



Security Configuration Guide: Cisco Umbrella Integration, Cisco IOS XE Gibraltar 16.12.x

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CONTENTS

CHAPTER 1

Read Me First 1

Short Description 2

CHAPTER 2

Cisco Umbrella Integration 3

Restrictions for Cisco Umbrella Integration 3

Prerequisites for Cisco Umbrella Integration 4

Cloud-based Security Service Using Cisco Umbrella Integration 4

Encrypting the DNS Packet 4

Benefits of Cisco Umbrella Integration 5

Configure the Cisco Umbrella Connector 5

Registering the Cisco Umbrella Tag 6

Configuring Cisco Device as a Pass-through Server 7

DNSCrypt, Resolver, and Public-key 7

Verifying the Cisco Umbrella Connector Configuration 8

Troubleshooting Cisco Umbrella Integration 9

Configuration Examples 10

Deploying Cisco Umbrella Integration Using Cisco Prime CLI Templates 10

Additional References for Cisco Umbrella Integration 11

Feature Information for Cisco Umbrella Integration 11



CHAPTER 1

Read Me First

Important Information



Note For CUBE feature support information in Cisco IOS XE Bengaluru 17.6.1a and later releases, see [Cisco Unified Border Element IOS-XE Configuration Guide](#).



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Feature Information

Use [Cisco Feature Navigator](#) to find information about feature support, platform support, and Cisco software image support. An account on Cisco.com is not required.

Related References

- [Cisco IOS Command References, All Releases](#)

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- [Short Description, on page 2](#)

Short Description

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CHAPTER 2

Cisco Umbrella Integration

The Cisco Umbrella Integration feature enables cloud-based security service by inspecting the Domain Name System (DNS) query that is sent to the DNS server through the device. The security administrator configures policies on the Cisco Umbrella portal to either allow or deny traffic towards the fully qualified domain name (FQDN). Cisco device acts as a DNS forwarder on the network edge, transparently intercepts DNS traffic, and forwards the DNS queries to the Cisco Umbrella portal. This feature is available on Cisco IOS XE Denali 16.3 and later releases.

- [Restrictions for Cisco Umbrella Integration](#) , on page 3
- [Prerequisites for Cisco Umbrella Integration](#), on page 4
- [Cloud-based Security Service Using Cisco Umbrella Integration](#), on page 4
- [Encrypting the DNS Packet](#), on page 4
- [Benefits of Cisco Umbrella Integration](#), on page 5
- [Configure the Cisco Umbrella Connector](#) , on page 5
- [Registering the Cisco Umbrella Tag](#), on page 6
- [Configuring Cisco Device as a Pass-through Server](#), on page 7
- [DNSEncrypt, Resolver, and Public-key](#), on page 7
- [Verifying the Cisco Umbrella Connector Configuration](#), on page 8
- [Troubleshooting Cisco Umbrella Integration](#), on page 9
- [Configuration Examples](#), on page 10
- [Deploying Cisco Umbrella Integration Using Cisco Prime CLI Templates](#), on page 10
- [Additional References for Cisco Umbrella Integration](#), on page 11
- [Feature Information for Cisco Umbrella Integration](#) , on page 11

Restrictions for Cisco Umbrella Integration

- If an application or host uses IP address directly instead of DNS to query domain names, policy enforcement is not applied.
- When the client is connected to a web proxy, the DNS query does not pass through the Cisco device. In this case, the connector does not detect any DNS request and the connection to the web server bypasses any policy from the Cisco Umbrella portal.
- When the Cisco Umbrella Integration policy blocks a DNS query, the client is redirected to a Cisco Umbrella block page. HTTPS servers provide these block pages and the IP address range of these block pages is defined by the Cisco Umbrella portal.

