



# Pulse Secure Desktop Client

Fully Qualified Domain Name (FQDN) based Split  
Tunneling

Deployment Guide

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Pulse Secure Desktop Client FQDN based Split Tunneling Deployment Guide.

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1.2, January 2020	Updated "FQDN resource and IPv4/IPv6 resources-based Split Tunneling" section.	
1.1.1, August 2019	Added a note in "Configuration" section.	
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# Purpose of this Guide

This guide describes how to configure split tunneling rules on the Pulse Desktop Client based on Fully Qualified Domain Names (FQDN) by directly specifying the domain names.

## Prerequisites

This guide assumes you are familiar with the use of the following products or documents and their related terminology.

- Windows, macOS
- Pulse Desktop Client 9.0R1
- Pulse Secure Desktop Client Administration Guide Release 9.0R1
- Pulse Connect Secure Administration Guide Release 9.0R1

# Overview

## Fully Qualified Domain Names (FQDN) based Split Tunneling

Fully Qualified Domain Names (FQDN) based split tunneling will allow the PCS administrator to configure the split tunneling based on FQDN. FQDN based resources can be defined as exclude policy and include policy for split tunneling. Based on the role merging rules as is done for IP/Netmask based resources, PCS will send lists of FQDN include policy and FQDN exclude policy to Pulse Desktop Client.

 **Note:** PCS will send list of FQDN based split tunneling rules with FQDN only to Pulse Desktop Clients 9.0R1 onwards. So, Pulse Desktop Client lesser than 9.0R1 release, are not affected by new set of configuration rules.

Pulse Desktop Client will send all DNS requests to the PCS server and then decide based on FQDN Exclude Policy and FQDN Include Policy lists.

A FQDN name might resolve to multiple IP addresses and can also have other CNAME addresses that are expected to be treated on par with the original FQDN.

This feature is helpful while configuring rules to ignore or tunnel cloud services.

## Related Features

FQDN based split tunneling works well along with the following additional features:

- **PCS Split Tunneling Overview**

Split tunneling is configured as a part of the role that is assigned to a user after authentication. When the client and Pulse Connect Secure (PCS) establish a VPN tunnel, the Pulse server takes control of the routing environment on the endpoint to ensure that only permitted network traffic is allowed access through the VPN tunnel. Split tunneling settings enable you to further define the VPN tunnel environment by permitting some traffic from the endpoint to reach the local network or another connected subnet. When split tunneling is enabled, split tunneling resource policies enable you to define the specific IP network resources and FQDN resources that are excluded from access or accessible through the VPN tunnel.

For more information on PCS Split Tunneling, see section Pulse Connect Secure Split Tunneling Overview in PDC Admin Guide.

- **FQDN Access Control Policies (ACL)**

Admin can configure IPv4/IPv6/FQDN addresses in the following 2 ways:

- Simple Rules
- Detailed Rules

**Simple Rules:** Admin can configure IPv4/IPv6/FQDN addresses with allow/deny rules. These rules permit/deny access to an IPv4/IPv6/FQDN resource based on the IPv4/IPv6/FQDN address configured.

**Detailed Rules:** Admin can configure IPv4/IPv6/FQDN addresses with allow/deny rules with conditions. These rules permit/deny access to an IPv4/IPv6/FQDN resource based on the IPv4/IPv6/FQDN address configured when the condition matches.

Every entry in the ACL policy corresponds to 2 entries in the FORWARD chain in iptables/ip6tables. One in the inbound direction and the other in the outbound direction.

For more information, see Writing a Detailed Rule for VPN Tunneling Access Control Policies ACL in PCS

Admin Guide.

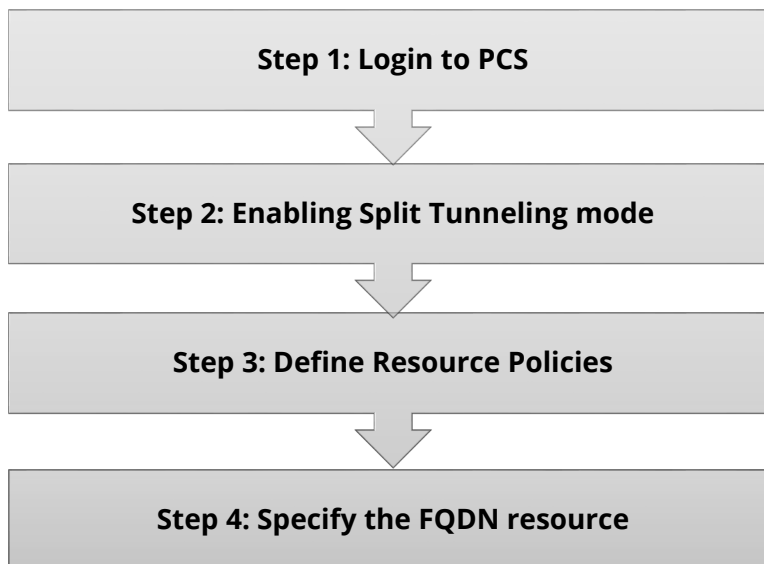
- **IPv4 Split Tunneling:** Pulse VPN now allows accessing both IPv4, IPv6 corporate resources from IPv4 and IPv6 endpoints and FQDN resources. It enables client to access both corporate network and local network at the same time. The network traffic designated is directed to tunnel interface for corporate network by configuring route policies, whereas other traffics are sent to direct interface.

