

# **Cisco Umbrella Integration**

The Cisco Catalyst SD-WAN 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 Umbrella portal to either allow or deny traffic towards the fully qualified domain name (FQDN). The router acts as a DNS forwarder on the network edge, transparently intercepts DNS traffic, and forwards the DNS queries to the Umbrella cloud.

#### **Table 1: Feature History**

Feature Name	Release Information	Description
Cisco Umbrella Scope Credentials	Cisco IOS XE Catalyst SD-WAN Release 17.15.1a Cisco Catalyst SD-WAN Manager Release 20.15.1	This feature provides the ability to define and configure a new single Cisco Umbrella credential for both Umbrella SIG and Umbrella DNS.

- Overview of Cisco Catalyst SD-WAN Umbrella Integration, on page 1
- Restrictions for Umbrella Integration, on page 4
- Prerequisites for Umbrella Integration, on page 5
- Configure Umbrella API Token, on page 5
- Configure Cisco Umbrella Registration, on page 6
- Create Cisco Umbrella Scope Credentials, on page 6
- Define Domain Lists, on page 7
- Configure Umbrella DNS Policy Using Cisco SD-WAN Manager, on page 7
- Attach DNS Umbrella Policy to Device Template, on page 9
- Upload Umbrella Root Certificates, on page 9
- Umbrella Integration Using CLI, on page 10
- DNS Security Policy Configuration, on page 22
- Monitor Umbrella Feature, on page 23

## **Overview of Cisco Catalyst SD-WAN Umbrella Integration**

The Cisco Catalyst SD-WAN 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 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 Umbrella Resolver. An EDNS record includes the device identifier information, organization ID and client IP. Based on this information, Umbrella Cloud applies different policies to the DNS query.

The Umbrella Integration cloud, based on the policies configured on the portal and the reputation of the DNS Fully Qualified Domain Name (FQDN) may take one of the following actions:

- If FQDN is found to be malicious or blocked by the customized Enterprise Security policy, then the IP address of the Umbrella Cloud's blocked landing page is returned in the DNS response. This is called a blocked list action at Umbrella Cloud.
- If FQDN is found to be non-malicious, then the IP address of the content provider is returned in the DNS response. This is called a allowed list action at Umbrella Cloud.
- If the FQDN is suspicious, then the intelligent proxy unicast IP addresses are returned in the DNS response. This is referred to as grey list action at Umbrella Cloud.

#### Figure 1: Umbrella Cloud



When the DNS response is received, the device forwards the response back to the host. The host will extract the IP address from the response and send the HTTP / HTTPS requests to this IP.

Note: The intelligent proxy option has to be enabled in the Umbrella dashboard for the Umbrella Resolver to return the intelligent proxy unicast IP addresses in the DNS response when an attempt is made to access the domains in the grey list.

#### Handling HTTP and HTTPs Traffic

With Cisco Catalyst SD-WAN Umbrella Integration, HTTP and HTTPs client requests are handled in the following ways:

- If the Fully Qualified Domain Name (FQDN) in the DNS query is malicious (falls under blocked domains), Umbrella Cloud returns the IP address of the blocked landing page in the DNS response. When the HTTP client sends a request to this IP, Umbrella Cloud displays a page that informs the user that the requested page was blocked and the reason for blocking the page.
- If the FQDN in the DNS query is non-malicious (falls under allowedlisted domains), Umbrella Cloud returns the IP address of the content provider. The HTTP client sends the request to this IP address and gets the desired content.
- If the FQDN in the DNS query falls under grey-listed domains, Umbrella Resolver returns the unicast IP addresses of intelligent proxy in the DNS response. All HTTP traffic from the host to the grey domain gets proxied through the intelligent proxy and undergo URL filtering.

One potential limitation in using intelligent proxy unicast IP addresses is the probability of the datacenter going down when the client is trying to send the traffic to the intelligent proxy unicast IP address. This is a scenario where a client has completed DNS resolution for a domain which falls under grey-listed domain and client's HTTP/(S) traffic is being sent to one of the obtained intelligent proxy unicast IP address. If that datacenter is down, then the client has no way of knowing it.

The Umbrella Connector does not act on the HTTP and HTTPS traffic. The connector does not redirect any web traffic or alter any HTTP/(S) packets.

#### **Encrypting the DNS Packet**

The DNS packet sent from the device to 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 device.

