Domain Filtering Guide

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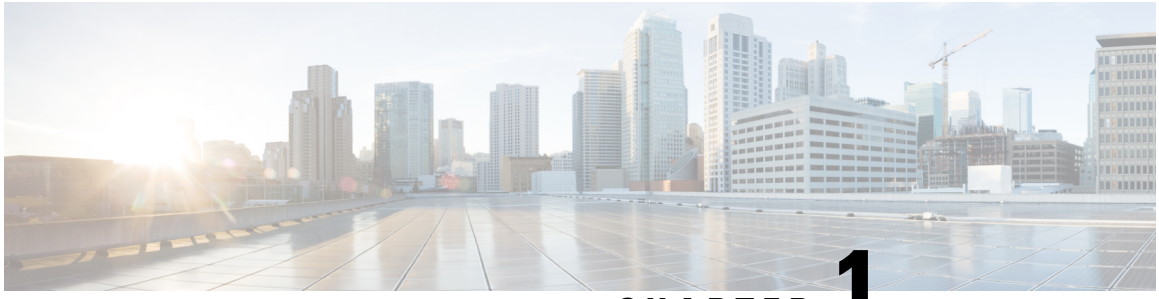


CHAPTER 1

Introduction

This document introduces the Domain Filtering feature and provides general guidelines for its deployment. The purpose of this document is to:

- Provide an overview of Domain Filtering
- Highlight supported key features and limitations
- Provide details on deploying and configuring Domain Filtering

Pre-requisite

- Beta customers must have AireOS 8.3 release installed on a supported WLC (see requirements).
- For the beta, AVC Engine Version 23 / Protocol Pack Version 16 must be manually installed on the WLC for Domain Filtering to function (provided on the beta web site).
- Domain Filtering requires the WLAN traffic to be centrally forwarded through the WLC. For this beta Domain Filtering requires Access Points to be operating in Local Mode or FlexConnect WLANs to be configured for Central Switching.

Requirements

Domain Filtering will be supported on the following Wireless LAN Controller platforms:

- Cisco 5508 Wireless LAN Controller
- Cisco 5520 Wireless LAN Controller
- Cisco 8510 Wireless LAN Controller
- Cisco 8540 Wireless LAN Controller
- Wireless Services Module 2 (WiSM2)

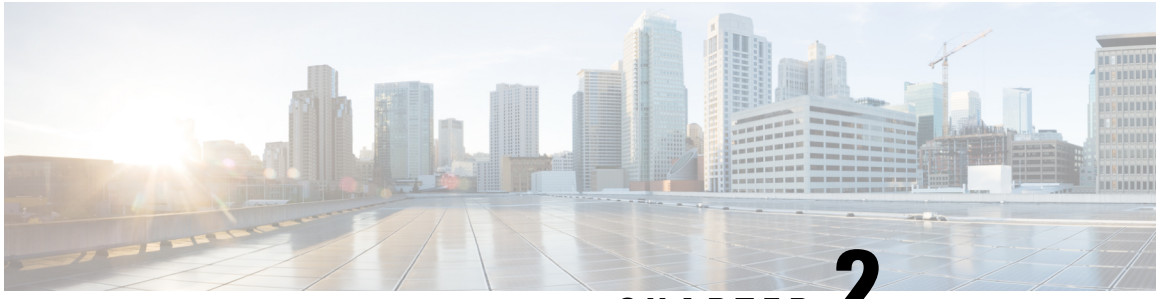
- Cisco Flex 7500 Wireless LAN Controller (FlexConnect Central Switching Only)

Components Used

The information in this document was created from devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Conventions

Refer to Cisco Technical Tips Conventions for more information on document conventions.