- User authentication and identity is not supported in this release.
- The type A, AAAA, and TXT queries are the only records that are redirected. Other types of query bypasses the connector. Cisco Umbrella Connector maintains a list of IP address that is known for malicious traffic. When the Cisco Umbrella roaming client detects the destination of packets to those addresses, it forwards those addresses to Cisco Umbrella cloud for further inspection.
- Only the IPv4 address of the host is conveyed in the EDNS option.
- A maximum of 64 local domains can be configured, and the allowed domain name length is 100 characters.

Prerequisites for Cisco Umbrella Integration

Before you configure the Cisco Umbrella Integration feature, ensure that the following are met:

- The device has a security K9 license to enable Cisco Umbrella Integration.
- The device runs the Cisco IOS XE Denali 16.3 software image or later.
- Cisco Umbrella subscription license is available.
- The device is set as the default DNS server gateway and needs to ensure that the DNS traffic goes through the Cisco device.
- Communication for device registration to the Cisco Umbrella server is via HTTPS. This requires a root certificate to be installed on the router. To download this certificate directly from a link instead of pasting it in, you can find the certificate here: <https://global-root-ca.chain-demos.digicert.com/info/index.html>.

Cloud-based Security Service Using Cisco Umbrella Integration

The Cisco Umbrella Integration feature provides cloud-based security service by inspecting the DNS query that is sent to the DNS server through the device. When a host initiates the traffic and sends a DNS query, the Cisco Umbrella Connector in the device intercepts and inspects the DNS query. If the DNS query is for a local domain, it forwards the query without changing the DNS packet to the DNS server in the enterprise network. If it is for an external domain, it adds an Extended DNS (EDNS) record to the query and sends it to Cisco Umbrella Resolver. An EDNS record includes the device identifier information, organization ID and client IP. Based on this information, Cisco Umbrella Cloud applies different policies to the DNS query.

Encrypting the DNS Packet

The DNS packet sent from the Cisco device to Cisco Umbrella Integration server must be encrypted if the EDNS information in the packet contains information such as user IDs, internal network IP addresses, and so on. When the DNS response is sent back from the DNS server, device decrypts the packet and forwards it to the host.

You can encrypt DNS packets only when the DNSCrypt feature is enabled on the Cisco device.

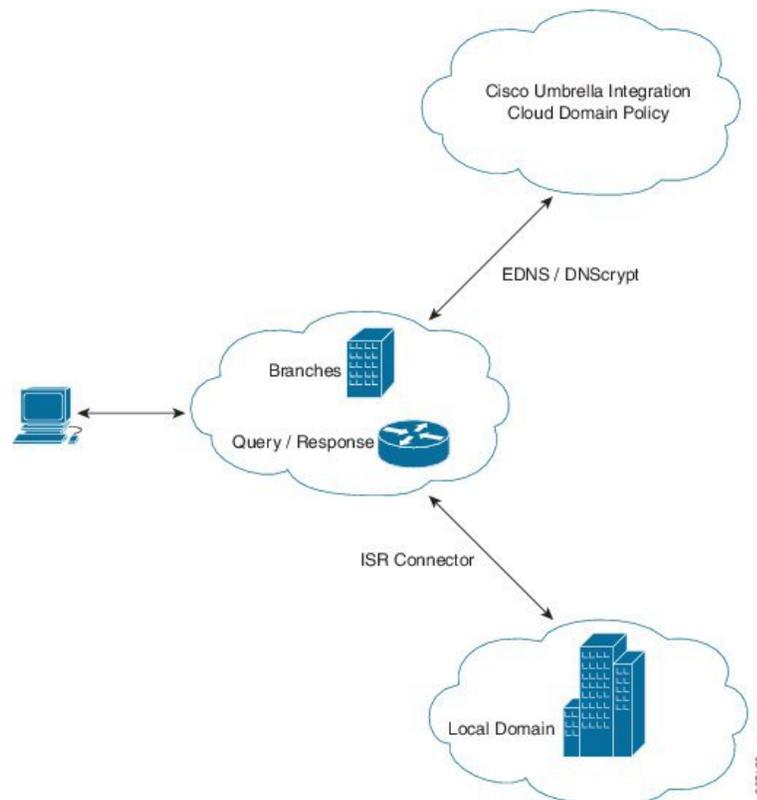
The Cisco device uses the following Anycast recursive Cisco Umbrella Integration servers:

- 208.67.222.222

- 208.67.220.220
- 2620:119:53::53
- 2620:119:35::35

The Figure 1 describes the Cisco Umbrella Integration topology.