 **Note:** All configurations to IPv6 are similar to IPv4.

For more information, see section IPv6/IPv4 Split Tunneling in PDC Admin Guide.

# Configuration

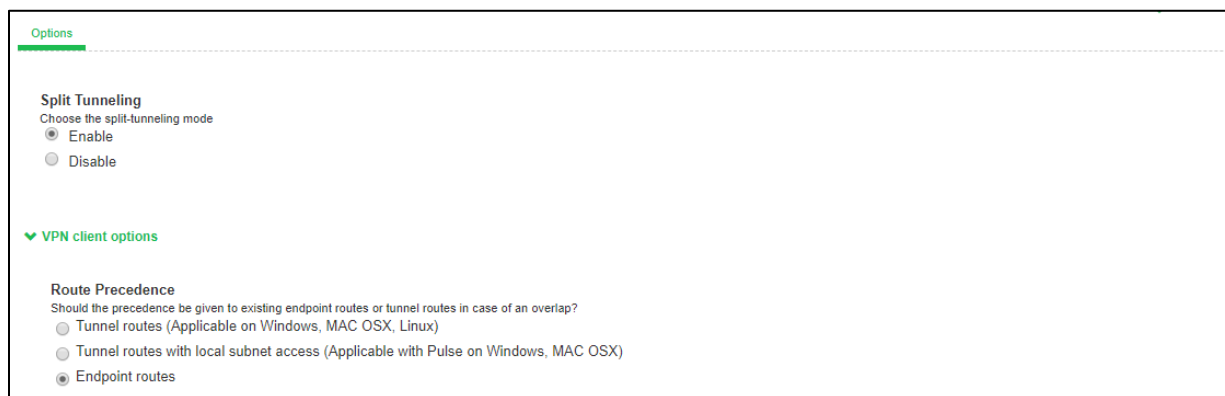
A high-level overview of the configuration steps to set up FQDN based split tunneling feature is shown below.



To configure the FQDN based split tunneling, perform the following steps:

1. Log in to Pulse Connect Secure administrator console.
2. Select **User > User Roles > Role Name > VPN Tunneling > Split Tunneling**  
Choose the split tunneling mode as **Enable**.

Figure 1: Split Tunneling Mode Enable



**Note:** Split Tunneling mode must be enabled for FQDN based Split tunneling.

3. Select **Resource Policy > VPN Tunneling > Split Tunneling Networks**  
Admin can add a new policy or can choose the already defined policy.
4. In the FQDN Resources section, specify the FQDN name.



Figure 2 FQDN Split Tunneling

\* Name:  Required: Label to reference this

Description:

▼ Resources

Specify the resources for which this policy applies, one per line.

IPv4 Resources:  Examples:  
10.10.0.0/255.255.0.0  
10.10.10.0/255.255.255.0  
10.2.12.0/24

IPv6 Resources:  Examples:  
[2001:db8:a0b:12f0::1]  
[2001:DB8:6:0/112]  
[2001:DB8::7:50]

FQDN Resources:  Examples:  
www.example.com  
\*.example.com

**Note:** FQDN resources will be resolved to IPv4 addresses only.

**Note:** For FQDN resources wild card domains will be allowed. For more information on format of these rules, see RFC 4592.

### Detailed Rule Tab

Select **Actions > Use Detailed Rules** box.

Figure 3 Detailed Rules Tab

**Actions**

Allow access

Exclude access

Use Detailed Rules(see [Detailed Rules page](#))

Click on **Detailed Rules**. The following screen appears:

Figure 4 Detailed Tab FQDN

VPN Tunneling Split Tunneling > test1\_allow\_policy

### Detailed Rule

▼ Actions

Allow access  
 Exclude access

▼ Resources

Specify the resources for which this rule applies, one per line.

IPv4 Resources:  Examples:  
 10.10.0.0/255.255.0.0  
 10.10.10.0/255.255.255.0  
 10.2.12.0/24

IPv6 Resources:  Examples:  
 [2001:db8:a0b:12f0::1]  
 [2001:DB8::6:0/112]  
 [2001:DB8::7:50]

FQDN Resources:  Examples:  
 www.example.com  
 \*.example.com  
 Note: FQDN resources will be resolved to IPv4 addresses only.

▼ Conditions

Specify the conditions, if any, under which this rule applies.

Conditions:

Conditions Dictionary

- ▶ Prebuilt Conditions
- ▶ Your Conditions
- ▶ Logical Operators

In the FQDN Resources section, specify the FQDN name. For FQDN resources wild card domains are allowed.

