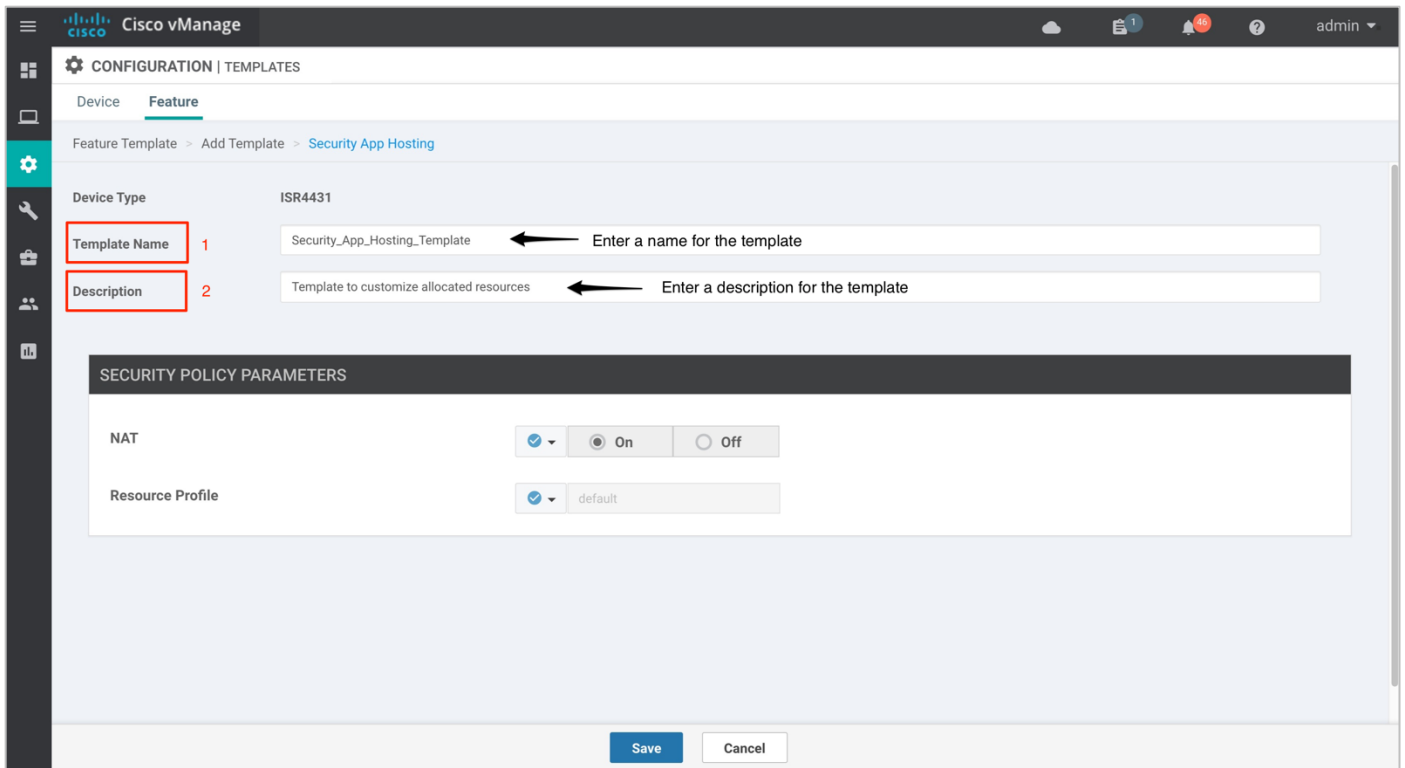
Step 3. Within **Feature Template**, select a device(s) or enter the device in the search bar.



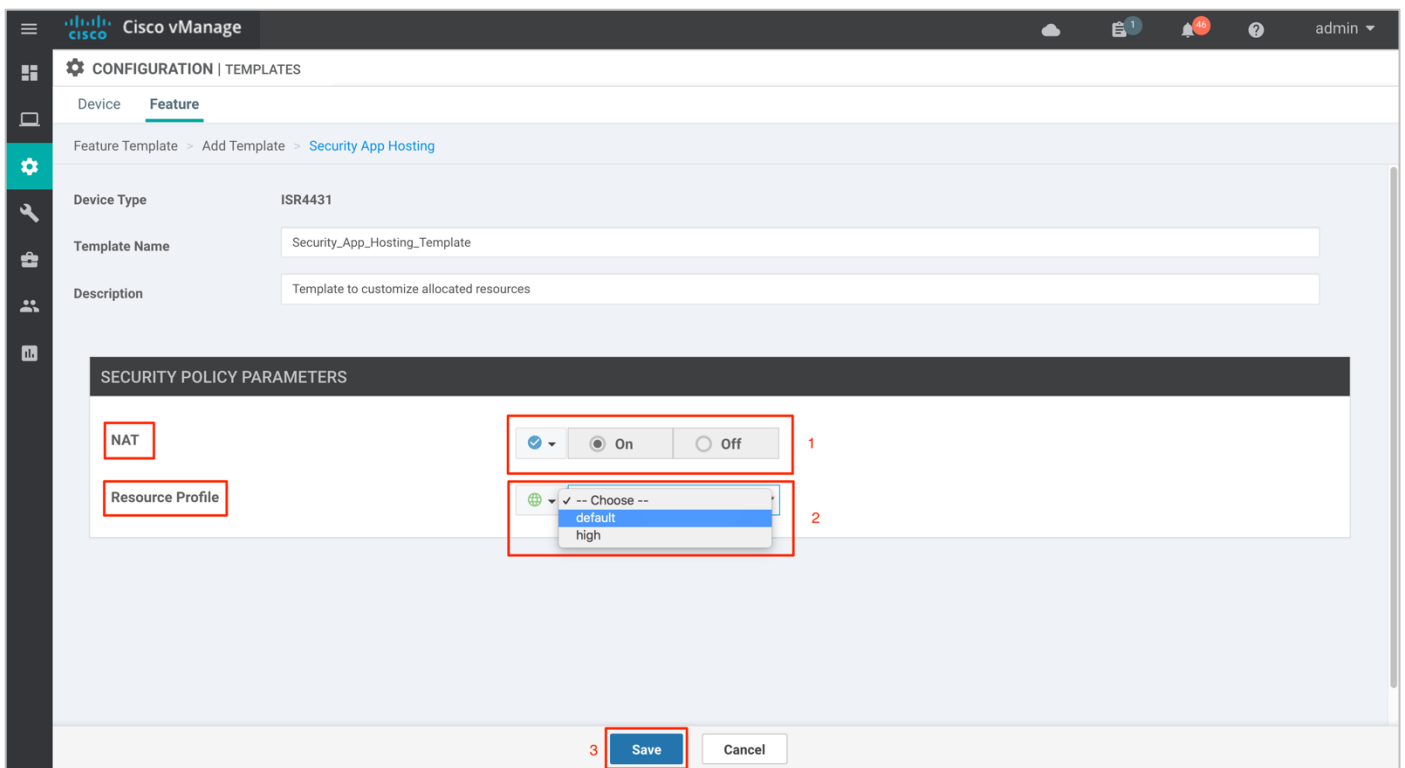
Step 4. Next, select **Security App Hosting** to create the template.



Step 5. Within the **Feature Template**, enter a name for the template along with the description.



Step 6. Customize the security policy parameters if required. Enable or disable **NAT** feature, based on your use case. For higher throughput or if more packets need to be inspected, set the **Resource Profile** to **High**. Please refer to the [Security Policy for Cisco IOS-XE SD-WAN Devices Design Guide](#), before making changes to the template. Finally, **Save** the template.



Process 5: (Optional) Define Lists for the Security Policy

You can choose to either configure firewall zones, data prefixes, domain, URL blacklists/whitelists and application families prior to building the security policy or at the time when the policy is built.

Step 1. Navigate to **Configuration > Security**.

The screenshot shows the Cisco vManage Dashboard. The left-hand navigation menu is open, and the 'Security' option is highlighted with a red box. The main dashboard area displays various health and configuration metrics:

- Configuration:** 1 (highlighted)
- WAN Edge:** 16
- vBond:** 1
- vManage:** 1
- Reboot:** 2 (Last 24 hrs)
- Warning Invalid:** 0

Key sections include:

- Site Health (Total 12):** Full WAN Connectivity (10 sites), Partial WAN Connectivity (2 sites), No WAN Connectivity (0 sites).
- WAN Edge Health (Total 16):** 16 Normal, 0 Warning, 0 Error.
- Transport Interface Distribution:** < 10 Mbps (57), 10 Mbps - 100 Mbps (0), 100 Mbps - 500 Mbps (0), > 500 Mbps (0).
- Transport Health:** Graph showing 100% health.
- Application-Aware Routing:** Table with columns: Tunnel Endpoints, Avg. Latency (ms), Avg. Loss (%), Avg. Jitter (ms).

Tunnel Endpoints	Avg. Latency (ms)	Avg. Loss (%)	Avg. Jitter (ms)
Router:mpls-BR2-WAN-Edge2:mpls	0	3.099	0
BR2-WAN-Edge2:mpls-Router:mpls	0	2.341	0
DC1-WAN-Edge1:mpls-BR2-WAN-Edge2:mpls	0	2.063	0

Step 2. Click **Custom Options**. A drop down of security options will appear. Click **Lists**.

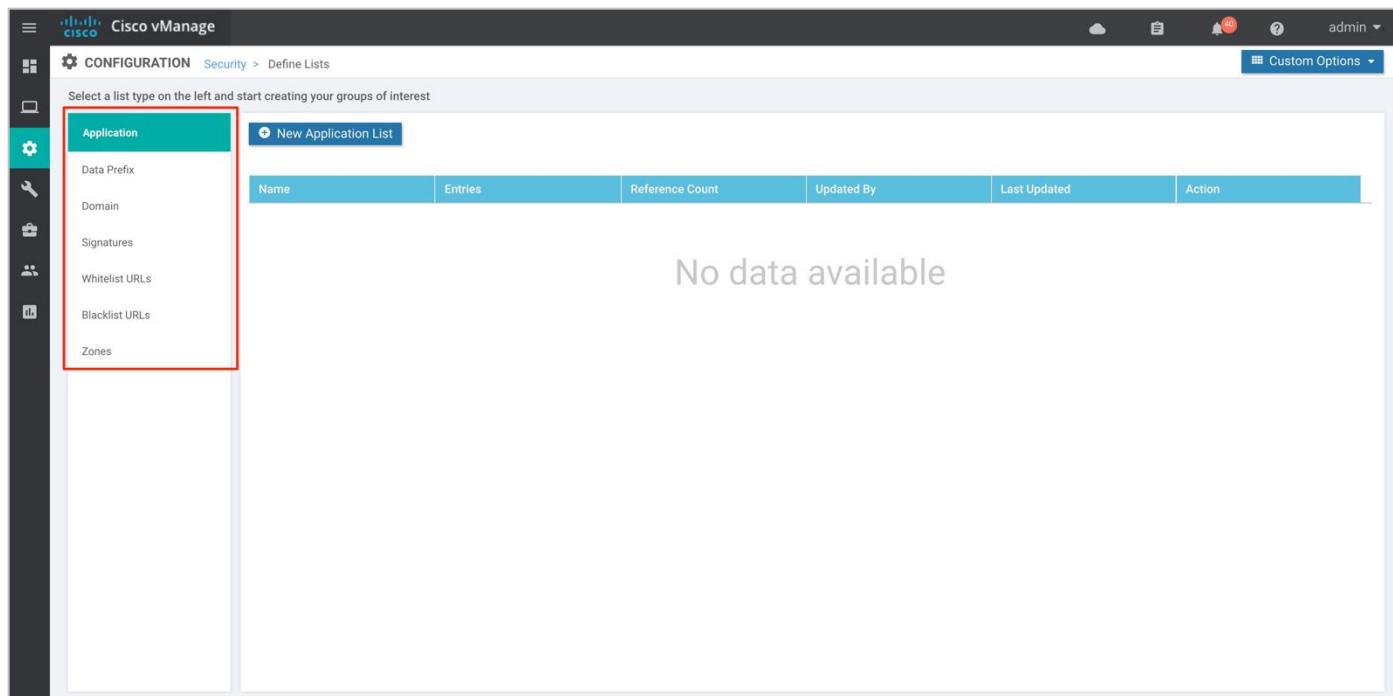
The screenshot shows the 'CONFIGURATION | SECURITY' page in Cisco vManage. The 'Add Security Policy' button is visible. A table lists existing security policies:

Name	Description	Use Case
Compliance_Security_Policy	Security policy specific to compliance use case	Compliance

The 'Custom Options' dropdown menu is open, showing the following options:

- Security
- Lists (highlighted with a red box)
- Firewall
- Intrusion Prevention
- URL Filtering
- Advanced Malware Protection
- DNS Security
- Umbrella API Token
- Threat Grid API Key

Step 3. Here, you can preconfigure lists such as **Application Lists**, **Data Prefixes**, **Signatures** and **Zones** which are later used as a part of the security policy. URLs can also be configured here, if configuring URL filtering.

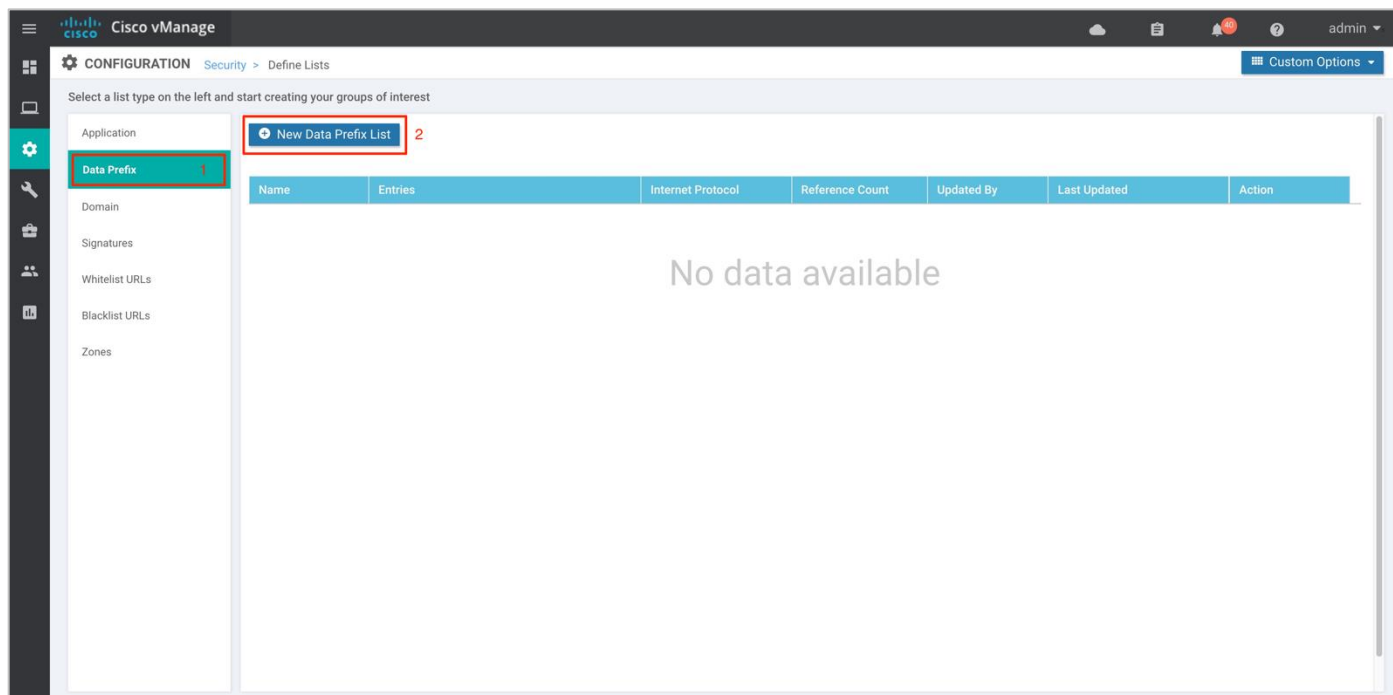


Technical Tip

Applications matched within a firewall policy is always dropped, regardless of what the action condition states.

Procedure 1. (Optional) Configure lists for Enterprise Firewall with Application Awareness

Step 1. To configure a data prefix list, select **Data Prefix** and then click on **New Data Prefix List**.



Step 2. Enter a name under **Data Prefix List Name**, along with the data prefix under **Add Data Prefix**. Enter prefix details and click **Add**.

Application

Data Prefix

Domain

Signatures

Whitelist URLs

Blacklist URLs

Zones

New Data Prefix List

Data Prefix List Name ¹ Enter a name for the prefix list

Client_Network

Internet Protocol

IPv4 IPv6

Add Data Prefix ² Enter the data prefix

10.10.0.0/16

³ Add Cancel

Name	Entries	Internet Protocol	Reference Count	Updated By	Last Updated
No data available					

Application

Data Prefix

Domain

Signatures

Whitelist URLs

Blacklist URLs

Zones

New Data Prefix List

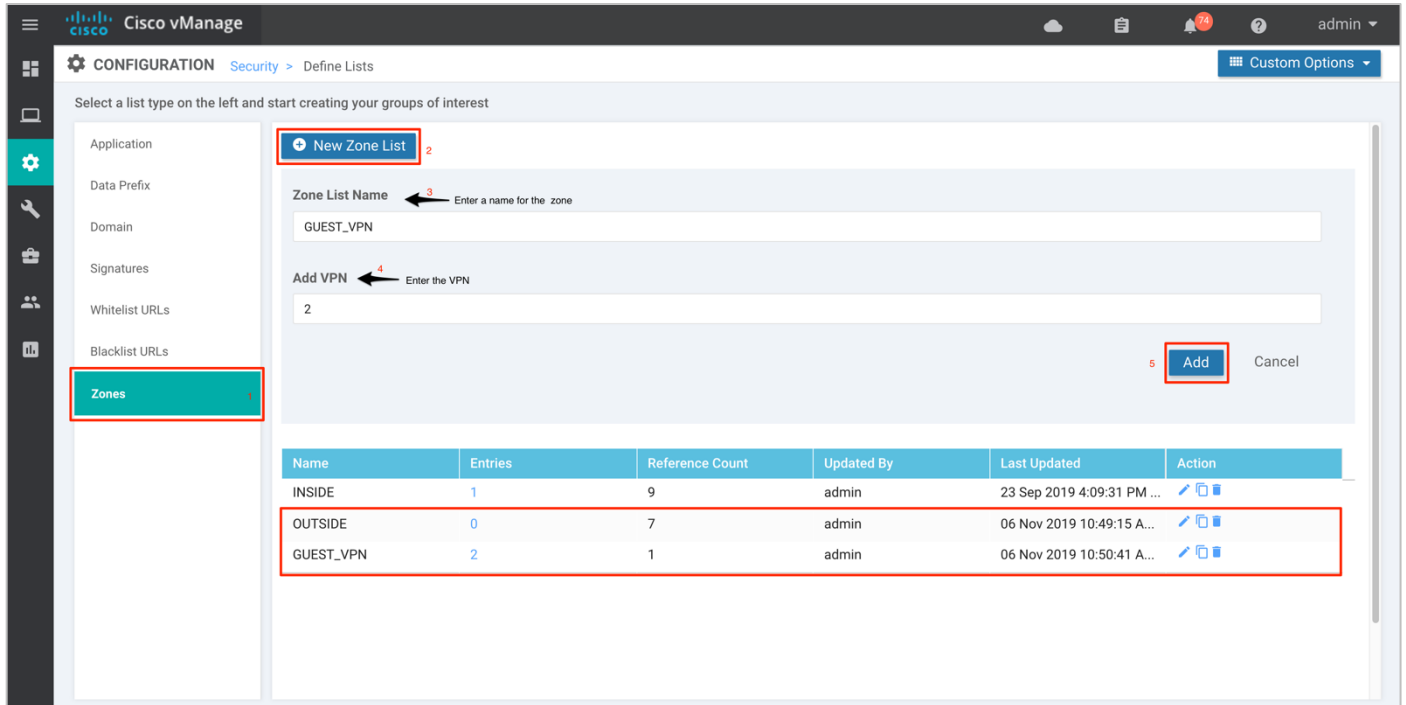
Name	Entries	Internet Protocol	Reference Count	Updated By	Last Updated
Client_Network	10.10.0.0/16	IPv4	0	admin	17 Sep 2019 4:19:59 PM

The lists configured under Data Prefix include,

Table 2. Data Prefix List

Data Prefix	Associated Prefix
Client_Network	10.10.0.0/16

Step 3. Similarly, configure a zone. Select **Zones** and then click on **New Zone List**. Enter a name within **Zone List Name** and add VPN's within **Add VPN**. Finally, click **Add**.



The list of zones configured for guest access use case.

Table 3. Zone List

Data Prefix	Associated Prefix
GUEST_VPN	2
OUTSIDE	0

Procedure 2. (Optional) Configure URL Blacklists/ Whitelists for URL Filtering

Similarly, blacklist or whitelist websites to be used later in the URL security policy.

Step 1. Select **Blacklist/ Whitelist URLs** and then click on **New Blacklist/ Whitelist URL List**. Enter a name within **Blacklist/ Whitelist URL List Name** and add the domain or URL within **Add Blacklist/ Whitelist URL**. Finally, click **Add**.

The screenshot shows the Cisco vManage interface for configuring a Blacklist URL List. The left sidebar contains a menu with 'Blacklist URLs' highlighted (1). The main area is titled 'Define Lists' and contains a form for creating a new list. The form has the following fields and annotations:

- 'New Blacklist URL List' button (2)
- 'Blacklist URL List Name' field with value 'bad_domain' (3)
- 'Add Blacklist URL' field with value '*.customer.com' (4)
- 'Add' button (5)

Below the form is a table with the following columns: Name, Entries, Reference Count, Updated By, Last Updated.

Technical Tip






Some of the possible combinations to whitelist or blacklist domain/URL is *.customer.com, *.customer.com.

Deploy - Cisco SD-WAN Secure Guest Access

This section covers the steps to deploy Cisco SD-WAN security features specific to the guest access use case. The features discussed include Enterprise Firewall with Application Awareness (Application Firewall) and URL Filtering.

Figure 4. Intent-Based Use Cases

Choose a scenario that fits your use-case. Click Proceed to continue building your desired policies.

	Compliance Application Firewall Intrusion Prevention
	Guest Access Application Firewall URL Filtering
	Direct Cloud Access Application Firewall Intrusion Prevention Advanced Malware Protection DNS Security
	Direct Internet Access Application Firewall Intrusion Prevention URL Filtering Advanced Malware Protection DNS Security
	Custom Build your ala carte policy by combining a variety of security policy blocks

Configuration Workflow

- Make sure the prerequisites explained previously are added.
- Create the security policy containing **Enterprise Firewall with Application Awareness (Application Firewall)**, and **URL Filtering (URLF)**.
- Attach the security policy to the **Device Template**.
- Attach the **Security App Hosting (Container Profile)** feature template to the device template.

Process 1: Create Security Policy

Configure security parameters such as Enterprise Firewall with Application Awareness and URL Filtering.

Step 1. In Cisco vManage NMS, navigate to **Configuration > Security** in the left side panel.

The screenshot shows the Cisco vManage dashboard. The left sidebar contains a menu with the following items: Configuration (1), Devices, Certificates, Network Design, Templates, Policies, Security (2), Cloud onRamp for SaaS (24), Cloud onRamp for IaaS (16), and Cloud OnRamp for Colocation (0). The main dashboard area displays various health and performance metrics:

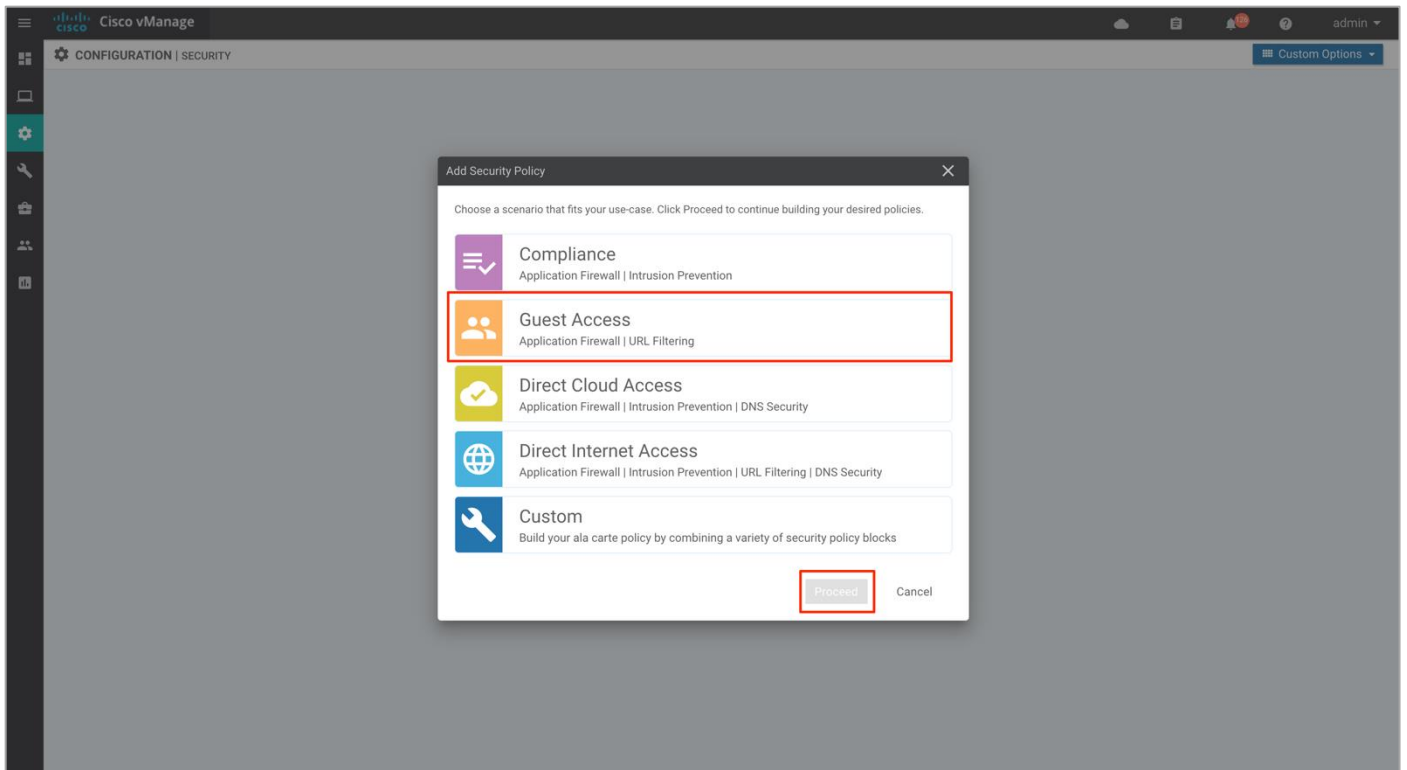
- Configuration:** 1
- WAN Edge:** 16
- vBond:** 1
- vManage:** 1
- Reboot:** 1 (Last 24 hrs)
- Warning/Invalid:** 0
- Site Health (Total 11):**
 - Full WAN Connectivity: 11 sites
 - Partial WAN Connectivity: 0 sites
 - No WAN Connectivity: 0 sites
- Transport Interface Distribution:**
 - < 10 Mbps: 57
 - 10 Mbps - 100 Mbps: 0
 - 100 Mbps - 500 Mbps: 0
 - > 500 Mbps: 0
- WAN Edge Health (Total 16):**
 - Normal: 16
 - Warning: 0
 - Error: 0
- Transport Health:** Type: By Loss
- Application-Aware Routing:** Type: By Loss

The URL at the bottom of the browser window is: <https://100.119.118.21:8443/#/app/config/security/policies/list>

Step 2. Click **Add Security Policy** to create a new security policy.

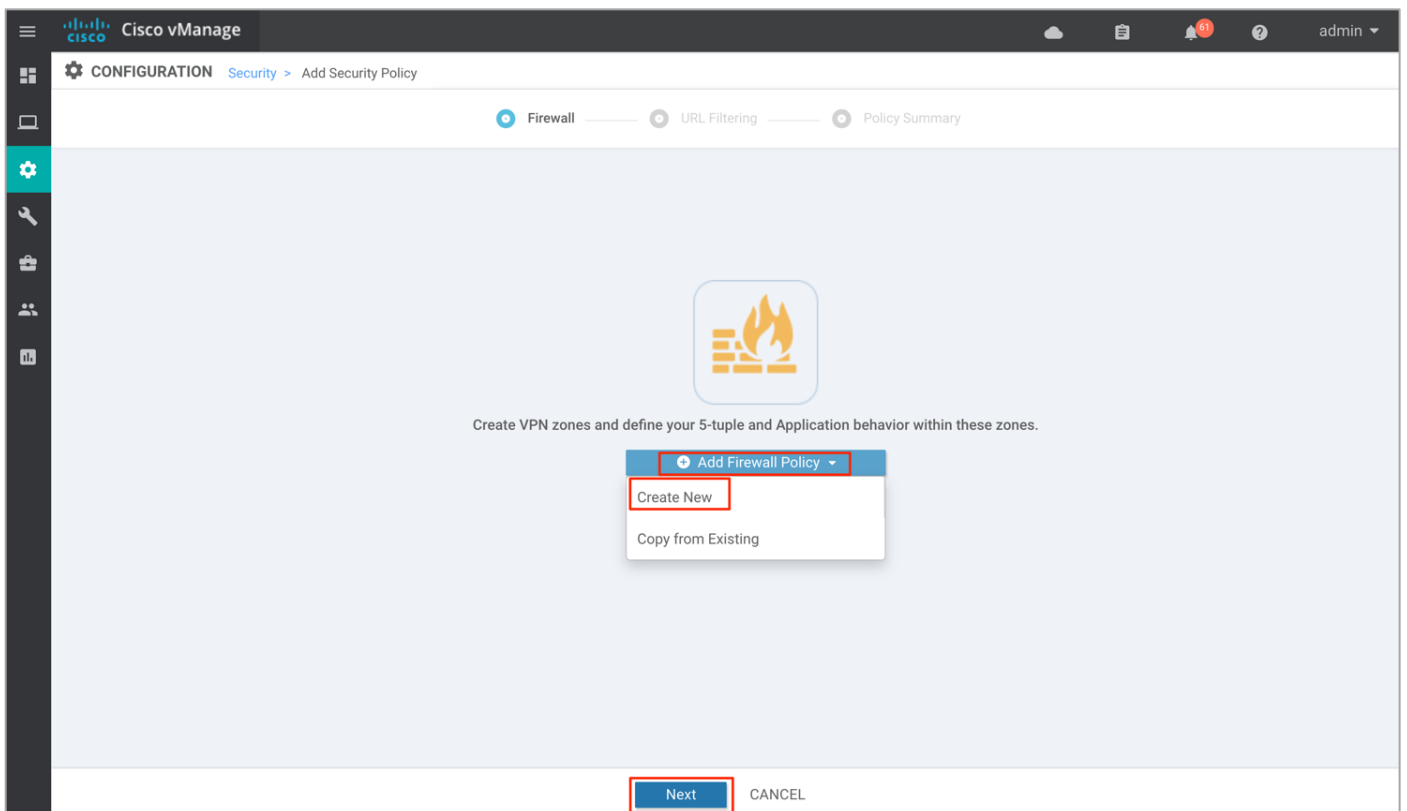
The screenshot shows the Cisco vManage Security configuration page. The page title is "CONFIGURATION | SECURITY". The main content area is empty, with a central shield icon and the text "No policies added, add your first security policy". Below this text is a button labeled "Add Security Policy", which is highlighted with a red box.

Step 3. The security policy wizard displays a list of intent-based use cases. From the given list, choose **Guest Access** and click **Proceed**.