The device uses the following Anycast recursive Umbrella Integration servers:

- 208.67.222.222
- 208.67.220.220
- 2620:119:53::53
- 2620:119:35::35



# **Restrictions for 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 device. In this case, the connector does not detect any DNS request and the connection to the web server bypasses any policy from the Umbrella portal.
- When the Umbrella Integration policy blocks a DNS query, the client is redirected to a Umbrella block page. HTTPS servers provide these block pages and the IP address range of these block pages is defined by the Umbrella portal.
- The type A, AAAA, and TXT queries are the only records that are redirected. Other types of query bypasses the connector. Umbrella Connector maintains a list of IP address that is known for malicious traffic. When the Umbrella roaming client detects the destination of packets to those addresses, it forwards those addresses to 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 under bypass list, and the allowed domain name length is 100 characters.
- Data-policy based NAT and Umbrella DNS redirect interoperability is not supported. If NAT for internet bound traffic is configured through a data policy instead of a default NAT route in service VPN, for Umbrella DNS redirection, you must create a rule to match the DNS request and then set action as umbrella redirect. The data policy rule created for DNS redirect must be configured before the NAT rule in a sequence.
- Umbrella redirection does not work with DNS sent over TCP. Only UDP is supported.
- In IKEv2 Preshared Keys (PSK), the '\' character is not supported and should not be used.
- DNS redirect does not work if DNS traffic is received over the tunnel towards data center in case of cloud services.
- When the local internet TLOC fails, there is no capability to redirect DNS to data center.
- The Cisco Umbrella configuration may enforce IP address restrictions for the Service VPN configurations. If you do not follow the guidelines, configuration may result in traffic loss. For additional information about Cisco Umbrella configuration, see Cisco Umbrella SIG User Guide.

## **Prerequisites for Umbrella Integration**

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

- The device has a security K9 license to enable Umbrella Integration.
- The device runs on the SD-WAN IOS XE 16.10 software image or later.
- Cisco Catalyst SD-WAN 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 device.

### **Configure Umbrella API Token**

To configure Umbrella API token:

- 1. From the Cisco SD-WAN Manager menu, choose Configuration > Security.
- 2. Click Custom Options to configure the Umbrella API.
- 3. Choose Umbrella API Token.
- 4. Enter token number in the Umbrella Token field.



- **Note** Must be exactly 40 hexadecimal.
- 5. Click Save Changes to configure the Umbrella API Token.

## **Configure Cisco Umbrella Registration**

#### **Table 2: Feature History**

Feature Name	Release Information	Description
Auto-registration for Cisco Umbrella Cloud Services	Cisco IOS XE Catalyst SD-WAN Release 17.2.1r	This feature adds the ability to register devices to Cisco Umbrella using the Smart Account credentials to automatically retrieve Umbrella credentials (organization ID, registration key, and secret). This offers a more automatic alternative to manually copying a registration token from Umbrella.

Use this procedure to configure Cisco Umbrella registration globally for all devices. The procedure retrieves the Umbrella registration parameters automatically.

When configuring individual policies, it is also possible to configure Umbrella registration, but it can be managed more flexibly using the following procedure:

- 1. From the Cisco SD-WAN Manager menu, choose **Configuration** > **Security**.
- 2. Click Custom Options and choose Umbrella Registration.
- **3.** In the **Manage Umbrella Registration** dialog box, use one of the following methods to register devices to Umbrella. The registration details are used globally.
  - Cisco Umbrella Registration Key and Secret
  - **a.** Click the **Get Keys** to retrieve Umbrella registration parameters automatically: Organization ID, Registration Key, and Secret.

Note

To automatically retrieve registration parameters, Cisco SD-WAN Manager uses the Smart Account credentials to connect to the Umbrella portal. The Smart Account credentials are configured in Cisco SD-WAN Manager under Administration > Settings > Smart Account Credentials.

- **b.** (Optional) If the Umbrella keys have been rotated and the details that are automatically retrieved are incorrect, enter the details manually.
- c. Click Save Changes.
- Cisco Umbrella Registration Token

(For legacy devices only) Enter a registration token (40 hexadecimal digits) provided by Umbrella.

### **Create Cisco Umbrella Scope Credentials**

- 1. From the Cisco SD-WAN Manager menu, choose Administration > Settings.
- 2. Click Cloud Credentials and select Umbrella as the provider.

**3.** Enter the following information, which is applicable to both Cisco Umbrella SIG and Cisco Umbrella DNS security:

Field	Description
Organization ID	Enter the Cisco Umbrella organization ID (Org ID) for your organization. For more information, see <i>Find Your Organization ID</i> in the <i>Cisco Umbrella</i> <i>SIG User Guide</i> .
Scope Credentials	
API Key	Enter the Umbrella management API key.
Secret	Enter the Umbrella management API secret.

4. Click Save.

### **Define Domain Lists**

- 1. From the Cisco SD-WAN Manager menu, choose Configuration > Security.
- 2. Click Custom Options, and choose Lists from the drop-down menu.
- 3. Choose **Domain** in the left pane.
- 4. Click New Domain List to create a new domain list or click the domain name, and click the pencil icon on the right side for an existing list.
- 5. Enter the Domain List Name, Add Domain, and click Add to create the list.