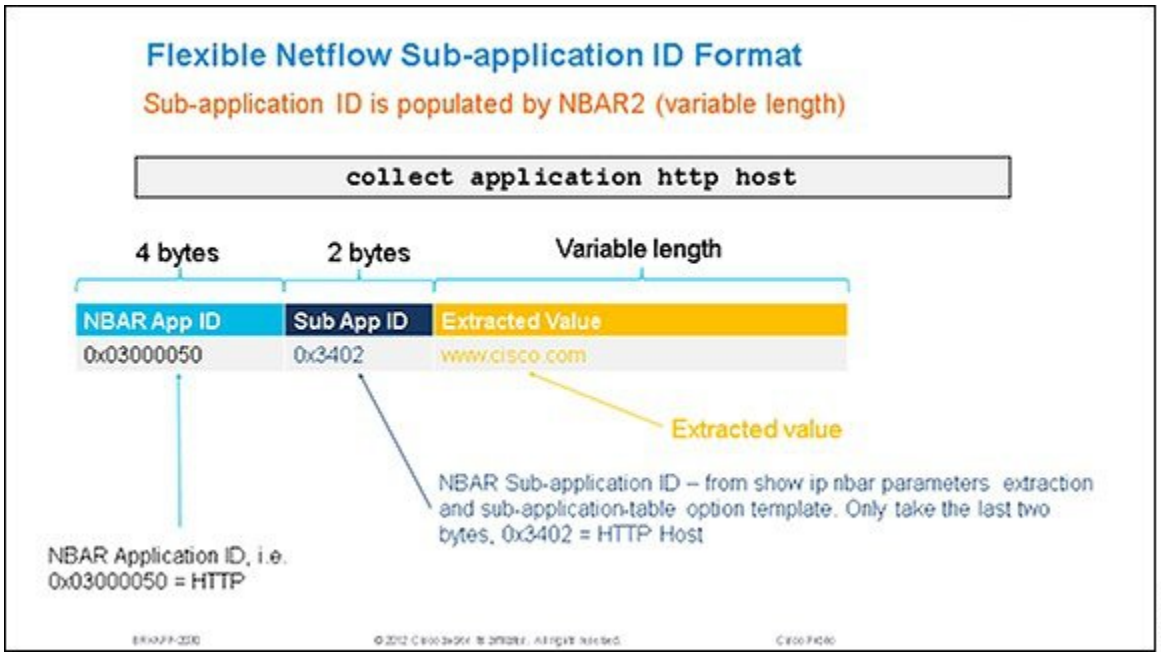
CHAPTER 2

Configurations Steps for Domain Filtering

Domain Filtering Overview

Domain Filtering is a new enhancement that is being introduced as part of the 8.3 release. This enhancement complements the Application Visibility Control (AVC) filtering currently available on the WLC. AVC filtering only supports the protocols and applications that are defined in the Protocol Pack for a given AirOS release allowing specific applications to be dropped, marked or rate-limited.

Domain Filtering builds upon AVC by using the NBAR2 engine to look deeper into the application layer matching on both the application type (e.g. HTTP) and host (e.g. www.cisco.com). In the 8.3 release administrators can now define ACLs and rules which can be applied to WLANs, Interfaces or Local Policies to either permit or deny HTTP traffic destined to specific hosts providing greater flexibility and control.



Domain Filtering is based on the NBAR2 engines filtering capabilities using field extraction. The latest NBAR2 engine supports 120 custom applications. URLs can be defined as a custom application and be classified by the engine:

1. URLs are classified using ACLs defined on the WLC. Each ACL has rules defined that determine the URLs to be matched.
2. The NBAR2 engine is configured to extract the URL field (if present) in the packets passed to it. Field extraction is performed per flow to optimize performance.
3. The WLC passes HTTP packets to the NBAR2 engine to extract the URL. If present, the NBAR2 engine returns the host-name (for example www.cisco.com) as the URL to the WLC.
4. The WLC implements filtering logic for the extracted URLs and takes the appropriate forwarding action (i.e. permit or denies the flow).

Considerations

- This release supports a maximum of 100 x URL ACLs:
  - Each ACL supports a maximum of 64 rules.
  - Each rule has either a permit or deny action. At least one permit rule must be defined per URL ACL for traffic to be permitted.
  - Each ACL has an implicit “deny all rule” as the last rule. If a URL does not match any of the rules, it is dropped by the WLC.
  - Each rule is inspected in order of precedence (lowest to highest). The first rule in the ACL that is matched is applied to the flow.
  - Each rule supports a maximum length 32 characters.
    - Each rule must match the exact subdomain, domain and top level domain you wish to match (example www.cisco.com, tools.cisco.com or partners.cisco.com).
    - Partial matches using wildcards or regular expressions are not supported in this release (example. www.c*.com or *.cisco.com).
    - No support for folders, file-names or extensions is provided in this release (example www.cisco.com/resources/index.html). A rule matching www.cisco.com will be applied to www.cisco.com/c/en/us/support.index.html as well as http://www.cisco.com/c/en/us/buy.html.
    - One wildcard (*) rule with a permit or deny action is supported per ACL. The wildcard matches all URLs.
- No support for AVC Profiles for matched URLs is provided in this release. URL ACLs and rules are defined separately then applied to WLANs, Interfaces or Local Policies.
- No support for IPv6 in this release (IPv4 support only).
- No support for PI is provided in this release.

Note This release supports HTTP URLs only. HTTPS URL support will be introduced in a later release.

Configurations Steps for Domain Filtering

Enabling Domain Filtering

Domain filtering is globally disabled on the WLC by default and must be enabled before the NBAR2 engine can inspect and filter HTTP based URLs. The following step demonstrates how to globally enable Domain Filtering on a WLC.

Enabling Domain Filtering using GUI

To enable domain filtering using GUI, perform the following steps:

Procedure

From the WLC main menu choose **Security > Access Control Lists > URL ACLs**. Select **Enable URL Acl** then click **Apply**.