Figure 1: Cisco Umbrella Integration Topology



Benefits of Cisco Umbrella Integration

Cisco Umbrella Integration provides security and policy enforcement at DNS level. It enables the administrator to split the DNS traffic and directly send some of the desired DNS traffic to a specific DNS server (DNS server located within the enterprise network). This helps the administrator to bypass the Cisco Umbrella Integration.

Configure the Cisco Umbrella Connector

To configure Cisco Umbrella Connector:

- Get the API token from the Cisco Umbrella registration server.

- Have the root certificate establish the HTTPS connection with the Cisco Umbrella registration server. Import the root certificate of DigiCert given below into the device using the **crypto pki trustpool import terminal** command.

```
-----BEGIN CERTIFICATE-----
MIIELDCCA3ygAwIBAgIQAf2j627KdciIQ4tyS8+8kTANBgkqhkiG9w0BAQsFADBh
MQswCQYDVQQGEwJVUzEVMBMGA1UEChMMRGlnaUNlcnQgSW5jMRkwFwYDVQQLExB3
d3cuZGlnaWNlcnQuY29tMSAwHgYDVQQDEXdEaWdpQ2VydCBHbG9iYWwgUm9vdCBD
QTAEFw0xMzAzMDgxMjAwMDBaFw0yMzAzMDgxMjAwMDBaME0xCzAJBgNVBAYTA1VT
MRUwEwYDVQQKEwxEaWdpQ2VydCBJbmMxJzAlBgNVBAMThkRpZ21dZXJ0IFNlQm90
U2VjdXJlIFNlcnZ1ciBDQ2CCASlWdQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEB
ANyuWJBNwcQwFZA1W248ghX1LFy949v/cUP6ZCWA1O4Yok3wZtAKc24RmDYXZK83
nf36QYSvx6+M/hpzTc8z15CilodTgyu5pnVILR1WN3vaMTIa16yrBvSgXUu3R0bd
KpPdkC55gIDvEwRqFDu1m5K+wgdlTvza/P96rtxcflUxD0g5B6TXvi/TC2rSsd9f
/ld0UzslgN2ujkSYs58009rg1/RrKatEp0tYhG2SS4HD2nOLEpdIkARFdRrdNzGX
kujNVA075ME/OV4uuPNcfhCohkEAjUvMr7ChZc6gqikJTvOX6+guqw9ypzAO+sf0
/RR3w6RbKfCs/mC/bdFWJscAwEAAaOCAVowggFWMBIGA1UdEwEB/wQIMAYBAf8C
AQAwDgYDVROPAQH/BAQDAgGMDQGCCsGAQUFBwEBBCgwJjAkBggrBgEFBQcwAYYY
aHR0cDovL29jZ3AuZGlnaWNlcnQuY29tMHsGA1UdHwR0MHIwN6A1oDOGMMWh0dHA6
Ly9jcmwzLmRpZ21jZXJ0LmNvbS9EaWdpQ2VydEdsb2JhbFJvb3RDQS5jcmwwN6A1
oDOGMMWh0dHA6Ly9jcmw0LmRpZ21jZXJ0LmNvbS9EaWdpQ2VydEdsb2JhbFJvb3RD
QS5jcmwwPQYDVROgBDYwNDAYBgRVHSAAMCOWKAYIKwYBBQUHAgEWHGh0dHBzOi8v
d3d3LmRpZ21jZXJ0LmNvbS9DUFMwHQYDVROOBByEFA+AYRyCMWHVlyjnjUY4tCzh
xtniMB8GA1UdIwQYMBAAFAPEUDVW0Uy7ZvCj4hsbw5eyPdFVMA0GCSqGS1b3DQEB
CwUAA4IBAQAjPt9L0jFCpbZ+Q1waRMxp0Wi0XUvgBCFsS+JtzLHgl4+mUwnNqip1
5TlPHoO1blyYoiQm5vuh7ZPHLgLTUq/sELfeNqzqPlt/yGFUzZgTHbO7Djc1lGA
8MXW5dRNJ2Srm8c+cftI17gzbcKTB+6WohsYFfZcTEDts8Ls/3HB40f/1LkAtDdC
2iDJ6m6K7hQGGrn2iWziIqBtvLfTyyRRfJs8sjX7tN8CplTm5gr8ZDOo0rWahaPit
c+LJMto4JQtV05od8GiG7S5BNO98pVAdvzr508EIDObtHopYJeS4d60tbvVS3bR0
j6tJLp07kzQoH3j01OrHvdPJbRzeXDLz
-----END CERTIFICATE-----
```

