Fast Re-Route

Fast Re-Route (FRR)

This section describes the FRR support on C8475-G2 and C8455-G2 in Autonomous mode.

To understand the working and configurations of FRR, see MPLS Traffic Engineering Fast Reroute—Link Protection and MPLS Traffic Engineering—Fast Reroute Link and Node Protection.

On C8455-G2 and C8475-G2 routers, MPLS tunnels over 1G, 10G or 25G ports all support FRR.

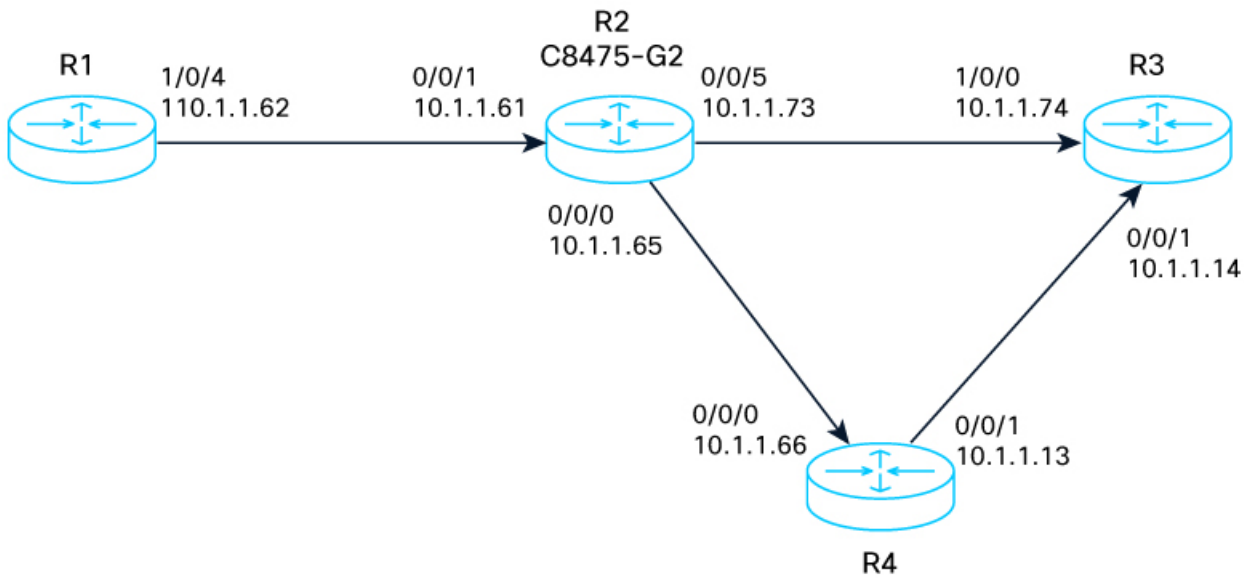
Limitations of FRR

- FRR is only supported in Autonomous mode, not in SDWAN or other modes.
- The FRR switch time with copper SFP's is known to be non-conforming at above 50 ms. See Restrictions for MPLS Traffic Engineering - Fast Reroute Link and Node Protection.

Link protection

FRR link protection uses a preconfigured backup MPLS tunnel to keep traffic flowing when a protected link fails. In this topology, the primary MPLS tunnel carries traffic from R1 to R3 through R2. The R2 router, which is a C8475-G2, acts as the point of local repair and protects the R2-to-R3 link with a backup tunnel through R4. If the R2-to-R3 link fails, R2 locally redirects traffic over the R2-to-R4-to-R3 path without waiting for the end-to-end tunnel to be recalculated. The R1, R3, and R4 routers are ISR4451 routers used for this demonstration.

Figure 1: Simple topology



Configuration examples

Examples of configuration for MPLS traffic engineering with Tunnels.

R1

```
mpls ldp graceful-restart
mpls traffic-eng tunnels
interface Loopback0
 ip address 100.1.1.1 255.255.255.255
!
interface Tunnel13
 ip unnumbered Loopback0
 mpls ip
 tunnel mode mpls traffic-eng
 tunnel destination 100.1.1.3
 tunnel mpls traffic-eng autoroute announce
 tunnel mpls traffic-eng priority 5 5
 tunnel mpls traffic-eng bandwidth 25
 tunnel mpls traffic-eng path-option 1 explicit name Primary13
 tunnel mpls traffic-eng fast-reroute
!
interface GigabitEthernet1/0/4
 ip address 10.1.1.62 255.255.255.252
 negotiation auto
 mpls ip
 mpls traffic-eng tunnels
 ip rsvp bandwidth
 ip rsvp signalling hello graceful-restart neighbor 10.1.1.62
 ip rsvp signalling hello graceful-restart neighbor 10.1.1.61
!
router ospf 100
 nsf cisco
 network 10.1.1.0 0.0.0.255 area 100
```

```
 network 100.1.1.0 0.0.0.255 area 100
 mpls traffic-eng router-id Loopback0
 mpls traffic-eng area 10
!
ip rsvp signalling hello graceful-restart mode full
!
ip explicit-path name Primary13 enable
 index 1 next-address 10.1.1.62
 index 2 next-address 10.1.1.61
 index 3 next-address 10.1.1.73
 index 4 next-address 10.1.1.74
```