Enabling Domain Filtering using CLI

To enable domain filtering using CLI, perform the following steps:

Procedure

Globally enable Domain Filtering:

```
(Cisco Controller) > config acl url-acl enable
Step 2: Verify enablement. The URL ACL Feature field will change from Disabled to Enabled:
(Cisco Controller) > show acl url-acl summary
```

```
URL ACL Feature                  Enabled
ACL Counter Status               Disabled
----------------------------------------
```

Access Control Lists and Rules

Domain filtering determines which HTTP based URLs to permit or deny using ACLs and rules that are assigned to WLANs, Interfaces or individual client sessions by way of Local Policies. The following steps demonstrate how to create URL based ACLs and rules for two common scenarios:

- Scenario 1—A ACL and rules are defined to deny access to specific HTTP URLs. This is commonly referred to as Blocked-Listing.
- Scenario 2—A ACL and rules are defined to only permit access to specific HTTP URLs. This is commonly referred to as Allowed-Listing.

Access Control Lists

Access Control Lists using GUI

To enable access control lists using GUI, perform the following steps:

Procedure

Step 1 From the WLC main menu choose **SECURITY** > **Access Control Lists** > **URL ACL**s and then click **New**.

Step 2 Enter the **URL ACL Name** and then click **Apply**.

In this example a ACL named **BLOCK-HTTP-SITES** has been defined.

Step 3 Click **New** to define additional ACLs.

Step 4 Enter the **URL ACL Name** and then click **Apply** .

In this example a second ACL named **PERMIT-HTTP-SITES** has been defined.

Access Control Lists using CLI

To enable access control lists using CLI, perform the following steps:

Procedure

Step 1 Create the URL ACLs named **BLOCK-HTTP-SITES** and **PERMIT-HTTP-SITES** :

```
(Cisco Controller) > config acl url-acl create BLOCK-HTTP-SITES
(Cisco Controller) > config acl url-acl create PERMIT-HTTP-SITES
```

Step 2 Verify ACL creation. Note the Applied status fields for both ACLs will display as **No** until rules are added and the ACLs are applied:

```
(Cisco Controller) > show acl url-acl summary
URL ACL Feature                  Enabled
ACL Counter Status               Disabled
----------------------------------------
URL ACL Name       Applied
```

```
---------------     -------
BLOCK-HTTP-SITES      No
ALLOW-HTTP-SITES      No
```

Rules–Blocked-Listing Example

The following configuration steps demonstrate how to use rules to deny access to specific HTTP URLs. In this example an ordered list of URLs is defined with a deny action to block access to specific requested HTTP based URLs. As the ACL itself has an implied deny, a wildcard permit rule is added as the last rule to provide access to all other requested HTTP URLs.

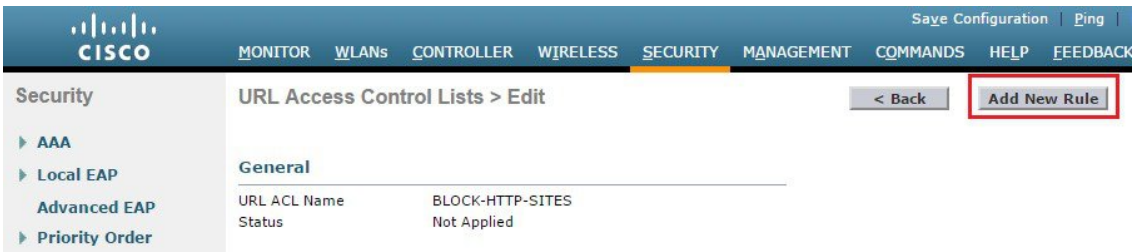
Rules Blocked-Listing using GUI

To enable rules Blocked-Listing using GUI, perform the following steps:

Procedure

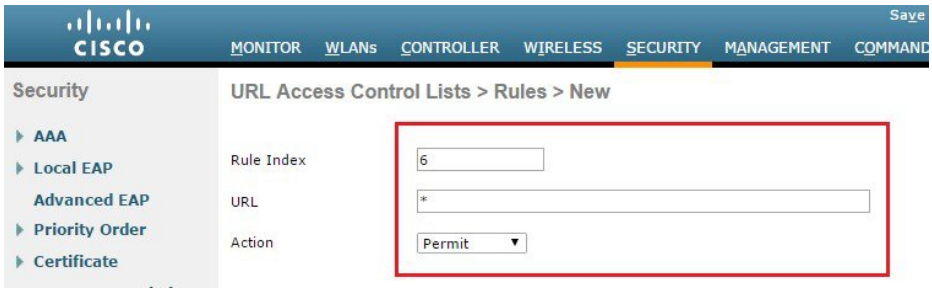
Step 1 From the WLC main menu choose **SECURITY** > **Access Control Lists** > **URL ACLs**. Click on the **URL ACL Name** to add rules.

Step 2 Click **Add New Rule**.



Step 3 Enter a **Rule Index** then define a **URL** to match and **Action**. In this example, the URL **www.cisco.com** has been defined as the first rule with the action set to **Deny**. Click **Apply**. Add additional **Deny** rules as required.