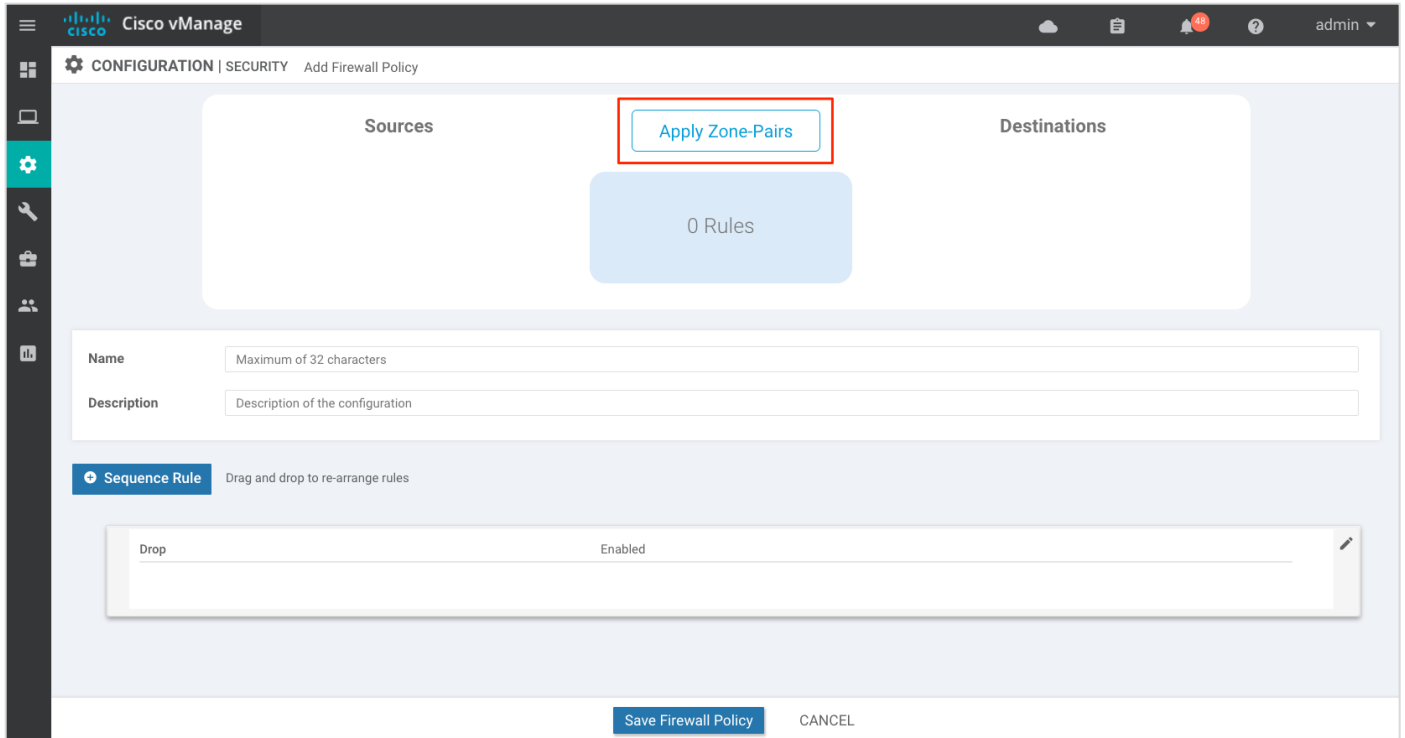


Procedure 1. Configure Enterprise Firewall with Application Awareness

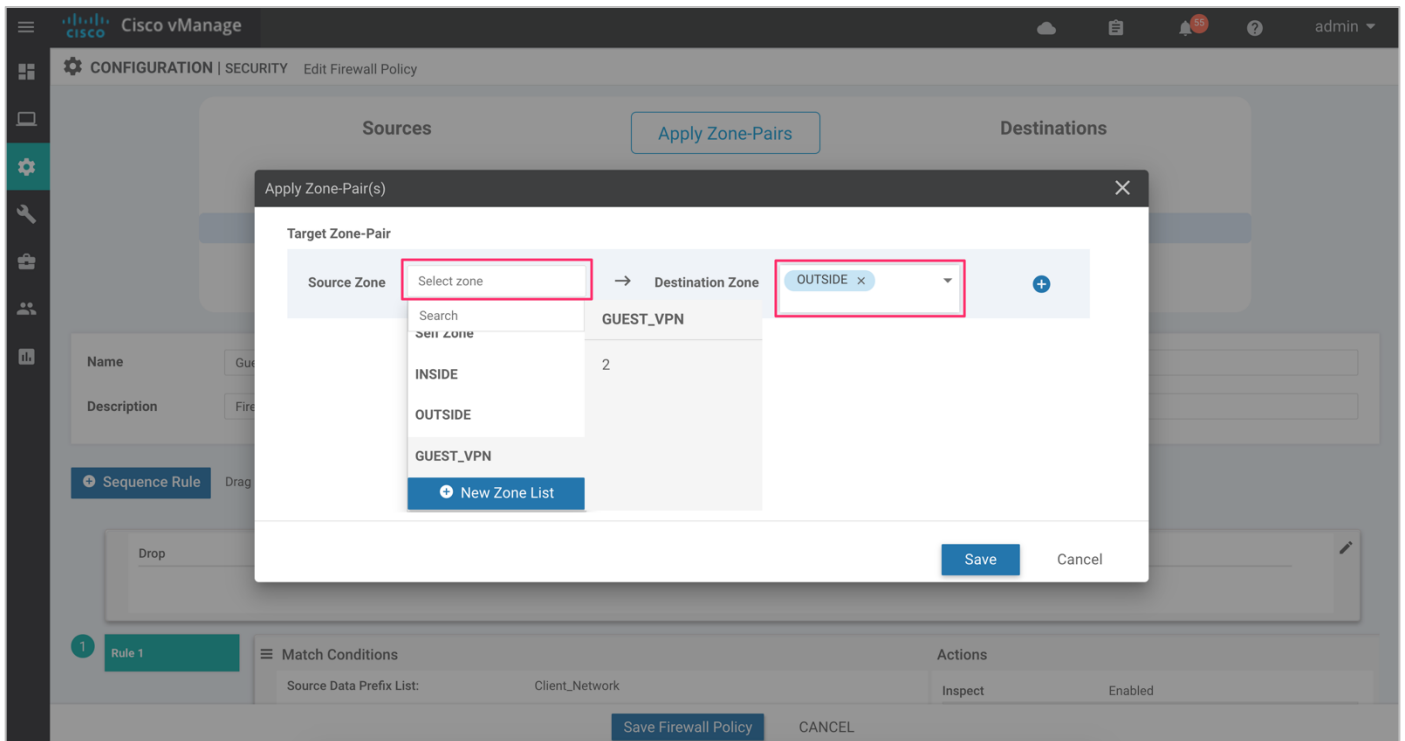
Step 1. Click **Add Firewall Policy**, create a new firewall policy by selecting **Create New** and click **Next**. However, if you have preconfigured a firewall policy, simply click on **Copy from Existing**.



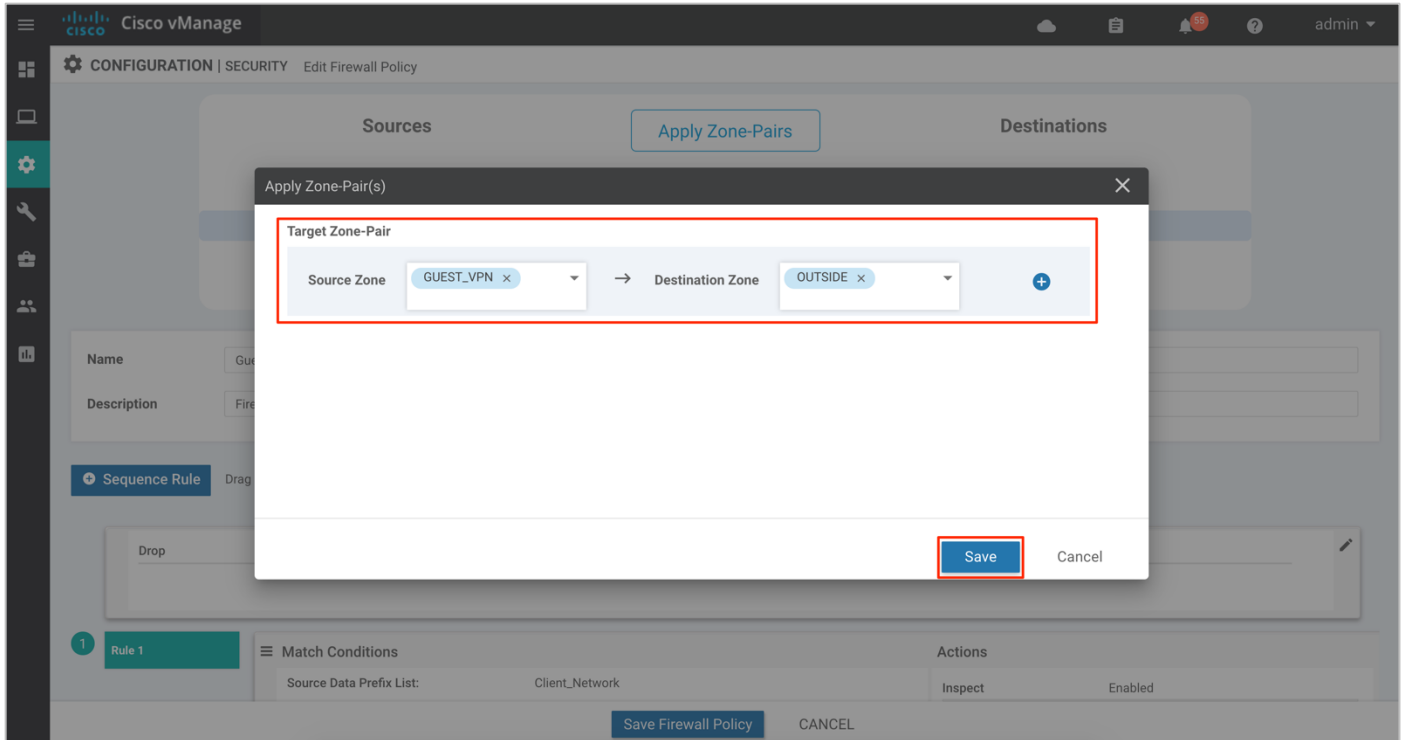
Step 2. Click on **Apply Zone-Pairs** to create your zone-pairs.



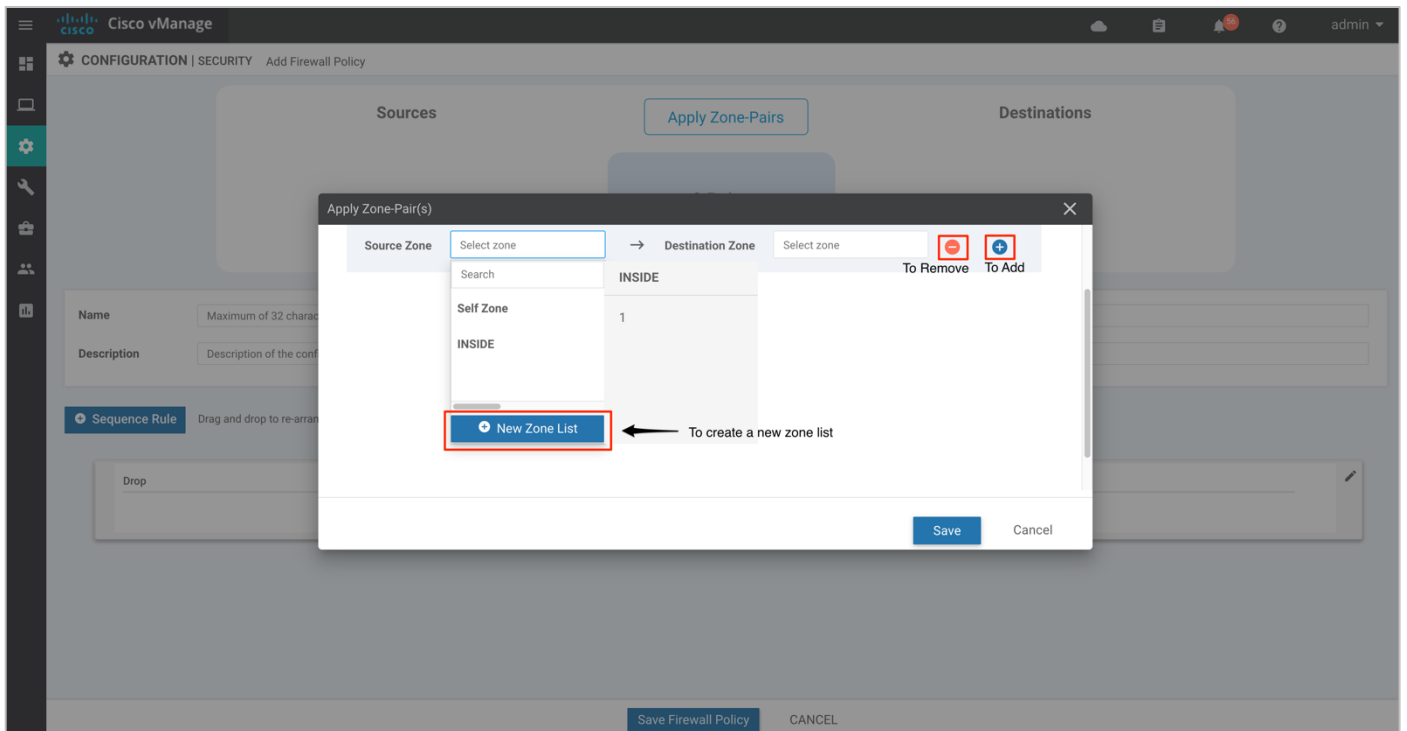
Step 3. Add the created zones to **Source Zone** and **Destination Zone**, and click **Save**.



Step 4. After the zone pair is created, click **Save**.



Note: If you wish to create a new zone, click on the New Zone List, and to add additional zone-pair click on the (+) sign. To remove a zone pair, click on (-) sign. Here's an example to understand it better,

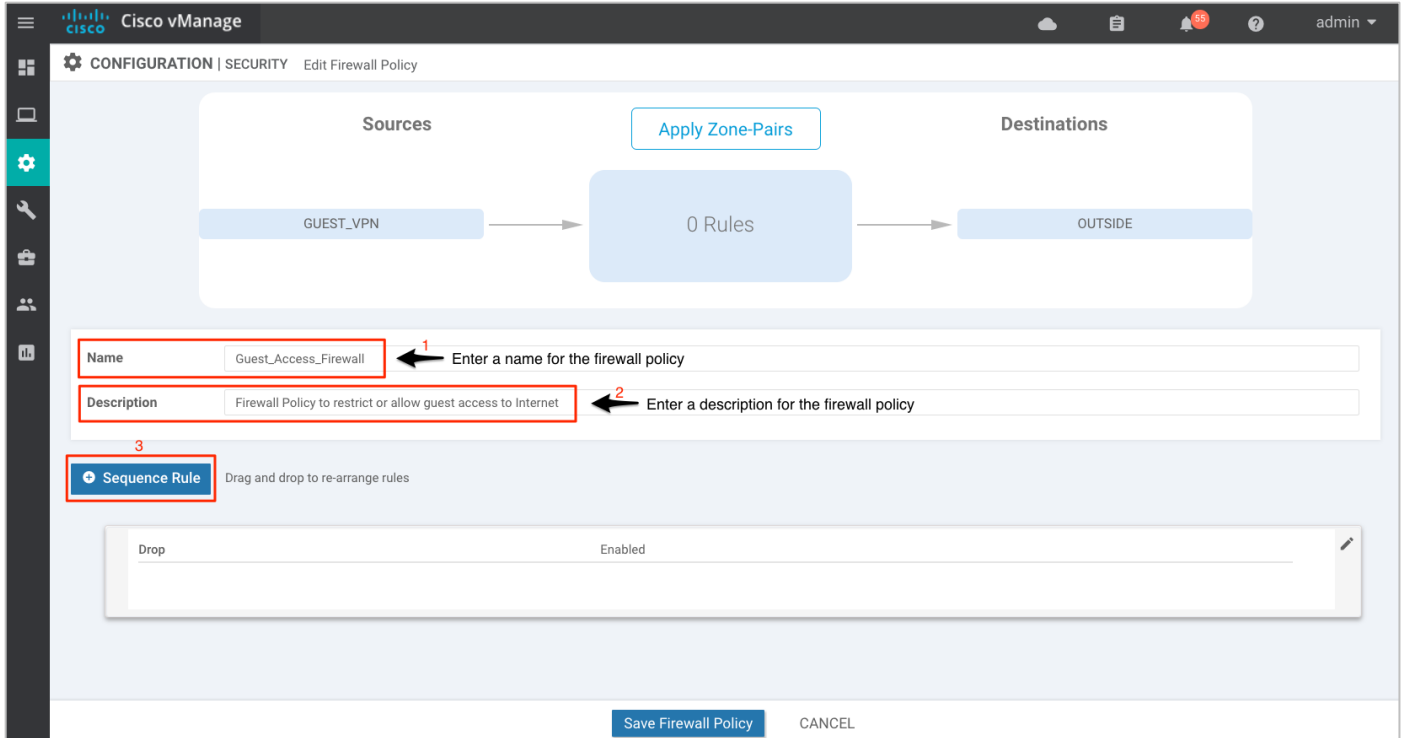


Technical Tip

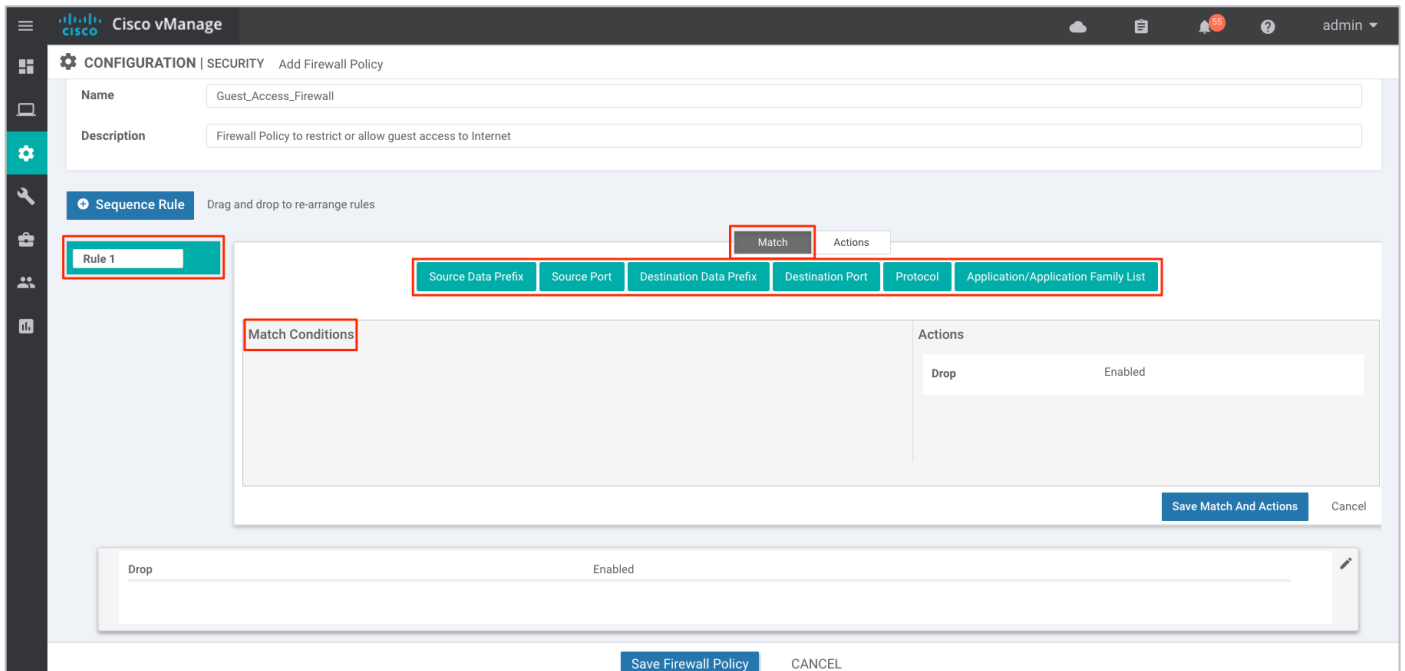
Starting from Cisco SD-WAN Release 19.2 and IOS XE Release 16.12, the Self Zone option is added in the Source Zone field. Self-zone is a self-defined zone that protects the packet going to or coming from the device. A zone pair that includes the self zone, along with the associated policy, applies to traffic directed to the device or traffic generated by the

device.

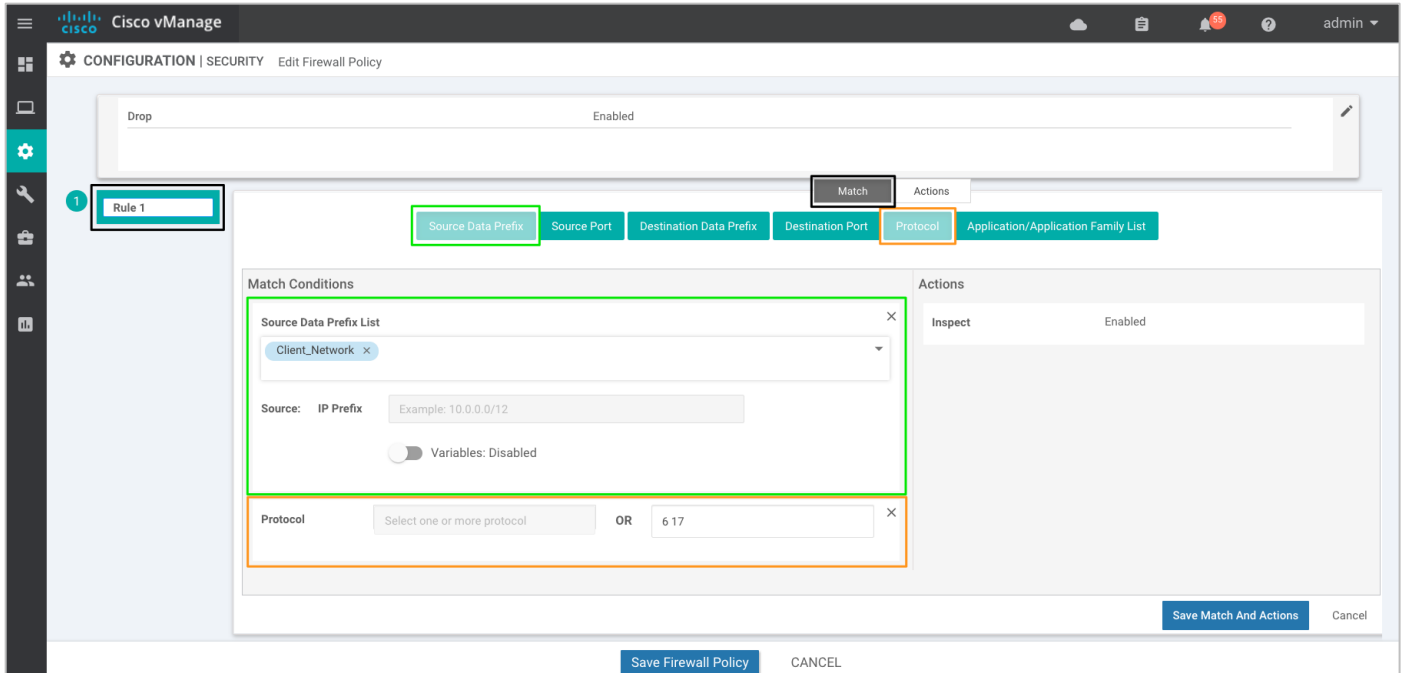
Step 5. Enter a **Name** and **Description** in the field for the firewall policy, next click on **Sequence Rule** to add policy rules.



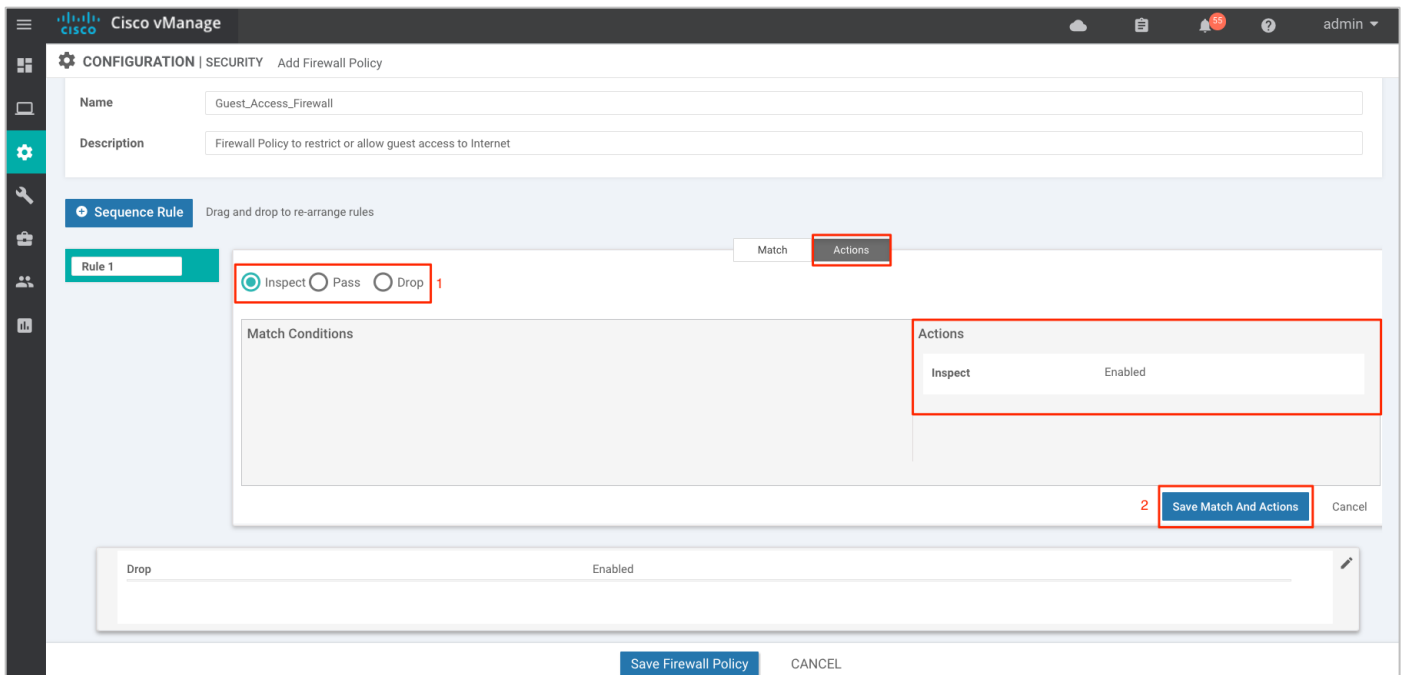
Step 6. The **Match** tab is selected by default. Click a match condition: **Source Data Prefix**, **Source Port**, **Destination Data Prefix**, **Destination Port**, **Protocol**, **Application/Application Family List**. You can select and configure more than one match condition in a sequence.



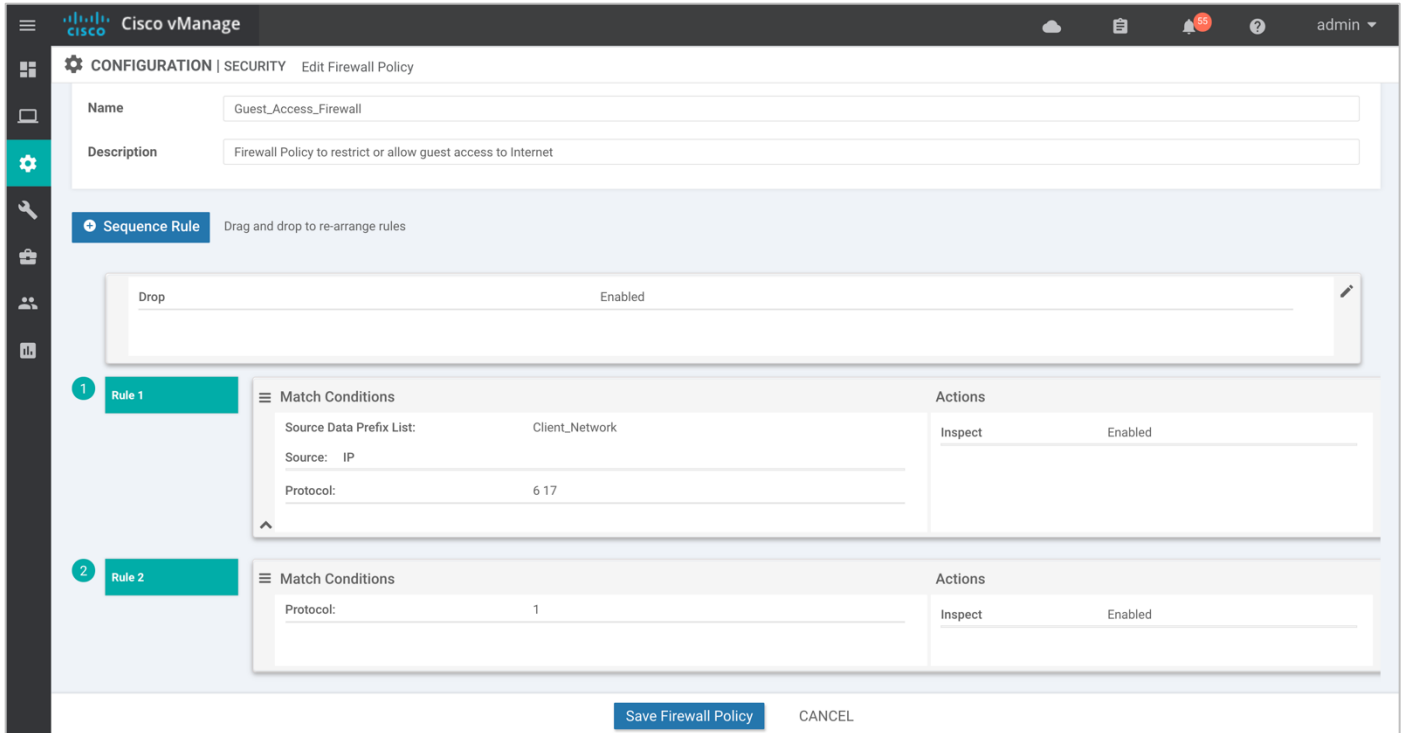
Here's an example of sequence rule within the Enterprise Firewall with Application Awareness policy deployed.



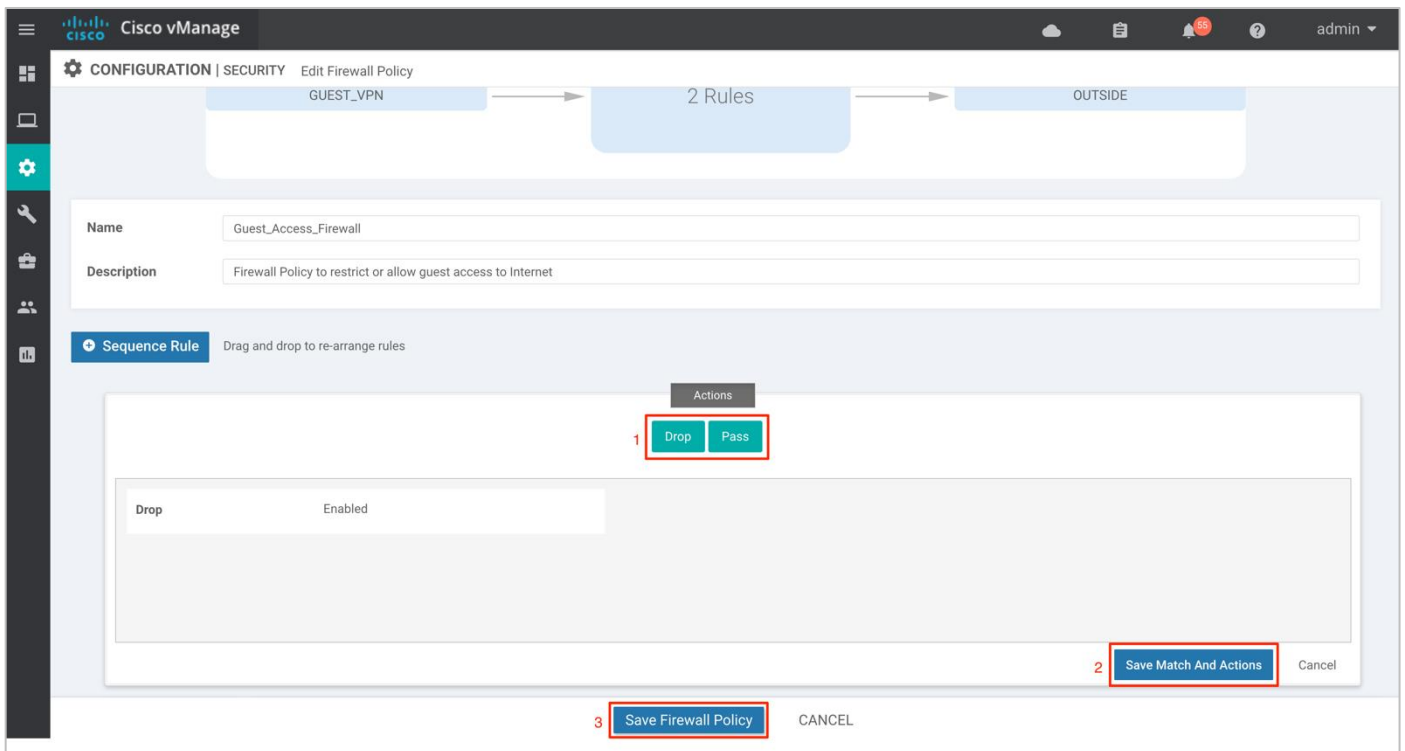
Step 7. Next, click on **Actions** tab and enter the actions to take if the traffic matches. We have enabled **Inspect**.



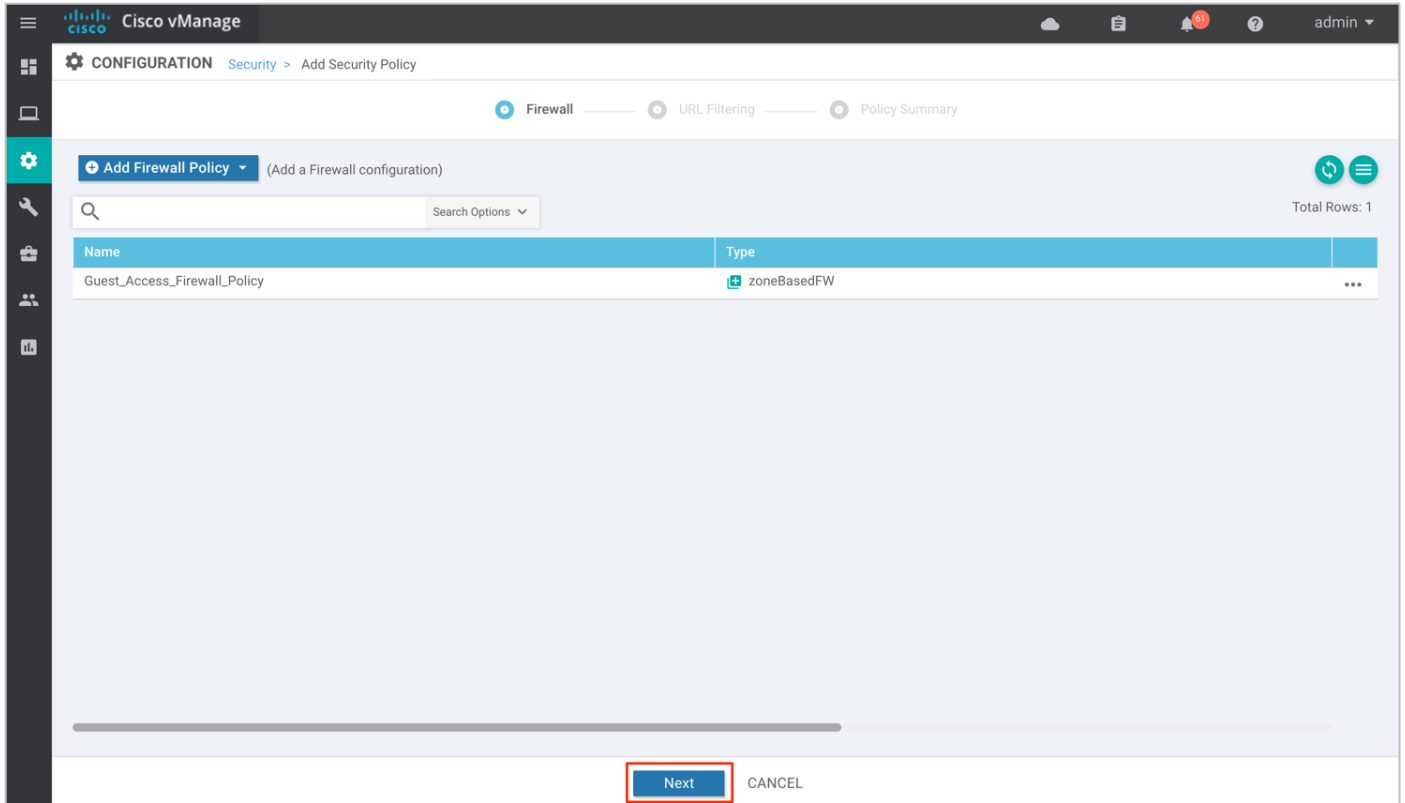
Note, in this deployment, the following sequence rules were added.