- Verify that the PEM import is successful. A message is displayed after importing the certificate.

This is the sample configuration:

```
enable
configure terminal
parameter-map type umbrella global
  token AABBA59A0BDE1485C912AFE472952641001EEEC
exit
```

Registering the Cisco Umbrella Tag

To register the Cisco Umbrella tag, perform these steps:

1. Configure the umbrella parameter map as shown in the previous section.
2. Configure **umbrella out** on the WAN interface:

```
interface gigabitEthernet 0/0/1
  umbrella out
```

3. Configure **umbrella in** on the LAN interface:

```
interface gigabitEthernet 0/0/0.4
  umbrella in mydevice_tag
```



Note For the Cisco devices, the length of the hostname and umbrella tag should not exceed 49 characters.

4. After you configure **umbrella in** with a tag using the **umbrella in mydevice_tag** command, the device registers the tag to the Cisco Umbrella Integration portal.
5. The device initiates the registration process by resolving *api.opendns.com*. You need to have a name server (*ip name-server x.x.x.x*) and domain lookup (*ip domain-lookup*) configured on the device to successfully resolve the FQDN.



Note You should configure the **umbrella out** command before you configure **umbrella in** command. Registration is successful only when the port 443 is in *open* state and allows the traffic to pass through existing firewall.

Configuring Cisco Device as a Pass-through Server

You can identify the traffic to be bypassed using domain names. In the Cisco device, you can define these domains in the form of regular expressions. If the DNS query that is intercepted by the device matches one of the configured regular expressions, then the query is bypassed to the specified DNS server without redirecting to the Cisco Umbrella cloud. This sample configuration shows how to define a regex parameter-map with a desired domain name and regular expressions:

```
Device# configure terminal
Device(config)# parameter-map type regex dns_bypass
Device(config)# pattern www.fisco.com
Device(config)# pattern .*engineering.fisco.*
```

Attach the regex param-map with the openDNS global configuration as shown below:

```
Device(config)# parameter-map type umbrella global
Device(config-profile)# token AADD5FF6E510B28921A20C9B98EEFF
Device(config-profile)# local-domain dns_bypass
```

DNSCrypt, Resolver, and Public-key

- DNSCrypt
- Resolver IP
- Public-Key

We recommend that you change the above parameters only when you perform certain tests in the lab. These parameters are reserved for future use. If you modify these parameters, it can affect the normal functioning of the device.

Resolver

The following commands change the redirection of DNS packets from the Cisco device to Cisco Umbrella cloud:

- **resolver ipv4 1.1.1.1**
- **resolver ipv4 1.1.1.2**
- **resolver ipv6 1234::1**
- **resolver ipv6 2345::1**

In this example, all the IPv4 DNS packets are redirected to 1.1.1.1 or 1.1.1.2 and IPv6 DNS packets are redirected to 1234::1 or 2345::1. You should remove the IP address to restore to the default values of the resolver. When you modify a resolver IP address, the following message is displayed:

```
User configured would overwrite defaults
Defaults are restored when no more user configured are present
```

With the default values of **208.67.222.222** and **208.67.220.220**, all DNS packets are redirected to Cisco Umbrella Anycast resolvers. The device uses the first default resolver IP address for all its redirection. When the Cisco device does not receive a response for three consecutive DNS queries, the device automatically switches to a different resolver IP address. This behavior remains the same for IPv6 resolver addresses.



