

Configure Load balancing on PFRv3

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Introduction

This document describes the methods used in Performance Routing version 3 (PfRv3) to perform load balancing on Branch router's WAN links.

Prerequisites

Requirements

Cisco recommends that you have basic knowledge of Performance Routing version 3 (PfRv3).

Components Used

This document is not restricted to specific software and hardware versions.

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

Background Information

One of the main applications of PfR is WAN load balancing even on links with different physical characteristics like Delay, Jitter, Bandwidth. To do this PfR keeps a check of the link utilization levels on the WAN links to efficiently utilize them across various Traffic Classes(TC) flowing through the edge routers.

Traffic Classes are divided in two groups:

- **Performance Traffic Classes (TCs):** this is all Traffic Classes with performance metrics defined (delay, loss, jitter).
- **Non Performance Traffic Classes:** this is basically the default Traffic Classes – ie TCs that do not match any of the match statements. They have no performance metrics defined

Note: Load Balancing only affects non-performance Traffic Classes.

There are four different roles a device can play in PfRv3 configuration:

- **Hub-master controller** — The master controller at the hub site, which can be either a data center or a head quarter. All policies are configured on hub-master controller. It acts as master controller for the site and makes optimization decision.
- **Hub-border router** — The border controller at the hub site. PfRv3 is enabled on the WAN interfaces of the hub-border routers. You can configure more than one WAN interface on the same device. You can have multiple hub border devices. On the hub-border router, PfRv3 must be configured with the address of the local hub-master controller, path names, and path-ids of the external interfaces. You can use the global routing table (default VRF) or define specific VRFs for the hub-border routers.
- **Branch-master controller** — The branch-master controller is the master controller at the branch site. There is no policy configuration on this device. It receives policy from the hub-master controller. This device acts as master controller for the branch site and makes optimization decision.
- **Branch- border router** — The border device at the branch-site. There is no configuration other than enabling of PfRv3 border-master controller on the device. The WAN interface that terminates on the device is detected automatically.