Step 8. (Optional) If a packet matches none parameters in any of the policy sequences, you define a default action to be taken on the packet. So, once you have the sequence rules configured, continue to edit the default action to either **Drop** or **Pass** and click **Save Match And Actions** to save the changes made. Finally, save the configured firewall policy.

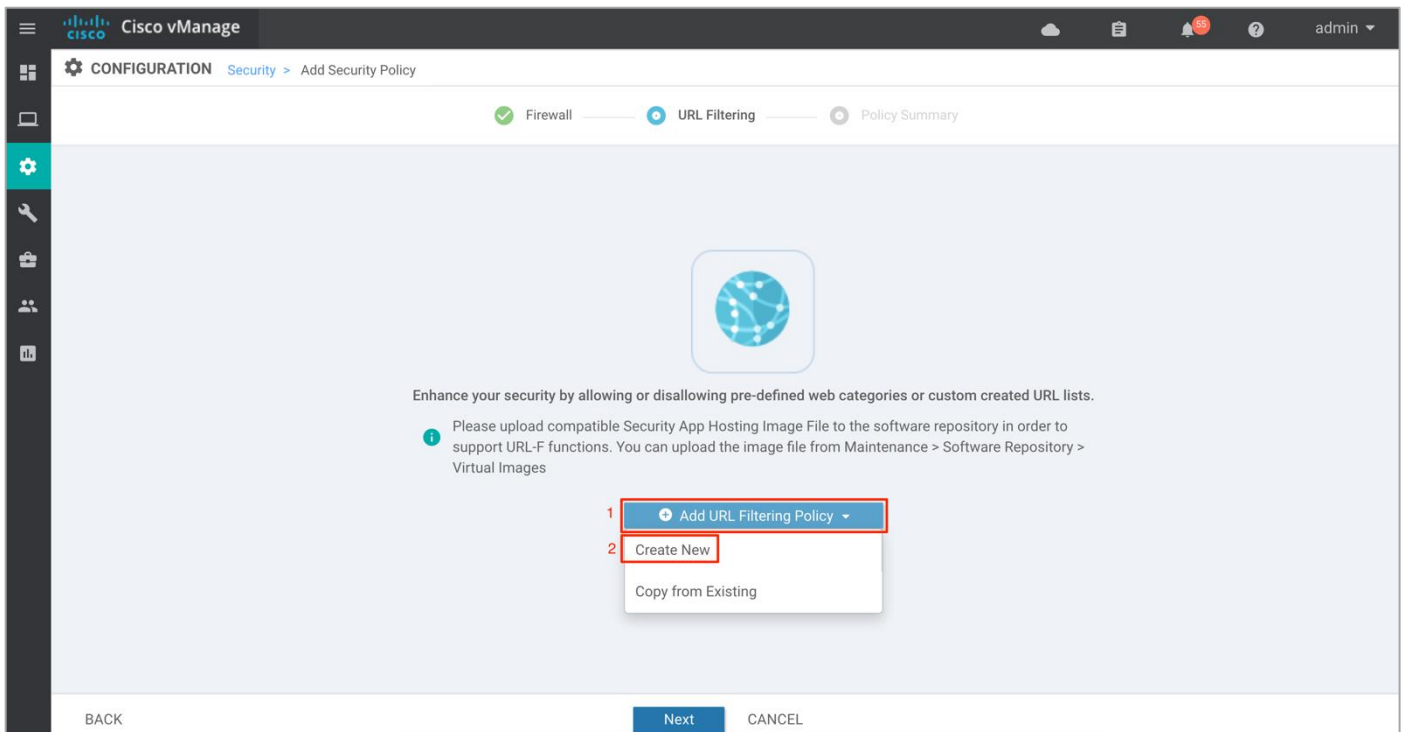


Step 9. Click **Next** to select the **URL Filtering Policy** tab.



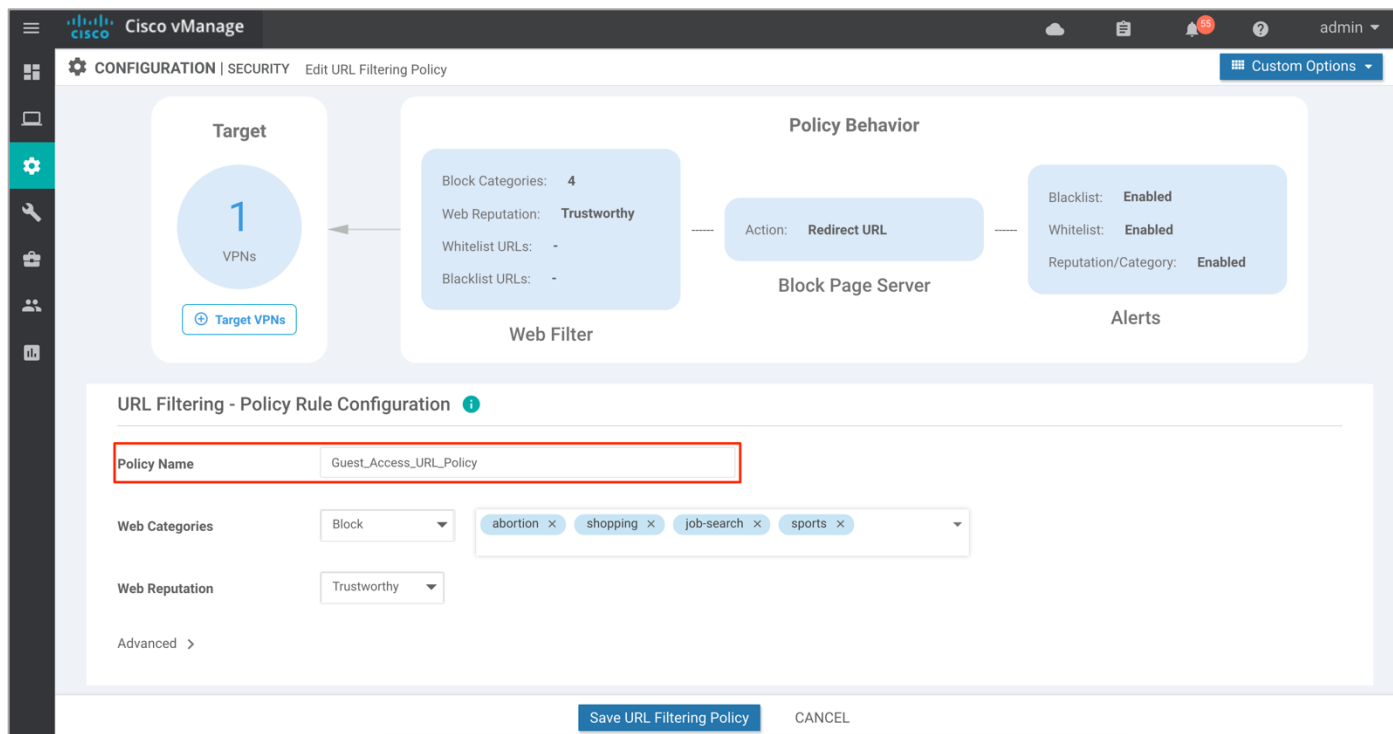
Procedure 2. Configure URL Filtering Policy

Step 1. Click **Add URL Filtering Policy** to allow or drop pre-defined web categories or custom created URL lists and click **Next**.



Note: If you wish to export an existing policy, simply click on **Copy from Existing**, fill in the policy details and then click **Next**.

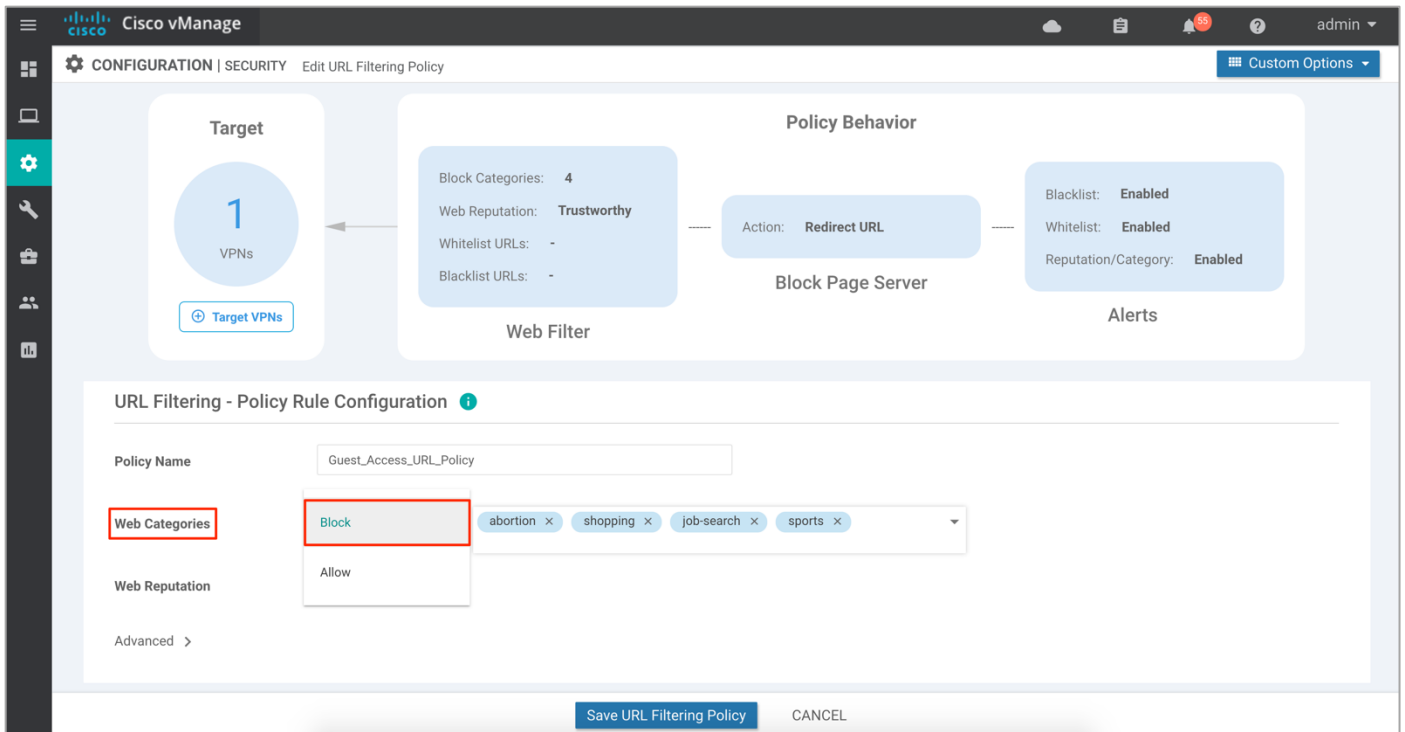
Step 2. Enter a policy name in the **Policy Name** field.



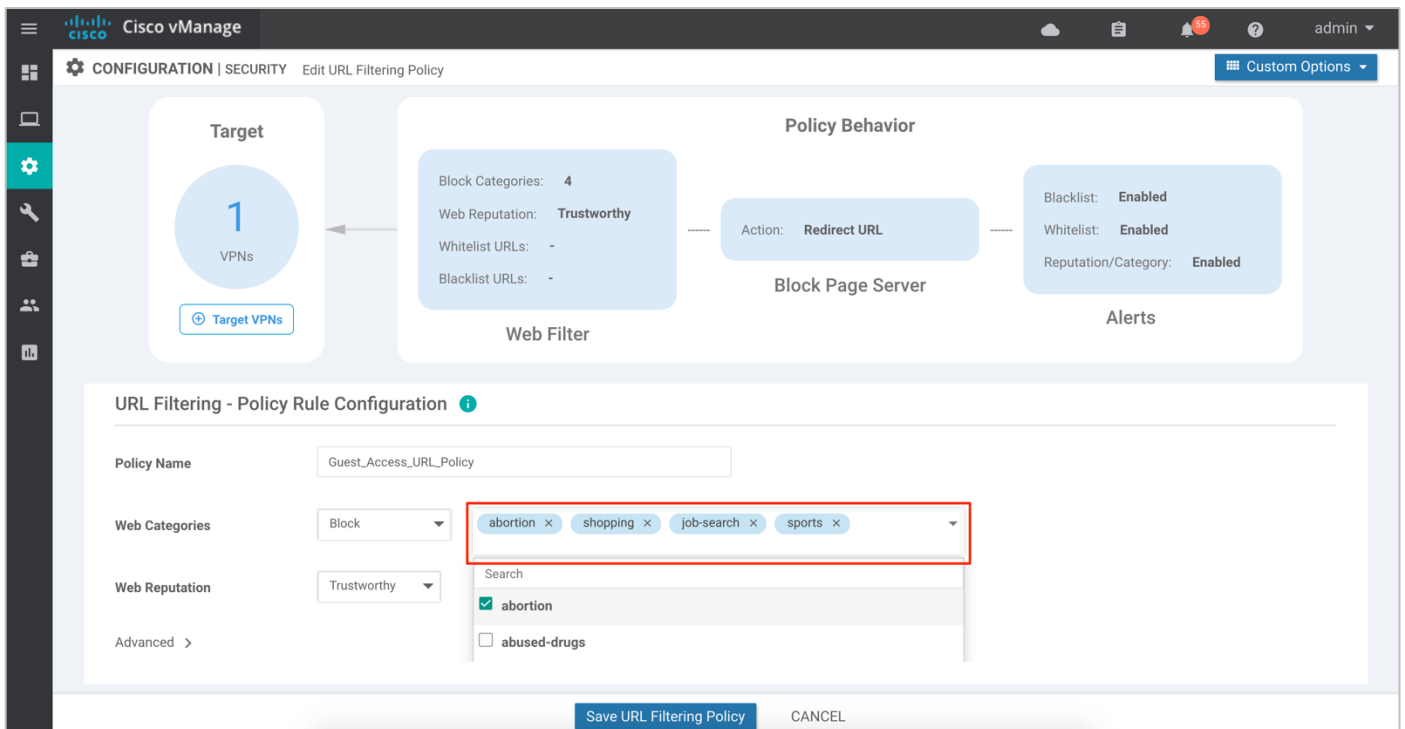
Step 3. Choose one of the following options from the **Web Categories** drop-down:

Block: To block websites that match the selected categories.

Allow: To allow websites that match the selected categories.



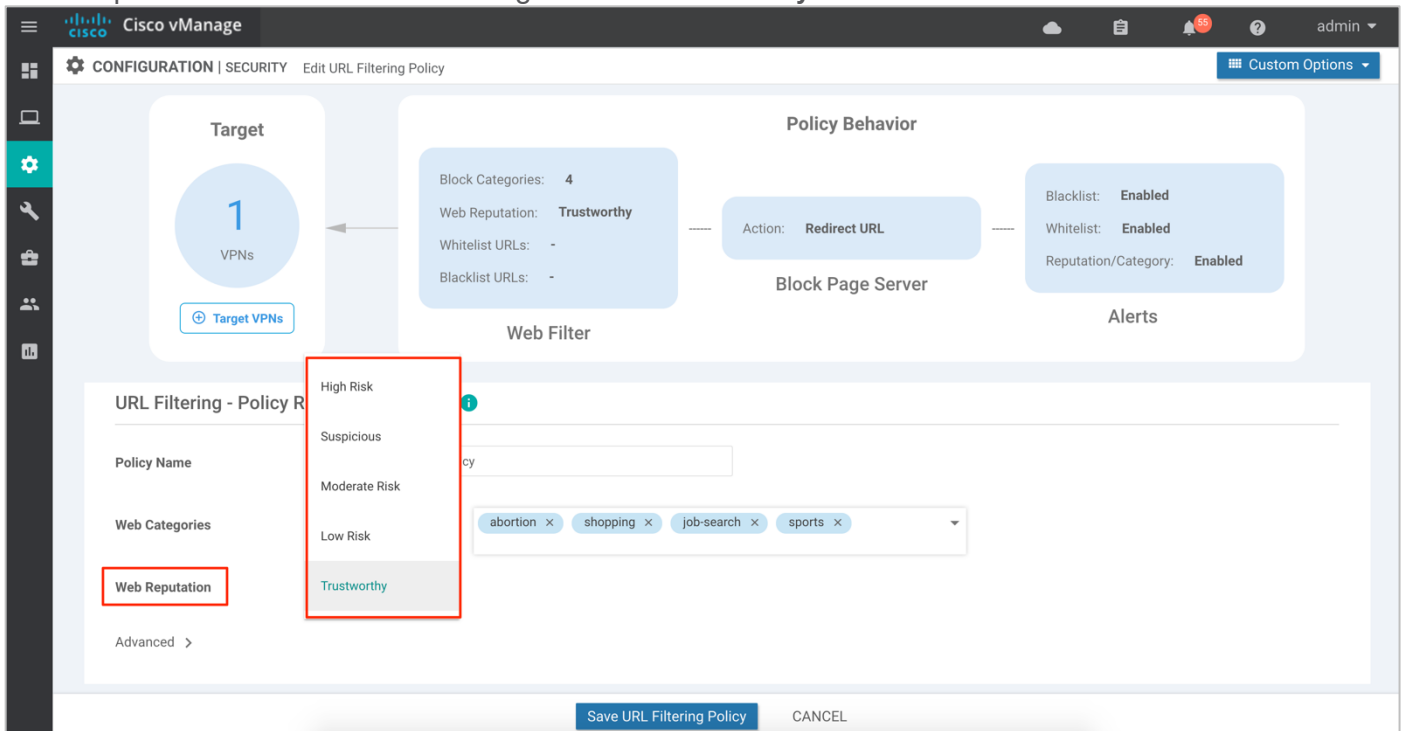
Step 4. Select one or more categories to block or allow from the **Web Categories list**. To understand the list of categories, refer to [Categories Data Sheet](#).



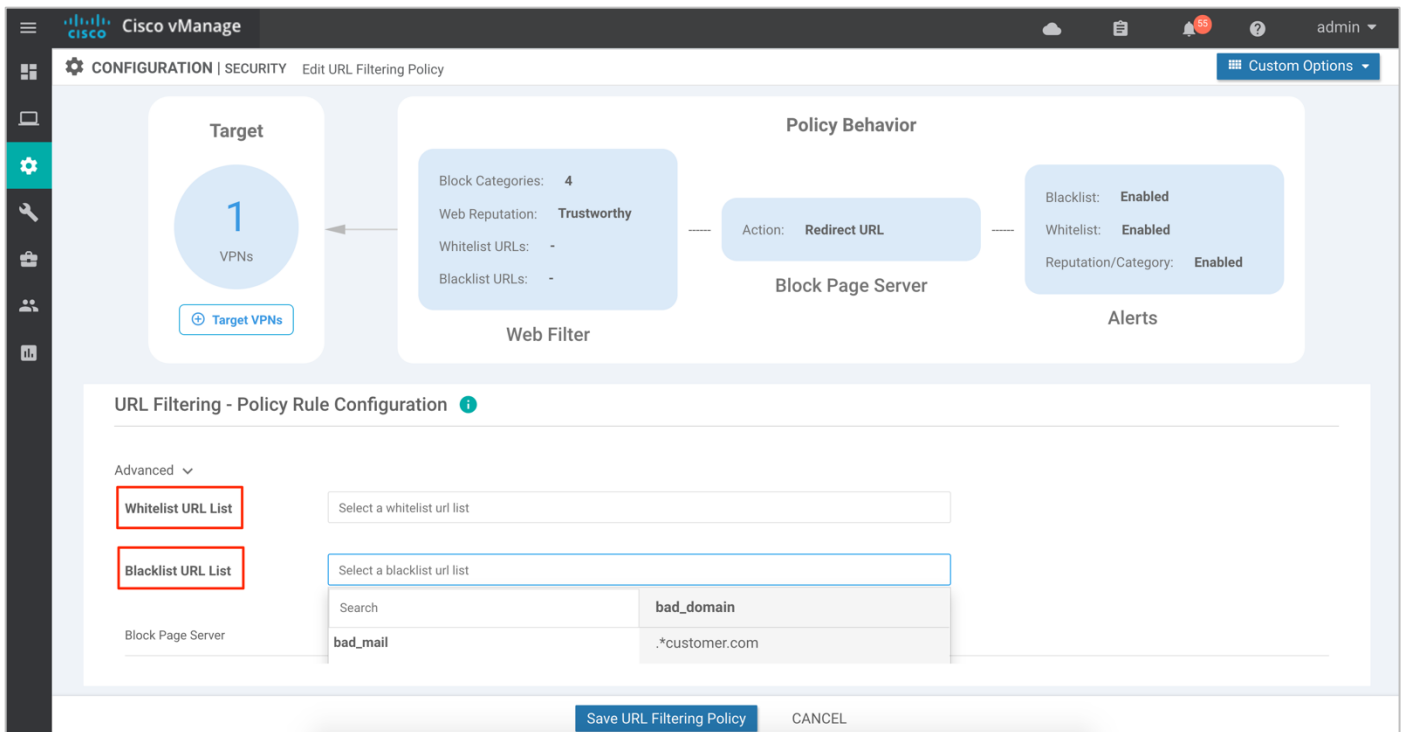
Step 5. Select a Web Reputation from the drop-down. The options are:

- Reputation score of 01-20 is categorized as **High Risk**.
- Reputation score of 21-40 is categorized as **Suspicious**.
- Reputation score of 41-60 is categorized as **Moderate Risk**.

- Reputation score of 61-80 is categorized as **Low Risk**.
- Reputation score of 81-100 is categorized as **Trustworthy**.

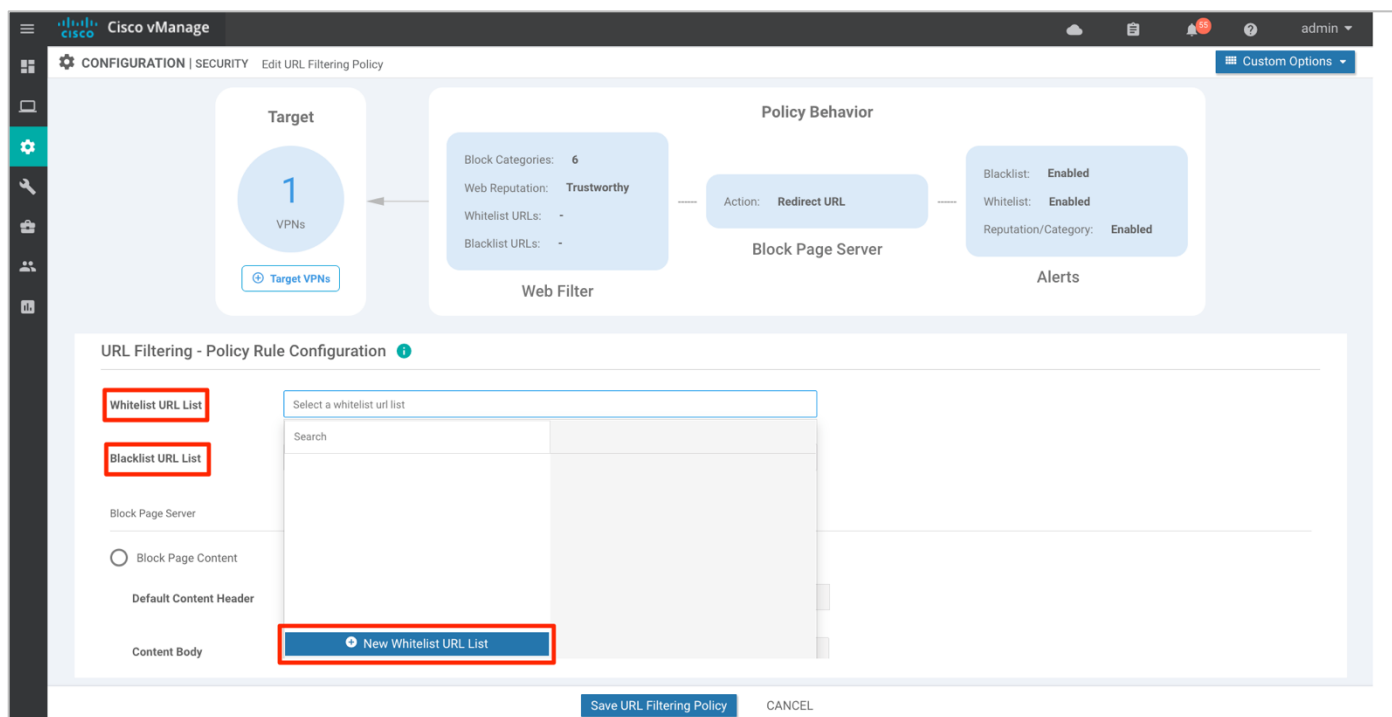


Step 6. (Optional) To whitelist or blacklist specific URLs or domains, click on the **Advanced** tab and within Whitelist/ Blacklist URL lists add in preconfigured URL lists or create new ones as needed.



Note: If you did not preconfigure URL Blacklists/ Whitelists you can create new URL lists, by following the steps below:

Click on +New Whitelist URL List or +New Blacklist URL List at the bottom of the drop-down and enter a list name consisting of up to 32 characters (letters, numbers, hyphens and underscores only), followed by entering the actual URL or domain in the following tab.



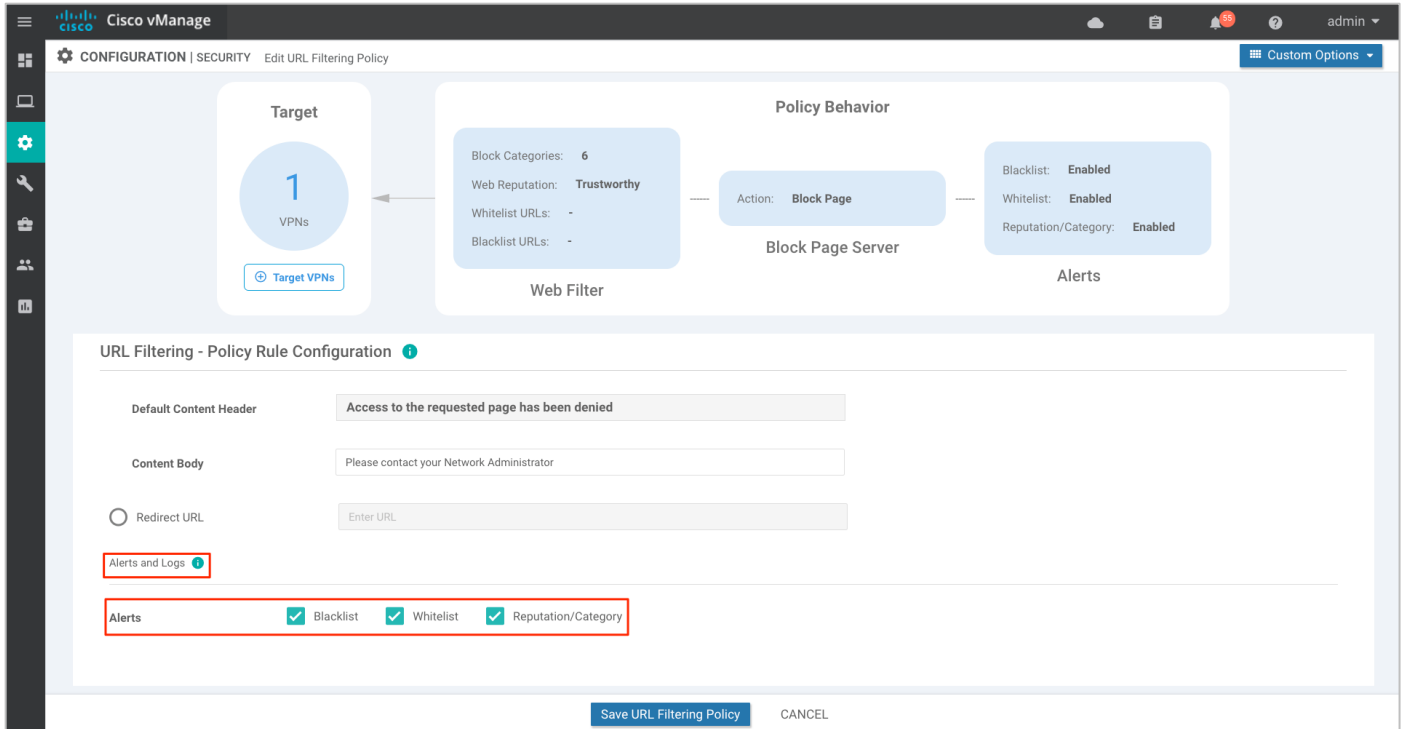
Step 7. (Optional) In the **Block Page Server** pane, choose an option to designate what happens when a user visits a URL that is blocked.

- **Block Page Content:** Choose this option to display a message that access to the page has been denied.
- **Redirect URL:** Choose the option to display another page.

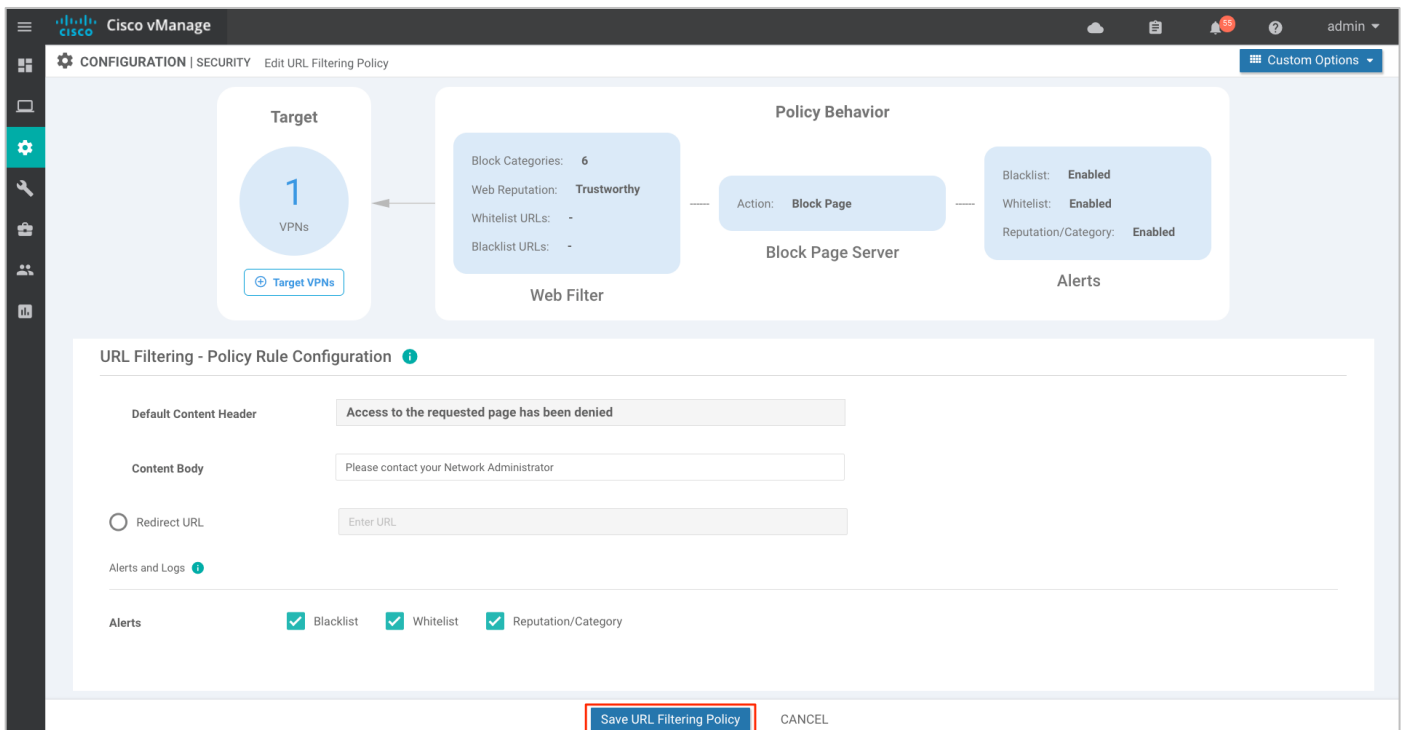
If you choose **Block Page Content**, users see the content header “**Access to the requested page has been denied**” in the Content Body field, enter text to display under this content header. The default content body text is “**Please contact your Network Administrator**” If you choose the option **Redirect URL**, enter a URL to which users are redirected.

Step 8. (Optional) In the **Alerts and Logs** pane, select one of the following types of **Alerts**,

- **Blacklist:** Exports an alert as a syslog message if a user tries to access a URL that is configured in the Blacklist URL List.
- **Whitelist:** Exports an alert as a syslog message if a user tries to access a URL that is configured in the Whitelist URL List.
- **Reputation/Category:** Exports an alert as a syslog message if a user tries to access a URL that has a reputation that is configured in the Web Reputation field or that matches a blocked or allowed web category.

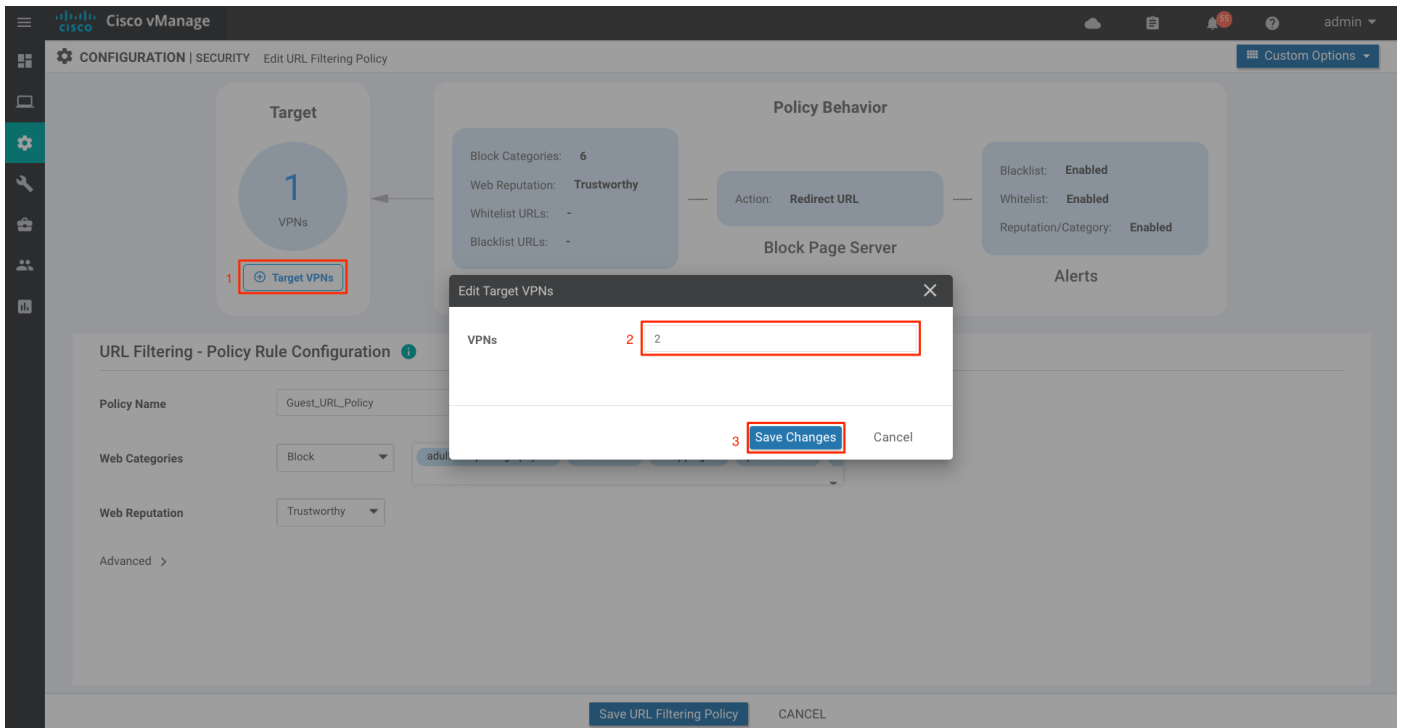


Step 9. Click **Save URL filtering Policy** to add a URL filtering policy.