### **Configure Umbrella DNS Policy Using Cisco SD-WAN Manager**

- 1. From the Cisco SD-WAN Manager menu, choose Configuration > Security.
- 2. Click Add Security Policy.
- 3. In the Add Security Policy wizard, click Direct Internet Access.
- 4. Click Proceed.
- 5. Click Next until you reach the DNS Security page.
- 6. From the Add DNS Security Policy drop-down list, choose one of the following:
  - Create New: A DNS Security Policy Rule Configuration wizard is displayed.
  - Copy from Existing: Choose a policy from the Policy field, enter a policy name, and click Copy.
- 7. If you are creating a new policy using the **Create New** option, the **DNS Security Policy Rule Configuration** wizard is displayed.
- 8. Enter a policy name in the **Policy Name** field.

- 9. The Umbrella Registration Status displays the status of the API Token configuration.
- 10. Click Manage Umbrella Registration to add a token, if you have not added one already.
- **11.** Click **Match All VPN** to keep the same configuration for all the available VPNs and continue with Step 13.

Or click **Custom VPN Configuration** if you need to add target service VPNs to your policy. A Target VPNs window appears, and continue with the next step.

- 12. To add target service VPNs, click **Target VPNs** at the top of the window.
- 13. Click Save Changes to add the VPN.
- 14. From the Local Domain Bypass List drop-down list, choose the domain bypass.
- 15. Configure DNS Server IP from the following options:
  - Umbrella Default
  - Custom DNS
- 16. Click Advanced to enable or disable the DNSCrypt. By default, the DNSCrypt is enabled.
- 17. Click Save DNS Security Policy.

The **Configuration > Security** window is displayed, and the DNS policy list table includes the newly created DNS Security Policy.



**Note** Starting from Cisco IOS XE Catalyst SD-WAN Release 17.11.1a and Cisco vManage Release 20.11.1, you can select Child Org ID from the dropdown when a parent Org ID of a multi-org tenant is added to the SIG Credentials.

Field	Description
Add DNS Security Policy	From the Add DNS Security Policy drop-down list, select Create New to create a new DNS Security Policy policy.
	<b>Copy from Existing</b> : Choose a policy from the <b>Policy</b> field, enter a policy name, and click <b>Copy</b> .
Create New	Displays the DNS Security Policy wizard.
Policy Name	Enter a name for the policy.
Umbrella Registration Status	Displays the status of the API Token configuration.
Manage Umbrella Registration	Click <b>Manage Umbrella Registration</b> to add a token, if you have not added one already.
Match All VPN	Click <b>Match All VPN</b> to keep the same configuration for all the available VPNs.

#### Table 3: DNS Security Policy

Field	Description
Custom VPN Configuration	choose <b>Custom VPN Configuration</b> to input the specific VPNs.
Local Domain Bypass List	Choose the domain bypass.
DNS Server IP	Configure <b>DNS Server IP</b> from the following options:
	• Umbrella Default
	• Custom DNS
DNSCrypt	Enable or disable the DNSCrypt.
Next	Click <b>Next</b> to the policy summary page.

## **Attach DNS Umbrella Policy to Device Template**

- 1. From the Cisco SD-WAN Manager menu, choose Configuration > Templates.
- 2. Click **Device Templates**, and choose **From Feature Template** from the Create Template drop-down menu.



Note In Cisco vManage Release 20.7.1 and earlier releases, Device Templates is called Device.

- 3. From the Device Model drop-down menu, choose a device.
- 4. Click Additional Templates. The screen scrolls to the Additional Templates section.
- **5.** From the Security Policy drop-down menu, choose the name of the Umbrella DNS Security Policy you configured in the above procedure.
- 6. Click Create to apply the Umbrella policy to a device template.

### Upload Umbrella Root Certificates

Minimum release: Cisco IOS XE Catalyst SD-WAN Release 17.9.1a, Cisco vManage Release 20.9.1.

If edge devices in your Cisco Catalyst SD-WAN network require new Umbrella root certificates for Umbrella DNS security, you can upload an Umbrella root certificate bundle. The bundle contains a certificate for Cisco vEdge devices and a certificate for Cisco IOS XE Catalyst SD-WAN devices, in that order. After you upload the bundle, Cisco SD-WAN Manager pushes the appropriate certificates to the appropriate devices.

- 1. In the Cisco SD-WAN Manager menu, choose Administration > Settings.
- 2. Click Edit in the Umbrella DNS Certificate row.
- **3.** Perform one of the following actions to enter the Umbrella root certificate bundle in the **Umbrella Root Certificate** field:

- Copy and paste the contents of the bundle. Ensure that the certificate for Cisco vEdge devices appears before the certificate for Cisco IOS XE Catalyst SD-WAN devices.
- Click Select a File and navigate to and select the bundle that you want.
- 4. Click Save.

Cisco SD-WAN Manager pushes the certificates to all devices that support an Umbrella root certificate.

### **Umbrella Integration Using CLI**

#### **Configure the Umbrella Connector**

Communication for device registration to the Cisco Umbrella server is via HTTPS. This requires a DigiCert root certificate which is auto installed on the router by default.