R2 (C8475-G2)

```
mpls ldp graceful-restart
mpls traffic-eng tunnels

interface Loopback0
 ip address 100.1.1.2 255.255.255.255
!
interface Tunnel23
 ip unnumbered Loopback0
 mpls ip
 tunnel mode mpls traffic-eng
 tunnel destination 100.1.1.3
 tunnel mpls traffic-eng path-option 1 explicit name bkup243
!
interface GigabitEthernet0/0/0
 ip address 10.1.1.65 255.255.255.252
 negotiation auto
 mpls ip
 mpls traffic-eng tunnels
 ip rsvp bandwidth
 ip rsvp signalling hello graceful-restart neighbor 10.1.1.65
 ip rsvp signalling hello graceful-restart neighbor 10.1.1.66
!
interface GigabitEthernet0/0/1
 ip address 10.1.1.61 255.255.255.252
 negotiation auto
 mpls ip
 mpls traffic-eng tunnels
 ip rsvp bandwidth
 ip rsvp signalling hello graceful-restart neighbor 10.1.1.61
 ip rsvp signalling hello graceful-restart neighbor 10.1.1.62
!
interface GigabitEthernet0/0/5
 ip address 10.1.1.73 255.255.255.252
 negotiation auto
 mpls ip
 mpls traffic-eng tunnels
 mpls traffic-eng backup-path Tunnel31
 ip rsvp bandwidth
 ip rsvp signalling hello graceful-restart neighbor 10.1.1.73
 ip rsvp signalling hello graceful-restart neighbor 10.1.1.74
!
router ospf 100
 nsf cisco
 network 10.1.1.0 0.0.0.255 area 100
 network 100.1.1.0 0.0.0.255 area 100
 mpls traffic-eng router-id Loopback0
 mpls traffic-eng area 100
!
ip explicit-path name bkup243 enable
```

```
 index 1 next-address 10.1.1.65
 index 2 next-address 10.1.1.66
 index 2 next-address 10.1.1.13
 index 2 next-address 10.1.1.14
```

R3

```
mpls ldp graceful-restart
mpls traffic-eng tunnels
!
interface Loopback0
 ip address 100.1.1.3 255.255.255.255
!
interface GigabitEthernet0/0/1
 ip address 10.1.1.14 255.255.255.252
 negotiation auto
 mpls ip
 mpls traffic-eng tunnels
 ip rsvp bandwidth
 ip rsvp signalling hello graceful-restart neighbor 10.1.1.14
 ip rsvp signalling hello graceful-restart neighbor 10.1.1.13
!
interface GigabitEthernet1/0/0
 ip address 10.1.1.74 255.255.255.252
 negotiation auto
 mpls ip
 mpls traffic-eng tunnels
 ip rsvp bandwidth
 ip rsvp signalling hello graceful-restart neighbor 10.1.1.74
 ip rsvp signalling hello graceful-restart neighbor 10.1.1.73
!
router ospf 100
 nsf cisco
 network 10.1.1.0 0.0.0.255 area 100
 network 100.1.1.0 0.0.0.255 area 100
 mpls traffic-eng router-id Loopback0
 mpls traffic-eng area 100
```

R4

```
mpls ldp graceful-restart
mpls traffic-eng tunnels
!
interface Loopback0
 ip address 100.1.1.4 255.255.255.255
!
interface GigabitEthernet0/0/0
 ip address 10.1.1.66 255.255.255.252
 negotiation auto
 mpls ip
 mpls traffic-eng tunnels
 ip rsvp bandwidth
 ip rsvp signalling hello graceful-restart neighbor 10.1.1.66
 ip rsvp signalling hello graceful-restart neighbor 10.1.1.65
!
interface GigabitEthernet0/0/1
 ip address 10.1.1.13 255.255.255.252
 negotiation auto
 mpls ip
 mpls traffic-eng tunnels
 ip rsvp bandwidth
```

```
 ip rsvp signalling hello graceful-restart neighbor 10.1.1.13
 ip rsvp signalling hello graceful-restart neighbor 10.1.1.14
!
router ospf 100
 nsf cisco
 network 10.1.1.0 0.0.0.255 area 100
 network 100.1.1.0 0.0.0.255 area 100
 mpls traffic-eng router-id Loopback0
 mpls traffic-eng area 100
```

Verify FRR operation

Send traffic from R1 to R3, break the link between R2 (C8475-G2) and R3. R2 detects the link down and initiates a fast re-route to R3 via R4.

Before the re-route:

```
R2#show mpls traffic-eng fast-reroute database detail
FRR Database Summary:
Protected interfaces    : 1
Protected LSPs/Sub-LSPs : 1
Backup tunnels          : 1
Active interfaces       : 0
FRR Active tunnels      : 0
……
```

After the FRR:

```
R2#show mpls traffic-eng fast-reroute database detail
FRR Database Summary:
Protected interfaces    : 1
Protected LSPs/Sub-LSPs : 1
Backup tunnels          : 1
Active interfaces       : 1
FRR Active tunnels      : 1
……
```

Now, restore the broken link between R2 and R3, traffic will be routed directly again from R2 to R3. The **show** command shows the state as before the FRR.