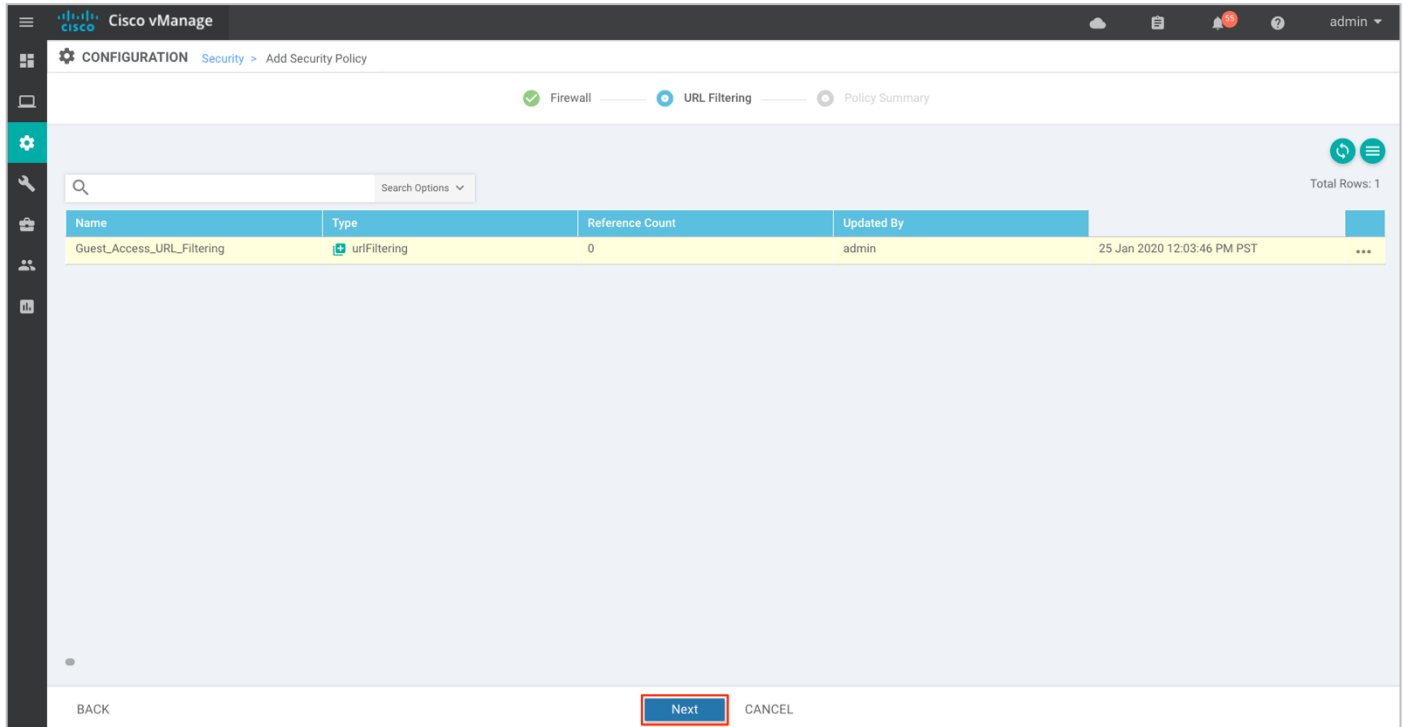


Step 10. Next, enter the VPNs affected by the policy. Within Target VPNs wizard, click on **Target VPNs** and enter the VPN number next to **VPNs** label.

If you wish to add more VPNs, separate each VPN with a comma. Finally, click on Save Changes and Save URL Filtering Policy.

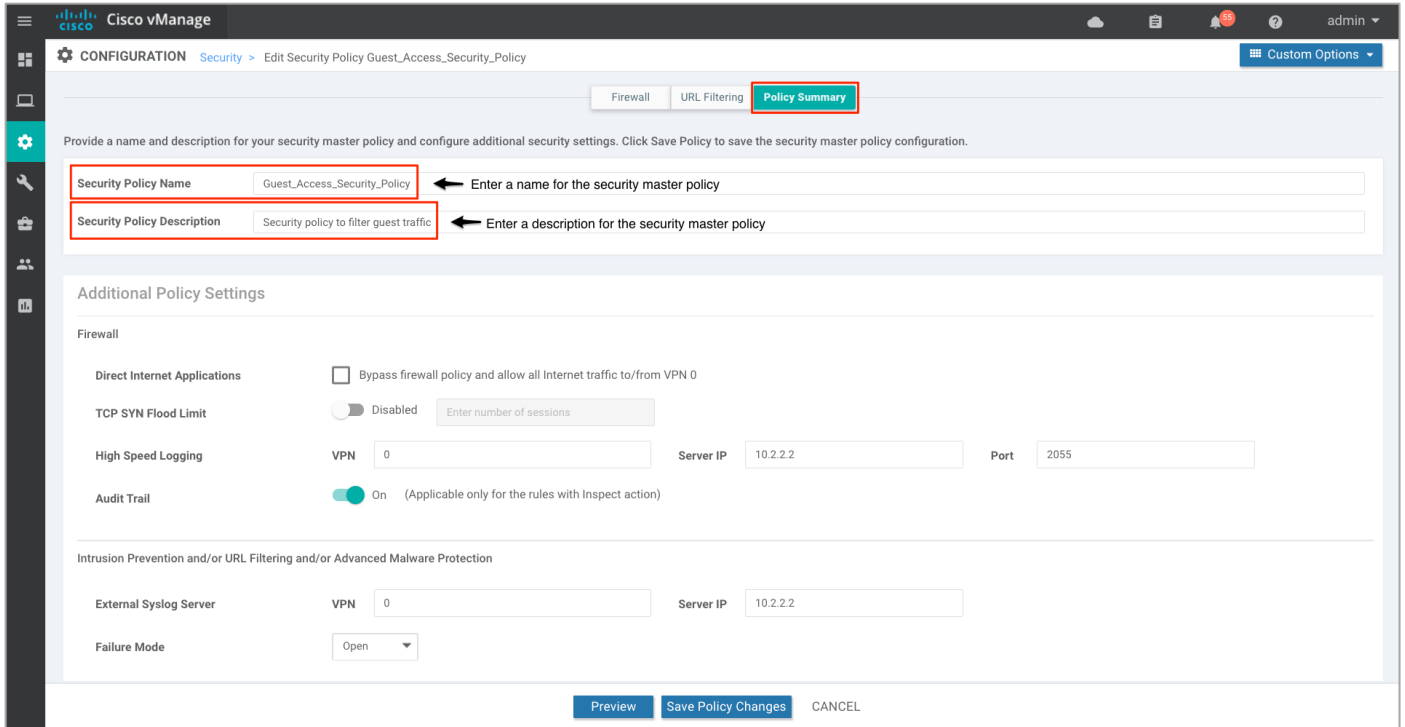


Step 11. Click **Next** to configure the master security policy.



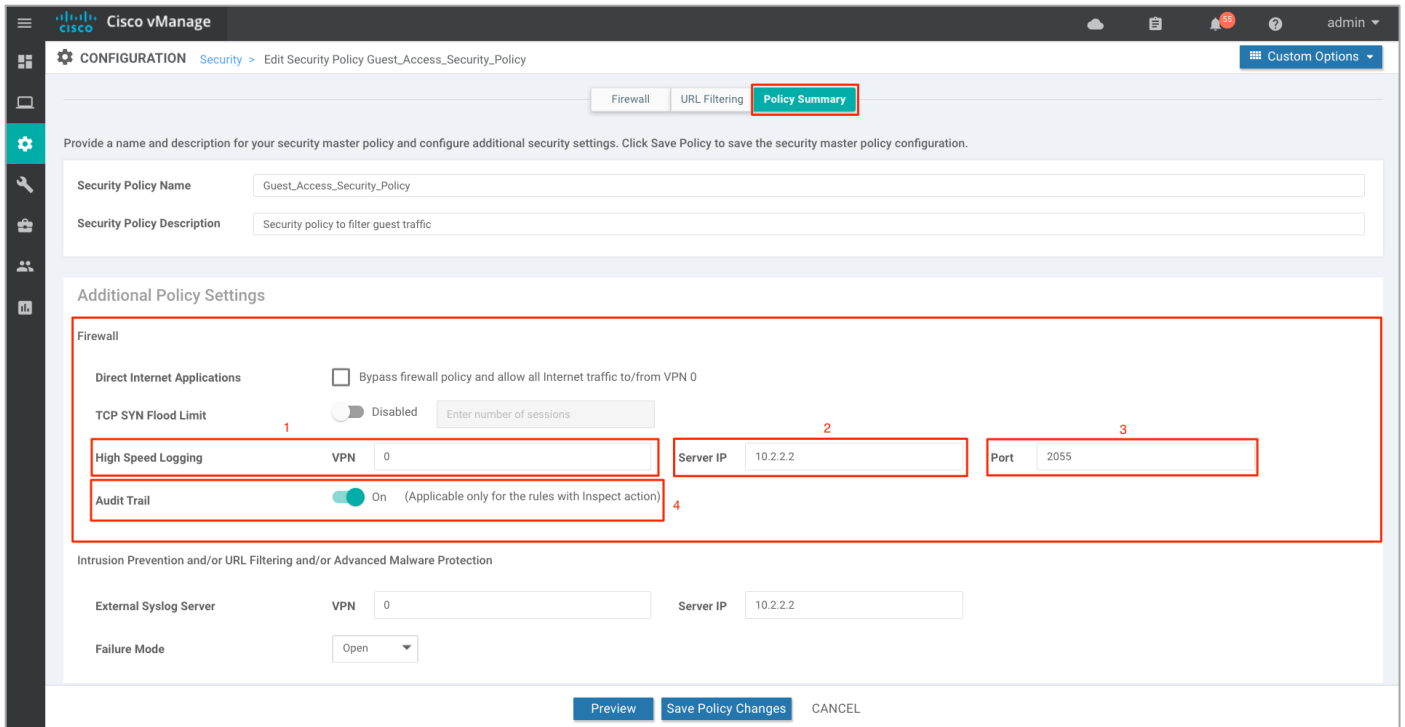
Procedure 3. Configure Policy Summary

Step 1. Within **Policy Summary**, provide a name and description for your security master policy.

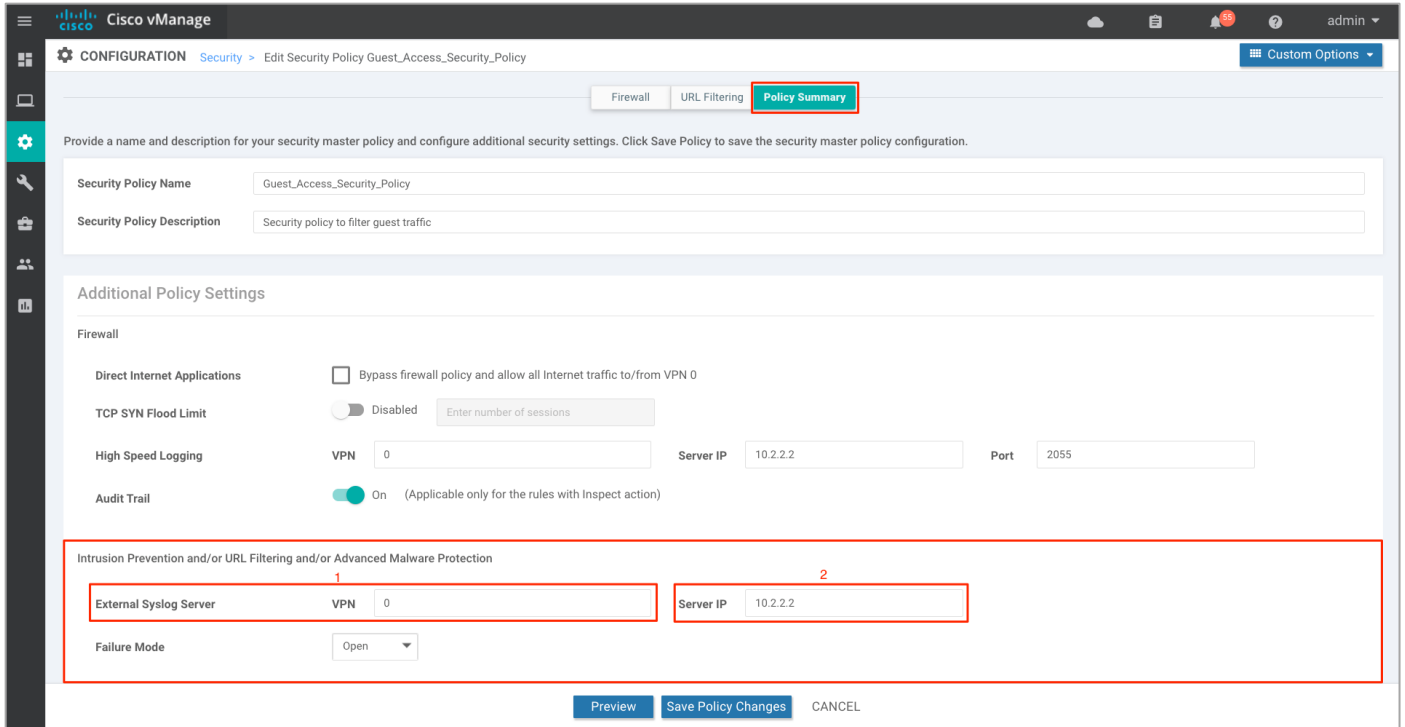


Step 2. To log firewall packets that flow through routing devices (similar to the NetFlow Version 9 records) to an external collector enable **High Speed Logging** and enable **Audit Trail** to record the start, stop, and duration of a connection or session, and the source and destination IP addresses.

Within **High Speed Logging**, next to **VPN** tab enter the VPN label and against **Server IP** enter the IP Address of your server. Note, this feature is supported on WAN Edge devices running code 16.12 or a later code.



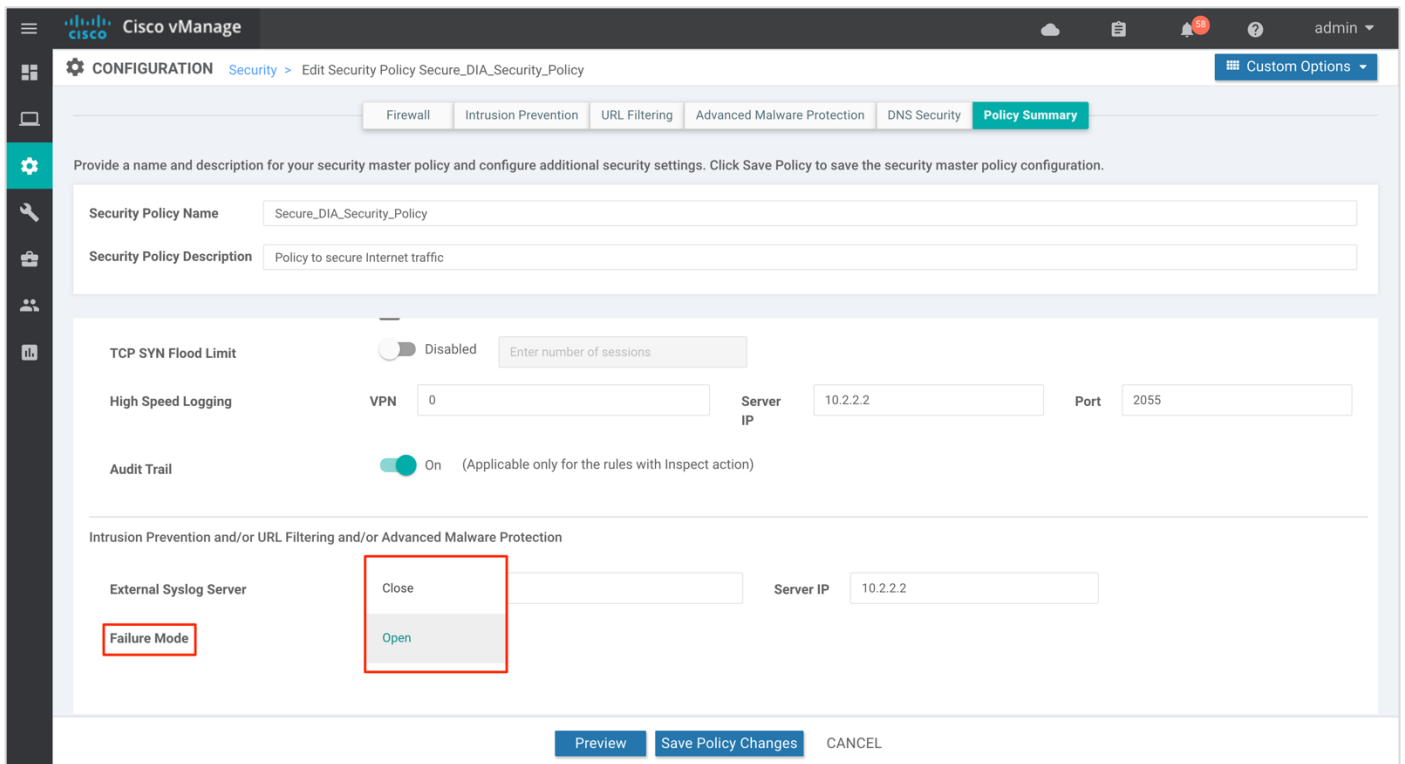
Step 3. Under the **Intrusion Prevention/ URL Filtering/ Advanced Malware Protection** section, you can fill in details to send URL syslogs to your **External Syslog Server**. Here, the **External Syslog Server** is set within VPN 0, hence the **VPN** label in **VPN** tab is **0**, followed by Server IP address next to **Server IP**.



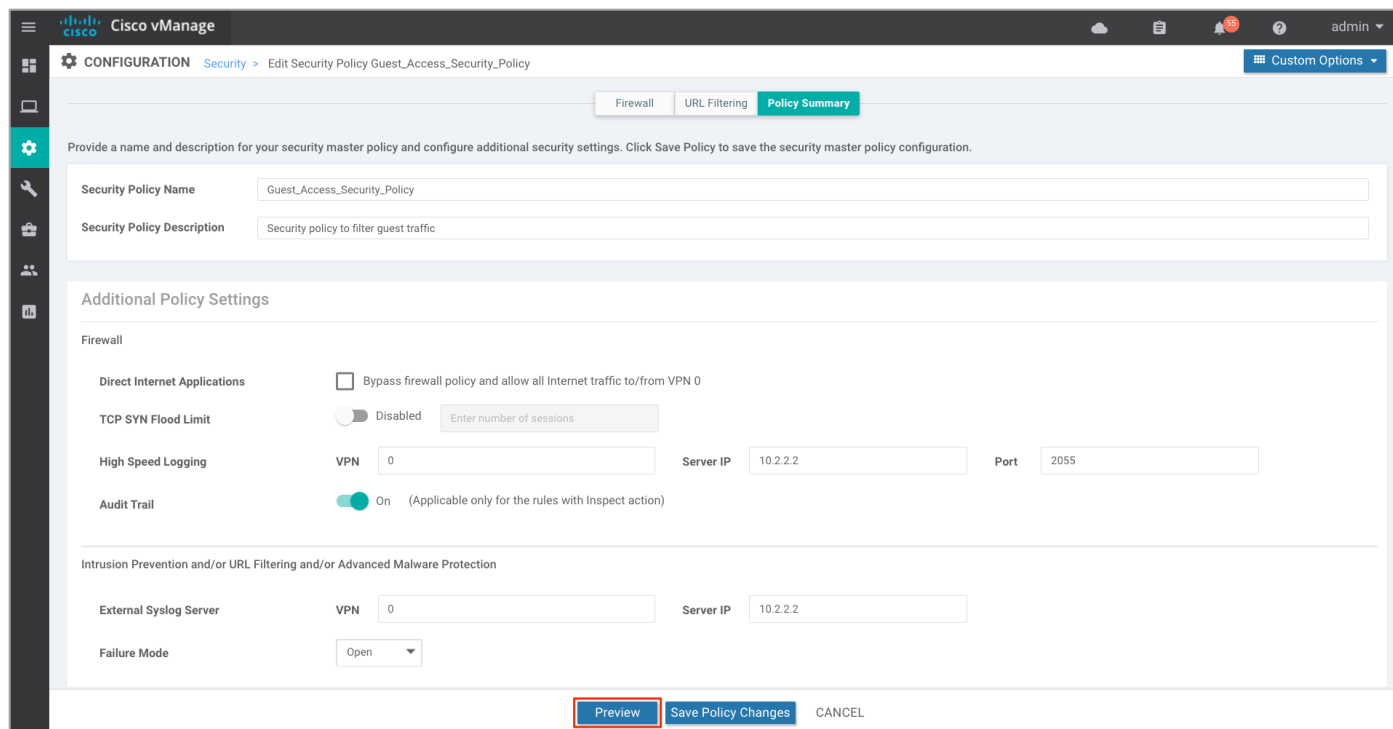
Step 4. Set the **Failure Mode** to either **Open** or **Close**.

Note: If the Snort engine fails for any reason, and the device is set in fail-open mode, then the traffic bypasses all security features. In fail-close mode, traffic is dropped when an engine failure is detected.

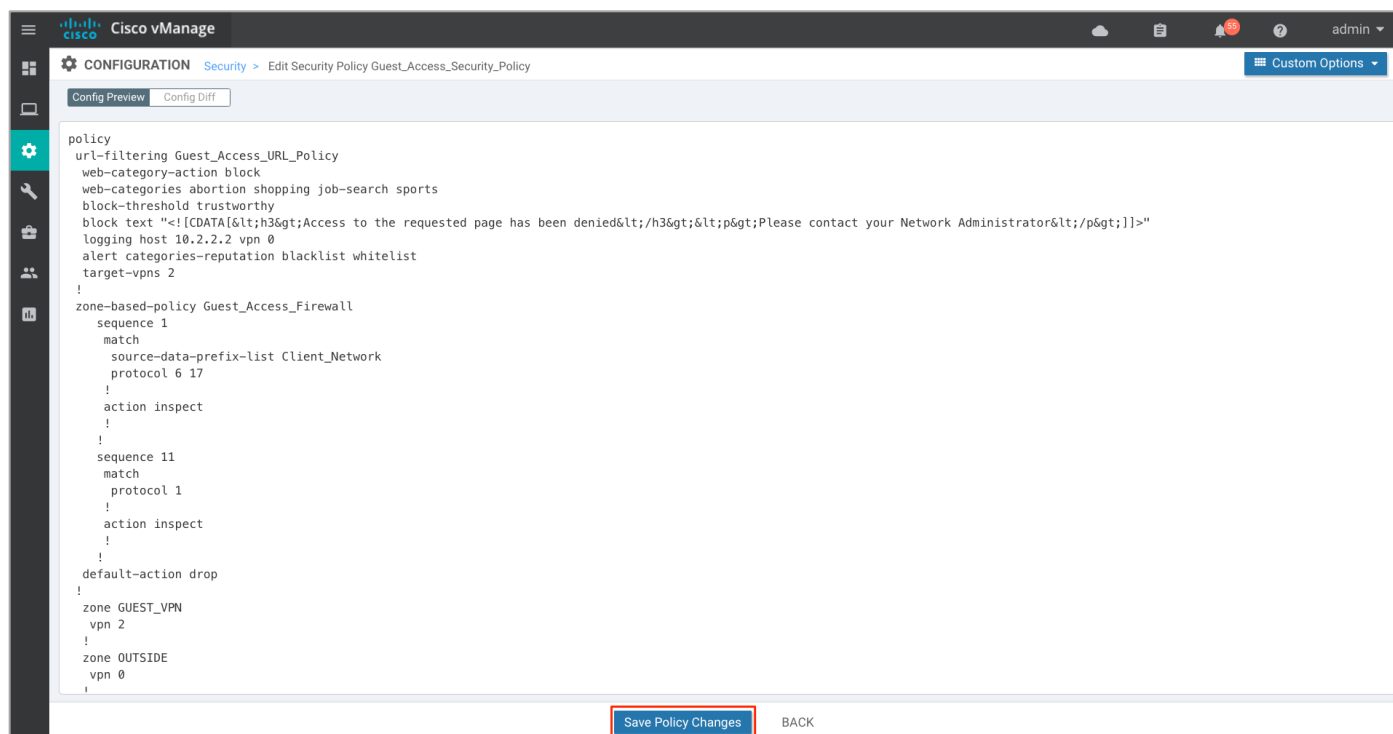
Enable fail-close, if security is the concern and select the option fail-open, only if connectivity is the concern. Select one among the two based on the design. For more details, refer to the [Security Policy Design Guide for Cisco IOS-XE SD-WAN Devices](#).



Step 5. Click on **Preview** to view the CLI equivalent for the policy to be deployed.



Step 6. Finally, click Save Policy Changes.



Process 3: Attach the Security Policy to the Device Template.

To apply the configured security policy to a remote-site WAN Edge device, follow the steps listed below.

Step 1. Navigate to **Configuration > Templates**.

Cisco vManage CONFIGURATION | TEMPLATES

Device Feature

Configuration 1

Templates 2

Search Options

Total Rows: 15

	Description	Type	Device Model	Feature Templates	
TLOC_SubInt OSPF	Branch Dual vEdge Hybrid TLOC Su...	Feature	vEdge 1000	20	...
nt OSPF	Branch Dual vEdge Hybrid TLOC Su...	Feature	vEdge 1000	20	...
S_DIA	Direct Internet Access in hybrid tran...	Feature	ISR4461	20	...
L_DCA	Branch A with OSPF on the LAN sid...	Feature	ISR4431	20	...
	vSmart	Feature	vSmart	9	...
et_LAN OSPF	Branch Dual WAN Edge router with ...	Feature	ISR4351	11	...
C_VRRP	Branch Dual vEdge Hybrid TLOC wit...	Feature	ISR4331	20	...
OSPF	Branch with Dual WAN with Hybrid t...	Feature	ISR4331	17	...
OSPF	Branch with Dual WAN with Hybrid t...	Feature	ISR4331	20	...
Compliance	Branch A with OSPF on the LAN sid...	Feature	ISR4431	20	...
	Branch Dual vEdge Hybrid TLOC wit...	Feature	ISR4331	19	...
	DC MPLS and INET - Static to CE an...	Feature	vEdge 5000	16	...
Branch_C_MPLS_TLOC_INET_DIA	Direct Internet Access in hybrid tran...	Feature	ISR4461	20	...
Branch_B_INET_TLOC_SubInt OSPF	Branch Dual vEdge Hybrid TLOC Su...	Feature	C1111X-8P	14	...
Branch_H_MPLS_CE_LAN OSPF	Branch with Dual WAN with Hybrid t...	Feature	ISR4331	17	...

Step 2. To attach the security policy to a **Device Template**, click on the **three dots** found on the right side of the template and select **Edit** from the drop-down options.

Cisco vManage CONFIGURATION | TEMPLATES

Device Feature

Create Template

Search Options

Total Rows: 12

Name	Description	Type	Device Model	Feature Templates	Devices Attached	Updated By	Last
Branch_F_INET_TLOC_VRRP	Branch Dual vEdge Hybrid TLOC with INET and LAN-side A...	Feature	ISR4331	18	1	admin	17: ...
Branch_C_MPLS_CE_LAN_OSPF	Branch with Dual WAN with Hybrid transport and DIA exit	Feature	ISR4331	19	1	admin	17: ...
Branch_F_MPLS_BGP_TLOC_VRRP	Branch Dual vEdge Hybrid TLOC with MPLS BGP and LAN...	Feature	ISR4331	19	1	admin	24: ...
Branch_C_INET_TLOC_MPLS_DIA	Direct Internet Access in hybrid transport branch with TLO...	Feature	ISR4461	19	1	admin	16: ...
Branch_A_INET_TLOC_SubInt_OSPF	Branch Dual vEdge Hybrid TLOC SubInts with INET and LA...	Feature	vEdge 1000	20	1	admin	26: ...
Branch_A_BRONZE_BGP_TLOC_Su...	Branch Dual vEdge Hybrid TLOC SubInts with MPLS BGP a...	Feature	vEdge 1000	20	1	admin	26: ...
vSmart	vSmart	Feature	vSmart	9	1	admin	14: ...
Branch_B_INET_TLOC_SubInt_OSPF	Branch Dual vEdge Hybrid TLOC SubInts with INET and LA...	Feature	C1111X-8P	10	1	admin	07: ...
Branch_C_MPLS_TLOC_INET_DIA	Direct Internet Access in hybrid transport branch	Feature	ISR4461	19	1	admin	17: ...
Branch_D_Bronze_BizInternet_LAN...	Branch Dual WAN Edge router with Dual Internet transport ...	Feature	ISR4351	18	1	admin	17: ...
Branch_A_Hybrid_Transport_Comp...	Branch A with OSPF on the LAN side with MPLS and Intern...	Feature	ISR4431	20	1	admin	19: ...
DC_Hybrid_Type_A_BGP	DC MPLS and INET - Static to CE and BGP to LAN	Feature	vEdge 5000	16	2	admin	19: ...