To configure Umbrella Connector:

- Get the API token from the Umbrella portal.
- Define VRFs and each VRF can has two options: DNS resolver and enabling local domain list.
  - Umbrella registration is done per VRF only if DNS resolver is configured as Umbrella.
  - Local domain bypass list is global and each VRF can enable or disable the local domain bypass list. If enabled, the DNS packet will be matched against the local domain list.
- Umbrella is a Direct Internet Access (DIA) feature, so NAT configuration is mandatory.

#### Sample configuration:

```
Device# config-transaction
     Device(config) # parameter-map type umbrella global
    Device (config-profile) #?
    parameter-map commands:
           dnscrypt Enable DNSCrypt
                               Exit from parameter-map
           exit
           IncludeIncludeIncludelocal-domainLocal domain processingnoNegative or set default values of a commandpublic-keyDNSCrypt provider public key
           registration-vrf Cloud facing vrf
           resolver Anycast address
            token
                                 Config umbrella token

        token
        config amoreties config

        udp-timeout
        Config timeout value for UDP sessions

        vrf
        Configure VRF

Per-VRF options are provided under VRF option:
Device(config) # parameter-map type umbrella global
Device(config-profile)#vrf 9
Device (config-profile-vrf) #?
vrf options:
                           DNS resolver address
    dns-resolver
    exit.
                           Exit from vrf sub mode
    match-local-domain Match local-domain list (if configured)
                           Negate a command or set its defaults
    no
 parameter-map type regex dns bypass
 pattern www.cisco.com
 pattern .*amazon.com
```

```
pattern .*.salesforce.com
1
parameter-map type umbrella global
token 648BF6139C379DCCFFBA637FD1E22755001CE241
local-domain dns bypass
dnscrypt udp-timeout 5
vrf 9
      dns-resolver 8.8.8.8
      match-local-domain
vrf 19
      dns-resolver 8.8.8.8
      no match-local-domain
 vrf 29
      dns-resolver umbrella
      match-local-domain
 vrf 39
      dns-resolver umbrella
      no match-local-domain
!
```

The following table captures the per VRF DNS packet behavior:

VRF	dns-resolver	Match-local-domain (dns_bypass)
9	8.8.8.8	Yes
19	8.8.8.8	No
29	umbrella	Yes
39	umbrella	No



**Note** The VRFs must be preconfigured. For example, the VRFs 9,19, 29, 39 are preconfigured in the above example.

#### Sample NAT config for DIA internet connectivity:

```
ip access-list extended dia-nat-acl
10 permit ip any any
ip nat inside source list dia-nat-acl interface <WAN-facing-Interface> overload
"ip nat outside" MUST be configured under <WAN-facing-Interface>
```

#### **Configure the Device as a Pass-through Server**

You can identify the traffic to be bypassed using domain names. In the Cisco Catalyst SD-WAN 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 Umbrella cloud. This sample configuration shows how to define a regex parameter-map with a desired domain name and regular expressions:

```
Device# config-transaction
Device(config)# parameter-map type regex dns_bypass
Device(config)# pattern www.cisco.com
Device(config)# pattern .*amazon.com
Device(config)# pattern .*[.]salesforce.com
```

For more information, see Regular Expression for URL Filtering and DNS Security.

#### **DNSCrypt, Resolver, and Public-key**

When you configure the device using the **parameter-map type umbrella global** command, the following values are auto-populated:

- DNSCrypt
- Public-Key

#### **Public-key**

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

**B735:1140:206F:225D:3E2B:D822:D7FD:691E:A1C3:3CC8:D666:8D0C:BE04:BFAB:CA43:FB79** which is the public-key of 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

DNSCrypt is an encryption protocol to authenticate communications between the device and the Umbrella Integration. When the **parameter-map type umbrella** is configured and enabled by default on all WAN interfaces. DNSCrypt gets triggered and a certificate is downloaded, validated, and parsed. A shared secret key is then negotiated, which is used to encrypt the DNS queries. For every hour this certificate is automatically downloaded and verified for an upgrade, a new shared secret key is negotiated to encrypt the DNS queries.