Step 4 Define a final rule that permits access to all other HTTP sites. In this example, a wildcard URL ***** has been defined as the last rule with the action set to **Permit**. Click **Apply**.



Step 5 Verify your rules are correct then click **Apply All**. The **Status** field will change from **Not Applied** to **Applied**.

Note The configuration steps for adding rules 2 - 5 are not shown in this example, however the procedure for adding the rules is identical to what is demonstrated in step 3.

Rules Blocked-Listing using CLI

To enable rules Blocked-Listing using CLI, perform the following steps:

Procedure

Step 1 Create rules for the ACL named **BLOCK-HTTP-SITES**.

```
(Cisco Controller) > config acl url-acl rule add BLOCK-HTTP-SITES 1
(Cisco Controller) > config acl url-acl rule url BLOCK-HTTP-SITES 1 www.cisco.local
(Cisco Controller) > config acl url-acl rule action BLOCK-HTTP-SITES 1 deny
(Cisco Controller) > config acl url-acl rule add BLOCK-HTTP-SITES 2
(Cisco Controller) > config acl url-acl rule url BLOCK-HTTP-SITES 2 www.nba.local
(Cisco Controller) > config acl url-acl rule action BLOCK-HTTP-SITES 2 deny
!
```

```
! Configuration Suppressed for rules 3 - 5
!
(Cisco Controller) > config acl url-acl rule add BLOCK-HTTP-SITES 6
(Cisco Controller) > config acl url-acl rule url BLOCK-HTTP-SITES 6 *
(Cisco Controller) > config acl url-acl rule action BLOCK-HTTP-SITES 6 permit
```

Step 2 Apply the ACL.

```
(Cisco Controller) > config acl url-acl apply BLOCK-HTTP-SITES
```

Step 3 Verify the ACL rules.

```
(Cisco Controller) > show acl url-acl detailed BLOCK-HTTP-SITES
RuleIndex   Action                  URL                    Hit Count
--------- ----------- ---------------------------------- -------------
     1        Deny     www.cisco.com                           0
     2        Deny     www.nba.com                             0
     3        Deny     www.disney.com                          0
     4        Deny     www.nfl.com                             0
     5        Deny     www.united.com                          0
     6      Permit     *                                       0
```

Step 4 Verify the ACL has been applied. The Applied status field for the **BLOCK-HTTP-SITES** ACL will change from **No** to **Yes**.

```
(Cisco Controller) > show acl url-acl summary
URL ACL Feature                  Enabled
ACL Counter Status               Disabled
----------------------------------------
URL ACL Name       Applied
---------------    -------
BLOCK-HTTP-SITES     Yes
ALLOW-HTTP-SITES     No
```

Rules–Allowed-Listing Example

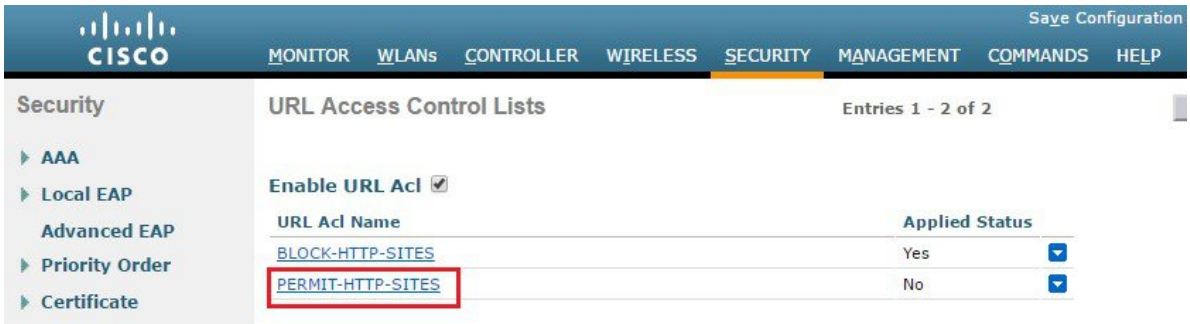
The following configuration steps demonstrate how to use rules to only permit access to specific HTTP URLs (commonly referred to as Allowed-Listing). In this example an ordered list of URLs is defined with a permit action to allow access to specific requested HTTP based URLs. As the ACL has an implied deny, access to all other requested HTTP URLs will be blocked.