Cisco vManage CONFIGURATION | TEMPLATES

Device Feature

Create Template

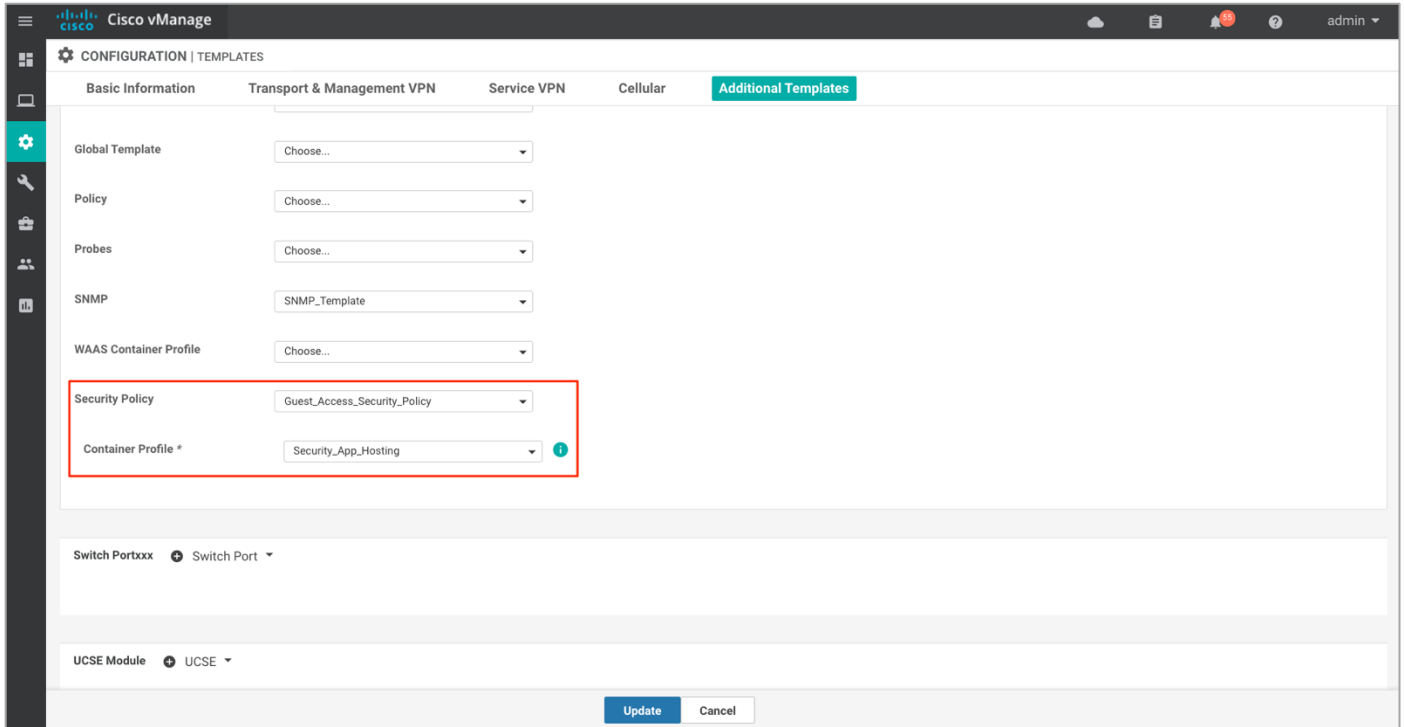
Search Options

Total Rows: 12

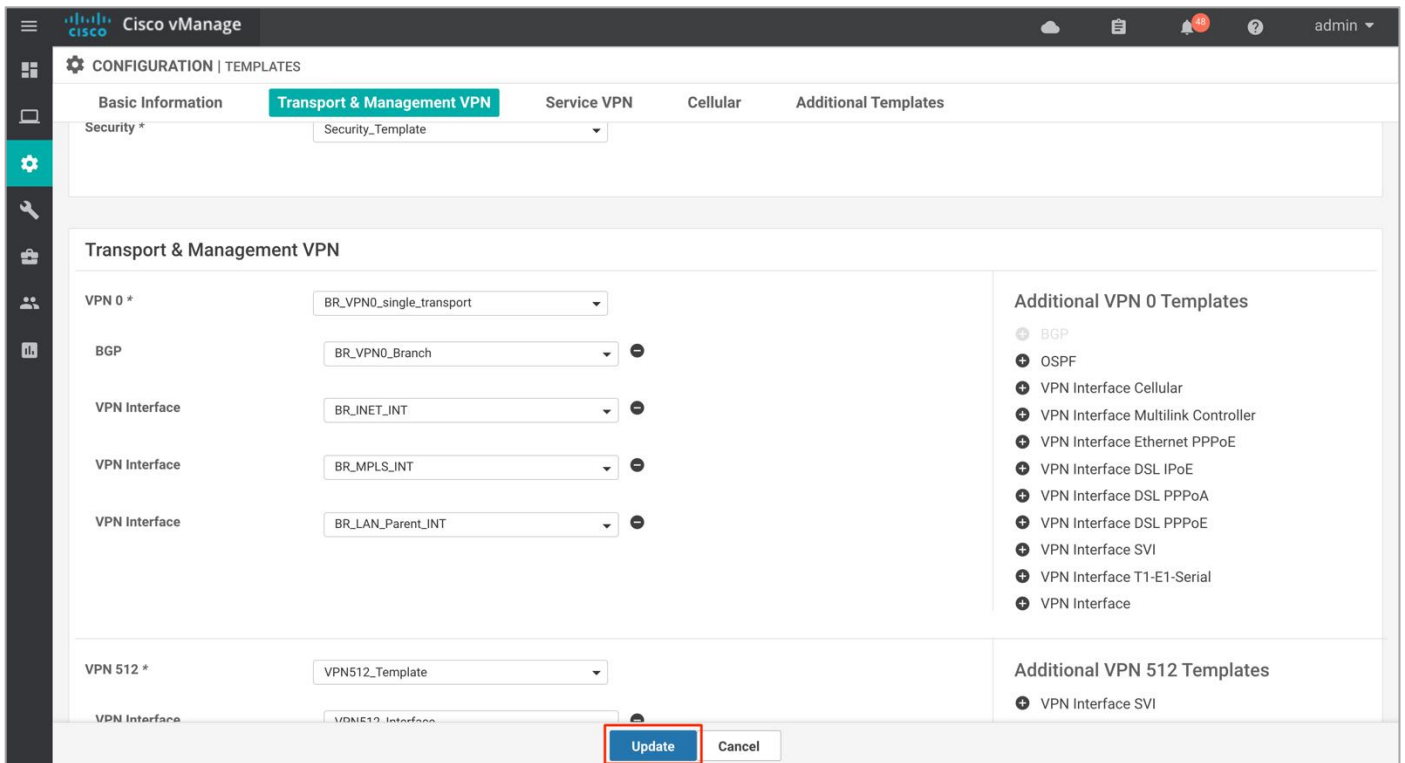
Name	Description	Type	Device Model	Feature Templates	Devices Attached	Updated By	Last
Branch_F_INET_TLOC_VRRP	Branch Dual vEdge Hybrid TLOC with INET and LAN-side A...	Feature	ISR4331	18	1	admin	17: ...
Branch_C_MPLS_CE_LAN_OSPF	Branch with Dual WAN with Hybrid transport and DIA exit	Feature	ISR4331	19	1	admin	17: ...
Branch_F_MPLS_BGP_TLOC_VRRP	Branch Dual vEdge Hybrid TLOC with MPLS BGP and LAN...	Feature	ISR4331	19	1	admin	24: ...
Branch_C_INET_TLOC_MPLS_DIA	Direct Internet Access in hybrid transport branch with TLO...	Feature	ISR4461	19	1	admin	16: ...
Branch_A_INET_TLOC_SubInt_OSPF	Branch Dual vEdge Hybrid TLOC SubInts with INET and LA...	Feature	vEdge 1000	20	1	admin	26: ...
Branch_A_BRONZE_BGP_TLOC_Su...	Branch Dual vEdge Hybrid TLOC SubInts with MPLS BGP a...	Feature	vEdge 1000	20	1	admin	26: ...
vSmart	vSmart	Feature	vSmart	9	1	admin	14: ...
Branch_B_INET_TLOC_SubInt_OSPF	Branch Dual vEdge Hybrid TLOC SubInts with INET and LA...	Feature	C1111X-8P	10	1	admin	07: ...
Branch_C_MPLS_TLOC_INET_DIA	Direct Internet Access in hybrid transport branch	Feature	ISR4461	19	1	admin	17: ...
Branch_D_Bronze_BizInternet_LAN...	Branch Dual WAN Edge router with Dual Internet transport ...	Feature	ISR4351	18	1	admin	17: ...
Branch_A_Hybrid_Transport_Comp...	Branch A with OSPF on the LAN side with MPLS and Intern...	Feature	ISR4431	20	1	admin	19: ...
DC_Hybrid_Type_A_BGP	DC MPLS and INET - Static to CE and BGP to LAN	Feature	vEdge 5000	16	2	admin	19: ...

- Edit
- View
- Delete
- Copy
- Attach Devices
- Detach Devices
- Export CSV
- Change Device Values

Step 3. Within the Device Template, navigate to Additional Templates and attach the **Security Policy (Guest_Access_Security_Policy)**, along with the **Container Profile* (Security_App_Hosting)**.



Step 4. Click **Update** to update the device template.



Step 5. Make sure **NAT** is already configured on the WAN Internet transport Interface. To do so click on the three dots and select **Edit**.

Cisco vManage CONFIGURATION | TEMPLATES

Device Template | Branch_A_Hybrid_Transport_Compliance

Search Options

Total Rows: 1

S...	Chassis Number	System IP	Hostname	Interface Name(vpn1_lan_int2_gex x_or_ gex x.VLAN)	IPv4 Address(vpn1_lan_int2_ip...
✓	ISR4431/K9-FOC22467A57	10.255.211.11	BR3-WAN-Edge1	GigabitEthernet0/0/0.20	10.10.12.2/30

1

2 Edit Device Template

Next Cancel

Cisco vManage CONFIGURATION | TEMPLATES

Device Template | Branch...

Update Device Template

Variable List (Hover over each field for more information)

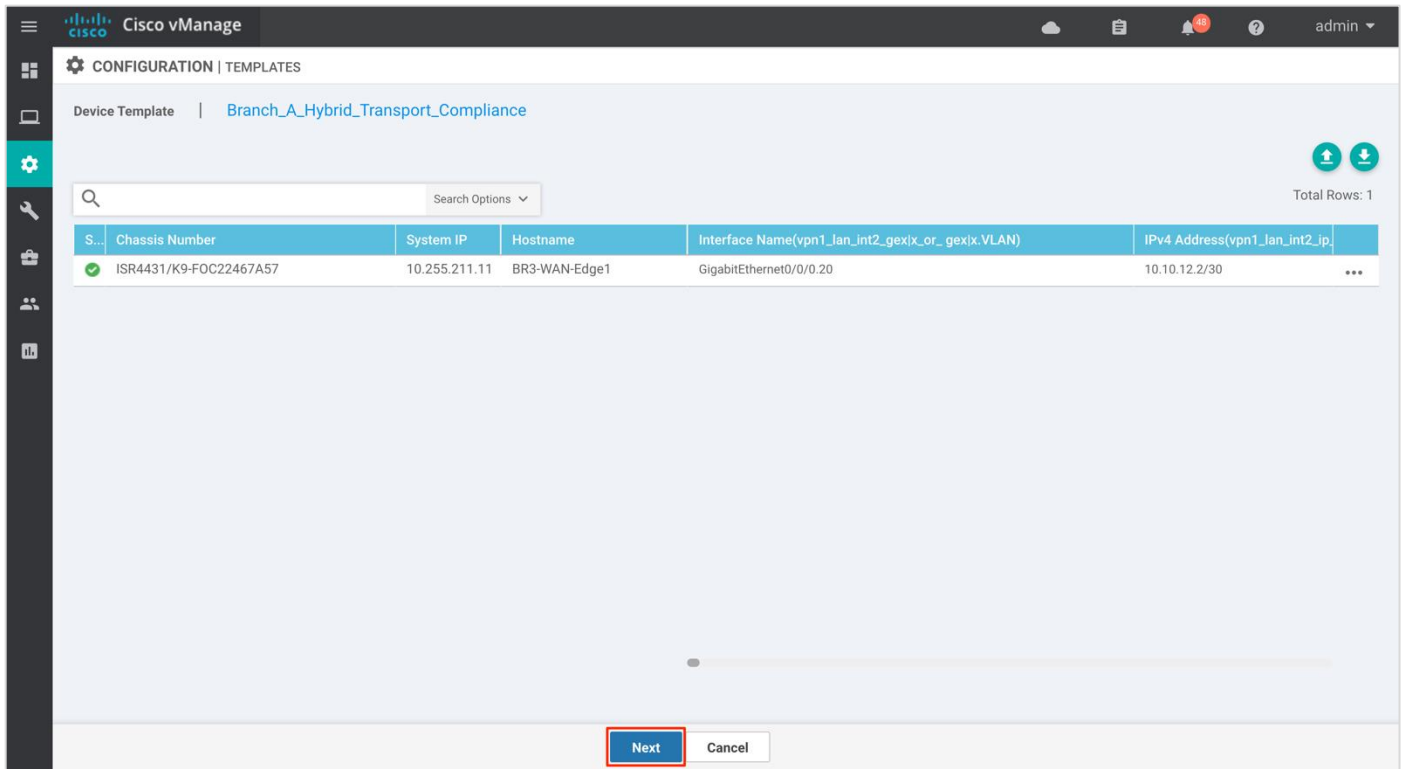
IPv4 Address(vpn0_mpls_int_ip_addr_maskbits)	10.30.1.1/30
NAT	<input type="checkbox"/>
Preference(vpn_if_tunnel_ipsec_preference)	200
IP MTU(vpn0_mpls_mtu)	1500
Shutdown(vpn0_mpls_int_shutdown)	<input type="checkbox"/>
Bandwidth Upstream(vpn0_mpls_int_bandwidth_up)	1000000
Bandwidth Downstream(vpn0_mpls_int_bandwidth_down)	1000000
Interface Name(vpn0_inet_int_gex)	GigabitEthernet0/0/1
IPv4 Address(vpn0_inet_int_ip_addr_maskbits)	30.60.1.1/30
NAT	<input checked="" type="checkbox"/> 1
Preference(vpn_if_tunnel_ipsec_preference)	100
IP MTU(vpn0_inet_mtu)	1500
Shutdown(vpn0_inet_int_shutdown)	<input type="checkbox"/>
Bandwidth Upstream(vpn0_inet_int_bandwidth_up)	1000000
Bandwidth Downstream(vpn0_inet_int_bandwidth_down)	1000000
Hostname(system_host_name)	BR3-WAN-Edge1
Latitude(system_latitude)	37.409284

2 Update Cancel

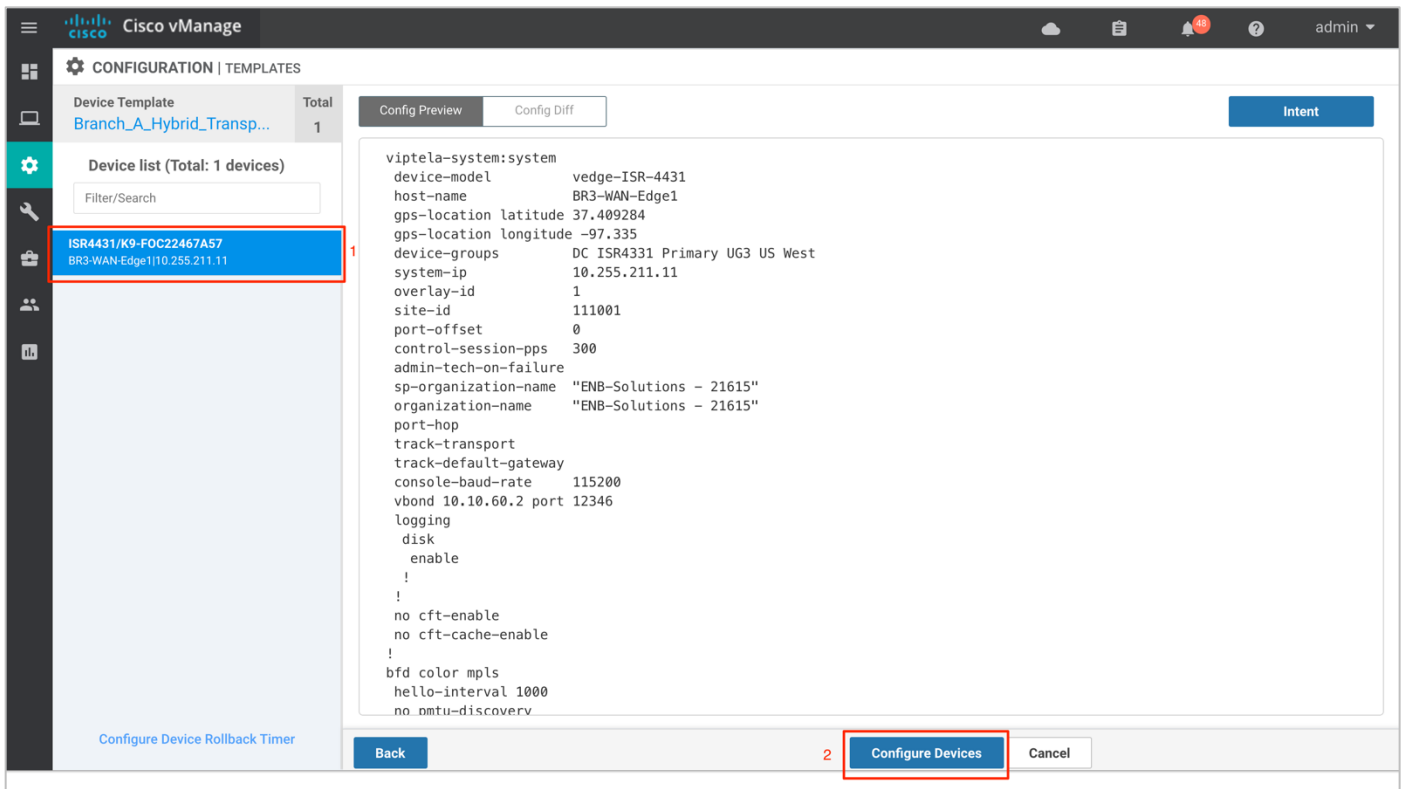
Next Cancel

Note: If NAT feature is not currently configured as a variable in your interface feature template, you will need to modify the **WAN Interface Feature Template** to enable NAT. You can do this before or after deploying the security policy.

Step 6. Once, the changes are made click **Next**.



Step 7. Finally, select the WAN Edge device from the **Device list** on the right panel to preview the configuration and then click, **Configure Devices** to configure the device with the security policy along with the container profile.



Step 8. The **Task View** screen will display the results. Look for the status of the template to verify if the template was successfully attached to the device.

The screenshot shows the Cisco vManage interface with the 'TASK VIEW' section active. The task is titled 'Push Feature Template Configuration' and shows a 'Validation Success' status. The task was initiated by 'admin' from IP '100.119.42.190'. The log shows the following steps:

- [20-Sep-2019 11:45:57 PDT] Starting Checks.
- [20-Sep-2019 11:45:57 PDT] Validating if device scheduled for template push are active
- [20-Sep-2019 11:45:57 PDT] Sending message to vmanage:172.27.0.14
- [20-Sep-2019 11:45:57 PDT] Published messages to vmanage(s)
- [20-Sep-2019 11:45:57 PDT] Checks completed.

Below the log is a table with the following columns: Status, Message, Chassis Number, Device Model, Hostname, System IP, Site ID, and vManage IP.

Status	Message	Chassis Number	Device Model	Hostname	System IP	Site ID	vManage IP
Success	Done - Push Feature Template Configuration	ISR4431/K9-FOC2246...	ISR4431	BR3-WAN-Edge1	10.255.211.11	111001	172.27.0.14

Below the table is a detailed log of the configuration process:

- [20-Sep-2019 11:45:57 PDT] Configuring device with feature template: Branch_A_Hybrid_Transport_Compliance
- [20-Sep-2019 11:45:57 PDT] Generating configuration from template
- [20-Sep-2019 11:46:10 PDT] Checking and creating device in vManage
- [20-Sep-2019 11:46:19 PDT] Device is online
- [20-Sep-2019 11:46:19 PDT] Updating device configuration in vManage
- [20-Sep-2019 11:46:25 PDT] Pushing configuration to device
- [20-Sep-2019 11:46:47 PDT] Template successfully attached to device

Operate - Cisco SD-WAN Secure Guest Access

Using the vManage GUI, you can monitor, troubleshoot and manage the Cisco SD-WAN security features deployed. The 3 main ways to troubleshoot the security features is via,

vManage Main Dashboard: The vManage main dashboard displays the graphical view of all the packets inspected, dropped by the firewall and URL categories allowed, and dropped.

vManage Monitor Dashboard: The vManage monitor dashboard displays the graphical and real time statistics of the traffic inspected by the security features configured.

vManage SSH Server Dashboard: The vManage SSH server dashboard provides the option to manage the WAN Edge device via CLI.

Note: You can also configure a syslog server and scan through the logs gathered within the server to monitor your WAN Edge device.

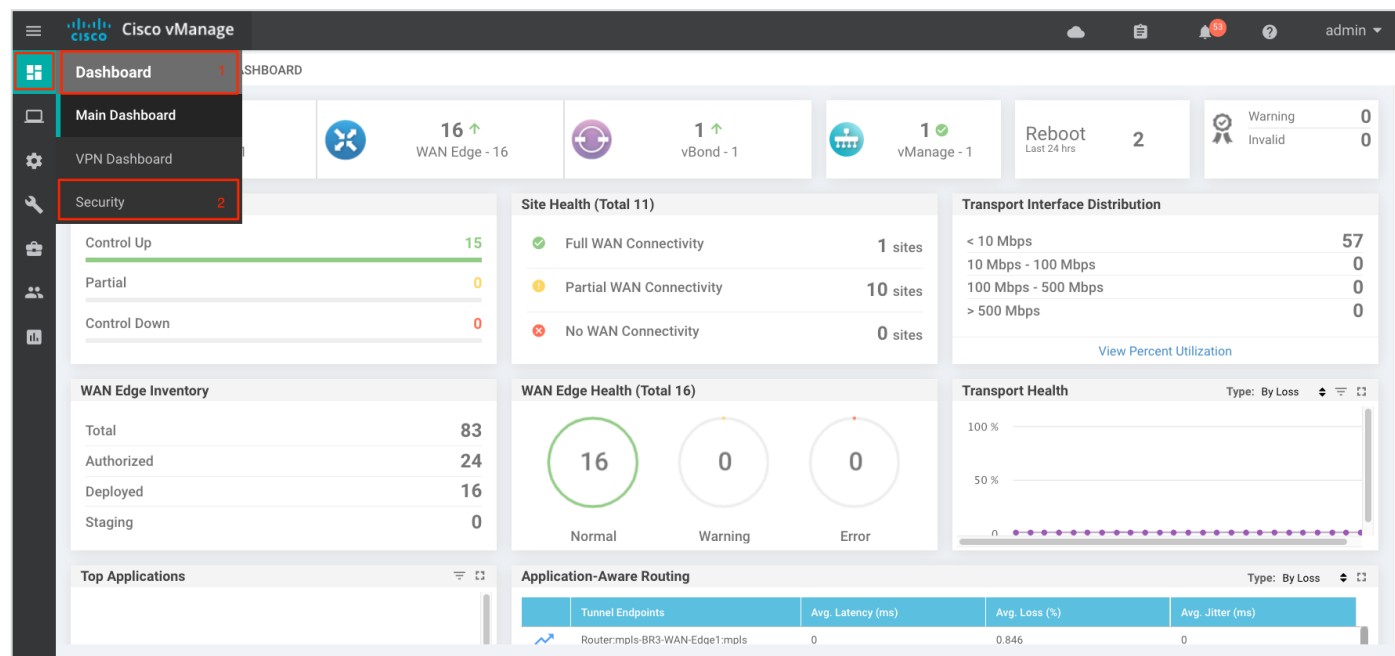
Process 1: Monitor the Enterprise Firewall with Application Awareness Feature via vManage NMS

Monitor, manage and troubleshoot the Enterprise Firewall with Application Awareness feature via vManage NMS.

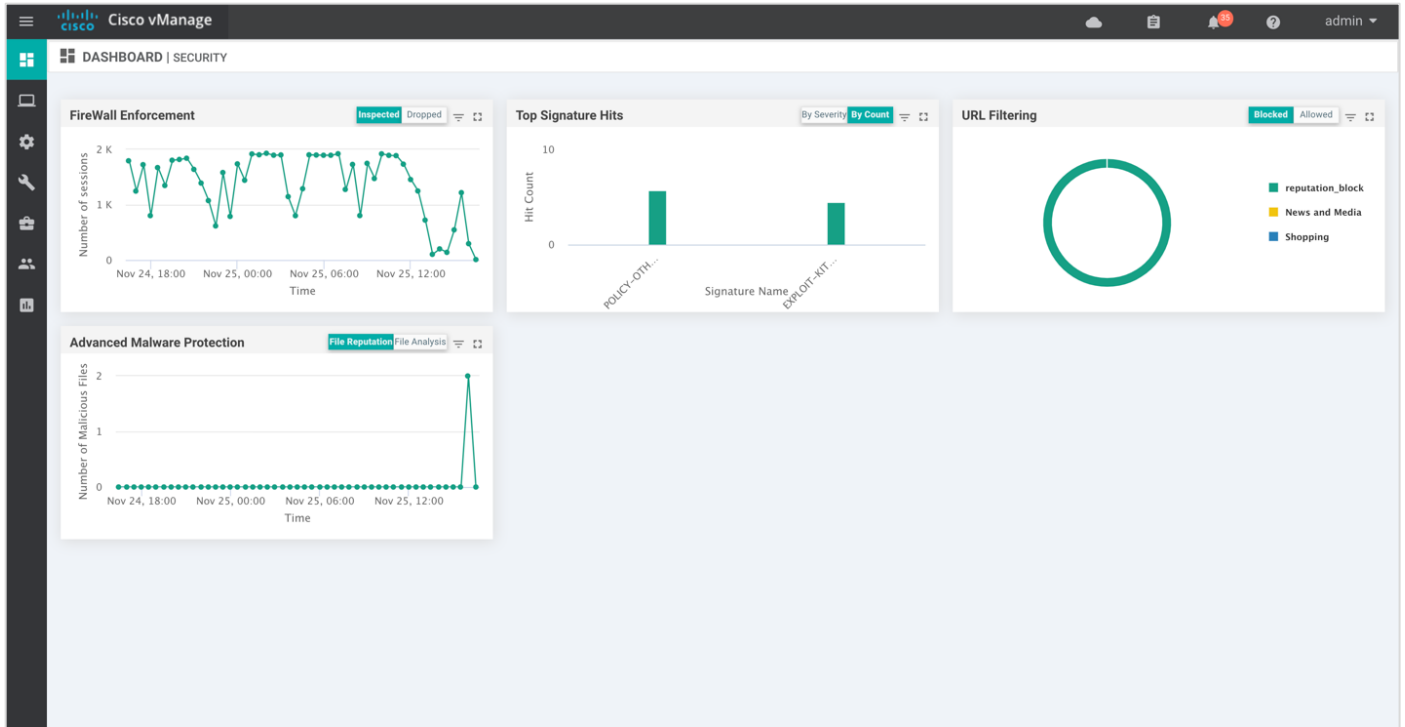
Procedure 1. Monitor the Firewall Feature via vManage Main Dashboard

Using the vManage NMS dashboard, you can view the firewall statistics via dashboard.

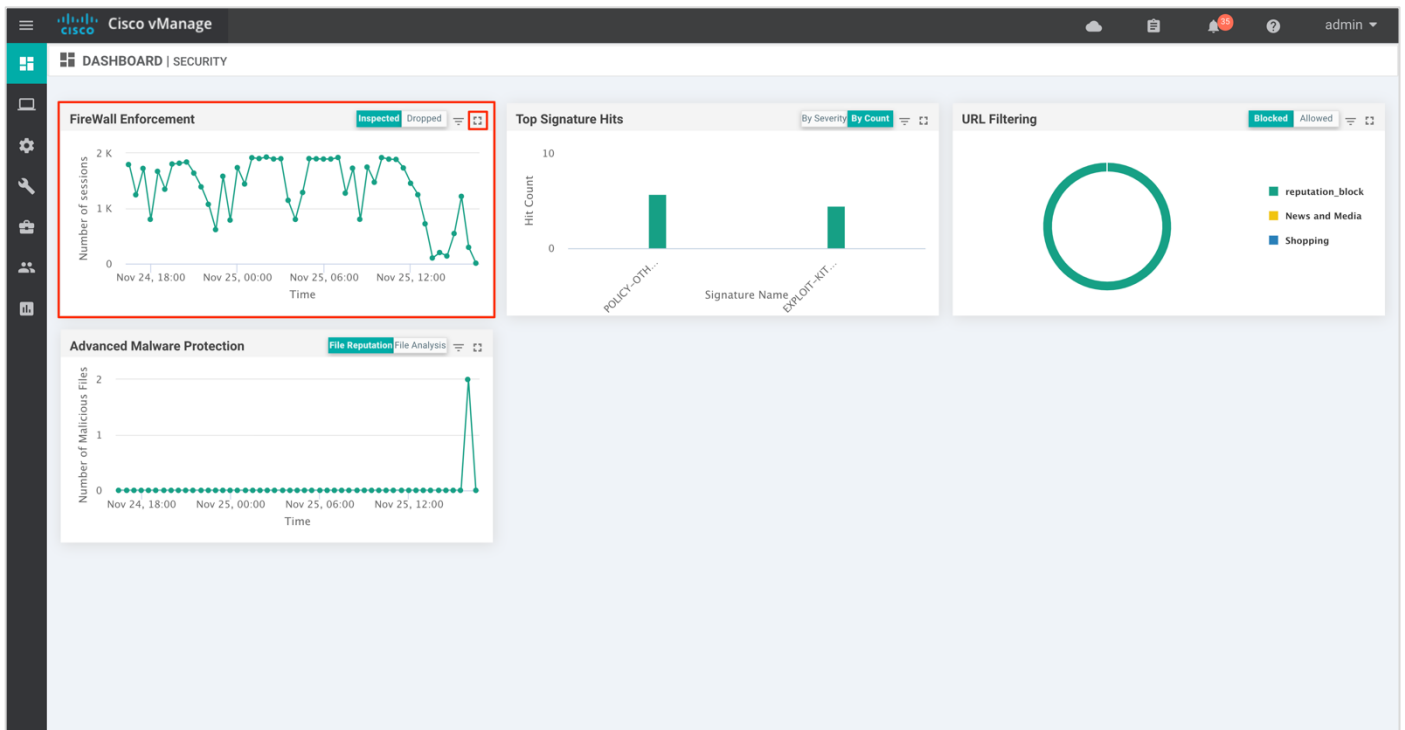
Step 1. Navigate to **Dashboard > Security**.



Step 2. The following screenshot of the security dashboard shows **Firewall Enforcement** activity and **Top Signature Hits** data.

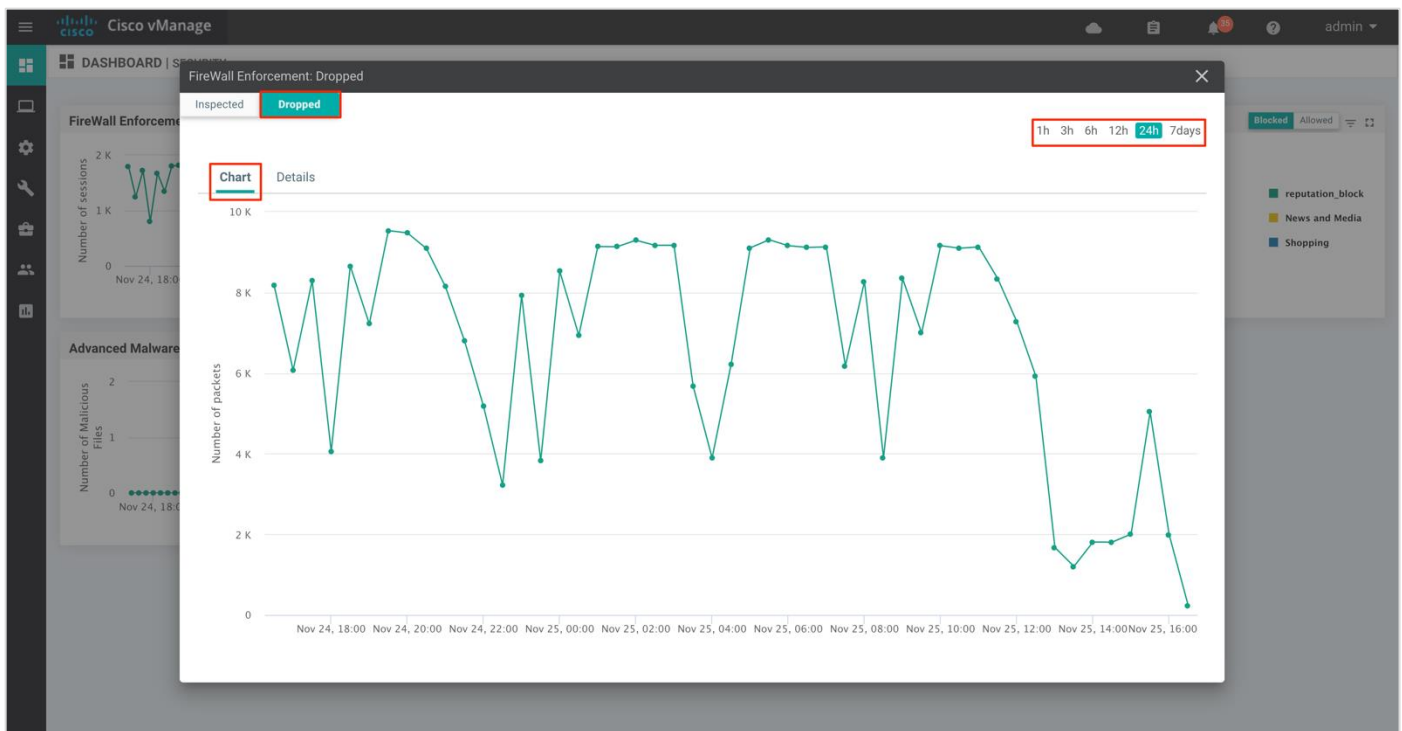
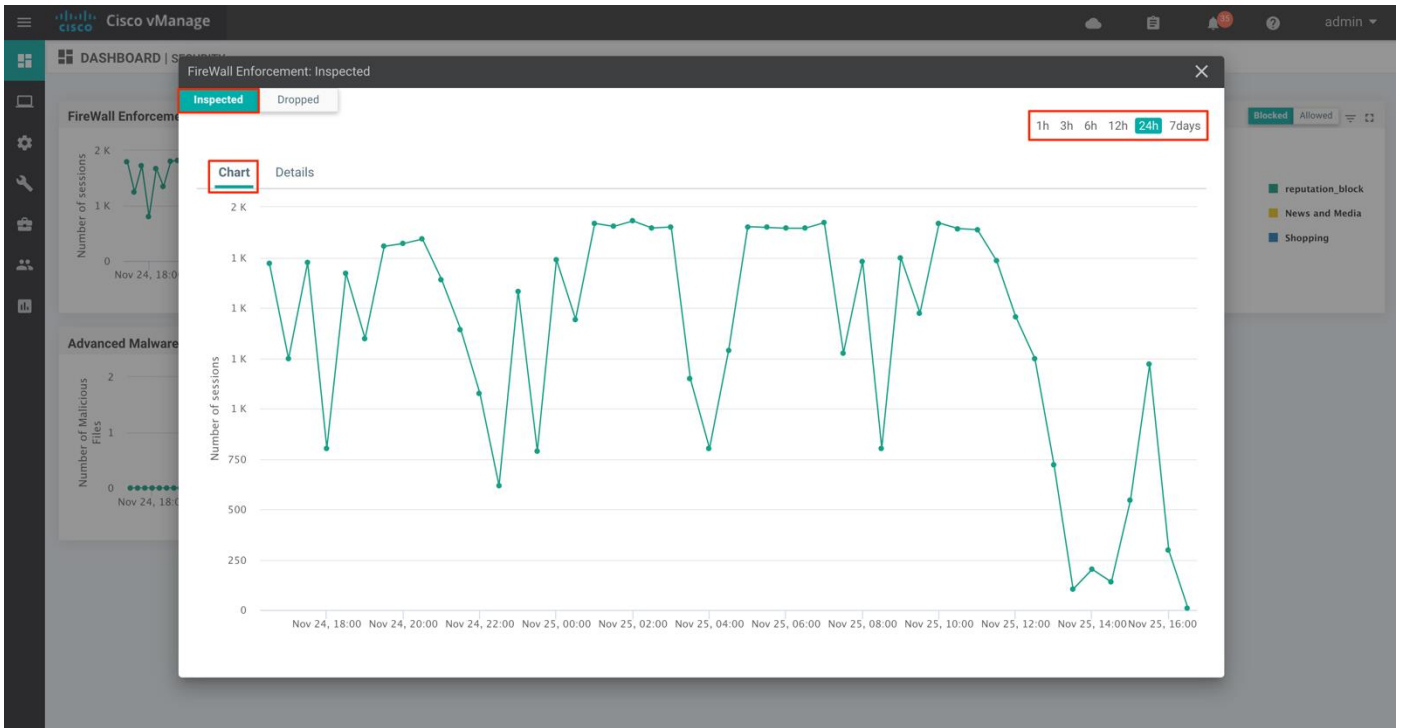


Step 3. To take a closer look into the **Firewall Enforcement** graph, click on the **square box**  on the top right.