**Note:**

- FQDN is not supported on IPv6.
- FQDN based split tunneling will not support Dual Stack (both IPv6 and IPv4).
- FQDN based split tunneling will not support Traffic Enforcement feature enabled for the respective role.
- FQDN based split tunneling with proxy configuration is not supported currently.

# FQDN resource and IPv4/IPv6 resources-based Split Tunneling

The following table describes the different scenarios for FQDN based split tunneling with respect to IPv4 and IPv6 based split tunneling.

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
1.	1.1.10/24	NA	NA	NA	NA	NA	1.1.1.0 pointing to the tunnel interface. All other IPv4 will go through physical interface. All IPv6 resources will go through the tunnel. FQDN resources are not considered, depends on the IPv4 default route if present will go through the tunnel interface else through physical interface.	No change in behaviour.

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
2.	NA	1.1.1.0/24	NA	NA	NA	NA	1.1.1.0 pointing to physical interface. All other IPv4 traffic except 1.1.1.0/24 will go through the tunnel interface. All IPv6 traffic will go through the tunnel interface. FQDN resources are not considered, depends on the IPv4 default route if present will go through the tunnel else through physical interface.	No change in behaviour.

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
3.	NA	NA	2001:cdba::3257:9652	NA	NA	NA	Default IPv4 route pointing to the tunnel. IPv6 route for 2001:cdba::3257:9652 pointing to tunnel. All IPv4 resource will go through the tunnel. All IPv6 traffic other than 2001:cdba::3257:9652 will go through the tunnel. FQDN resources are not considered , depends on the IPv4 default route if present will go through the tunnel else through physical interface.	No change in behaviour.

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
4.	NA	NA	NA	2001:cdba::3257:9652	NA	NA	IPv4 default route pointing to the tunnel. IPv6 default route pointing to the tunnel. IPv6 route for 2001:cdba::3257:9652 pointing to physical interface. All other IPv4 and IPv6 resource will go through the tunnel. FQDN resources are not considered , depends on the IPv4 default route if present will go through the tunnel else through physical interface.	No change in behaviour.
5.	NA	NA	NA	NA	www.google.com	NA	IPv4 default route will be present. IPv6 default route will be present. FQDN resources are not considered, depends on the IPv4 default route if present will go through the tunnel else through physical interface.	Only www.google.com will go through the tunnel. IPv4 will go through the physical interface. IPv6 will go through the tunnel.

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
6.	NA	NA	NA	NA	NA	www.google.com	IPv4 default route will be present. IPv6 default route will be present. FQDN resources are not considered, depends on the IPv4 default route if present will go through the tunnel else through physical interface.	www.google.com will go through the physical interface. All other FQDN resources will go through the tunnel. All IPv4/IPv6 resources will go through the tunnel.
7.	1.1.1.0/24	NA	2001:cdba::3257:9652	NA	NA	NA	Route for 1.1.1.0/24 pointing to the tunnel. Route for 2001:cdba::3257:9652 pointing to the tunnel. Except for [1.1.1.0/24 and 2001:cdba::3257:9652 ] all other IPv4 and IPv6 will go through the tunnel. FQDN resources are not considered , depends on the IPv4 default route if present will go through the tunnel else through physical interface.	No change in behaviour.

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
8.	NA	1.1.1.0/24	NA	1.1.1.0/24	NA	NA	IPv4 default route pointing to the tunnel. IPv6 default route pointing to tunnel. Route for 1.1.1.0/24 pointing to physical interface. Route for 2001:cdba::3257:9652 pointing to physical interface. Except for 1.1.1.0/24 and 2001 all other IPv4 and IPv6 will go through the tunnel. FQDN resources are not considered.	No change in behaviour.



S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
9.	1.1.1.0/24	NA	NA	NA	www.google.com	NA	No default IPv4 route. IPv6 default route pointing to the tunnel. Other than 1.1.1.0/24 all IPv4 will go through the physical interface. FQDN resources are not considered, depends on the IPv4 default route if present will go through the tunnel else through physical interface.	Except for 1.1.1.0/24 and www.google.com all other IPv4 and FQDN will go through the physical interface. All IPv6 will go through the tunnel.

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
10.	NA	1.1.1.0/24	NA	NA	NA	www.google.com	<p>IPv4 default route pointing to the tunnel.  IPv6 default route pointing to tunnel.  Route for 1.1.1.0/24 pointing to physical interface will be added.  Except for 1.1.1.0/24 all other IPv4 and IPv6 resource will go through the tunnel.  FQDN resources are not considered , depends on the IPv4 default route if present will go through the tunnel else though physical interface.</p>	<p>Except for 1.1.1.0/24 and www.google.com all other IPv4,IPv6 and FQDN resource will go through the tunnel.  All IPv6 will go through the tunnel.</p>

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
11.	NA	NA	2001:cdba::3257:9652	NA	www.google.com	NA	<p>IPv4 default route pointing to the tunnel.                      No IPv6 default route.                      Route for 2001:cdba::3257:9652 pointing to the tunnel.                      Except for 2001:cdba::3257:9652 IPv6 will go through the physical interface.                      All IPv4 traffic will go through the tunnel.                      FQDN resources are not considered , depends on the IPv4 default route if present will go through the tunnel else through physical interface.</p>	<p>Except for 2001:cdba::3257:9652 and www.google.com all other IPv4/IPv6/FQDN will go through the physical interface.</p>