Rules Allowed-Listing using GUI

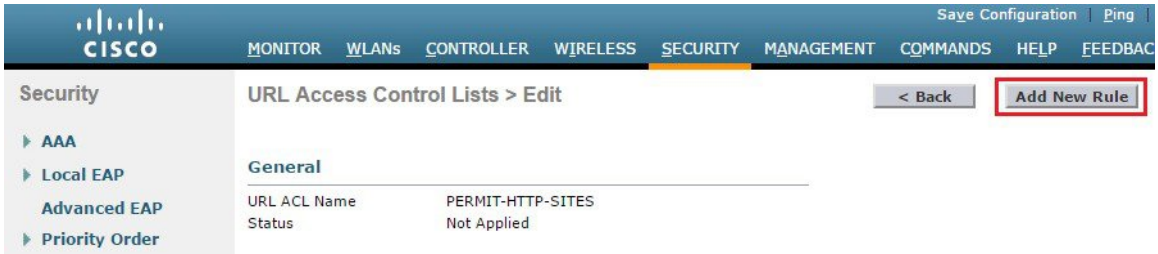
To enable rules Allowed-Listing using GUI, perform the following steps:

Procedure

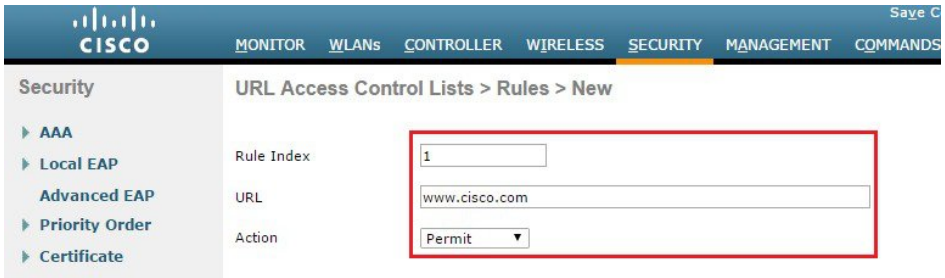
Step 1 From the WLC main menu choose **SECURITY > Access Control Lists > URL ACLs**. Click on the **URL ACL Name** to add rules.



Step 2 Click **Add New Rule**.



Step 3 Enter a **Rule Index** then define a **URL** to match and **Action**. In this example the URL **www.cisco.com** has been defined as the first rule with the action set to **Permit**. Click **Apply**. Add additional **Permit** rules as required.



Step 4 Verify your rules are correct then click **Apply All**. The **Status** field changes from **Not Applied** to **Applied**.

Rules Allowed-Listing using CLI

To enable rules Allowed-Listing using CLI, perform the following steps:

Procedure

Step 1 Create rules for the ACL named **ALLOW-HTTP-SITES**.

```
(Cisco Controller) > config acl url-acl rule add ALLOW-HTTP-SITES 1
(Cisco Controller) > config acl url-acl rule url ALLOW-HTTP-SITES 1 www.cisco.local
(Cisco Controller) > config acl url-acl rule action ALLOW-HTTP-SITES 1 permit
```

Step 2 Apply the ACL.

```
(Cisco Controller) > config acl url-acl apply ALLOW-HTTP-SITES
```

Step 3 Verify the ACL rules

```
(Cisco Controller) > show acl url-acl detailed ALLOW-HTTP-SITES
RuleIndex   Action                  URL                    Hit Count
--------- ----------- --------------------------------- -------------
     1      Permit     www.cisco.com                           0
```

Step 4 Verify the ACL has been applied. The Applied status field for the **ALLOW-HTTP-SITES** ACL will change from **No** to **Yes**.

```
(Cisco Controller) > show acl url-acl summary
URL ACL Feature                  Enabled
ACL Counter Status               Disabled
----------------------------------------
URL ACL Name       Applied
---------------    -------
BLOCK-HTTP-SITES     Yes
ALLOW-HTTP-SITES     Yes
```

Enabling Hit Counters

Hit counters can be optionally enabled to monitor the number of rule hits for each URL ACL. Hit counters are useful for troubleshooting ACLs as the counters are incremented by one as each rule is matched. The following step demonstrates how to globally enable ACL hit counters on a WLC.

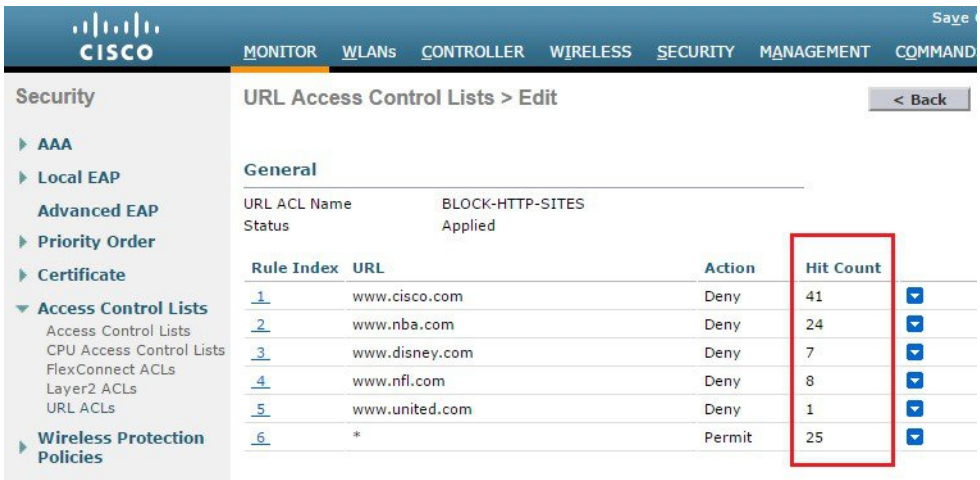
Enabling Hit Counters using GUI

To enable hit counters using GUI, perform the following steps:

Procedure

Step 1 From the WLC main menu choose **Security > Access Control Lists > Access Control Lists**. Select **Enable Counters** and then click **Apply**.