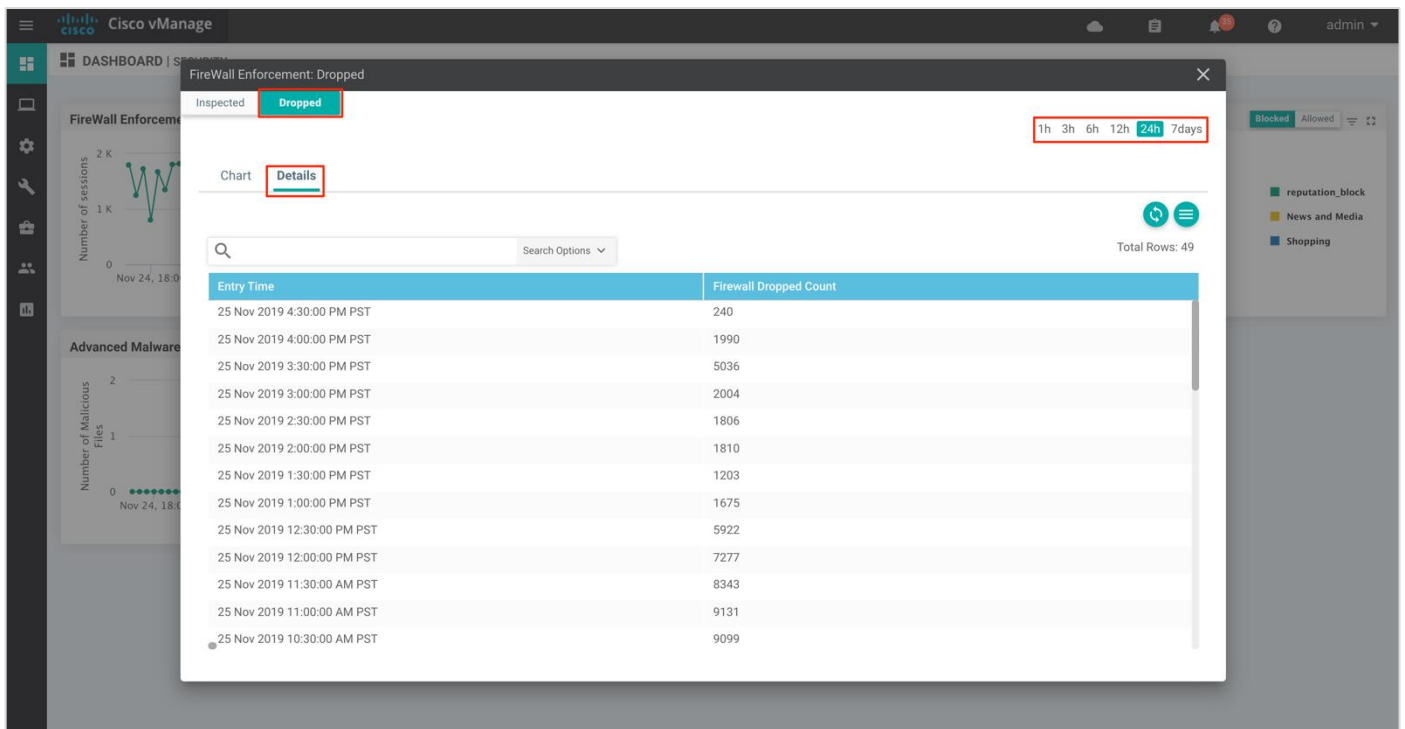
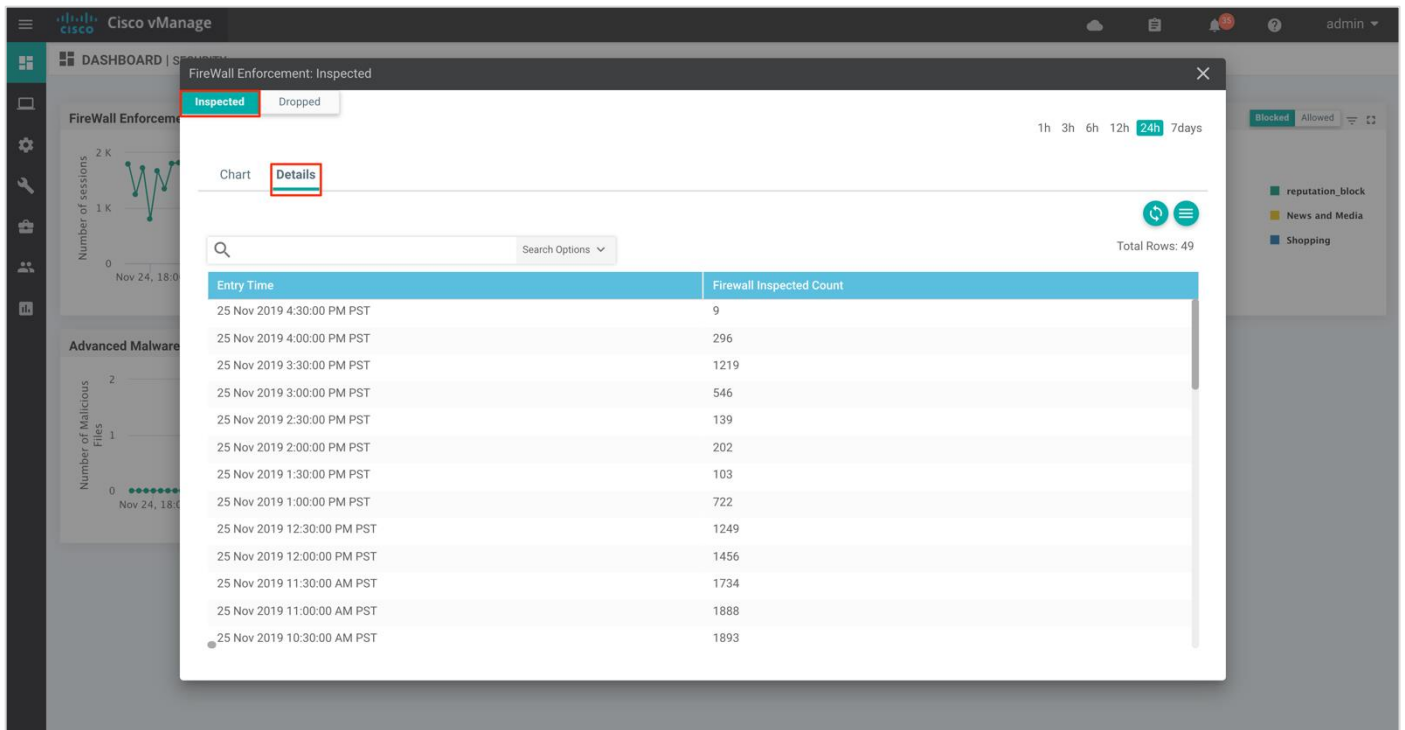


Step 4. Drilling down into the graph provides more information. Toggle between inspected and dropped packets and click on **1h, 3h, 6h, 12h, 24h (default)** or **7 days** to view the hourly, daily or weekly firewall statistics.

Chart displays the graphical representation of the firewall statistics for both traffic inspected and traffic dropped.



Details displays the Firewall Inspected/Dropped Count.



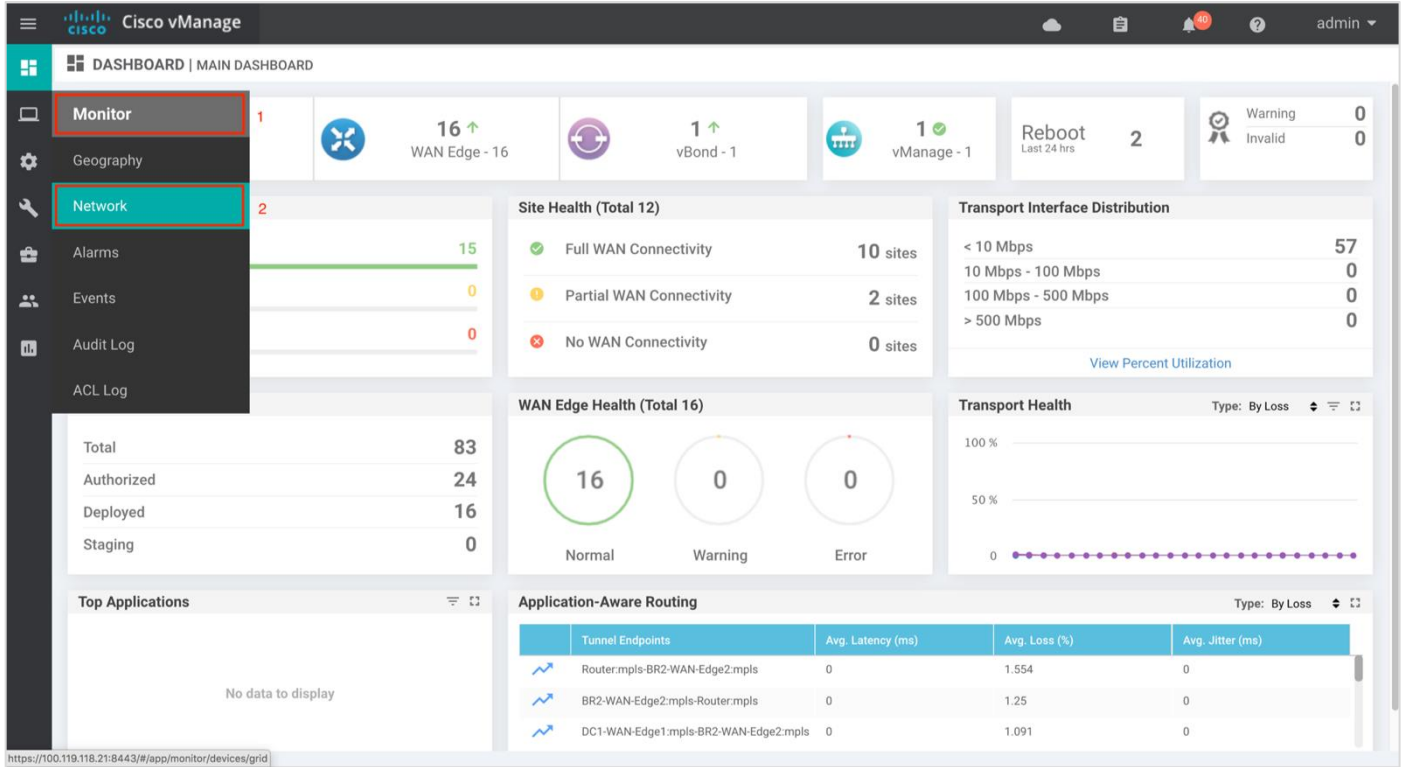
Technical Tip

To view the details such as IP address of the packet inspected or dropped, click on the peaks of the graphical representation.

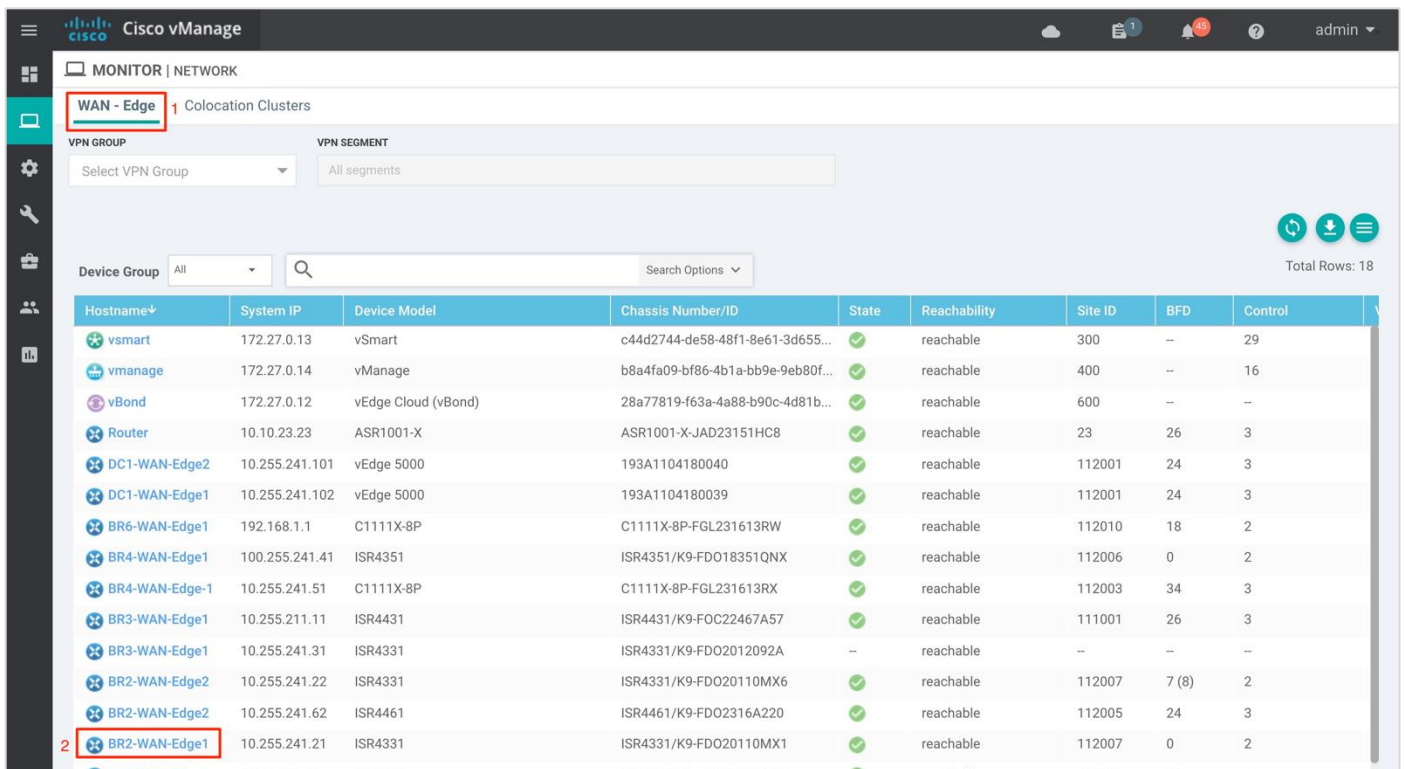
Procedure 2. Monitor the Firewall Feature via vManage Monitor Dashboard

Using the vManage NMS dashboard, you can view the Enterprise Firewall with Application Awareness statistics via the monitor dashboard.

Step 1. Navigate to **Network** within **Monitor** available on the left pane and click on the WAN Edge device you wish to monitor.



Step 2. Click on a specific WAN Edge device to monitor the firewall policy.



Step 3. Click on **Firewall Policy** tab under **Security Monitoring** from the left pane. Within the dashboard, you can view statistics for all the firewall policies created.

The screenshot shows the Cisco vManage interface for the Firewall Policy dashboard. The left sidebar has 'Firewall' selected under 'Security Monitoring'. The main area displays a bar chart of 'Bytes Transferred' for three policies: 'Compliance_FW_Policy_copy', 'DIA_Firewall_Policy', and 'DIA_Firewall_Policy_copy'. A tooltip for the second bar shows 'DIA_Firewall_Policy::INSIDE:OUTSIDE' and 'Byte Transferred: 92.29 KB'. Below the chart is a table with the following data:

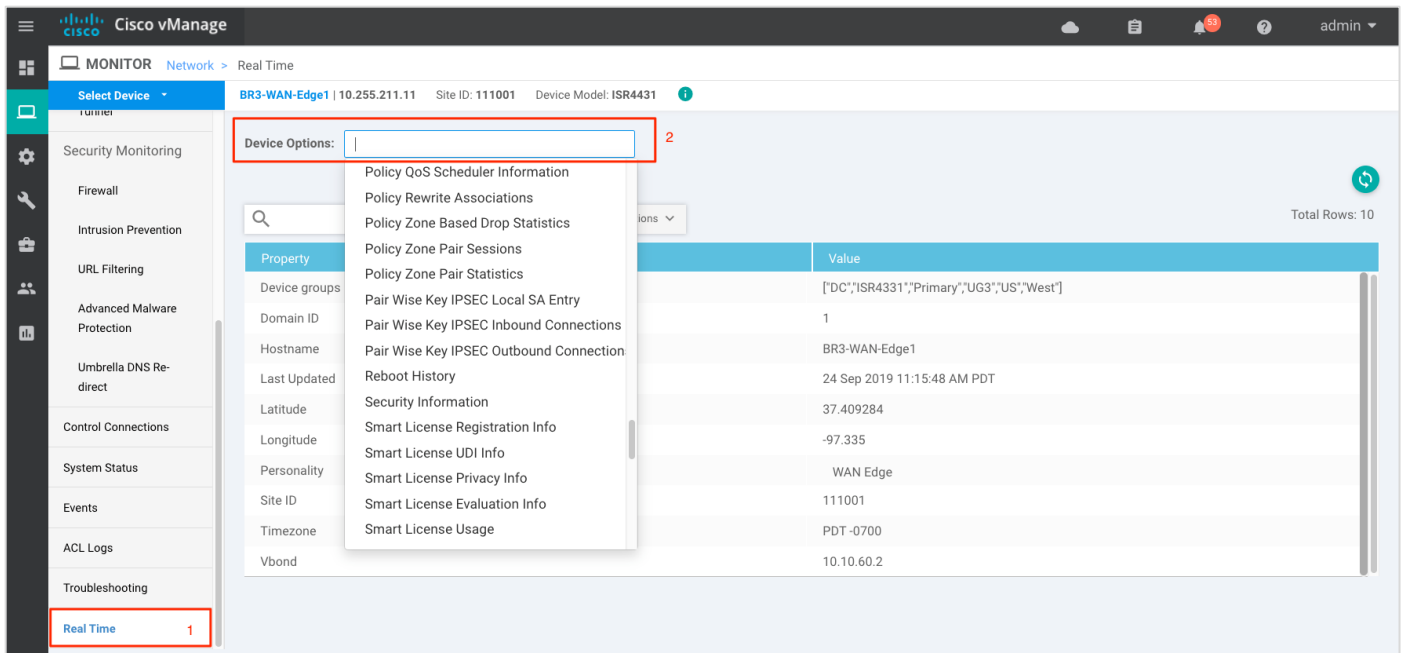
Policies	Source Zone	Destination Zone	Sequence Count	No. of Bytes Transferred
DIA_Firewall_Policy_copy	INSIDE	OUTSIDE	3	5227327
DIA_Firewall_Policy	INSIDE	OUTSIDE	2	94505
Compliance_FW_Policy_copy	INSIDE	INSIDE	2	28195

Step 4. As explained previously, the statistics within the **Network > Firewall** dashboard can be viewed either hourly, daily, weekly or for a customized period. To customize the time period, select **Custom** and then click on the calendar icon, to input the **Start date and time** followed by the **End Date and time**. Finally, click **Done**.

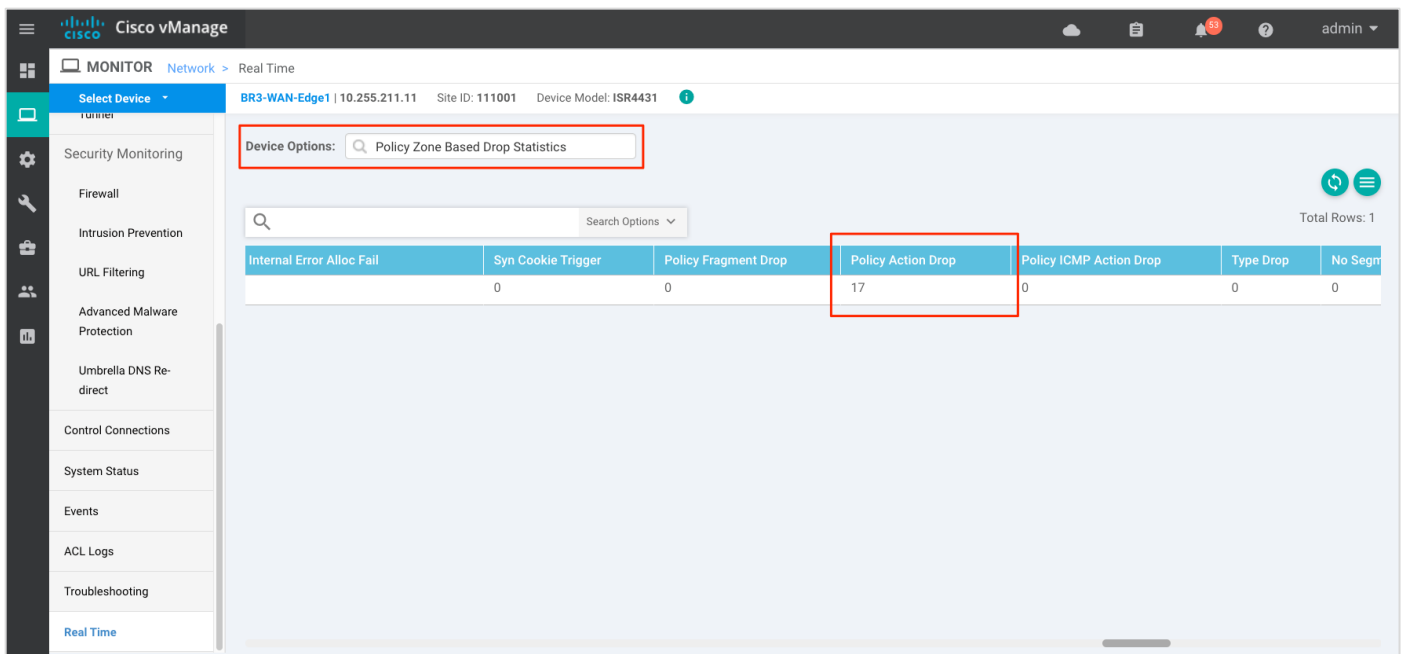
This screenshot shows the same dashboard as Step 3, but with the 'Custom' option selected in the time period dropdown. A dialog box is open for selecting a custom date range. The 'Start date and time' is '11-24-2019 00:00' and the 'End date and time' is '11-25-2019 06:06'. The 'DONE' button is highlighted. A tooltip for the bar chart shows 'DIA_Firewall_Policy_copy::INSIDE:OUTSIDE' and 'Byte Transferred: 2.15 MB'. The table below the chart shows the following data:

Policies	Source Zone	Destination Zone	Sequence Count	No. of Bytes Transferred
DIA_Firewall_Policy	INSIDE	OUTSIDE	3	2255921

Step 5. Click on **Real Time** from the left pane of the monitor dashboard. Within **Network > Real time**, a pop-up screen will appear with **Device Options**. Click on the search tab to populate a list of options that can be chosen to monitor, troubleshoot and manage your device.



Step 6. To view the drop statistics, click on **Policy Zone Based Drop Statistics**. This output displays counters that explains reasons for packet drops. In the figure, notice drops due to the action set within the policy.



Some of the other examples of packet drops include, **TCP Invalid TCP initiator** when the first packet from a TCP initiator is not a SYN (Non-initial TCP segment is received without a valid session). For instance, the initial SYN packet has the ACK flag set or **Syn flood** due to a TCP SYN flood attack.

Refer to the [ZBFW troubleshoot Guide](#) to get an understanding on firewall drop reasons and explanations. Although the document caters to IOS-XE WAN Edge devices, the explanation for packet drops may be useful.

Step 7. To view the zone pair session details, click on **Policy Zone Pair Sessions**.

The output displays the state of the session. It can be open, opening, closing or closed. For each individual session you can also find the session update timestamp, along with the source/ destination IP, source/

destination port and source/ destination VPN for the flow. Scroll further to the right, to find the title of the zone pair for the session, the title of the class-map which will be the same as the title of the main firewall policy, followed by TCP flag, total initiator bytes and responder bytes.

Device Options:

Search Options

Total Rows: 23

Last Updated	Session Id	State	Source IP	Destination IP	Source Port	Destination Port	Protocol
27 Sep 2019 ...	5143	open	10.10.1.1	216.58.194.195	44342	80	PROTO_L7_HTTP
27 Sep 2019 ...	5219	closing	10.10.1.1	172.217.164.118	58390	443	PROTO_L7_HTTPS
27 Sep 2019 ...	5157	open	10.10.1.1	23.63.74.40	55514	80	PROTO_L7_HTTP
27 Sep 2019 ...	5139	open	10.10.1.1	172.217.0.42	59076	443	PROTO_L7_HTTPS
27 Sep 2019 ...	5160	open	10.10.1.1	52.24.113.72	57560	443	PROTO_L7_HTTPS
27 Sep 2019 ...	5113	open	10.10.1.1	10.1.1.1	8	5316	PROTO_L4_ICMP
27 Sep 2019 ...	5128	open	10.10.1.1	72.21.91.29	47140	80	PROTO_L7_HTTP
27 Sep 2019 ...	5155	open	10.10.1.1	23.63.74.40	55512	80	PROTO_L7_HTTP
27 Sep 2019 ...	5120	open	10.10.1.1	52.24.113.72	57538	443	PROTO_L7_HTTPS
27 Sep 2019 ...	5184	open	10.10.1.1	216.58.194.195	44362	80	PROTO_L7_HTTP
27 Sep 2019 ...	5123	open	10.10.1.1	52.23.120.80	35986	443	PROTO_L7_HTTPS
27 Sep 2019 ...	5150	open	10.10.1.1	184.29.104.234	38018	443	PROTO_L7_HTTPS
27 Sep 2019 ...	5167	open	10.10.1.1	99.84.197.216	35042	443	PROTO_L7_HTTPS
27 Sep 2019 ...	5131	open	10.10.1.1	52.24.113.72	57546	443	PROTO_L7_HTTPS
27 Sep 2019 ...	5134	open	10.10.1.1	52.43.139.170	45044	443	PROTO_L7_HTTPS
27 Sep 2019 ...	5179	open	10.10.1.1	172.217.164.110	54584	443	PROTO_L7_HTTPS

Step 8. To view the zone pair statistics, click on **Policy Zone Pair Statistics**. Within this output, you can view the byte counters, attempted/ active/ half-open/ terminating sessions per zone-pair along with the policy title, protocol of the packet and the action applied to the packet.

In the figure, notice the action applied for two out of eight is inspect and drop.

Device Options:

Search Options

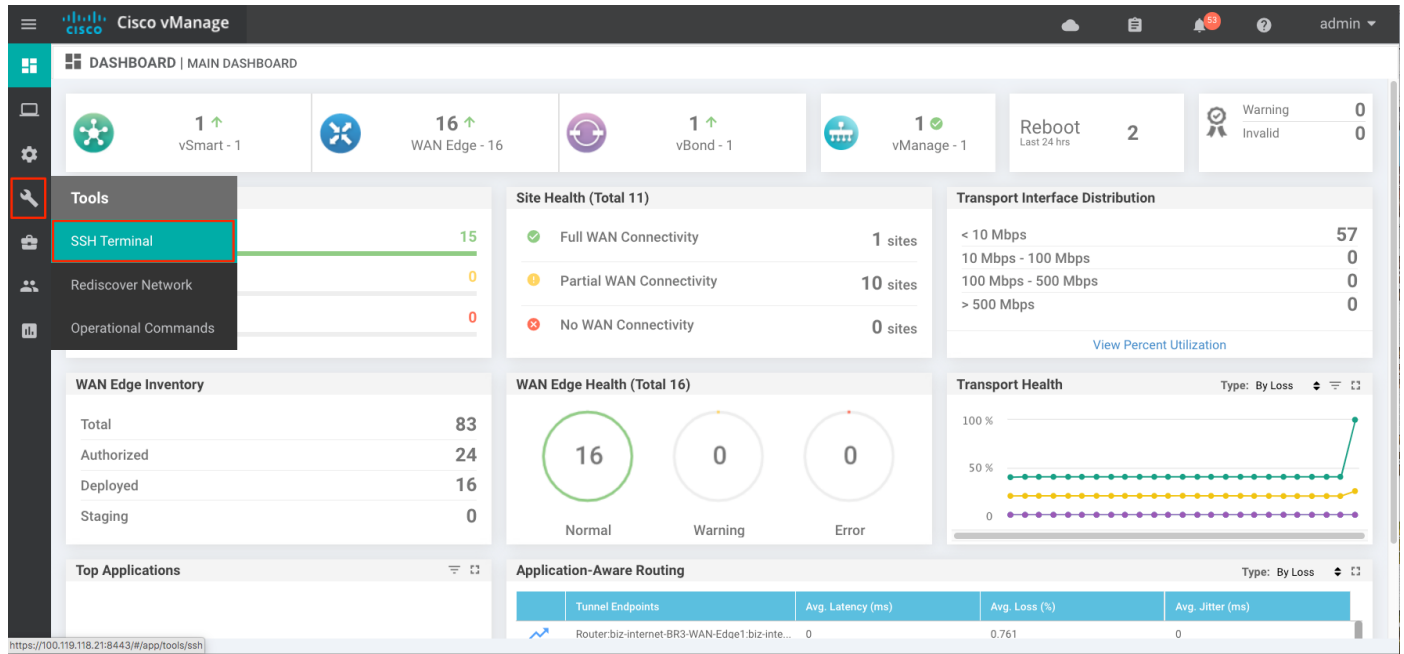
Total Rows: 8

Zone-Pair Name	Source Zone Name	Destination Zone Name	Policy Name	Class Name	Class Action	Packets Counter	Bytes Counter	Active Sessions
ZP_INSIDE_INSIDE...	INSIDE	INSIDE	Compliance_Fire...	Compliance_Fi...	Inspect	0	22879	2
ZP_INSIDE_INSIDE...	--	--	--	Compliance_Fi...	Inspect Drop	0	0	0
ZP_INSIDE_INSIDE...	--	--	--	Compliance_Fi...	Inspect	0	279975	15
ZP_INSIDE_INSIDE...	--	--	--	Compliance_Fi...	Inspect	0	13985285	40
ZP_INSIDE_INSIDE...	--	--	--	Compliance_Fi...	Inspect	0	0	0
ZP_INSIDE_INSIDE...	--	--	--	Compliance_Fi...	Inspect	0	0	0
ZP_INSIDE_INSIDE...	--	--	--	Compliance_Fi...	Inspect	0	0	0
ZP_INSIDE_INSIDE...	--	--	--	class-default	Inspect Drop	0	564	0

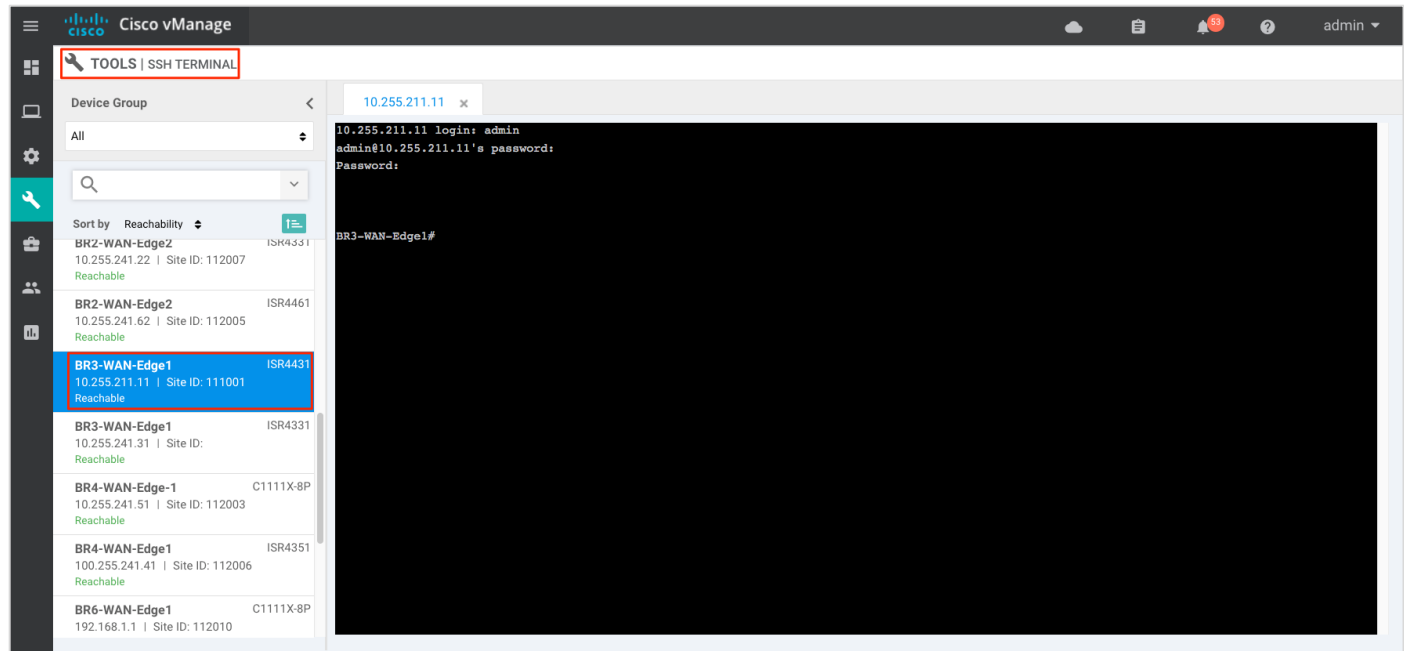
Procedure 3. Monitor the Firewall Feature and Statistics via vManage SSH Server Dashboard

Using the vManage NMS dashboard, you can monitor the traffic flow through the policy via CLI commands.

Step 1. Navigate to **Tools > SSH Terminal** available on the left pane.



Step 2. Select the device from the list devices, and login.



Step 3. To view the existing firewall sessions, enter the CLI command - **Show sdwan zonebfwdp sessions**.