Configure

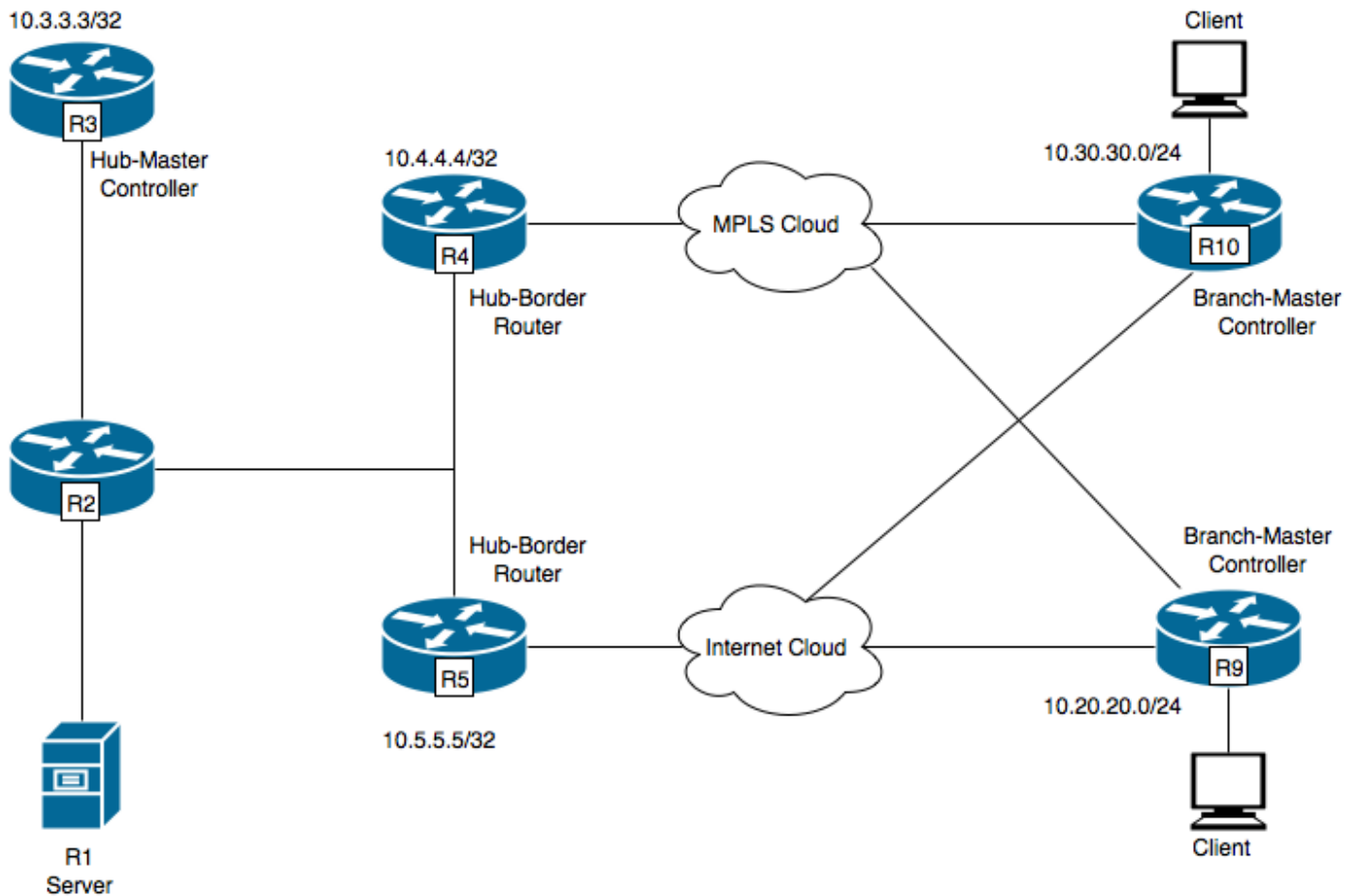
Load-balancing mechanism in PfRv3 works only for traffic that gets classified in default class. When load balancing is disabled, PfRv3 deletes this default class and traffic is not load balanced and is routed based on the routing table information.

In PfRv3, load-balancing kicks in as soon as the difference in the link performance of the Border routers reaches 20% and the "load-balance" command is configured on the Hub-Master Controller. This value is fixed and non-configurable.

Note: The load-balancing is only achieved for the traffic-classes which are not specified in the Hub-Master Controller policy list.

Network Diagram

Following image would be used as a sample topology for rest of the document:



R1- Server, Initiating traffic.

R3- Hub-Master Controller.

R4- Hub-Border Router.

R5- Hub-Border Router.

R9- Branch-Master Controller for Spoke Location

R10- Branch-Master Controller for Spoke Location

R9 is having two DMVPN tunnels i.e. Tunnel 100 and Tunnel 200 . Tunnel 100 is terminating on R4 and Tunnel 200 is terminating on R5 .

Configurations

R3 (Master Router)

```
hostname R3
!
!
domain one
vrf default
master hub
source-interface Loopback0
load-balance -----> Command to enable PfRv3 Load-balancing
```

```
class TEST sequence 10
match dscp ef policy voice
path-preference INET1 fallback INET2
!
!
interface Loopback0
ip address 10.3.3.3 255.255.255.255
!
```

Note: Load-balance is disabled by default

R4 (Border Router)

```
hostname R4
!
!
domain one
vrf default
  border
source-interface Loopback0
master 10.3.3.3
domain one path INET1
!
!
interface Loopback0
ip address 10.4.4.4 255.255.255.255
```

R5 (Border Router)

```
!
hostname R5
!
domain one
vrf default
  border
source-interface Loopback0
master 10.3.3.3
domain one path INET2
!
!
interface Loopback0
ip address 10.5.5.5 255.255.255.255
```

Verify

R3 (Master Router) has been configured to keep sending traffic for all traffic classes.

```
R3#show domain one master status
```

```
*** Domain MC Status ***
```

```
Master VRF: Global
```

```
Instance Type: Hub
```

```
Instance id: 0
```