Step 2 From the WLC main menu choose **Security > Access Control Lists > URL ACLs**. Click on the desired **URL ACL Name** to view the Hit Count for each matched URL.



Enabling Hit Counters using CLI

To enable hit counters using CLI, perform the following steps:

Procedure

Step 1 Globally enable ACL Hit Counters.

```
(Cisco Controller) > config acl counter start
```

Step 2 Verify enablement. The **ACL Counter Status** field changes from **Disabled** to **Enabled**.

```
(Cisco Controller) > show acl url-acl summary
URL ACL Feature                  Enabled
ACL Counter Status               Enabled
----------------------------------------
URL ACL Name        Applied
---------------     -------
BLOCK-HTTP-SITES      Yes
ALLOW-HTTP-SITES      Yes
```

Step 3 View the Hit Counters for a specific ACL. In this example the Hit Count for the ACL named **BLOCK-HTTP-SITES** is displayed.

```
(Cisco Controller) > show acl url-acl detailed BLOCK-HTTP-SITES
RuleIndex   Action                  URL                    Hit Count
```

```
--------- ----------- --------------------------------- -------------
     1        Deny     www.cisco.com                            41
     2        Deny     www.nba.com                              24
     3        Deny     www.disney.com                           7
     4        Deny     www.nfl.com                              8
     5        Deny     www.united.com                           1
     6      Permit     *                                        25
```

Applying Access Control Lists

URL ACLs can be assigned dynamically to clients using Local Policies or directly to WLANs or Interfaces:

- Local Policy–The URL ACL is applied to all clients assigned the Local Policy. URL ACLs assigned using Local Policies have the highest priority and will override URL ACLs assigned to the WLAN or Interface.
- WLANs – The URL ACL is applied to all clients associated to the WLAN (unless a URL ACL is assigned to a client using a Local Policy). URL ACLs assigned to a WLAN will override a URL ACL assigned to an Interface.
- Interfaces – The URL ACL is applied to all traffic forwarded specific interface.

  The following steps demonstrate how to assign URL ACLs on a WLC to WLANs, Interfaces and Local Policies.