BR3-WAN-Edge1#`sh sdwan zonebfwdp sessions`

SESSION ID	STATE	SRC IP	DST IP	PORT	PORT	PROTOCOL	NAT	SRC NAT INTERNAL	DST NAT INTERNAL	VPN ID	VPN ID	ZP NAME	APP
1282	open	10.10.1.1	8.8.4.4	36952	53	PROTO_L4_UDP	2	2	1	1	ZP_INSIDE_INSIDE		
Compliance_Firewall_Policy_Copy-seq-31-cm_ - 0 124 0													
1289	open	10.10.1.1	8.8.4.4	45741	53	PROTO_L4_UDP	2	2	1	1	ZP_INSIDE_INSIDE		
Compliance_Firewall_Policy_Copy-seq-31-cm_ - 0 68 0													
1294	open	10.10.1.1	8.8.8.8	42615	53	PROTO_L4_UDP	2	2	1	1	ZP_INSIDE_INSIDE		
Compliance_Firewall_Policy_Copy-seq-31-cm_ - 0 60 0													
1276	open	10.10.1.1	8.8.4.4	43454	53	PROTO_L4_UDP	2	2	1	1	ZP_INSIDE_INSIDE		
Compliance_Firewall_Policy_Copy-seq-31-cm_ - 0 136 0													
1283	open	10.10.1.1	8.8.4.4	60838	53	PROTO_L4_UDP	2	2	1	1	ZP_INSIDE_INSIDE		
Compliance_Firewall_Policy_Copy-seq-31-cm_ - 0 176 0													

Step 4. To view the firewall drop counters, enter the CLI command - *Show platform hardware qfp active feature firewall drop.*

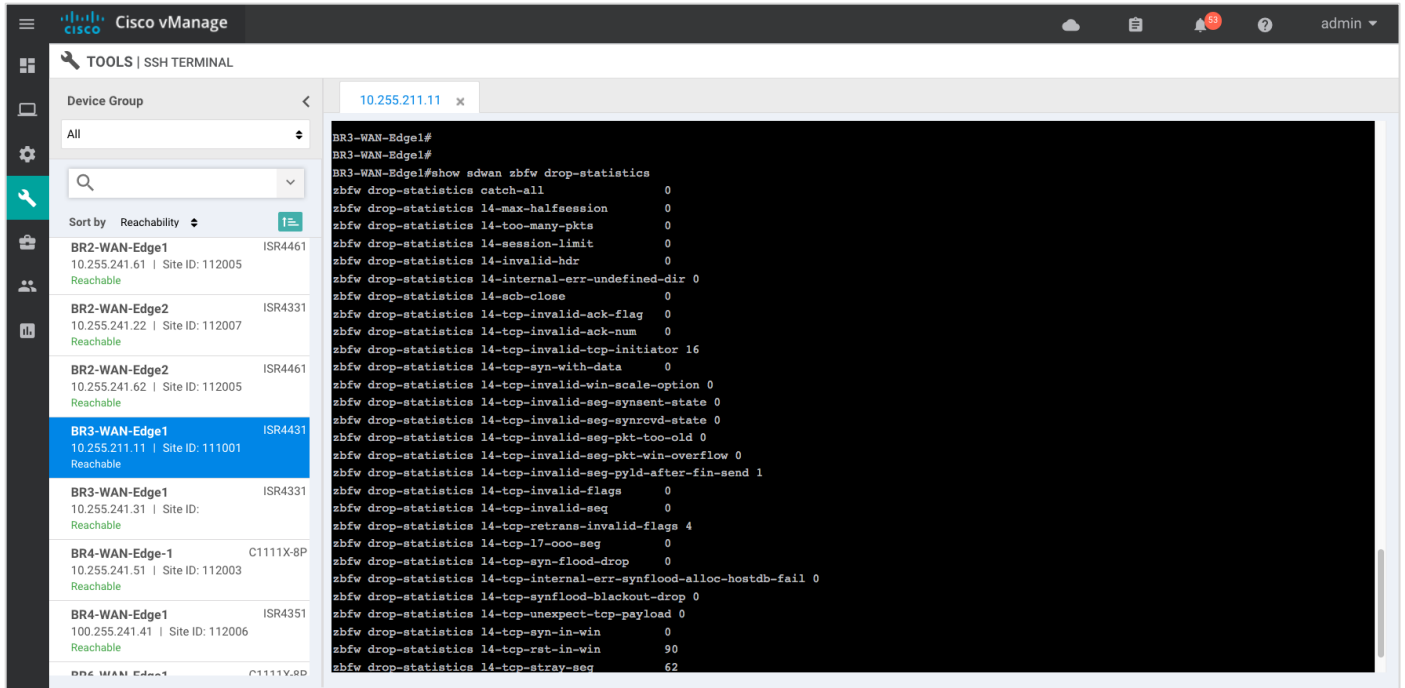
BR3-WAN-Edge1#`show platform hardware qfp active feature firewall drop`

Drop Reason	Packets
Invalid TCP initiator	16
TCP extra payload after FIN	1
Retrans with invalid flags	4
RST inside current window	90
Stray Segment	62
Same zone without Policy	1
Policy drop:classify result	17

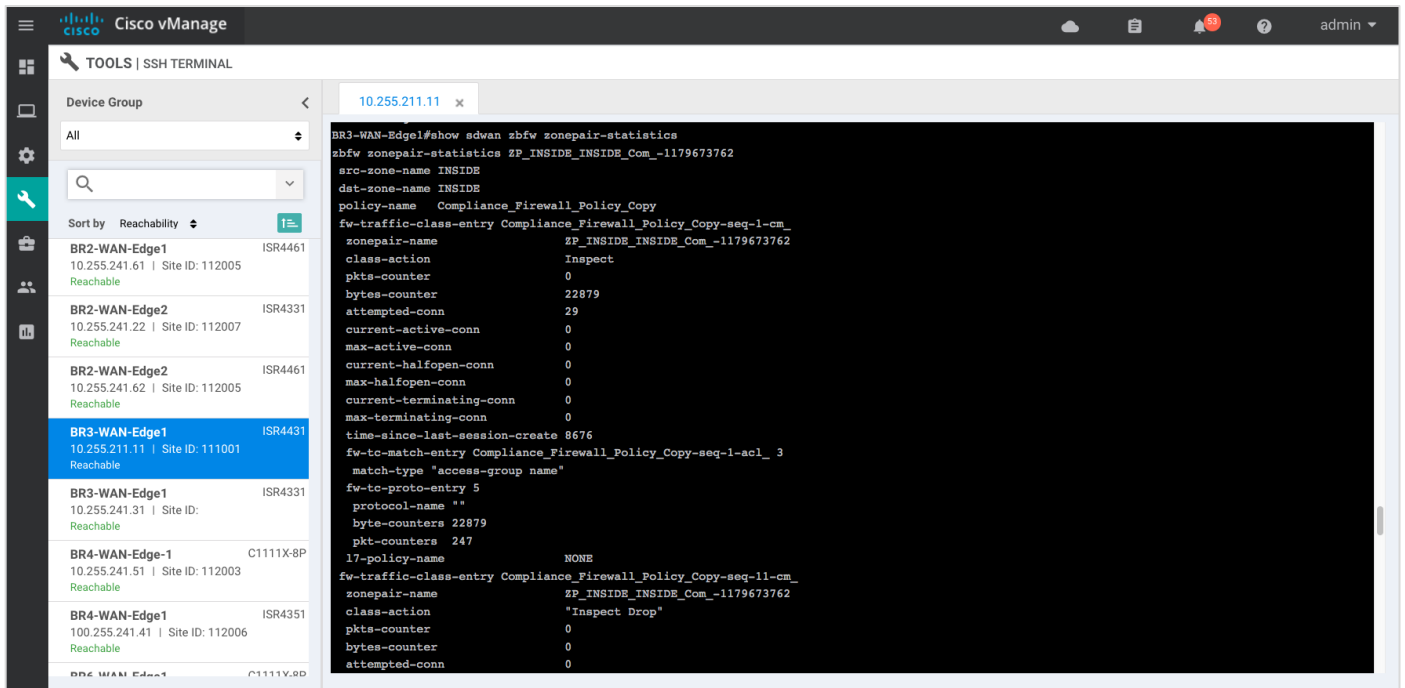
Technical Tip

Clear the drop counters before troubleshooting firewall packet drop. To do so, use the command *Show platform hardware qfp active feature firewall drop clear.*

Step 5. To view the overall firewall, drop statistics, enter the CLI command - *Show sdwan zbfw drop-statistics.*



Step 6. To view the zone-pair statistics, enter the CLI command - **Show sdwan zbwf zonepair-statistics**.



Outside the listed CLI commands, some of the other useful CLI commands include **show log** and **show zone security** to view error logs and zone pairs.

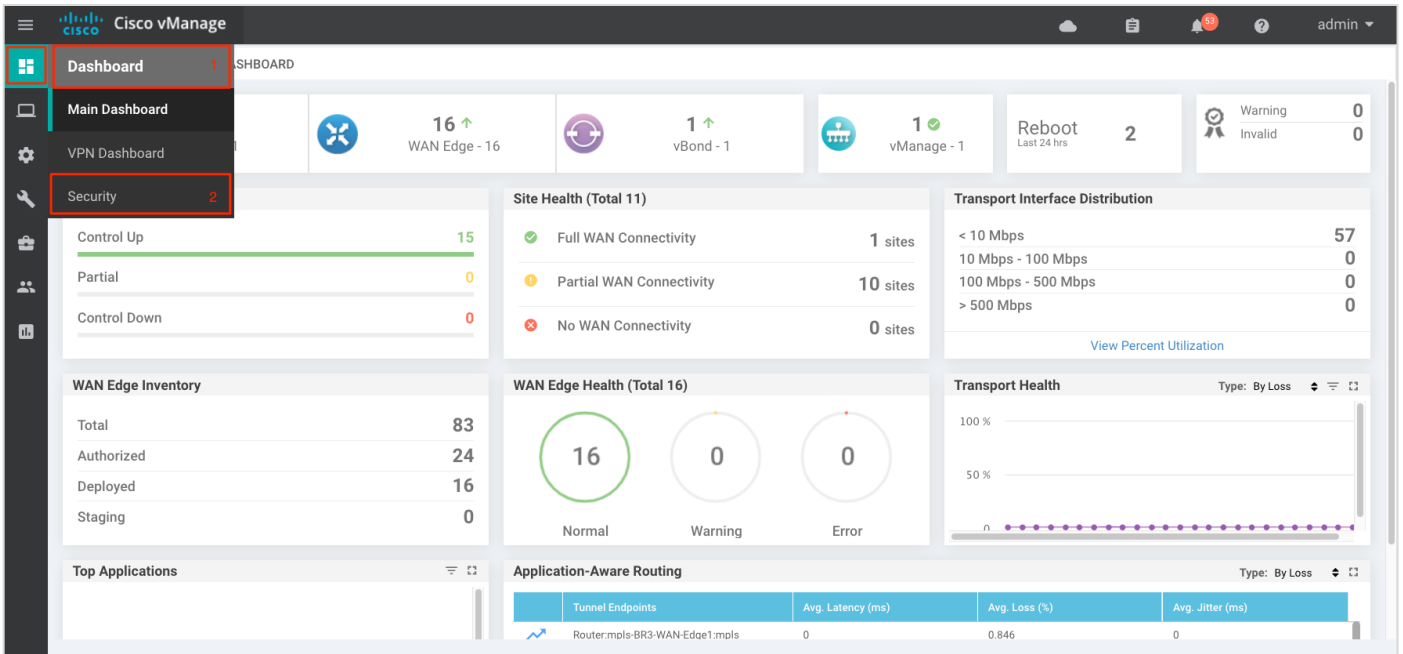
Process 4: Monitor URL Filtering Feature via vManage NMS

Using the vManage NMS dashboard, you can monitor the URL Filtering feature via vManage NMS.

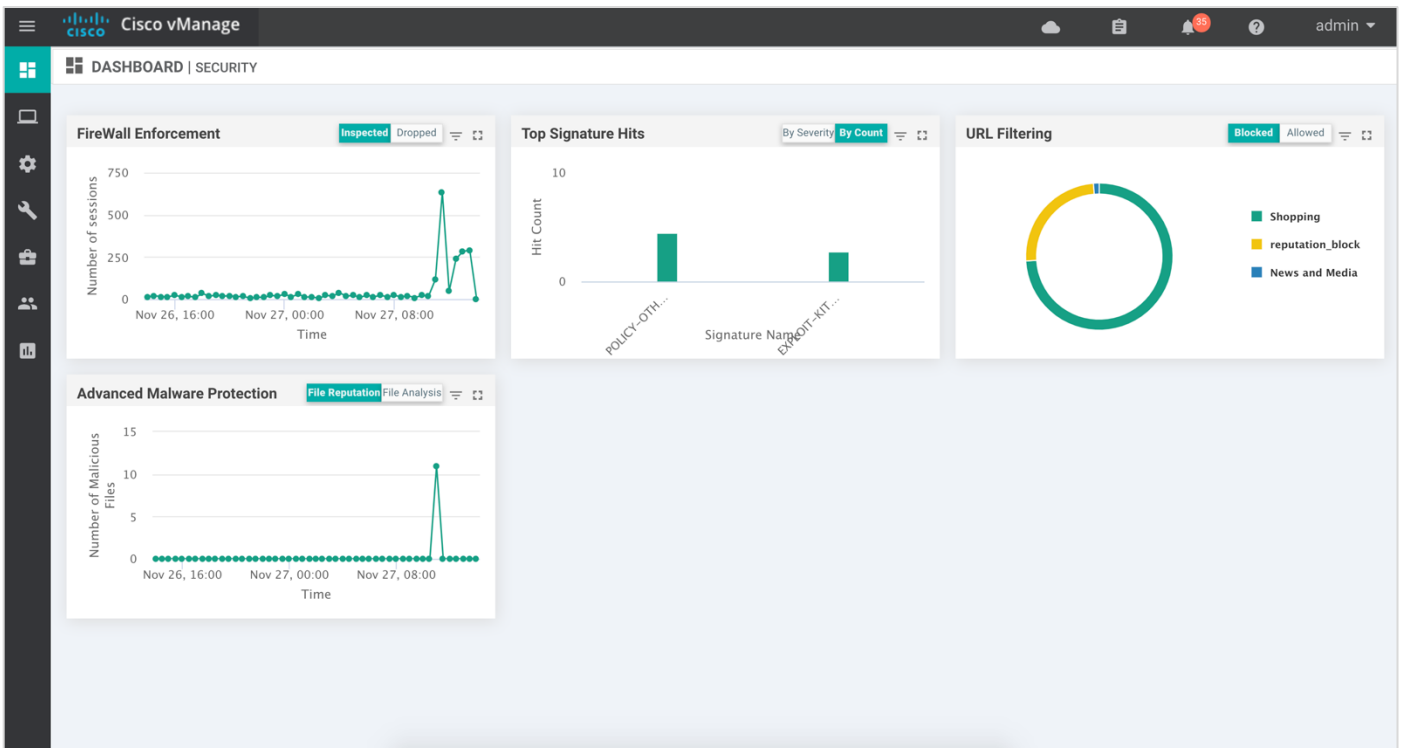
Procedure 1. Monitor URL Filtering Signature Violations via vManage Main Dashboard

Using vManage NMS, you can monitor the URL Filtering feature for a WAN Edge device by web categories using the following steps.

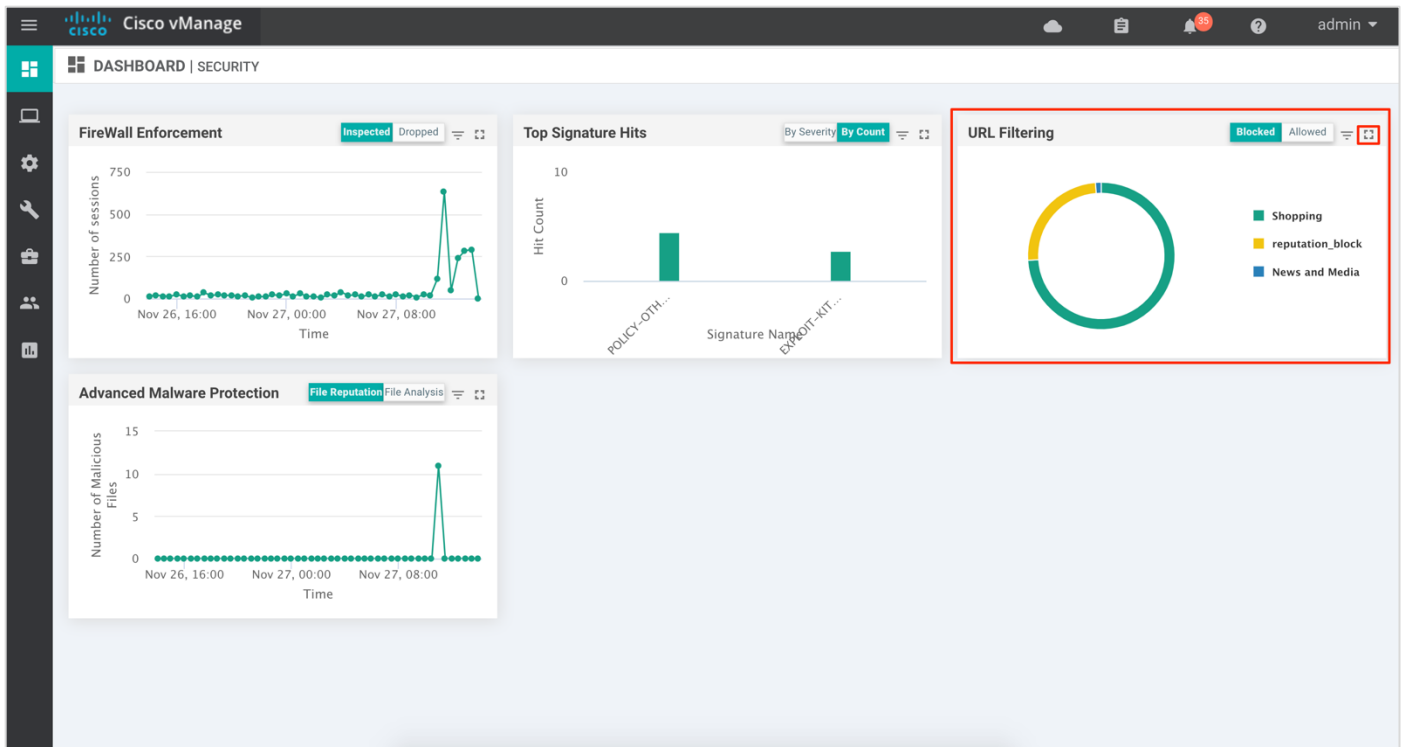
Step 1. Navigate to Dashboard > Security.



Step 2. The following screenshot displays the overall security dashboard.

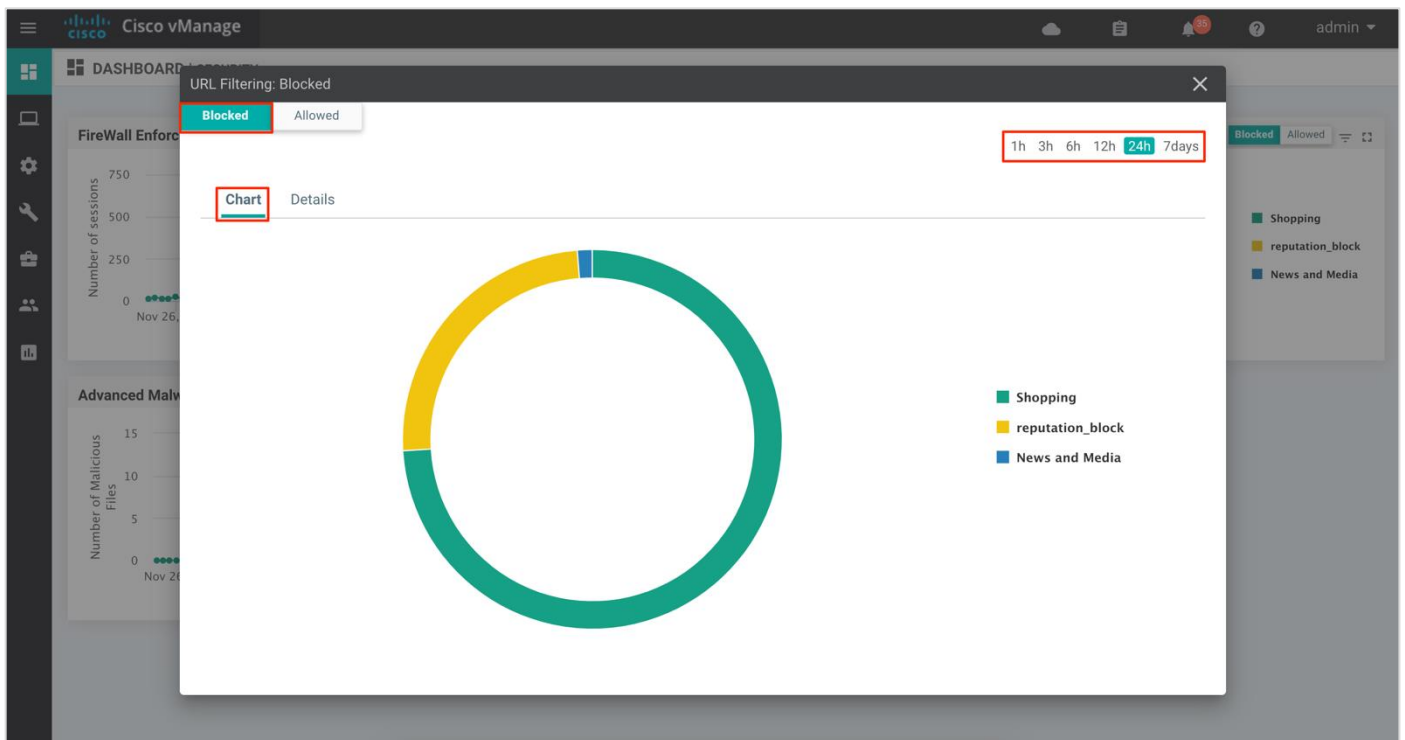


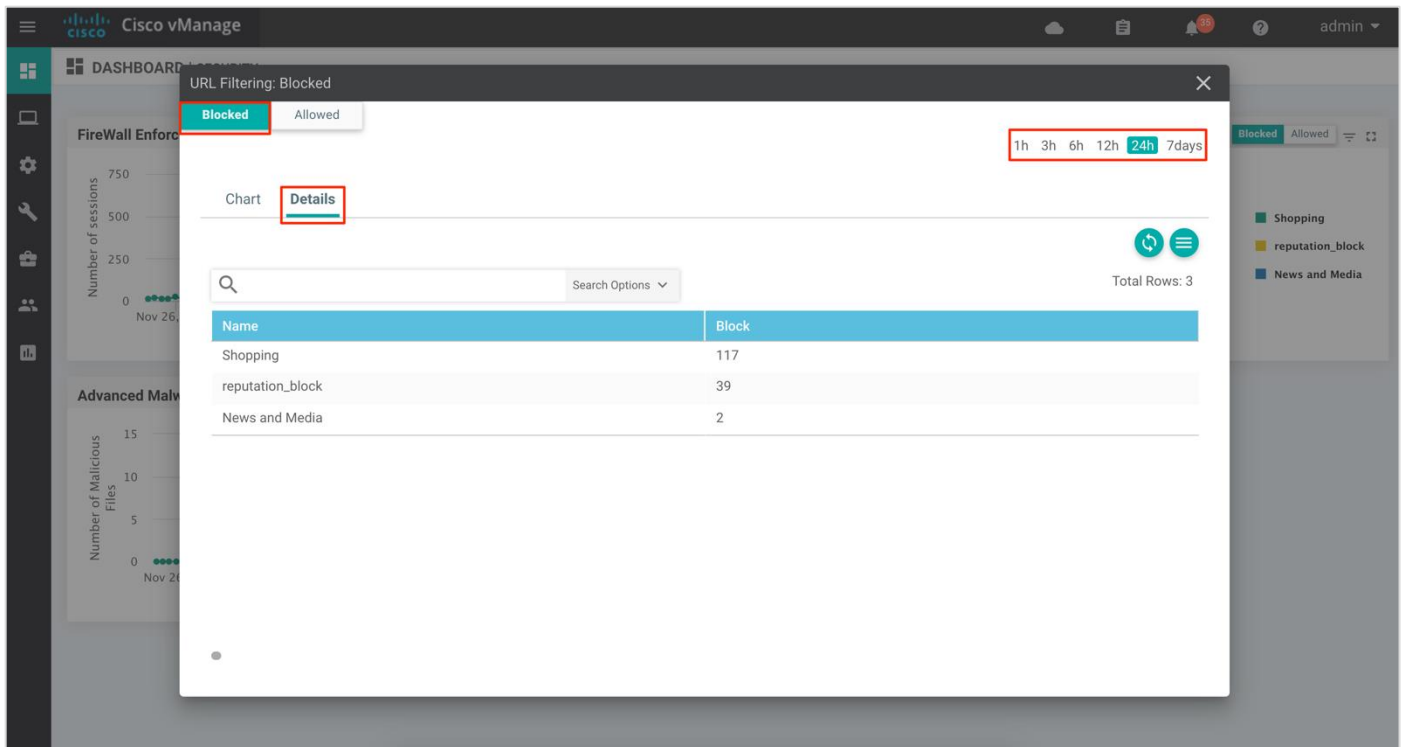
Step 3. To take a closer look into the Web Categories within URL Filtering, click on the square box [] on the top right.



Drill down into the URL Filtering graph for more information on the categories blocked and allowed for 1h, 3h, 6h, 12h, 24h (default) or 7 days.

Some of the categories blocked are displayed below,

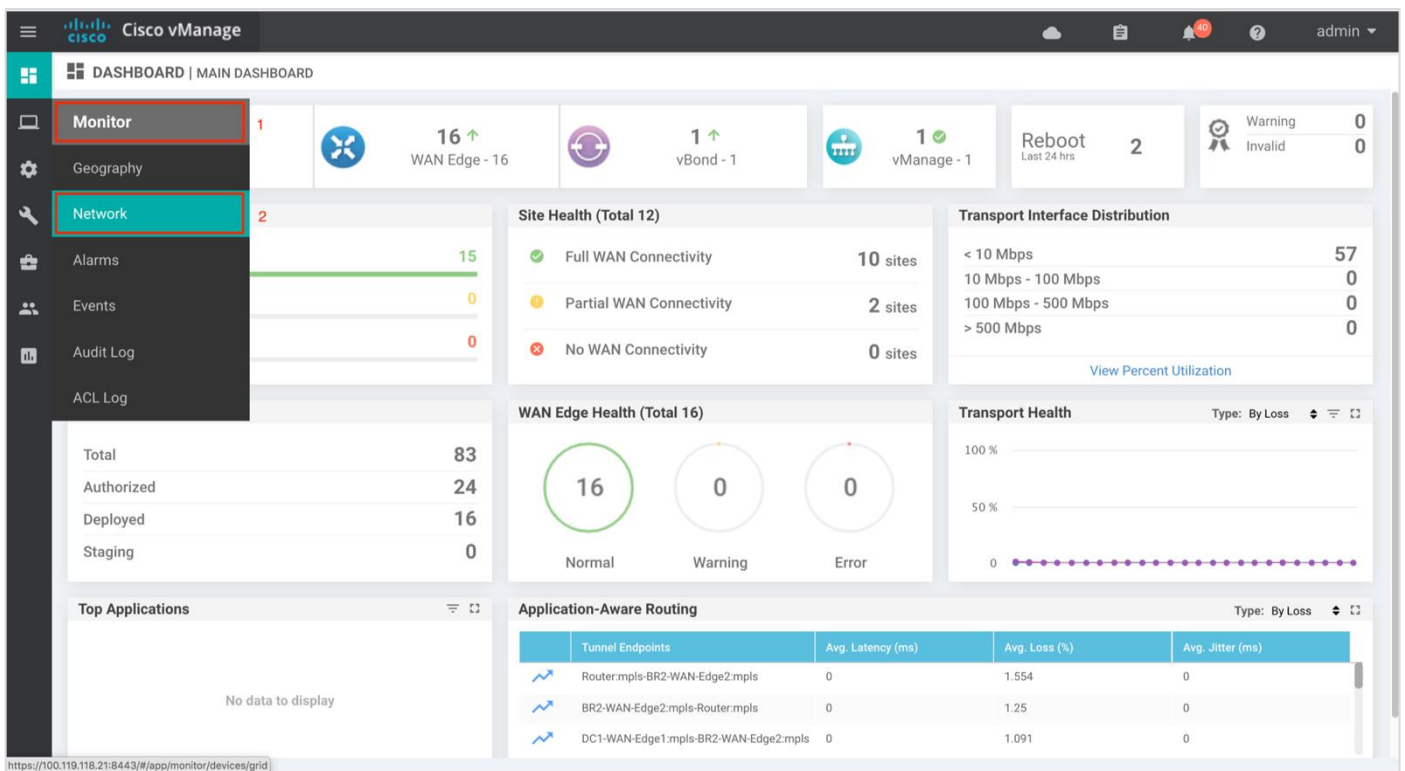




Procedure 2. Monitor URL Filtering Feature via vManage Monitor Dashboard

Using the vManage NMS dashboard, you can view the URL Filtering feature via the monitor dashboard contained within vManage.

Step 1. Navigate to Network within Monitor available on the left pane and click on the WAN Edge device you wish to monitor.



Step 2. Click on a specific WAN Edge device to monitor the URL Filtering policy.

The screenshot shows the Cisco vManage interface. In the top left, the 'MONITOR | NETWORK' section is active. Underneath, the 'WAN - Edge' tab is selected, with a red box around it and a '1' next to it. Below this, there are filters for 'VPN GROUP' and 'VPN SEGMENT'. A 'Device Group' dropdown is set to 'All'. A search bar is present. The main area displays a table of devices with columns: Hostname, System IP, Device Model, Chassis Number/ID, State, Reachability, Site ID, BFD, and Control. The 'BR2-WAN-Edge1' device is highlighted with a red box and a '2' next to it.

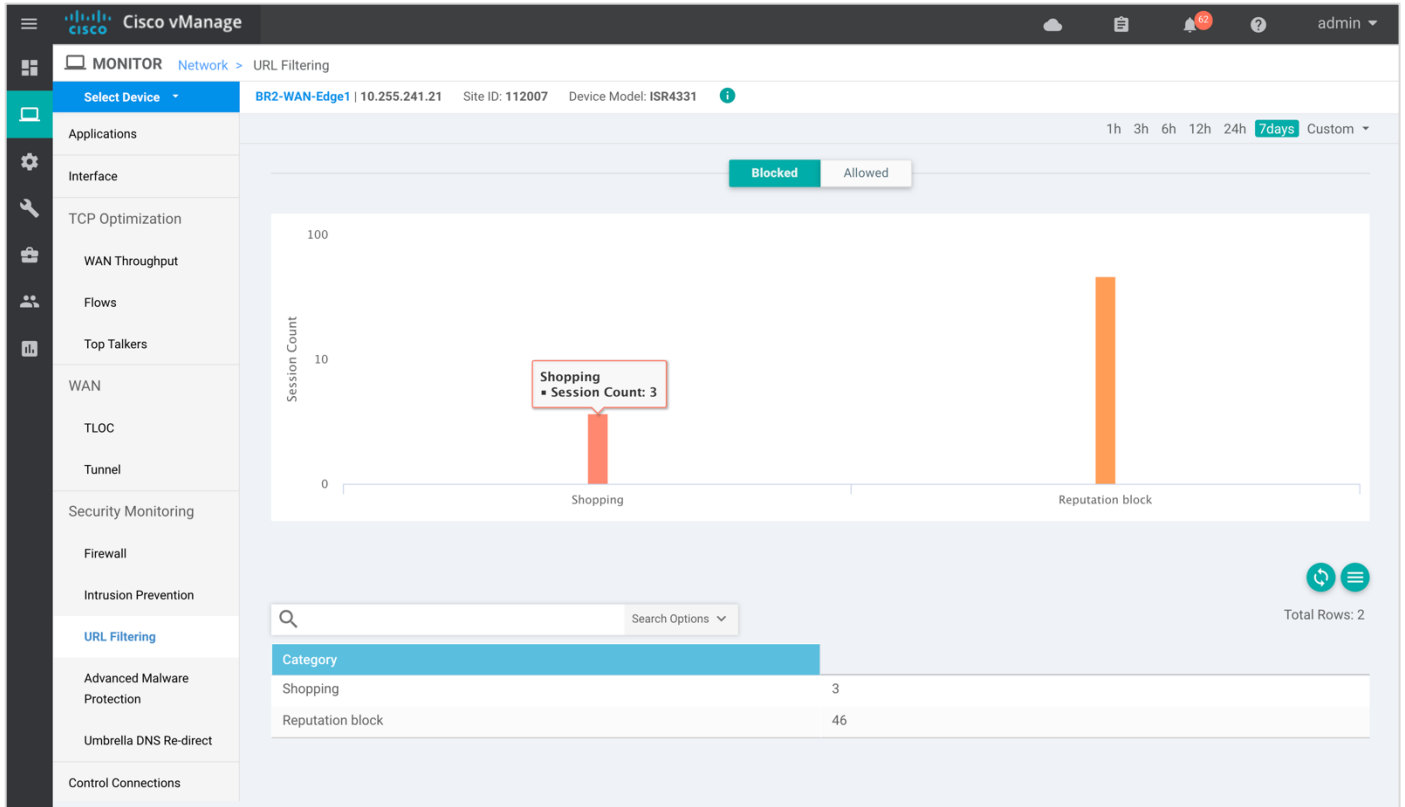
Hostname	System IP	Device Model	Chassis Number/ID	State	Reachability	Site ID	BFD	Control
vsmart	172.27.0.13	vSmart	c44d2744-de58-48f1-8e61-3d655...	✓	reachable	300	--	29
vmanage	172.27.0.14	vManage	b8a4fa09-bf86-4b1a-bb9e-9eb80f...	✓	reachable	400	--	16
vBond	172.27.0.12	vEdge Cloud (vBond)	28a77819-f63a-4a88-b90c-4d81b...	✓	reachable	600	--	--
Router	10.10.23.23	ASR1001-X	ASR1001-X-JAD23151HC8	✓	reachable	23	26	3
DC1-WAN-Edge2	10.255.241.101	vEdge 5000	193A1104180040	✓	reachable	112001	24	3
DC1-WAN-Edge1	10.255.241.102	vEdge 5000	193A1104180039	✓	reachable	112001	24	3
BR6-WAN-Edge1	192.168.1.1	C1111X-8P	C1111X-8P-FGL231613RW	✓	reachable	112010	18	2
BR4-WAN-Edge1	100.255.241.41	ISR4351	ISR4351/K9-FDO18351QNX	✓	reachable	112006	0	2
BR4-WAN-Edge-1	10.255.241.51	C1111X-8P	C1111X-8P-FGL231613RX	✓	reachable	112003	34	3
BR3-WAN-Edge1	10.255.211.11	ISR4431	ISR4431/K9-FOC22467A57	✓	reachable	111001	26	3
BR3-WAN-Edge1	10.255.241.31	ISR4331	ISR4331/K9-FDO2012092A	--	reachable	--	--	--
BR2-WAN-Edge2	10.255.241.22	ISR4331	ISR4331/K9-FDO20110MX6	✓	reachable	112007	7 (8)	2
BR2-WAN-Edge2	10.255.241.62	ISR4461	ISR4461/K9-FDO2316A220	✓	reachable	112005	24	3
BR2-WAN-Edge1	10.255.241.21	ISR4331	ISR4331/K9-FDO20110MX1	✓	reachable	112007	0	2

Step 3. In the left panel, under **Security Monitoring**, select **URL Filtering** tab. Click on the **Blocked** tab.