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
12.	NA	NA	NA	2001:cdba::3257:9652	NA	www.google.com	IPv4 default route pointing to the tunnel. IPv6 default route pointing to the tunnel. Except for 2001:cdba::3257:9652 all other IPv4 and IPv6 traffic will go through the tunnel. FQDN resources are not considered , depends on the IPv4 default route if present will go through the tunnel else through physical interface.	Except for 2001:cdba::3257:9652 and www.google.com all the other IPv4/IPv6/FQDN will go through the tunnel.

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
13.	1.1.1.0 /24	NA	NA	NA	NA	www.google.com	No default IPv4 route pointing to the tunnel. IPv6 default route pointing to the tunnel. Route for 1.1.1.0 pointing to the tunnel. Except for 1.1.1.0 all other IPv4 traffic will go through physical interface. All the IPv6 traffic will go through the tunnel. FQDN resources are not considered , depends on the IPv4 default route if present will go through the tunnel else through physical interface.	Except for 1.1.1.0/24 all other IPv4 will go through physical interface. Except for www.google.com all other FQDN resource will go through the tunnel. All IPv6 traffic will go through the tunnel.

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
14.	NA	1.1.1.0/24	NA	NA	www.google.com	NA	IPv4 default route pointing to the tunnel. IPv6 default route pointing to the tunnel. Except for 1.1.1.0/24 all other IPv4 traffic will go through the tunnel. All IPv6 traffic will go through the tunnel. FQDN resources are not considered, depends on the IPv4 default route if present will go through the tunnel else through physical interface.	Except for 1.1.1.0/24 all other IPv4 resources will go through the tunnel. All the IPv6 traffic will go through the tunnel. Except for www.google.com all other FQDN resources will go through the physical interface.

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
15.	NA	NA	2001:cdba::3257:9652	NA	NA	www.google.com	Default IPv4 route pointing to the tunnel. No default IPv6 route pointing to tunnel. All IPv4 resource will go through the tunnel. Except for 2001:cdba::3257:9652 all other IPv6 traffic will go through the physical interface. FQDN resources are not considered , depends on the IPv4 default route if present will go through the tunnel else through physical interface.	Except for www.google.com, all other FQDN resources will go through the tunnel. Except for 2001:cdba::3257:9652 all the IPv6 traffic will go through the physical interface. All the IPv4 traffic will go through the tunnel.

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
16.	NA	NA	NA	2001:cdba::3257:9652	www.google.com	NA	IPv4 default route pointing to the tunnel. IPv6 default route pointing to tunnel. Route for 2001:cdba::3257:9652 pointing to physical interface. All IPv4 traffic will go through the tunnel. Except for 2001:cdba::3257:9652 all other IPv6 traffic will go through the tunnel. FQDN resources are not considered , depends on the IPv4 default route if present will go through the tunnel else through physical interface.	Except www.google.com, all other FQDN resources will go through the physical interface. Except 2001:cdba::3257:9652 all other IPv6 traffic will go through the tunnel. All the IPv4 traffic will go through the physical interface.



S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
17.	1.1.1.0 /24	2.2.2.0/ 24	NA	NA	NA	NA	No IPv4 default route. IPv6 default route pointing to the tunnel. Route for 1.1.1.0/24 pointing to the tunnel. Except for 1.1.1.0/24 all the IPv4 traffic will go through the physical interface. All the IPv6 traffic will go through the tunnel. FQDN resources are not considered , depends on the IPv4 default route if present will go through the tunnel else through physical interface.	No change in behaviour.

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
18.	NA	NA	2001:cdba::3257:9652	2001:cdba::3257:9653	NA	NA	IPv4 default route pointing to the tunnel. Route for 2001:cdba::3257:9652 pointing to the tunnel. Route for 2001:cdba::3257:9653 pointing to physical interface. All IPv4 traffic will go through the tunnel. FQDN resources are not considered , depends on the IPv4 default route if present will go through the tunnel else through physical interface.	No change in behaviour.

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
19.	NA	NA	NA	NA	www.google.com	www.facebook.com	IPv4 default route pointing to the tunnel. IPv6 default route pointing to the tunnel. All IPv4 and IPv6 traffic will go through the tunnel. FQDN resources are not considered , depends on the IPv4 default route if present will go through the tunnel else through physical interface.	www.google.com will go through the tunnel. www.facebook.com will go through the physical interface. All the IPv4 and IPv6 resources will go through the physical interface.