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

Sample umbrella dnscrypt notifications:

```
Device# show sdwan 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 Successfull Attempt: 08:46:32 IST May 21 2018
  Certificate Details:
          Certificate Magic : DNSC
          Major Version
                               : 0x0001
          Minor Version
                               : 0x0000
                               : 0x714E7A696D657555
          Query Magic
          Serial Number
                               : 1517943461
          Start Time
                                : 1517943461 (00:27:41 IST Feb 7 2018)
          End Time
                                : 1549479461 (00:27:41 IST Feb 7 2019)
         Server Public Key : 240B:11B7:AD02:FAC0:6285:1E88:6EAA:44E7:AE5B:AD2F:921F:9577:514D:E226:D552:6836
         Client Secret Key Hash: 8A97:BBD0:A8BE:0263:F07B:72CB:BB21:330B:D47C:7373:B8C8:5F96:9F07:FEC6:BBFE:95D0
         Client Public key
                             : 0622:C8B4:4C46:2F95:D917:85D4:CB91:5BCE:78C0:F623:AFE5:38BC:EF08:8B6C:BB40:E844
         NM key Hash
                             : 88FC:7825:5B58:B767:32B5:B36F:A454:775C:711E:B58D:EE6C:1E5A:3BCA:F371:4285:5E3A
When disabled:
Device# show umbrella dnscrvpt
      DNSCrypt: Not enabled
       Public-key: NONE
Sample configuration steps for dns-resolver and match-local-domain-to-bypass per vrf:
Router(config) # vrf definition 1
Router(config-vrf) # address-family ipv4
Router(config-ipv4) # exit-address-family
```

```
Router(config-vrf) # commitCommit complete.
Router(config-vrf) # exit
Router(config) # parameter-map type umbrella global
Router(config-profile)# ?
Possible completions:
    dnscrypt
    local-domain
   public-key
   registration-vrf
   resolver
    token
    udp-timeout
    vrf
Router(config-profile) # vrf ?
This line doesn't have a valid range expression
Possible completions:
    <name:string, min: 1 chars, max: 32 chars> 1
Router(config-profile) # vrf 1
Router(config-profile-vrf)# ?
Possible completions:
    dns-resolver
    match-local-domain-to-bypass
Router(config-profile-vrf)# dns-resolver umbrella
Router(config-profile-vrf) # match-local-domain-to-bypass
Router(config-profile-vrf) # commit
Commit complete.
Router(config-profile-vrf) # end
Router(config) # vrf definition 2
Router(config-vrf)# address-family ipv4
Router(config-ipv4) # exit-address-family
Router(config-vrf) # commitCommit complete.
Router(config-vrf) # exit
Router(config) # parameter-map type umbrella global
Router(config-profile) # vrf 2
Router(config-profile-vrf) # dns-resolver 8.8.8.8
Router(config-profile-vrf) # no match-local-domain-to-bypass
Router(config-profile-vrf)# commit
Commit complete.
Router(config-profile-vrf) # end
Router#sh 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
Registration VRF: default
VRF List:
1. VRF 1 (ID: 1)
```

DNS-Resolver: umbrella

```
Match local-domain-to-bypass: Yes
2. VRF 2 (ID: 3)
DNS-Resolver: 8.8.8.8
Match local-domain-to-bypass: No
```

#### Verify the Umbrella Connector Configuration

Verify the Umbrella Connector configuration using the following commands:

```
Device# show umbrella config
Umbrella Configuration
_____
  Token: 648BF6139C379DCCFFBA637FD1E22755001CE241
  OrganizationID: 1892929
  Local Domain Regex parameter-map name: dns bypass
  DNSCrvpt: 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
  Registration VRF: default
  VRF List:
     1. VRF 9 (ID: 4)
          DNS-Resolver: 8.8.8.8
         Match local-domain: Yes
      2. VRF 19 (ID: 1)
          DNS-Resolver: 8.8.8.8
         Match local-domain: No
      3. VRF 29 (ID: 2)
          DNS-Resolver: umbrella
         Match local-domain: Yes
      4. VRF 39 (ID: 3)
          DNS-Resolver: umbrella
         Match local-domain: No
The output of VRF will have name and ID. The ID here is VRF ID:
Device# show vrf detail | inc VRF Id
VRF 19 (VRF Id = 1); default RD <not set>; default VPNID <not set>
VRF 29 (VRF Id = 2); default RD <not set>; default VPNID <not set>
VRF 39 (VRF Id = 3); default RD <not set>; default VPNID <not set>
VRF 9 (VRF Id = 4); default RD <not set>; default VPNID <not set>
When DNSCrypt is disabled:
Device# show umbrella config
Umbrella Configuration
_____
   Token: 648BF6139C379DCCFFBA637FD1E22755001CE241
   OrganizationID: 1892929
   Local Domain Regex parameter-map name: dns_bypass
    DNSCrypt: Not enabled
   Public-key: NONE
   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
 Registration VRF: default
 VRF List:
     1. VRF 9 (ID: 4)
        DNS-Resolver: 8.8.8.8
        Match local-domain: Yes
     2. VRF 19 (ID: 1)
        DNS-Resolver: 8.8.8.8
        Match local-domain: No
     3. VRF 29 (ID: 2)
        DNS-Resolver: umbrella
```

```
Match local-domain: Yes
4. VRF 39 (ID: 3)
DNS-Resolver: umbrella
Match local-domain: No
```