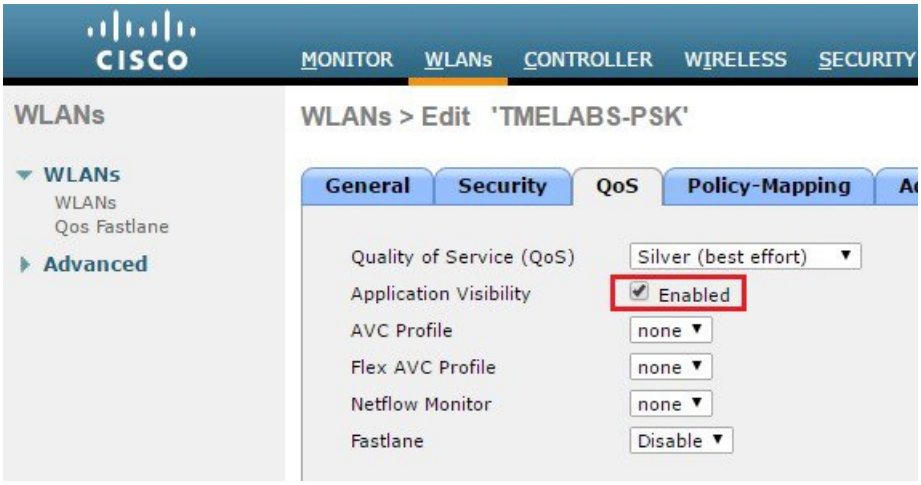
WLANs

Accessing WLANs using GUI

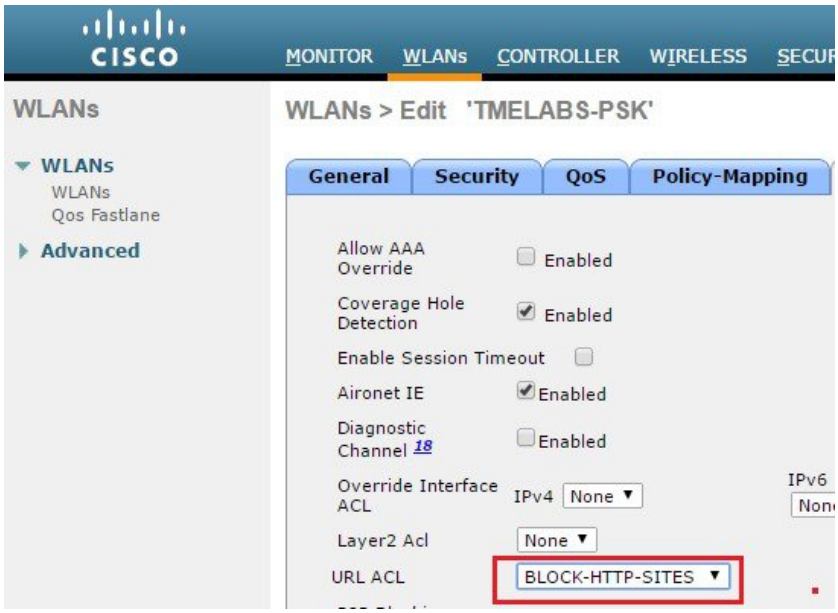
To access WLANs using GUI, perform the following steps:

Procedure

Step 1 From the WLC main menu choose**WLANs > WLANs**. Select a **WLAN ID** to modify the access to the **QoS** tab. Verify **Application Visibility** is enabled.



Step 2 Access the **Advanced Tab** then assign the desired **URL ACL**. Click **Apply**.



Note Application Visibility must be enabled on each WLAN for an assigned URL ACL.

Accessing WLANs using CLI

To access WLANs using CLI, perform the following steps:

Procedure

Step 1 Disable the target WLAN. In this example WLAN id **1** is disabled. The WLC does not allow you to assign the ACL if the target WLAN is enabled.

```
(Cisco Controller) > config wlan disable 1
```

Step 2 Assign the URL ACL to the WLAN. In this example the ACL named **BLOCK-HTTP-SITES** is assigned to WLAN **1**.

```
(Cisco Controller) > config wlan url-acl 1 BLOCK-HTTP-SITES
```

Step 3 Re-enable the disabled WLAN.

```
(Cisco Controller) > config wlan enable 1
```

Step 4 Verify the ACL assignment. If no ACL has been assigned to the WLAN, the **WLAN URL ACL** field will show **unconfigured**.

```
(Cisco Controller) > show wlan 1
WLAN Identifier.................................. 1
Profile Name..................................... TMELABS-PSK
Network Name (SSID).............................. TMELABS-PSK
Status........................................... Enabled
MAC Filtering.................................... Disabled
!
```

```
! Output Suppressed
!
WLAN Layer2 ACL..................................... unconfigured
WLAN URL ACL........................................ BLOCK-HTTP-SITES
mDNS Status......................................... Enabled
!
```

Note You can remove the ACL from a WLAN by issuing the **config wlan url-acl <wlan-id> none** command.

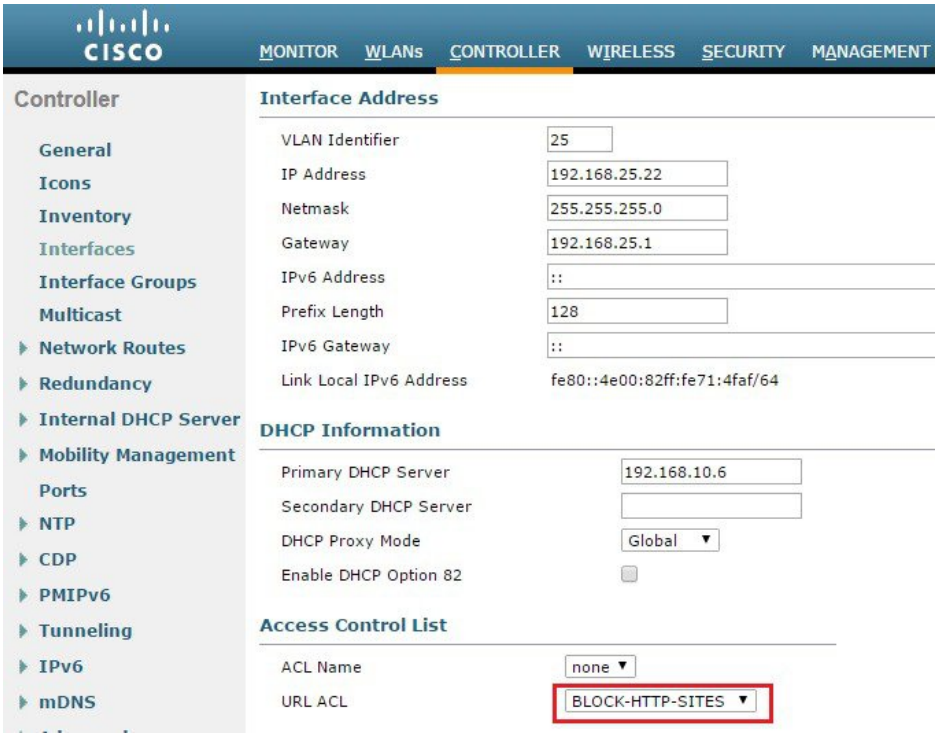
Interfaces

Interfaces using GUI

To access interfaces using GUI, perform the following steps:

Procedure

From the WLC main menu choose **CONTROLLER > Interfaces**. Select an **Interface Name** to modify, then under **Access Control List** assign the desired **URL ACL**. Click **Apply**.