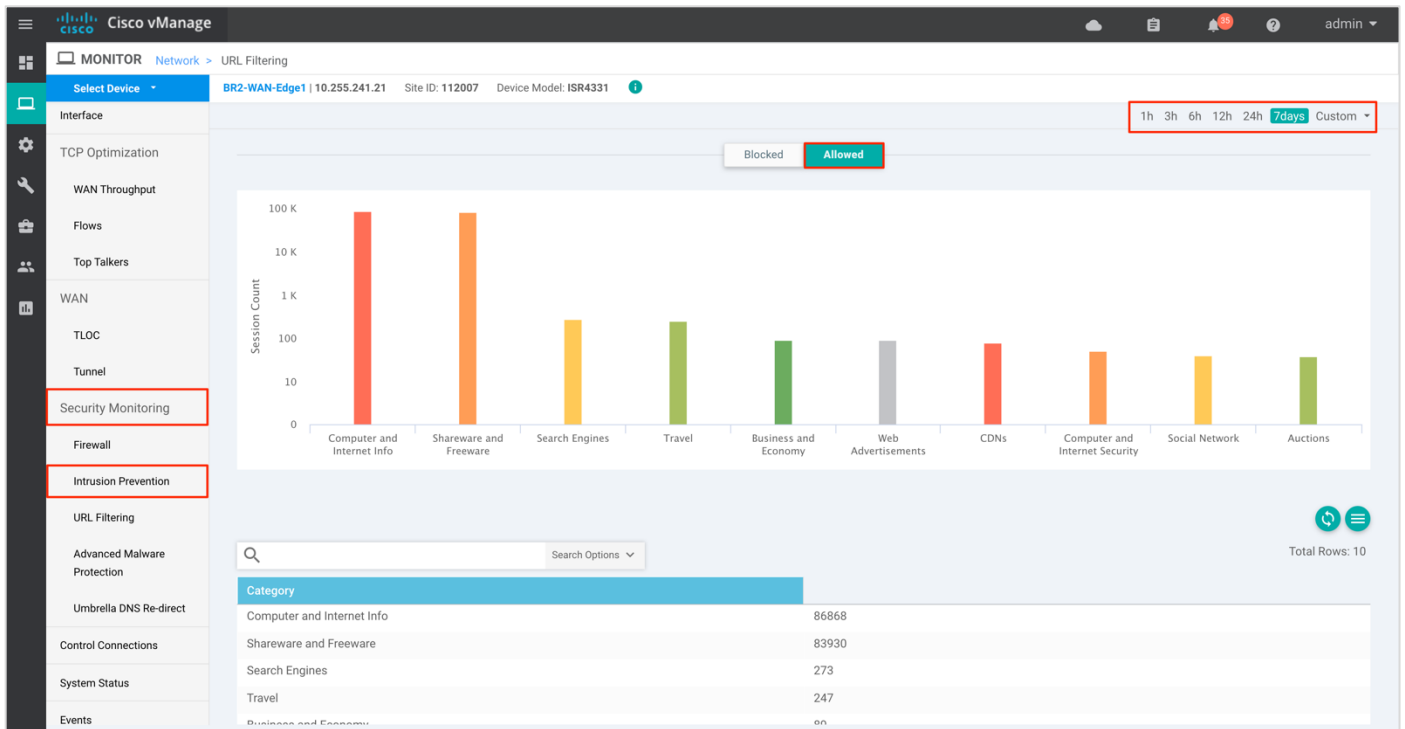
The screenshot shows the Cisco vManage interface. In the top left, the 'MONITOR | Network > URL Filtering' section is active. Below this, there are filters for 'Select Device', 'Site ID', and 'Device Model'. The 'BR2-WAN-Edge1' device is selected. In the top right, there are time range filters: '1h', '3h', '6h', '12h', '24h', '7days', and 'Custom'. The 'Blocked' tab is selected, with a red box around it and a '3' next to it. Below this, there is a bar chart showing 'Session Count' for various categories. The 'Reputation block' category has the highest session count. Below the chart, there is a table showing the session counts for each category.

Category	Session Count
Job Search	43
News and Media	19
Social Network	16
Shopping	13
Reputation block	87701

Note: The session count for the blocked URL appears by clicking on the graph.



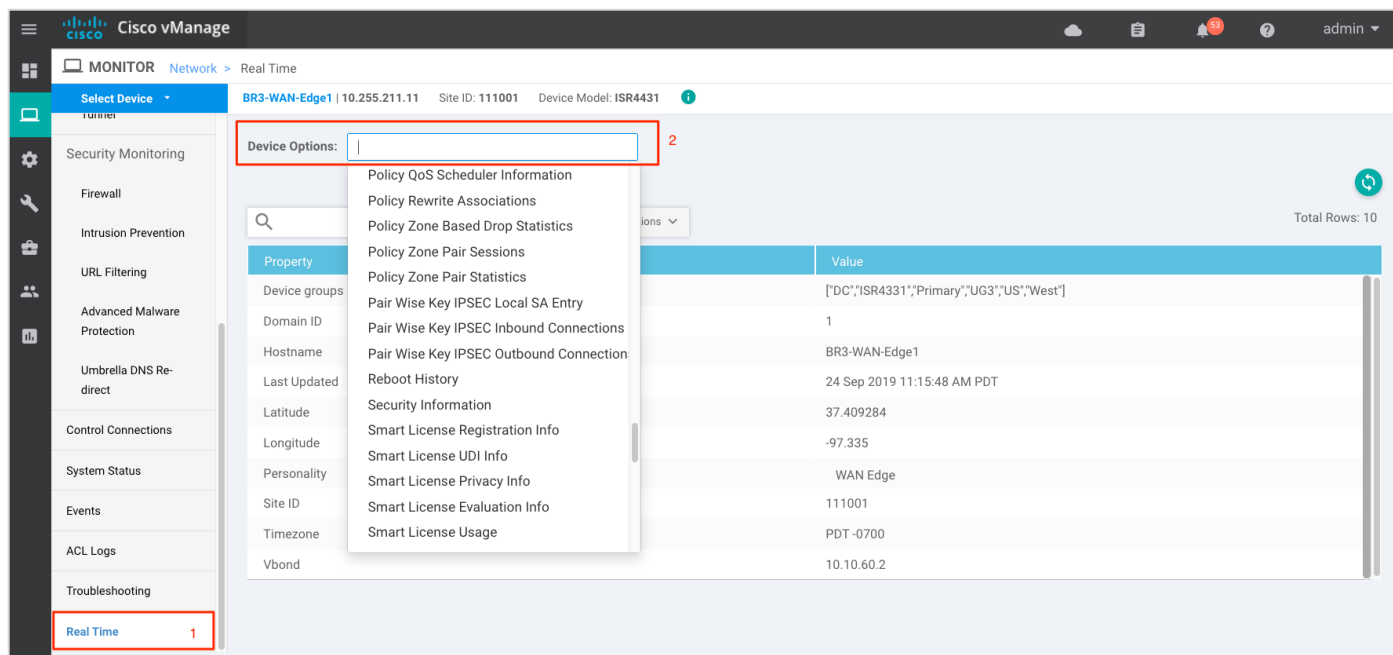
Step 4. Click on **Allowed** tab to view the session count on allowed URLs.



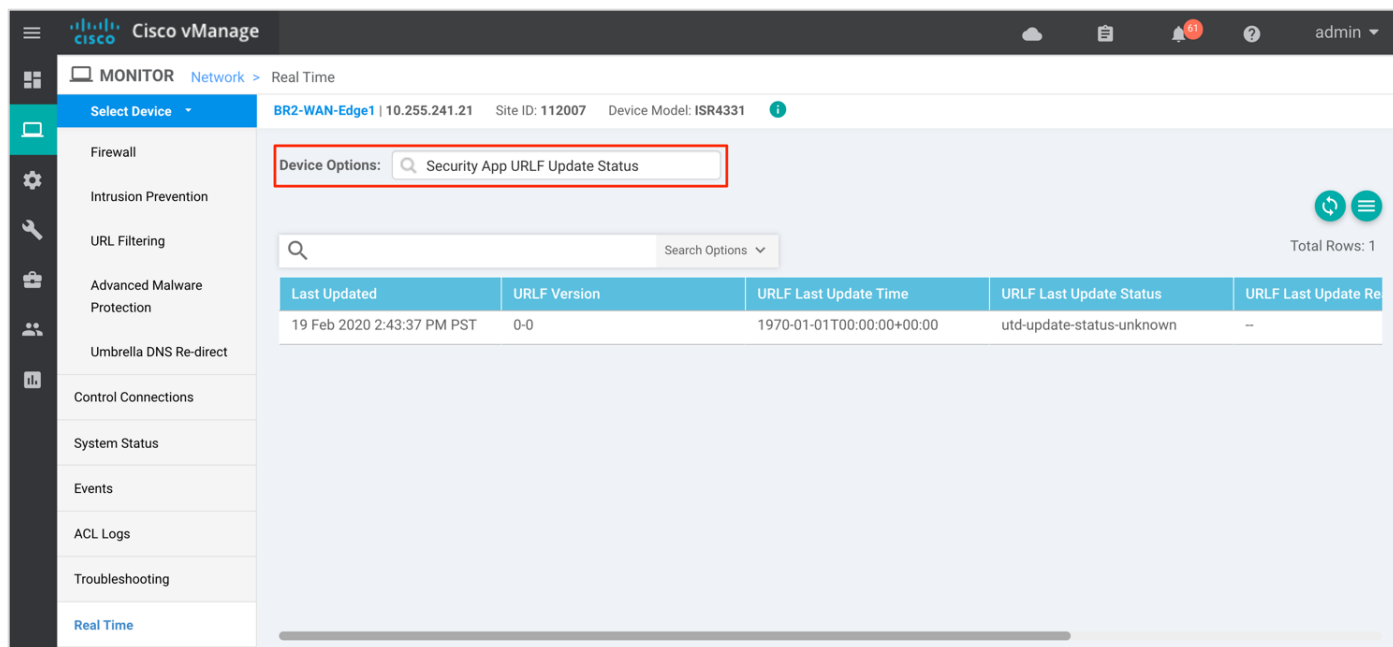
Technical Tip

To customize the time period, select Custom and click on the calendar icon to enter the Start date and time followed by End Date and time. Finally, click Done.

Step 5. Next, click on **Real Time** from the left pane. Within **Network > Real time** and a screen will appear with **Device Options**. Click on the search tab to populate a list of options that can be chosen to monitor, troubleshoot and manage your device.



Step 6. To view the status of URL Filtering update, click on **Security App URLF Update Status**.



Procedure 3. Monitor URL Filtering Feature and Statistics via vManage SSH Server Dashboard

Using the vManage NMS dashboard, you can monitor the URL Filtering feature via CLI commands.

Step 1. Navigate to **Tools > SSH Terminal** available on the left pane.

The screenshot shows the Cisco vManage Dashboard with the following components:

- Top Navigation:** Cisco vManage logo, user 'admin', and navigation icons.
- Dashboard Summary:**
 - vSmart - 1 (up arrow)
 - WAN Edge - 16 (up arrow)
 - vBond - 1 (up arrow)
 - vManage - 1 (up arrow)
 - Reboot (Last 24 hrs) - 2
 - Warning - 0
 - Invalid - 0
- Tools Menu:** SSH Terminal (highlighted), Rediscover Network, Operational Commands.
- Site Health (Total 11):**
 - Full WAN Connectivity: 1 sites
 - Partial WAN Connectivity: 10 sites
 - No WAN Connectivity: 0 sites
- Transport Interface Distribution:**
 - < 10 Mbps: 57
 - 10 Mbps - 100 Mbps: 0
 - 100 Mbps - 500 Mbps: 0
 - > 500 Mbps: 0
- WAN Edge Inventory:**
 - Total: 83
 - Authorized: 24
 - Deployed: 16
 - Staging: 0
- WAN Edge Health (Total 16):**
 - Normal: 16
 - Warning: 0
 - Error: 0
- Transport Health:** Line graph showing health metrics over time.
- Application-Aware Routing:** Table with columns: Tunnel Endpoints, Avg. Latency (ms), Avg. Loss (%), Avg. Jitter (ms). Row: Router.biz-internet-BR3-WAN-Edge1.biz-inte... with values 0, 0.761, 0.

Step 2. Select the device from the list devices, and login.

The screenshot shows the Cisco vManage SSH Terminal interface with the following components:

- Header:** TOOLS | SSH TERMINAL
- Device Group:** 10.255.211.11
- Terminal Output:**

```
10.255.211.11 login: admin
admin@10.255.211.11's password:
Password:
BR3-WAN-Edge1#
```
- Device List:**
 - BR2-WAN-Edge2 (ISR4331) - 10.255.241.22 | Site ID: 112007 - Reachable
 - BR2-WAN-Edge2 (ISR4461) - 10.255.241.62 | Site ID: 112005 - Reachable
 - BR3-WAN-Edge1 (ISR4431) - 10.255.211.11 | Site ID: 111001 - Reachable**
 - BR3-WAN-Edge1 (ISR4331) - 10.255.241.31 | Site ID: - Reachable
 - BR4-WAN-Edge-1 (C1111X-8P) - 10.255.241.51 | Site ID: 112003 - Reachable
 - BR4-WAN-Edge1 (ISR4351) - 100.255.241.41 | Site ID: 112006 - Reachable
 - BR6-WAN-Edge1 (C1111X-8P) - 192.168.1.1 | Site ID: 112010 - Reachable

Step 3. Enter the following CLI command to view the container log file. Note, the log file is always copied into flash memory which contains error messages and other logs that may help decode the reason for failure.

- app-hosting move appid utd log to bootflash:
- more /compressed <Filename.bin.gz>

The screenshot shows the Cisco vManage interface. On the left, a sidebar contains navigation icons, with the 'Tools' icon highlighted. The main area is split into two panes. The left pane, titled 'Device Group', displays a list of devices with columns for name, IP address, Site ID, and status. The device 'BR2-WAN-Edge1' with IP 10.255.241.21 and Site ID 112007 is selected and highlighted in blue. The right pane is an SSH terminal window for the selected device, showing a series of 'BR2-WAN-Edge1#' prompts. The terminal output includes the command 'app-hosting move appid utd log to bootflash:', the message 'Successfully moved tracelog to bootflash:', and the command 'iox_utd_R0-0_R0-0.14086_0.20200129165805.bin.gz'. It also shows the output of the 'more' command, displaying system logs for 'CLIMGR' and 'clim_common_init'.

Technical Tip

The provisioned containers use OpenDNS server 208.67.222.222 and 208.67.220.220.

Step 4. To view the session events that are dropped based on category reputation or those which are either blacklisted/whitelisted, enter the CLI command - **Show utd engine standard logging events**. However, note that the **Alerts** tab within the URL Filtering policy must be enabled to see relevant logs under this show command.

The screenshot shows the Cisco vManage interface with an SSH terminal window. The terminal is connected to device 10.255.241.21. The user has entered the command `show utd engine standard statistics url-filtering`. The output displays UTM Preprocessor Statistics for the device BR2-WAN-Edge1.

```

BR2-WAN-Edge1#
BR2-WAN-Edge1#
BR2-WAN-Edge1#show utd engine standard statistics url-filtering
UTM Preprocessor Statistics
-----
URL Filter Requests Sent:          25      3
URL Filter Response Received:     25      3
Blacklist Hit Count:              0      0
Whitelist Hit Count:              0      0

Reputation Lookup Count:          25      3
Reputation Action Block:          25      3
Reputation Action Pass:           0      0
Reputation Action Default Pass:   0      0
Reputation Action Default Block:  0      0
Reputation Score None:            0      0
Reputation Score Out of Range:    0      0

Category Lookup Count:            25      3
Category Action Block:            0      0
Category Action Pass:             25      3
Category Action Default Pass:     0      0
Category None:                    0      0
Category Out of Range:            0      0
  
```

Some additional commands include, `show utd engine standard config` and `show utd engine standard global`.

Process 5: Monitor URL Filtering via Syslog Server

Log into the syslog server and view the error logs. In the logs, you can view the host IP, VRF ID, destination IP, along with details such as the reputation Pass score of the website dropped based on the category.

Date	Time	Priority	Hostname	Message
02-19-2020	20:44:43	User.Critical	30.100.1.1	213.211.198.62:80 -> 10.10.1.1:48224
02-19-2020	20:44:43	User.Critical	30.100.1.1	2020/02/19-17:06:43.146756 PDT [**] [Hostname: 10.255.241.21] [**] [Instance_ID: 1] [**] Drop [**] [1:37732:3] POLICY-OTHER eicar test string download attempt [**] [Classification: Misc activity] [Priority: 3] [VRF: 1] {TCP} 213.211.198.62:80 -> 10.10.1.1:48224
02-19-2020	20:44:09	User.Critical	30.100.1.1	2020/02/19-17:06:43.130000 PDT [**] [Hostname: 10.255.241.21] [**] [Instance_ID: 1] [**] Drop [**] UTD WebFilter Category/Reputation [**] [URL: www.eicar.org/download/eicar.com.txt] [**] [Category: Computer and Internet Security] [**] [Reputation: 33] [VRF: 1] {TCP} 213.211.198.62:80 -> 10.10.1.1:48224
02-19-2020	20:44:09	User.Critical	30.100.1.1	2020/02/19-17:06:09.839205 PDT [**] [Hostname: 10.255.241.21] [**] [Instance_ID: 1] [**] Drop [**] UTD WebFilter Category/Reputation [**] [URL: www.eicar.org] [**] [Category: Computer and Internet Security] [**] [Reputation: 33] [VRF: 1] {TCP} 213.211.198.62:443 -> 10.10.1.1:37376
02-19-2020	20:44:09	User.Critical	30.100.1.1	2020/02/19-17:06:09.839205 PDT [**] [Hostname: 10.255.241.21] [**] [Instance_ID: 1] [**] Drop [**] UTD WebFilter Category/Reputation [**] [URL: www.eicar.org] [**] [Category: Computer and Internet Security] [**] [Reputation: 33] [VRF: 1] {TCP} 213.211.198.62:443 -> 10.10.1.1:37374

Appendix A: New in this Guide

This guide is new and is not updated from a previous version.

Appendix B: Hardware and Software Used for Validation

This guide was validated using the following hardware and software.

Table 4. System Feature Template Settings

Functional Area	Product	Software Version
Cloud	Cisco vManage NMS	19.2.099
Cloud	Cisco vBond Controller	19.2.099
Cloud	Cisco vSmart Controller	19.2.099
Data center	Cisco vEdge 5000 Series Routers	19.2.099
Branch office	Cisco ISR 4431	16.12.1e
Branch office	Cisco ISR 4331	16.12.1e
Branch office	Cisco ISR c1111x-8P	16.12.1e

Appendix C: Cisco WAN Edge Configuration Summary (Templates)

This section includes the security policy feature template, along with an example device template and CLI configuration specific to the Cisco WAN Edge router ISR4331, deployed within this deployment guide. To deploy other feature/device templates to establish SD-WAN overlay network, please refer to the SD-WAN End-to-End Deployment Guide.

Feature Template

Within this section, the configured lists, the main security policy template and its container template is listed.

Security Policy feature template

Devices: All devices except vManage and vSmart

Template: Basic Information/Security

Template Name: Guest_Access_Security_Policy

Description: Security Policy Template

The following lists are configured for the security policy,

Table 5. Zone Settings

Section	List Type	Value
List	Zones	Guest_VPN = VPN 2
		OUTSIDE = VPN 0
	Data Prefix	Client_Network = 10.10.0.0/16

The configured lists are used in the security policy,

Table 6. Security Policy Template Settings

Policy sub-section	Section	Condition/Parameter	Type	Value
Enterprise Firewall with Application Awareness	Target Zone-Pair	Source Zone	Drop-down	Guest_VPN
		Destination Zone	Drop-down	OUTSIDE
	Name		Entry tab	Guest Access_Firewall_Policy
	Description		Entry tab	Firewall policy to protect guest users
	Match (Rule 1)	Source Data Prefix List	Variable	Client_Network
		Protocol	Drop-down	6 17
	Actions (Rule 1)	Inspect	Radio Button	Enable
	Match (Rule 2)	Protocol	Drop-down	1

Policy sub-section	Section	Condition/Parameter	Type	Value	
	Actions (Rule 2)	Inspect	Radio Button	Enabled	
			Select	Log	
URL Filtering	Target	VPNs	Entry tab	2	
	Policy Name		Entry tab	Guest Access_URL_Filtering_Policy	
	Policy Description		Entry tab	URL Filtering policy to filter guest Internet traffic	
	Web Categories		Drop down	Block	
	Web Categories		Drop down	Abortion, Job search, Shopping	
	Web Reputation		Drop down	Low Risk	
	Advanced				
	Whitelist URL List	Good_URL	Drop down	.*abcxyz.com	
	Blacklist URL List	Bad_URL	Drop down	.*customer.com	
	Block Page Server	Block Page Content	Radio Button	Error message	
	Alerts		Radio Button	Blacklist, Whitelist, Reputation/Category	
Policy Summary	Security Policy Name		Entry tab	Guest_Access_Security_Policy	
	Security Policy Description		Entry tab	Security Policy Specific to Guest Access Use Case	
	Additional Policy Settings (Firewall)	High Speed Logging - VPN	Entry tab	0	
		High Speed Logging - Server IP	Entry tab	10.2.2.2	
		High Speed Logging - Port	Default	2055	
	Additional Policy Settings (IPS/ AMP/ URL)	Audit Trail	slide	On	
		External Syslog Server - VPN	Entry tab	0	
		External syslog Server - Server IP		10.2.2.2	
		Failure Mode	Drop-down	Open	

Container Profile feature template

Devices: All devices except vManage and vSmart

Template: Basic Information/Security

Template Name: Security_App_Hosting

Description: Security Template

Section	Value
NAT	On
Resource Profile	Default/ High (tested both)

Device Template

This section lists the device template deployed, along with CLI configuration on ISR4331 router.

Device Model: ISR4331

Template Name: Branch_B_Hybrid_Transport_Single_LAN_Int

Description: Branch B with OSPF on the LAN side single port with MPLS and Internet transport

Table 7. Branch 112002 Device Template: Branch_A_INET_TLOC_SubInt_OSPF

Template Type	Template Sub-Type	Template Name
System		System_Template
	Logging	Logging_Template
	NTP	NTP_Template
BFD		BFD_Template
OMP		OMP_Template
Security		Security_Template
VPN0		BR_VPN0_Single_Transport
	BGP	BR_VPN0_BGP
	VPN Interface	BR_INET_INT
		BR_MPLS_INT
VPN512		VPN512_Template
	VPN Interface	VPN512_Interface
VPN1		BR_VPN1_BASE
	OSPF	BR_VPN1_OSPF
	VPN Interface	BR_LAN_VPN1_INT1

Template Type	Template Sub-Type	Template Name
Security Policy		Guest_Access_Security_Policy
	Container Profile	Security_App_Hosting

Example Branch Configuration

The following section lists out an example branch configuration.

Guest_Access_Security_Policy

```

policy
  url-filtering Guest_Access_URL_Policy
  web-category-action block
  web-categories abortion shopping job-search sports
  block-threshold low-risk
  white-list test4
  black-list bad_domain
  block text "<![CDATA[&lt;h3&gt;Access to the requested page has been
denied&lt;/h3&gt;&lt;p&gt;Please contact your Network Administrator&lt;/p&gt;]]>"
  logging host 10.2.2.2 vpn 0
  alert categories-reputation blacklist whitelist
  target-vpns 2
!
zone-based-policy Guest_Access_Firewall
  sequence 1
  match
    source-data-prefix-list Client_Network
    protocol 6 17
  !
  action inspect
  !
!
sequence 11
  match
    protocol 1
  !
  action inspect
  !
!
default-action drop
!
zone GUEST_VPN

```



```

    vpn 2
    !
    zone OUTSIDE
    vpn 0
    !
    zone-pair ZP_GUEST_VPN_OUTSIDE__2128202431
    source-zone GUEST_VPN
    destination-zone OUTSIDE
    zone-policy Guest_Access_Firewall
    !
    high-speed-logging
    server-ip 10.2.2.2
    port 2055
    vrf 0
    !
    lists
    data-prefix-list Client_Network
    ip-prefix 10.10.0.0/16
    !
    url-black-list bad_url
    pattern .*customer.com
    !
    url-white-list good_url
    pattern .*abcxyz.com
    !
    !
    zone-to-nozone-internet deny
    failure-mode open
    audit-trail on
    !

```

Branch 122003: BR2-WAN-Edge1: Branch_B_Hybrid_Transport_Single_LAN_Int

```

viptela-system:system
    device-model          vedge-ISR-4331
    host-name             BR2-WAN-Edge1
    gps-location latitude 33.4484
    gps-location longitude -112.074
    device-groups         BRANCH Primary UG5 US West v1000
    system-ip             10.255.241.21
    overlay-id            1
    site-id               112007
    port-offset           1

```

```
control-session-pps 300
admin-tech-on-failure
sp-organization-name "ENB-Solutions - 21615"
organization-name "ENB-Solutions - 21615"
port-hop
track-transport
track-default-gateway
console-baud-rate 115200
vbond 10.10.60.2 port 12346
logging
  disk
    enable
  !
!
!
bfd color mpls
  hello-interval 1000
  no pmtu-discovery
  multiplier 7
!
bfd color biz-internet
  hello-interval 1000
  no pmtu-discovery
  multiplier 7
!
bfd app-route multiplier 6
bfd app-route poll-interval 120000
omp
  no shutdown
  graceful-restart
!
security
  ipsec
    rekey 86400
    replay-window 4096
    authentication-type sha1-hmac ah-sha1-hmac
  !
!
no service pad
no service tcp-small-servers
no service udp-small-servers
hostname BR2-WAN-Edge1
```

```
username admin privilege 15 secret 9
$9$3VEF3VAI3lMM3E$awMmxogwHvRdxoHA5ulutUOAmKPBUvUbkd4PnwNWmWk

vrf definition 1
  description Service VPN
  rd          1:1
  address-family ipv4
    exit-address-family
  !
  address-family ipv6
    exit-address-family
  !
!
vrf definition 65529
  rd 65529:1
  address-family ipv4
    exit-address-family
  !
!
vrf definition Mgmt-intf
  description Management VPN
  rd          1:512
  address-family ipv4
    exit-address-family
  !
  address-family ipv6
    exit-address-family
  !
!
no ip finger
no ip rcmd rcp-enable
no ip rcmd rsh-enable
no ip dhcp use class
ip name-server 8.8.4.4 8.8.8.8
ip route 0.0.0.0 0.0.0.0 30.100.1.2 1
ip access-list extended Guest_Access_Firewall-seq-1-acl_
  11 permit object-group Guest_Access_Firewall-seq-1-service-og_ object-group
Client_Network any
!
ip access-list extended Guest_Access_Firewall-seq-11-acl_
  11 permit object-group Guest_Access_Firewall-seq-11-service-og_ any any
!
ip access-list extended utd-nat-acl
```

```

10 permit ip any any
!
no ip http ctc authentication
no ip igmp ssm-map query dns
ip nat inside source list nat-dia-vpn-hop-access-list interface GigabitEthernet0/0/1
overload
ip nat inside source list utd-nat-acl interface GigabitEthernet0/0/1 overload
ip nat translation tcp-timeout 3600
ip nat translation udp-timeout 60
ip nat route vrf 65529 0.0.0.0 0.0.0.0 global
class-map type inspect match-all Guest_Access_Firewall-seq-1-cm_
match access-group name Guest_Access_Firewall-seq-1-acl_
!
class-map type inspect match-all Guest_Access_Firewall-seq-11-cm_
match access-group name Guest_Access_Firewall-seq-11-acl_
!
policy-map type inspect Guest_Access_Firewall
class Guest_Access_Firewall-seq-1-cm_
inspect audit-trail-pmap_
!
class Guest_Access_Firewall-seq-11-cm_
inspect audit-trail-pmap_
!
class class-default
drop
!
!
interface GigabitEthernet0
description Management Interface
no shutdown
arp timeout 1200
vrf forwarding Mgmt-intf
ip address 100.119.118.8 255.255.255.0
ip redirects
ip mtu 1500
mtu 1500
negotiation auto
exit
interface GigabitEthernet0/0/0
description Service side Interface
no shutdown
arp timeout 1200

```

```
vrf forwarding 1
ip address 10.20.16.2 255.255.255.0
ip redirects
ip mtu 1500
ip ospf 1 area 0
ip ospf authentication message-digest
ip ospf network point-to-point
ip ospf cost 1
ip ospf dead-interval 40
ip ospf hello-interval 10
ip ospf message-digest-key 22 md5 0 cisco123
ip ospf priority 1
ip ospf retransmit-interval 5
mtu 1500
negotiation auto
exit
interface GigabitEthernet0/0/1
description INET Interface
no shutdown
arp timeout 1200
ip address 30.100.1.1 255.255.255.252
ip redirects
ip tcp adjust-mss 1350
ip mtu 1496
ip nat outside
mtu 1500
negotiation auto
exit
interface GigabitEthernet0/0/2
description MPLS Interface
no shutdown
arp timeout 1200
ip address 20.20.1.1 255.255.255.252
ip redirects
ip tcp adjust-mss 1350
ip mtu 1500
mtu 1500
negotiation auto
exit
interface Tunnel1
no shutdown
ip unnumbered GigabitEthernet0/0/1
```

```
no ip redirects
ipv6 unnumbered GigabitEthernet0/0/1
no ipv6 redirects
tunnel source GigabitEthernet0/0/1
tunnel mode sdwan
exit
interface Tunnel2
no shutdown
ip unnumbered GigabitEthernet0/0/2
no ip redirects
ipv6 unnumbered GigabitEthernet0/0/2
no ipv6 redirects
tunnel source GigabitEthernet0/0/2
tunnel mode sdwan
exit
interface VirtualPortGroup0
no shutdown
vrf forwarding 65529
ip address 192.168.1.1 255.255.255.252
exit
interface VirtualPortGroup1
no shutdown
ip address 192.0.2.1 255.255.255.252
exit
object-group network Client_Network
10.10.0.0 255.255.0.0
!
object-group service Guest_Access_Firewall-seq-1-service-og_
tcp
udp
!
object-group service Guest_Access_Firewall-seq-11-service-og_
icmp
!
clock summer-time PDT recurring
clock timezone PDT -8 0
logging persistent size 104857600 filesize 10485760
logging buffered 512000
no logging rate-limit
logging persistent
aaa authentication login default local
aaa authorization exec default local
```

```
aaa session-id common
parameter-map type inspect audit-trail-pmap_
  audit-trail on
!
parameter-map type inspect-global
  alert on
  log dropped-packets
  log flow-export v9 udp destination 10.2.2.2 2055 vrf 0
  multi-tenancy
  vpn zone security
!
parameter-map type regex bad_url-bl_
  pattern .*customer.com
!
parameter-map type regex good_url-wl_
  pattern .*abcxyz.com
!
zone security GUEST_VPN
  vpn 2
!
zone security OUTSIDE
  vpn 0
!
zone-pair security ZP_GUEST_VPN_OUTSIDE__2128202431 source GUEST_VPN destination
OUTSIDE
  service-policy type inspect Guest_Access_Firewall
!
no crypto ikev2 diagnose error
no crypto isakmp diagnose error
router bgp 65201
  bgp log-neighbor-changes
  distance bgp 20 200 20
  maximum-paths eibgp 2
  neighbor 20.20.1.2 remote-as 70
  neighbor 20.20.1.2 description MPLS Service Provider
  neighbor 20.20.1.2 ebgp-multihop 1
  neighbor 20.20.1.2 maximum-prefix 2147483647 100
  neighbor 20.20.1.2 password 0 cisco123
  neighbor 20.20.1.2 send-community both
  neighbor 20.20.1.2 timers 3 9
  address-family ipv4 unicast
    network 20.20.1.0 mask 255.255.255.252
```

```

    exit-address-family
    !
    timers bgp 60 180
    !
router ospf 1 vrf 1
    area 0 range 10.20.16.0 255.255.255.0 advertise
    auto-cost reference-bandwidth 100000
    timers throttle spf 200 1000 10000
    router-id 10.20.16.16
    compatible rfc1583
    default-information originate
    distance ospf external 110
    distance ospf inter-area 110
    distance ospf intra-area 110
    redistribute omp subnets
    !
line con 0
    login authentication default
    speed 115200
    stopbits 1
    !
iox
app-hosting appid utd
    app-resource package-profile cloud-medium
    app-vnic gateway0 virtualportgroup 0 guest-interface 0
        guest-ipaddress 192.168.1.2 netmask 255.255.255.252
    !
    app-vnic gateway1 virtualportgroup 1 guest-interface 1
        guest-ipaddress 192.0.2.2 netmask 255.255.255.252
    !
start
!
utd multi-tenancy
utd engine standard multi-tenancy
    web-filter block page profile block-Guest_Access_URL_Policy
        text <![CDATA[<h3>Access to the requested page has been
denied</h3>&lt;p>Please contact your Network Administrator&lt;/p>]]>
    !
    web-filter url profile Guest_Access_URL_Policy
        alert blacklist categories-reputation whitelist
        blacklist
        parameter-map regex bad_domain-bl_

```



```

!
categories block
  abortion
  job-search
  shopping
  sports
!
block page-profile block-Guest_Access_URL_Policy
log level error
reputation
  block-threshold low-risk
!
whitelist
  parameter-map regex test4-wl_
!
!
utd global
  logging host 10.2.2.2
!
!
sdwan
interface GigabitEthernet0/0/1
  tunnel-interface
  encapsulation ipsec preference 100 weight 1
  no border
  color biz-internet
  no last-resort-circuit
  no low-bandwidth-link
  control-connections
  no vbond-as-stun-server
  vmanage-connection-preference 5
  port-hop
  carrier                                default
  nat-refresh-interval                    5
  hello-interval                          1000
  hello-tolerance                         12
  allow-service all
  allow-service bgp
  no allow-service dhcp
  allow-service dns
  allow-service icmp
  no allow-service sshd

```

```
no allow-service netconf
allow-service ntp
no allow-service ospf
no allow-service stun
no allow-service snmp
exit
exit
interface GigabitEthernet0/0/2
tunnel-interface
encapsulation ipsec preference 0 weight 1
no border
color mpls restrict
no last-resort-circuit
no low-bandwidth-link
control-connections
no vbond-as-stun-server
vmanage-connection-preference 5
port-hop
carrier default
nat-refresh-interval 5
hello-interval 1000
hello-tolerance 12
allow-service all
allow-service bgp
no allow-service dhcp
allow-service dns
allow-service icmp
no allow-service sshd
no allow-service netconf
allow-service ntp
no allow-service ospf
no allow-service stun
no allow-service snmp
exit
exit
interface VirtualPortGroup0
access-list vpg-log-server-acl in
exit
omp
no shutdown
send-path-limit 16
ecmp-limit 16
```

```
graceful-restart
no as-dot-notation
timers
  holdtime          60
  advertisement-interval 1
  graceful-restart-timer 43200
  eor-timer         300
exit
address-family ipv4 vrf 1
  advertise ospf external
  advertise connected
  advertise static
!
!
!
policy
no app-visibility
no flow-visibility
no implicit-acl-logging
log-frequency      1000
lists
  data-prefix-list Client_Network
  ip-prefix 10.10.0.0/16
!
!
access-list vpg-log-server-acl
sequence 5
match
  destination-ip 10.2.2.2/32
  protocol      17
!
action accept
count cipslog-vpn-0
set
  local-vpn 0
!
!
!
default-action accept
!
!
!
```

!

Appendix D: Glossary

URLF URL Filtering

VPN Virtual Private Network

NAT Network Address Translation

LAN Local Area Network

WAN Wide Area Network

DNS Domain Name Server

Feedback

For comments and suggestions about this guide and related guides, join the discussion on [Cisco Community](https://cs.co/en-cvds) at <https://cs.co/en-cvds>.

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