#### **Display Umbrella Registration Details**

The following example displays the device registration information:

```
Device# show sdwan umbrella device-registration
Device registration details
VRF
          Tag Status
                               Device-id29
                SUCCESS
                            010a9b2b0d5cb21f39
vpn29
          200
vpn39
          200
               SUCCESS 010a1a2e1989da19
The following example displays the device registration information in detail:
Device# show umbrella deviceid detailed
Device registration details
1.29
                    : vpn29
   Tag
   Device-id
                    : 010a9b2b0d5cb21f
   Description
                   : Device Id recieved successfully
   WAN interface
                   : None
2.39
   Tag
                    : vpn39
   Device-id
                    : 010a1a2e1989da19
                 : De
   Description
   vice Id recieved successfully
   WAN interface
                   : None
```

#### **Configure Cisco Umbrella Using a CLI Device Template**

For more information on using the CLI device template, see Device Configuration-Based CLI Templates for Cisco IOS XE Catalyst SD-WAN devices.

This section provides example CLI configurations for Cisco Umbrella.

```
secure-internet-gateway
umbrella org-id <umbrella org id>
umbrella api-key <api key>
umbrella api-secret "<secret key>"
sdwan
interface Tunnel100001
 tunnel-options tunnel-set secure-internet-gateway-umbrella tunnel-dc-preference primary-dc
 source-interface GigabitEthernet0/0/0
 exit
 interface Tunnel100002
 tunnel-options tunnel-set secure-internet-gateway-umbrella tunnel-dc-preference secondary-dc
 source-interface GigabitEthernet0/0/0
  exit
service sig vrf global
 ha-pairs
  interface-pair Tunnel100001 active-interface-weight 1 Tunnel100002 backup-interface-weight1
vrf definition <vrf#>
address-family ipv4
exit-address-family
interface Loopback<some value>
no shutdown
```

```
vrf forwarding <vrf#>
ip address <IP Address> <mask>
exit
interface Tunnel100001
 no shutdown
 ip unnumbered GigabitEthernet0/0/0
 no ip clear-dont-fragment
 ip tcp adjust-mss 1300
 ip mtu 1400
 tunnel source GigabitEthernet<#/#/#>
  tunnel destination dynamic
  tunnel mode ipsec ipv4
  tunnel protection ipsec profile if-ipsec1-ipsec-profile
  tunnel vrf multiplexing
  tunnel route-via GigabitEthernet<###> mandatory
exit
interface Tunnel100002
 no shutdown
  ip unnumbered GigabitEthernet0/0/0
 no ip clear-dont-fragment
  ip tcp adjust-mss 1300
  ip mtu 1400
  tunnel source GigabitEthernet<#/#/#>
  tunnel destination dynamic
  tunnel mode ipsec ipv4
  tunnel protection ipsec profile if-ipsec2-ipsec-profile
  tunnel vrf multiplexing
  tunnel route-via GigabitEthernet<###> mandatory
exit
crypto ikev2 policy policy1-global
 proposal p1-global
crypto ikev2 profile if-ipsec1-ikev2-profile
 no config-exchange request
  dpd 10 3 on-demand
  dynamic
  lifetime 86400
crypto ikev2 profile if-ipsec2-ikev2-profile
 no config-exchange request
 dpd 10 3 on-demand
 dynamic
  lifetime 86400
crypto ikev2 proposal p1-global
  encryption aes-cbc-128 aes-cbc-256
  group 14 15 16
  integrity shal sha256 sha384 sha512
crypto ipsec transform-set if-ipsec1-ikev2-transform esp-gcm 256
crypto ipsec transform-set if-ipsec2-ikev2-transform esp-gcm 256
crypto ipsec profile if-ipsec1-ipsec-profile
  set ikev2-profile if-ipsec1-ikev2-profile
  set transform-set if-ipsec1-ikev2-transform
  set security-association lifetime kilobytes disable
  set security-association lifetime seconds 3600
  set security-association replay window-size 512
crypto ipsec profile if-ipsec2-ipsec-profile
  set ikev2-profile if-ipsec2-ikev2-profile
```

```
set transform-set if-ipsec2-ikev2-transform
set security-association lifetime kilobytes disable
set security-association lifetime seconds 3600
set security-association replay window-size 512
```

### Umbrella show commands at FP Layer

The **show platform software umbrella f0 config** command displays all the local domains configured for Open DNS in the FP Layer.

```
Device# show platform software umbrella f0 config
+++ Umbrella Config +++
Umbrella feature:
_____
Init: Enabled
Dnscrypt: Enabled
Timeout:
_____
udp timeout: 5
OrgId :
 -----
orgid : 1892929
Resolver config:
RESOLVER IP's
_____
208.67.220.220
208.67.222.222
2620:119:35::35
2620:119:53::53
Dnscrypt Info:
public key:
A5:BA:18:C5:59:70:67:94:E5:37:38:33:06:F9:63:83:39:86:82:E4:00:F5:D8:BE:C1:AA:77:4A:4C:BA:64:00
magic key: 71 4E 7A 69 6D 65 75 55
serial number: 1517943461
ProfileID DeviceID
                         Mode
                                 Resolver
                                            Local-Domain Tag
_____
    0
                          OUT
                                               False
                          IN 8.8.8.8 True
IN 8.8.8.8 False
    4
                                                            vpn9
    1
                                                            vpn19
        010a9b2b0d5cb21f IN 208.67.220.220 True
    2
                                                           vpn29
         010a1a2e1989da19 IN 208.67.220.220 False
    3
                                                           vpn39
The show platform software umbrella f0 local-domain displays the local domain list.
Device# show platform software umbrella f0 local-domain
01. www.cisco.com
02. .*amazon.com
03. .*.salesforce.com
```