Interfaces using CLI

To access interfaces using CLI, perform the following steps:

Procedure

Step 1 Disable the WLANs using the target Interface. In this example WLAN id **3** is mapping clients **vlan25**. The WLC does not allow you to assign the ACL to an Interface if there are any active WLANs using the interface.

```
(Cisco Controller) > config wlan disable 3
```

Step 2 Assign the URL ACL to the WLAN. In this example the ACL named **BLOCK-HTTP-SITES** is assigned to WLAN **1**.

```
(Cisco Controller) > config interface url-acl vlan25 BLOCK-HTTP-SITES
```

Step 3 Re-enable the disabled WLAN.

```
(Cisco Controller) > config wlan enable 3
```

Step 4 Verify the ACL assignment. Note if no ACL has been is assigned to the Interface, the **WLAN URL ACL** field will show **unconfigured**.

```
(Cisco Controller) > show interface detailed vlan25
Interface Name................................ vlan25
MAC Address................................... 4c:00:82:71:4f:af
IP Address.................................... 192.168.25.22
IP Netmask.................................... 255.255.255.0
IP Gateway.................................... 192.168.25.1
!
! Output Suppressed
!
IPv4 ACL...................................... Unconfigured
URL ACL....................................... BLOCK-HTTP-SITES
!
```

Note You can remove the ACL from a Interface by issuing the **config interface url-acl <interface-name> none** command.

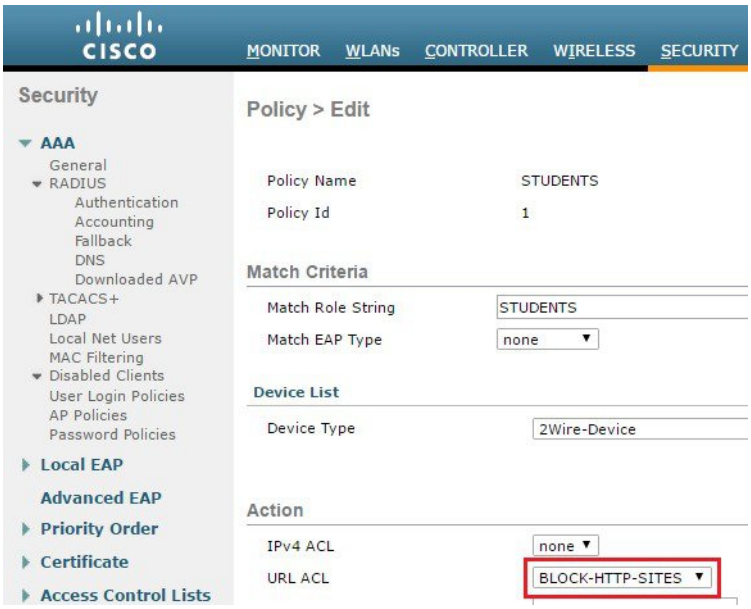
Local Policies

Local Policies using GUI

To access local policies using GUI, perform the following steps:

Procedure

From the WLC main menu select **SECURITY > Local Policies**. Select a **Policy Name** to modify, then under **Action** assign the desired **URL ACL**. Click **Apply**.



Note For additional information please reference the **Wireless Device Profiling and Policy Classification Engine on WLC** technical reference available http://www.cisco.com/c/en/us/td/docs/wireless/controller/technotes/7-5/NativeProfiling75.html

Local Policies using CLI

To access local policies using CLI, perform the following steps:

Procedure

Step 1 Assign the ACL to the target Local Policy. In this example the ACL named **BLOCK-HTTP-SITES** is assigned to a Local Policy named **STUDENTS**.

```
(Cisco Controller) > config policy STUDENTS action url-acl enable BLOCK-HTTP-SITES
```

Step 2 Verify the ACL assignment.

```
(Cisco Controller) > config interface url-acl vlan25 BLOCK-HTTP-SITES
```

Step 3 Re-enable the disabled WLAN.

```
(Cisco Controller) > config wlan enable 3
```

Step 4 Verify the ACL assignment. Note if no ACL has been assigned to the Local Policy, the **URL ACL** field will show **<none>**.

```
(Cisco Controller) > show POLICY STUDENTS
Policy Index..................................... 1
Match Role....................................... STUDENTS
Match Eap Type................................... <none>
IPv4 ACL......................................... <none>
URL ACL.......................................... BLOCK-HTTP-SITES
FlexConnect Client ACL........................... <none>
```

```
QOS............................................ BRONZE
!
! Output Suppressed
!
```

Note You can remove the ACL from a Local Policy by issuing the config policy <policy-name> action url-acl disable command.