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
20.	NA	1.1.1.0/24	NA	2001:cdba::3257:9652	NA	www.google.com	<p>IPv4 default route pointing to the tunnel. IPv6 default route pointing to the tunnel. Route for 1.1.1.0/24 pointing to physical interface. Route for 2001:cdba::3257:9652 pointing to physical interface. Except for 1.1.1.0/24 all other IPv4 traffic will go through the tunnel. Except for 2001:cdba::3257:9652 all other IPv6 traffic will go through the tunnel. FQDN resources are not considered , depends on the IPv4 default route if present will go through the tunnel else through physical interface.</p>	<p>Except www.google.com, all other FQDN resources will go through the tunnel. All the IPv4 resources will go through the tunnel, except 1.1.1.0/24. All the IPv6 resources will go through the tunnel except 2001:cdba::3257:9652.</p>

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
21.	NA	1.1.1.0/24	NA	2001:cdba::3257:9652	NA	www.google.com	<p>IPv4 default route pointing to the tunnel. IPv6 default route pointing to tunnel. Route for 1.1.1.0/24 pointing to physical interface. Route for 2001:cdba::3257:9652 pointing to physical interface. Except for 1.1.1.0/24 all other IPv4 traffic will go through the tunnel. Except for 2001:cdba::3257:9652 all other IPv6 traffic will go through the tunnel. FQDN resources are not considered, depends on the IPv4 default route if present will go through the tunnel else through physical interface.</p>	<p>Except <a href="http://www.google.com">www.google.com</a>, all other FQDN resources will go through the tunnel. All the IPv4 resource will go through the tunnel except 1.1.1.0/24. All the IPv6 resources will go through the tunnel except 2001:cdba::3257:9652.</p>

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
22.	1.1.1.0/24	NA	2001:cdba::3257:9652	NA	NA	www.google.com	<p>No IPv4 default route.  No IPv6 default route.  Route for 1.1.1.0/24 pointing to the tunnel.  Route for 2001:cdba::3257:9652 pointing to the tunnel.  Except for 1.1.1.0/24 all IPv4 traffic will go through the physical interface.  Except for 2001:cdba::3257:9652 all IPv6 traffic will go through the physical interface.  FQDN resources are not considered , depends on the IPv4 default route if present will go through the tunnel else through physical interface.</p>	<p>Except <a href="http://www.google.com">www.google.com</a>, all other FQDN resources will go through the tunnel.  All the IPv4 resources will go through the physical interface except 1.1.1.0/24.  All the IPv6 resources will go through the physical interface except 2001:cdba::3257:9652.</p>

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
23.	1.1.1.0 /24	NA	NA	2001:cdba::3257:9652	www.google.com	NA	No IPv4 default route. IPv6 default route pointing to the tunnel. Route for 1.1.1.0 pointing to the tunnel. Route for 2001:cdba::3257:9652 pointing to physical interface. Except for 1.1.1.0/24 all other IPv4 traffic will go through the physical interface. Except for 2001:cdba::3257:9652 all other IPv6 traffic will go through the tunnel. FQDN resources are not considered , depends on the IPv4 default route if present will go through the tunnel else through physical interface.	www.google.com will go through the tunnel. All other FQDN resources will go through the physical interface. All the IPv4 resource will go through the physical interface except 1.1.1.0/24. All the IPv6 resource will go through the tunnel except 2001:cdba::3257:9652.

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
24.	NA	1.1.1.0/24	2001:cdba::3257:9652	NA	www.google.com	NA	<p>IPv4 default route pointing to the tunnel. No IPv6 default route. Route for 1.1.1.0/24 pointing to physical interface. Route for 2001:cdba::3257:9652 pointing to the tunnel. Except for 1.1.1.0/24 all other IPv4 traffic will go through the tunnel. Except for 2001:cdba::3257:9652 all other IPv6 traffic will go through the physical interface. FQDN resources are not considered , depends on the IPv4 default route if present will go through the tunnel else through physical interface.</p>	<p>www.google.com will go through the tunnel. All other FQDN resources which are not mentioned will go through the physical interface. All the IPv4 resources will go through the tunnel except 1.1.1.0/24. All the IPv6 resources will go through the physical interface except 2001:cdba::3257:9652.</p>



S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
25.	1.1.1.0/24	NA	NA	2001:cdba::3257:9652	NA	www.google.com	No IPv4 default route. IPv6 default route pointing to the tunnel. Route for 1.1.1.0/24 pointing to the tunnel. Route for 2001:cdba::3257:9652 pointing to physical interface. Except for 1.1.1.0/24 all other IPv4 traffic will go through the physical interface. Except for 2001:cdba::3257:9652 all other IPv6 traffic will go through the tunnel. FQDN resources are not considered , depends on the IPv4 default route if present will go through the tunnel else through physical interface.	Except <a href="http://www.google.com">www.google.com</a> , all other FQDN resources will go through the tunnel. All the IPv4 resources will go through the physical interface except 1.1.1.0/24. All the IPv6 resource will go through the tunnel except 2001:cdba::3257:9652.