### Umbrella show commands at CPP Layer

The show platform hardware qfp active feature umbrella client config command displays the configuration in CPP layer.

```
+++ Umbrella Config +++
Umbrella feature:
-----
Init: Enabled
Dnscrypt: Enabled
Timeout:
------
```

```
udp timeout: 5
Orgid:
_____
orgid: 1892929
Resolver config:
_____
RESOLVER IP's
   208.67.220.220
   208.67.222.222
   2620:119:53::53
   2620:119:35::35
Dnscrypt Info:
_____
public key:
D9:2D:20:93:E8:8C:B4:BD:32:E6:A3:D1:E0:5B:7E:1A:49:C5:7F:96:BD:28:79:06:A2:DD:2E:A7:A1:F9:3D:7E
magic_key: 71 4E 7A 69 6D 65 75 55
serial number: 1517943461
Umbrella Interface Config:
_____
11
      GigabitEthernet4 :
       Mode : IN
       DeviceID : 010a9b2b0d5cb21f
       Tag : vpn29
10
      GigabitEthernet3 :
      Mode : IN
       DeviceID : 0000000000000000
       Tag
             : vpn9
05
       NullO :
      Mode
               : OUT
06
     VirtualPortGroup0 :
      Mode : OUT
      VirtualPortGroup1 :
07
       Mode
            : OUT
08
      GigabitEthernet1 :
            : OUT
      Mode
09
       GigabitEthernet2 :
       Mode : OUT
12
       GigabitEthernet5 :
       Mode
              : OUT
Umbrella Profile Deviceid Config:
ProfileID: 0
   Mode : OUT
ProfileID: 1
        : IN
   Mode
   Resolver : 8.8.8.8
   Local-Domain: False
   DeviceID : 000000000000000
   Tag : vpn19
ProfileID: 3
   Mode
          : IN
   Resolver : 208.67.220.220
   Local-Domain: False
   DeviceID : 010a1a2e1989da19
   Tag : vpn39
ProfileID: 4
   Mode
          : IN
   Resolver : 8.8.8.8
   Local-Domain: True
   DeviceID : 000000000000000
   Tag : vpn9
ProfileID: 2
```

```
Mode
           : IN
   Resolver : 208.67.220.220
   Local-Domain: True
   DeviceID : 010a9b2b0d5cb21f
           : vpn29
   Taq
Umbrella Profile ID CPP Hash:
  ------
VRF ID :: 1
   VRF NAME : 19
   Resolver : 8.8.8.8
   Local-Domain: False
VRF ID :: 4
   VRF NAME : 9
   Resolver : 8.8.8.8
   Local-Domain: True
VRF ID :: 2
   VRF NAME : 29
   Resolver : 208.67.220.220
   Local-Domain: True
VRF ID :: 3
   VRF NAME : 39
    Resolver : 208.67.220.220
   Local-Domain: False
```

### **Umbrella Data-Plane show commands**

The **show platform hardware qfp active feature umbrella datapath stats** command displays the umbrella statistics in data plane.

```
Device# show platform hardware qfp active feature umbrella datapath stats
Umbrella Connector Stats:
   Parser statistics:
        parser unknown pkt: 0
        parser fmt error: 0
        parser count nonzero: 0
        parser pa error: 0
        parser non query: 0
        parser multiple name: 0
        parser dns name err: 0
        parser matched ip: 0
        parser opendns redirect: 0
        local domain bypass: 0
        parser dns others: 0
        no device id on interface: 0
        drop erc dnscrypt: 0
        regex locked: 0
        regex not matched: 0
        parser malformed pkt: 0
    Flow statistics:
        feature object allocs : 0
        feature object frees : 0
        flow create requests : 0
        flow create successful: 0
        flow create failed, CFT handle: 0
        flow create failed, getting FO: 0
        flow create failed, malloc FO : 0
        flow create failed, attach FO : 0
        flow create failed, match flow: 0
        flow create failed, set aging : 0
        flow lookup requests : 0
        flow lookup successful: 0
        flow lookup failed, CFT handle: 0
```

```
flow lookup failed, getting FO: 0
   flow lookup failed, no match : 0
   flow detach requests : 0
   flow detach successful: 0
   flow detach failed, CFT handle: 0
    flow detach failed, getting FO: 0
   flow detach failed freeing FO : 0
   flow detach failed, no match : 0
   flow ageout requests
                                  : 0
   flow ageout failed, freeing FO: 0
   flow ipv4 ageout requests : 0
   flow ipv6 ageout requests
                                 : 0
   flow update requests : 0
   flow update successful: 0
   flow update failed, CFT handle: 0
   flow update failed, getting FO: 0
   flow update failed, no match : 0
DNSCrypt statistics:
    bypass pkt: 0
    clear sent: 0
    enc sent: 0
    clear rcvd: 0
    dec rcvd: 0
    pa err: 0
    enc lib err: 0
    padding err: 0
    nonce err: 0
    flow bypass: 0
    disabled: 0
    flow not enc: 0
DCA statistics:
   dca match success: 0
   dca match failure: 0
```