Note IPv6 redirection is deferred and all IPV6 DNS packets are not redirected to Cisco Umbrella Anycast servers.

Public-key

Public-key is used to download the DNSCrypt certificate from Cisco Umbrella Integration cloud. This value is preconfigured to

B735:1140:206F:225D:3E2B:D822:D7FD:691E:A1C3:3CC8:D666:8DOC:BE04:BFAB:CA43:FB79 which is the public-key of Cisco Umbrella Integration Anycast servers. If there is a change in the public-key and if you modify this command, then you have to remove the modified command to restore the default value. If you modify the value, the DNSCrypt certificate download may fail.

DNSCrypt

To disable DNSCrypt, use the **no dnsencrypt** command and to re-enable DNSCrypt, use the **dnsencrypt** command.

When the DNSCrypt is used, the DNS request packets size is more than 512 bytes. Ensure that these packets are allowed through the intermediary devices; otherwise, the response may not reach the intended recipients.

Verifying the Cisco Umbrella Connector Configuration

Verify the Cisco Umbrella Connector configuration using the following commands:

```
Router# show umbrella config
Umbrella Configuration
=====
Token: AAC1A2555C11B2B798FFF3AF27C2FB8F001CB7B2
OrganizationID: 1882034
Local Domain Regex parameter-map name: NONE
```

```

DNSCrypt: Enabled
Public-key: B735:1140:206F:225D:3E2B:D822:D7FD:691E:A1C3:3CC8:D666:8D0C:BE04:BFAB:CA43:FB79

UDP Timeout: 5 seconds
Resolver address:
  1. 208.67.220.220
  2. 208.67.222.222
  3. 2620:119:53::53
  4. 2620:119:35::35
Umbrella Interface Config:
  Number of interfaces with "opendns out" config: 1
  1. GigabitEthernet0/0/0
     Mode      : OUT
     VRF       : global(Id: 0)
  Number of interfaces with "opendns in" config: 1
  1. GigabitEthernet0/0/1
     Mode      : IN
     Tag       : test
     Device-id : 010a6aef0b443f0f
     VRF       : global(Id: 0)

```

```

Device# show umbrella deviceid
Device registration details
Interface Name      Tag      Status  Device-id
GigabitEthernet0/0/1  guest  200 SUCCESS 010a7ba73bd216d1

```

```

Device#show umbrella dnscrypt
DNSCrypt: Enabled
Public-key: B735:1140:206F:225D:3E2B:D822:D7FD:691E:A1C3:3CC8:D666:8D0C:BE04:BFAB:CA43:FB79
Certificate Update Status:
Last Successful Attempt : 10:55:40 UTC Apr 14 2016
Last Failed Attempt : 10:55:10 UTC Apr 14 2016
Certificate Details:
Certificate Magic : DNSC
Major Version : 0x0001
Minor Version : 0x0000
Query Magic : 0x717744506545635A
Serial Number : 1435874751
Start Time : 1435874751 (22:05:51 UTC Jul 2 2015)
End Time : 1467410751 (22:05:51 UTC Jul 1 2016)
Server Public Key :
ABAA:F000:D394:8045:672D:73E0:EAE6:F181:19D0:2A62:3791:EFAD:B04E:40B7:B6F9:C40B
Client Secret Key Hash :
BBC3:409F:5CB5:C3F3:06BD:A385:78DA:4CED:62BC:3985:1C41:BCCE:1342:DF13:B71E:F4CF
Client Public key :
ECE2:8295:2157:6797:6BE2:C563:A5A9:C5FC:C20D:ADAF:EB3C:A1A2:C09A:40AD:CAEA:FF76
NM key Hash :
F9C2:2C2C:330A:1972:D484:4DD8:8E5C:71FF:6775:53A7:0344:5484:B78D:01B1:B938:E884