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
26.	NA	1.1.1.0/24	2001:cdba::3257:9652	NA	NA	www.google.com	IPv4 default route pointing to the tunnel. No IPv6 default route. Except for 1.1.1.0/24 all other IPv4 traffic will go through the tunnel. Except for 200:cdba:3257:9652 all other IPv6 traffic will go through the physical interface. FQDN resources are not considered , depends on the IPv4 default route if present will go through the tunnel else through physical interface.	Except <a href="http://www.google.com">www.google.com</a> , all other FQDN resources will go through the tunnel. All the IPv4 resources will go through the tunnel except 1.1.1.0/24. All the IPv6 resources will go through the physical interface except 2001:cdba::3257:9652.

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
27.	NA	1.1.1.0/24	NA	2001:cdba::3257:9652	www.google.com	NA	IPv4 default route pointing to the tunnel. IPv6 default route pointing to the tunnel. Except for 1.1.1.0/24 all other IPv4 traffic will go through the tunnel. Except for 2001:cdba::3257:9652 all other IPv6 traffic will go through the tunnel. FQDN resources are not considered , depends on the IPv4 default route if present will go through the tunnel else through physical interface.	www.google.com will go through the tunnel. All other FQDN resource except <a href="http://www.google.com">www.google.com</a> will go through the physical interface. All the IPv4 resources will go through the tunnel except 1.1.1.0/24. All the IPv6 resource will go through the tunnel except 2001:cdba::3257:9652.

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
28.	1.1.1.0/24	2.2.2.0/24	2001:cdba::3257:9652	2001:cdba::3257:9653	www.google.com	www.facebook.com	No IPv4 default route. No IPv6 default route. Except for 1.1.1.0/24 all other IPv4 traffic will go through the physical interface. Except for 2001:cdba::3257:9652 all other IPv6 traffic will go through the physical interface. FQDN resources are not considered , depends on the IPv4 default route if present will go through the tunnel else through physical interface.	www.google.com will go through the tunnel. All other FQDN resources which are not mentioned will go through the physical interface including www.facebook.com. All the IPv4 resources will go through the physical interface including 2.2.2.0/24 except 1.1.1.0/24. All the IPv6 resource will go through the physical interface including 2001:cdba::3257:9653 except 2001:cdba::3257:9652.

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
29.	1.1.1.0/24	2.2.2.0/24	2001:cdba::3257:9652	2001:cdba::3257:9653	www.google.com	NA	No IPv4 default route. No IPv6 default route. Except for 1.1.1.0/24 all other IPv4 traffic will go through the physical interface. Except for 2001:cdba::3257:9652 all other IPv6 traffic will go through the physical interface. FQDN resources are not considered, depends on the IPv4 default route if present will go through the tunnel else through physical interface.	www.google.com will go through the tunnel. All other FQDN resource which are not mentioned will go through the physical interface All the IPv4 resource will go through the physical interface including 2.2.2.0/24 except 1.1.1.0/24. All the IPv6 resource will go through the physical interface including 2001:cdba::3257:9653 except 2001:cdba::3257:9652.

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
30.	1.1.1.0/24	2.2.2.0/24	2001:cdba::3257:9652	NA	www.google.com	www.facebook.com	No IPv4 default route. No IPv6 default route. Except for 1.1.1.0/24 all other IPv4 traffic will go through the physical interface. Except for 2001:cdba::3257:9652 all other IPv6 traffic will go through the physical interface. FQDN resources are not considered , depends on the IPv4 default route if present will go through the tunnel else through physical interface.	www.google.com will go through the tunnel. All other FQDN resource which are not mentioned will go through the physical interface including www.facebook.com . All the IPv4 resources will go through the physical interface including 2.2.2.0/24 except 1.1.1.0/24. All the IPv6 resources will go through the physical interface except 2001:cdba::3257:9652.

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
31.	1.1.1.0/24	NA	2001:cdba::3257:9652	2001:cdba::3257:9653	www.google.com	www.facebook.com	No IPv4 default route. No IPv6 default route. Except for 1.1.1.0/24 all other IPv4 traffic will go through the physical interface. Except for 2001:cdba::3257:9652 all other IPv6 traffic will go through the physical interface. FQDN resources are not considered , depends on the IPv4 default route if present will go through the tunnel else through physical interface.	www.google.com will go through the tunnel. All other FQDN resources which are not mentioned will go through the physical interface including facebook.com. All the IPv4 resources will go through the physical interface except 1.1.1.0/24. All the IPv6 resources will go through the physical interface including 2001:cdba::3257:9653 except 2001:cdba::3257:9652.


S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
32.	NA	2.2.2.0/24	2001:cdba::3257:9652	2001:cdba::3257:9653	www.google.com	www.facebook.com	IPv4 default route pointing to the tunnel. No IPv6 default route. Except for 2.2.2.0/24 all other IPv4 traffic will go through the tunnel. Except for 2001:cdba::3257:9652 all other IPv6 traffic will go through the physical interface. FQDN resources are not considered , depends on the IPv4 default route if present will go through the tunnel else through physical interface.	www.google.com will go through the tunnel. All other FQDN resources which are not mentioned will go through the physical interface including www.facebook.com. All the IPv4 resources will go through the tunnel except 2.2.2.0/24 . All the IPv6 resources will go through the physical interface including 2001:cdba::3257:9653 except 2001:cdba::3257:9652.