The **show platform hardware qfp active feature umbrella datapath memory** command displays CFT information.

```
Device# show platform hardware qfp active feature umbrella datapath memory
==Umbrella Connector CFT Information==
CFT inst_id 0 feat id 0 fo id 0 chunk id 4
==Umbrella Connector Runtime Information==
umbrella init state 0x4
umbrella dsa client handler 0x2
```

The **show platform hardware qfp active feature umbrella datapath runtime** command displays internal information. For example, key index used for DNSCrypt.

```
Device# show platform hardware qfp active feature umbrella datapath runtime
udpflow_ageout: 5
ipv4 count: 2
ipv6 count: 2
ipv4 index: 0
ipv6 index: 0
Umbrella IPv4 Anycast Address
IP Anycast Address0: 208.67.220.220
IP Anycast Address1: 208.67.222.222
Umbrella IPv6 Anycast Address
IP Anycast Address0: 2620:119:53:0:0:0:0:53
IP Anycast Address1: 2620:119:35:0:0:0:35
=DNSCrypt=
key index: 0
-key[0]-
sn: 1517943461
ref cnt: 0
magic: 714e7a696d657555
```

#### **Clear Command**

The **clear platform hardware qfp active feature umbrella datapath stats** command clears the Umbrella connector statistics in datapath.

```
Device# clear platform hardware qfp active feature umbrella datapath stats Umbrella Connector Stats Cleared
```

### Troubleshooting the Umbrella Integration

Troubleshoot issues that are related to enabling the 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 39FF0000000000000"
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)"
```

# **DNS Security Policy Configuration**

#### Domain List

CLI Command	Possible Completions	Description and possible input values
policy lists local-domain-list <name></name>		List of domain name regular expression patterns
		Domain name regular expression pattern string. For example, policy lists local-domain-list name as google.com.

#### **Umbrella Registration**

CLI Command	Possible Completions	Description and possible input values
security umbrella		Configure Umbrella service related security properties.
	api-key	Config umbrella api-key. The value ranges from 1 to 64 characters.
	dnscrypt	Enable DNScrypt while redirecting DNS requests to Umbrella.
	orgid	Config umbrella org id
	secret	Config umbrella secret. The value can be $[0   6]$ .
	token	Umbrella service registration token. The value ranges from 1 to 64 characters.

CLI Command	Possible Completions	Description and possible input values
vpn <number, range&gt;</number, 	dns-redirect match-local-domain-to-bypass	List of domain name regular expression patterns
	dns-redirect umbrella	Bypass the dns redirect for entries in the local domain list Use Umbrella as DNS redirect service.

#### **DNS-Security Policy with Domain List**

```
policy
lists
local-domain-list domain-list
google.com
!
exit
!
```

```
exit
!
security
umbrella
dnscrypt
!
exit
!
vpn matchAllVpn
dns-redirect umbrella match-local-domain-to-bypass
```

#### **DNS-Redirection with NAT**

This example displays the centralized policy configuration for NAT with DNS redirection.

```
policy
data-policy DP1
  vpn-list VPN1
   sequence 1
    match
    dns request
    1
    action accept
     redirect-dns umbrella
    1
   !
   sequence 2
   action accept
    nat use-vpn 0
    !
   !
   default-action drop
  1
```

### **Monitor Umbrella Feature**

You can monitor the registered VPNs, DNSCrypt status, packet counts for required timestamps on an Umbrella configured router using the following steps.

To monitor the status of Umbrella DNS Configuration on a device:

1. From the Cisco SD-WAN Manager menu, choose Monitor > Devices.

Cisco vManage Release 20.6.1 and earlier: From the Cisco SD-WAN Manager menu, choose the **Monitor** > **Network**.

- 2. Under Security Monitoring, click Umbrella DNS Re-direct in the left pane. Umbrella DNS Re-direct displays the number of packets that are redirected to configured DNS server.
- 3. Click Local Domain Bypass to view the number of packets that are bypassed from DNS server.

I