```

Troubleshooting Cisco Umbrella Integration

Troubleshoot issues that are related to enabling Cisco Umbrella Integration feature using these commands:

- **debug umbrella device-registration**
- **debug umbrella config**
- **debug umbrella dnscrypt**

Depending on the OS, run either of these two commands from the client device:

- The **nslookup -type=txt debug.umbrella.com** command from the command prompt of the Windows machine
- The **nslookup -type=txt debug.umbrella.com** command from the terminal window or shell of the Linux machine

```
nslookup -type=txt debug.opendns.com 8.8.8.8
Server: 8.8.8.8
Address: 8.8.8.8#53
Non-authoritative answer:
debug.opendns.com text = "server r6.mum1"
debug.opendns.com text = "device 010A826AAABB6C3D"
debug.opendns.com text = "organization id 1892929"
debug.opendns.com text = "remoteip 171.168.1.7"
debug.opendns.com text = "flags 436 0 6040 39FF0000000000000000"
debug.opendns.com text = "originid 119211936"
debug.opendns.com text = "orgid 1892929"
debug.opendns.com text = "orgflags 3"
debug.opendns.com text = "actype 0"
debug.opendns.com text = "bundle 365396"
debug.opendns.com text = "source 72.163.220.18:36914"
debug.opendns.com text = "dnscrypt enabled (713156774457306E)"
```

Configuration Examples

This example shows how to enable Cisco Umbrella Integration:

Deploying Cisco Umbrella Integration Using Cisco Prime CLI Templates

You can use the Cisco Prime CLI templates to provision the Cisco Umbrella Integration deployment. The Cisco Prime CLI templates make provisioning Cisco Umbrella Integration deployment simple.



Note The Cisco Prime CLI templates is supported only on Cisco Prime version 3.1 or later.

To use the Cisco Prime CLI templates to provision the Cisco Umbrella Integration deployment, perform these steps:

-
- Step 1** Download the Cisco Prime templates corresponding to the Cisco IOS XE version running on your system.
 - Step 2** Unzip the file, if it is a zipped version.
 - Step 3** From Cisco Prime Web UI, choose **Configuration > Templates > Features and Technologies**, and then select **CLI Templates (User Defined)**.
 - Step 4** Click **Import**.
 - Step 5** Select the folder where you want to import the templates and click **Select Templates** and choose the templates that you just downloaded.
 - Step 6** The following Cisco Umbrella Integration templates are available:

- Umbrella—Use this template to provision Umbrella Connector on the device.
- Umbrella Cleanup—Use this template to remove previously configured Umbrella Connector.

Additional References for Cisco Umbrella Integration

Related Documents

Related Topic	Document Title
IOS commands	Cisco IOS Master Command List, All Releases
Security commands	<ul style="list-style-type: none"> • Cisco IOS Security Command Reference: Commands A to C • Cisco IOS Security Command Reference: Commands D to L • Cisco IOS Security Command Reference: Commands M to R • Cisco IOS Security Command Reference: Commands S to Z

Technical Assistance

Description	Link
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p> <p>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.</p> <p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	http://www.cisco.com/support

Feature Information for Cisco Umbrella Integration

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 1: Feature Information for Cisco Umbrella Integration

Feature Name	Releases	Feature Information
Cisco Umbrella Integration	Cisco IOS XE Everest Release 16.6.1	The Cisco Umbrella Integration feature enables cloud-based security service by inspecting the DNS query that is sent to any DNS server through Cisco devices. The security administrator configures policies on the Umbrella cloud to either allow or deny traffic towards the fully qualified domain name (FQDN). This feature is supported only on Cisco ISRs.