S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
33.	1.1.1.0/24	2.2.2.0/24	NA	2001:cdba::3257:9652	www.google.com	www.facebook.com	No IPv4 default route. IPv6 default route pointing to the tunnel. Except for 1.1.1.0/24 all other IPv4 traffic will go through the physical interface. Except for 2001:cdba::3257:9652 all other IPv6 traffic will go through the tunnel. FQDN resources are not considered, depends on the IPv4 default route if present will go through the tunnel else through physical interface.	www.google.com will go through the tunnel. All other FQDN resources which are not mentioned will go through the physical interface including www.facebook.com. All the IPv4 resources will go through the physical interface except 1.1.1.0/24. All the IPv6 resources will go through the tunnel except 2001:cdba::3257:9652.

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
34.	1.1.1.0/24	2.2.2.0/24	2001:cdba::3257:9652	2001:cdba::3257:9653	NA	www.facebook.com	<p>No IPv4 default route.</p> <p>No IPv6 default route.</p> <p>Except for 1.1.1.0/24 all other IPv4 traffic will go through the physical interface.</p> <p>Except for 2001:cdba::3257:9652 all other IPv6 traffic will go through the physical interface.</p> <p>FQDN resources are not considered , depends on the IPv4 default route if present will go through the tunnel else through physical interface.</p>	<p>www.facebook.com will go through the physical interface.</p> <p>All other FQDN resources which are not mentioned will go through the tunnel.</p> <p>All the IPv4 resources will go through the physical interface including 2.2.2.0/24 except 1.1.1.0/24.</p> <p>All the IPv6 resources will go through the physical interface including 2001:cdba::3257:9653 except 2001:cdba::3257:9652.</p>

S. No.	IPv4 Include Policy	IPv4 Exclude Policy	IPv6 Include Policy	IPv6 Exclude Policy	FQDN Include Policy	FQDN Exclude Policy	Client Existing Behavior (5.3R4 and below)	Client New Behavior (9.1R2 and above)
35.	1.1.1.0/24	2.2.2.0/24	2001:cdba::3257:9652	2001:cdba::3257:9653	www.google.com	NA	No IPv4 default route. No IPv6 default route. Except for 1.1.1.0/24 all other IPv4 traffic will go through the physical interface. Except for 2001:cdba::3257:9652 all other IPv6 traffic will go through the physical interface. FQDN resources are not considered, depends on the IPv4 default route if present will go through the tunnel else through physical interface.	www.google.com will go through the tunnel. All other FQDN resources which are not mentioned will go through the physical interface All the IPv4 resources will go through the physical interface including 2.2.2.0/24 except 1.1.1.0/24. All the IPv6 resources will go through the physical interface including 2001:cdba::3257:9653 except 2001:cdba::3257:9652.

 **Note:** Split Tunnel should be enabled for all the above scenarios.

## FQDN Policy Evaluation

FQDN policy will be evaluated based on the longest suffix matching algorithm.

The following table explains the above statement.

Include Policy/ Exclude Policy	FQDN	Client Behavior
<b>Case-1</b>		
Include Policy	*.google.com	According to longest prefix match algorithm, FQDN resources such as mail.google.com or maps.google.com will go through the virtual interface and only <a href="http://www.google.com">www.google.com</a> will go through the physical interface.
Exclude Policy	<a href="http://www.google.com">www.google.com</a>	
<b>Case-2</b>		
Include Policy	<a href="http://www.google.com">www.google.com</a>	According to longest prefix match algorithm, only <a href="http://www.google.com">www.google.com</a> will go through the virtual interface and all other FQDN resources such as mail.google.com or maps.google.com will go through the physical interface.
Exclude Policy	*.google.com	

## Exception

The resources accessed through IP address (IPv4 or IPv6) which has been accessed using FQDN in the same tunnel session may have their route table entries modified, due to the configured FQDN rules evaluation.

The following scenario explains the above statement.

In the below table, FQDN resource [www.google.com](http://www.google.com) resolves to the IP address 1.1.1.1.

Include Policy/ Exclude Policy	IPv4	FQDN	Client New Behavior (9.1R2 and above)
<b>Case 1 – <a href="http://www.google.com">www.google.com</a> is accessed with IP address 1.1.1.1 for the first time.</b>			
Include Policy			FQDN rules will not be applicable. <a href="http://www.google.com">www.google.com</a> will go through the tunnel.
Exclude Policy	2.2.2.2	<a href="http://www.google.com">www.google.com</a>	
<b>Case 2 – <a href="http://www.google.com">www.google.com</a> is accessed with FQDN name during the same tunnel session, route table entry for 1.1.1.1 is created.</b>			
Include Policy			FQDN rules will be applicable. <a href="http://www.google.com">www.google.com</a> will go through the physical interface.
Exclude Policy	2.2.2.2	<a href="http://www.google.com">www.google.com</a>	
<b>Case 3 – <a href="http://www.google.com">www.google.com</a> is accessed with IP address 1.1.1.1 during same tunnel session.</b>			
Include Policy			FQDN rules will be applicable. As a result of the route table entry created for 1.1.1.1 in Case 2, <a href="http://www.google.com">www.google.com</a> will go through the physical interface.
Exclude Policy	2.2.2.2	<a href="http://www.google.com">www.google.com</a>	

# FQDN resource and IPv4 resource-based Split Tunneling Conflict

From 9.1R2 release onwards, FQDN resource preference will be based on the applied FQDN rule, in case of the conflict between FQDN resource and IPv4 resource.

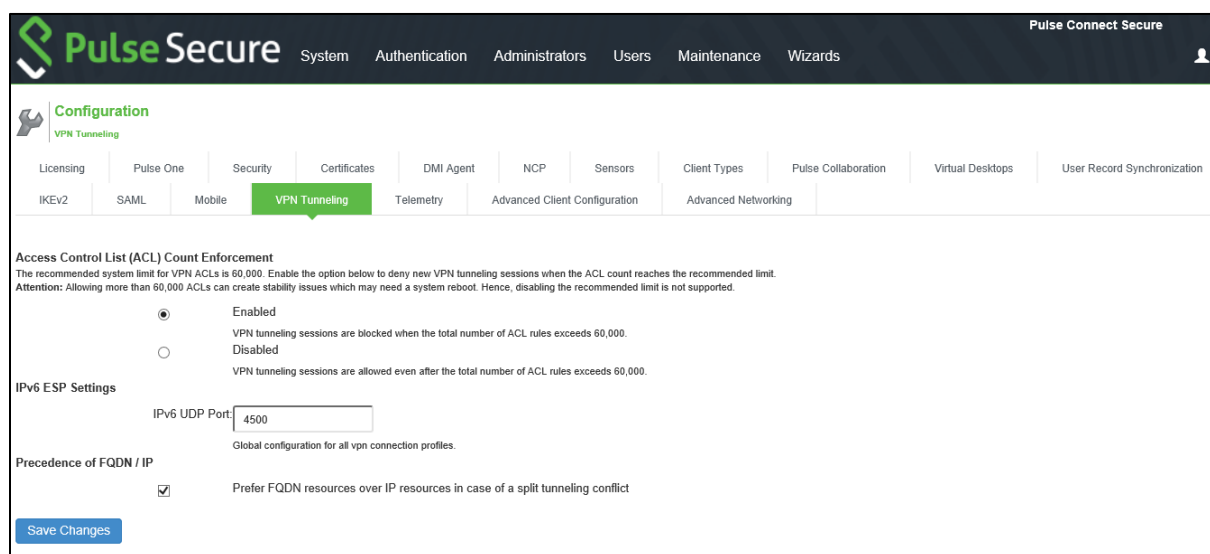
Administrator can provide FQDN resource precedence over IPv4 resource, in case of the conflict, with the following configuration.

To configure the FQDN resource precedence over IPv4 resource, perform the following steps:

1. Go to **System > Configurations > VPN Tunneling**.

The following screen appears:

Figure 5: Prefer FQDN resources over IP resources in case of a split tunneling conflict



2. Select the **Prefer FQDN resources over IP resources in case of a split tunneling conflict** check box.

If the check box is not checked, IPv4 resource will be given preference over FQDN resource.

**Note:** The above check box is to give precedence for FQDN resource over IPv4 resource only in case of conflict between FQDN resource and IPv4 resource.

In case of conflict between FQDN resource and IPv4 resource, FQDN will be given preference, by default.

The following table describes the different conflicting scenarios for FQDN based split tunneling with respect to the IPv4 resource.

In the below table, FQDN resource [www.google.com](http://www.google.com) resolves to the IP address 1.1.1.1.

Include Policy/ Exclude Policy	IPv4	FQDN	Client New Behavior (9.1R2 and above)
<b>Case 1 – “Prefer FQDN resources over IP resources in case of a split tunneling conflict” check box is checked; hence FQDN resource is given preference over IP resource.</b>			
<b>Scenario - 1</b>			
Include Policy		<a href="http://www.google.com">www.google.com</a>	<a href="http://www.google.com">www.google.com</a> will go through the tunnel.
Exclude Policy	1.1.1.1		
<b>Scenario - 2</b>			
Include Policy	1.1.1.1		<a href="http://www.google.com">www.google.com</a> will not go through the tunnel.
Exclude Policy		<a href="http://www.google.com">www.google.com</a>	
<b>Case 2 – “Prefer FQDN resources over IP resources in case of a split tunneling conflict” check box is un-checked; hence IP resource is given preference over FQDN resource.</b>			
<b>Scenario - 1</b>			
Include Policy	1.1.1.1		<a href="http://www.google.com">www.google.com</a> will go through the tunnel.
Exclude Policy		<a href="http://www.google.com">www.google.com</a>	
<b>Scenario - 2</b>			
Include Policy		<a href="http://www.google.com">www.google.com</a>	<a href="http://www.google.com">www.google.com</a> will not go through the tunnel.
Exclude Policy	1.1.1.1		