UNIUNEA EUROPEANĂ

GUVERNUL ROMÂNIEI

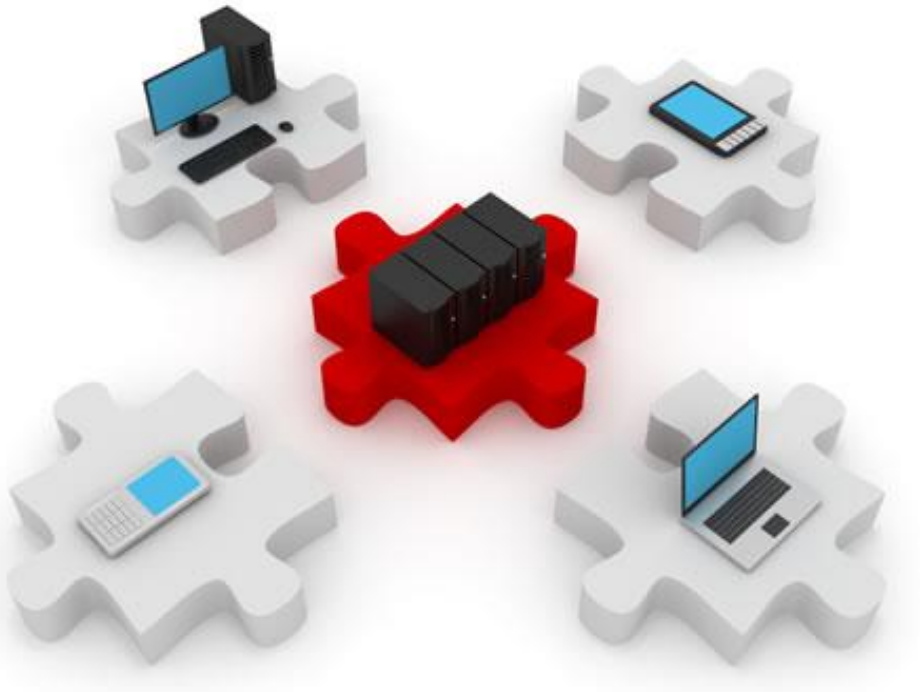
Instrumente Structurale
2007-2013

POLITEHNICA DIN BUCUREȘTI
UNIVERSITATEA
1818

Platformă de e-learning și curriculă e-content pentru învățământul superior tehnic

Securizarea Calculatoarelor și a Rețelelor

33. Implementarea MPLS L3 VPN



Configuring frame mode MPLS

Lesson 4.3: Implementing Frame Mode MPLS

The Procedure to Configure MPLS

- Configure CEF.
- Configure MPLS on a frame mode interface.
- (Optional) Configure the MTU size in label switching.

Step 1: Configure CEF

- To enable MPLS, you must first configure CEF.

- Configure CEF:
  - Enable CEF switching to create the FIB table.
  - Enable CEF switching on all core interfaces.
- Configure MPLS on a frame mode interface.
- (Optional) Configure the MTU size in label switching.

Commands for Configuring CEF

```
Router(config)#ip cef [distributed]
```

- Starts CEF switching and creates the FIB table
- The **distributed** keyword configures distributed CEF (running on VIP or line cards)
- All CEF-capable interfaces run CEF switching

```
Router(config-if)#ip route-cache cef
```

- Enables CEF switching on an interface
- Usually not needed

Monitoring IP CEF

- Display a summary of the FIB:

```
Router#show ip cef detail
  IP CEF with switching (Table Version 6), flags=0x0
  6 routes, 0 reresolve, 0 unresolved (0 old, 0 new)
  9 leaves, 11 nodes, 12556 bytes, 9 inserts, 0 invalidations
  0 load sharing elements, 0 bytes, 0 references
  2 CEF resets, 0 revisions of existing leaves
  refcounts:  543 leaf, 544 node

Adjacency Table has 4 adjacencies
0.0.0.0/32, version 0, receive
192.168.3.1/32, version 3, cached adjacency to Serial0/0.10
0 packets, 0 bytes
  tag information set
    local tag: 28
    fast tag rewrite with Se0/0.10, point2point, tags imposed: {28}
  via 192.168.3.10, Serial0/0.10, 0 dependencies
    next hop 192.168.3.10, Serial0/0.10
    valid cached adjacency
    tag rewrite with Se0/0.10, point2point, tags imposed: {28}
```

Using `show ip cef` Parameters

Parameter	Description
Unresolved	(Optional) Displays unresolved FIB entries
Summary	(Optional) Displays a summary of the FIB
Network	(Optional) Displays the FIB entry for the specified destination network
Mask	(Optional) Displays the FIB entry for the specified destination network and mask
Longer-prefixes	(Optional) Displays the FIB entries for all the specific destinations
Detail	(Optional) Displays detailed FIB entry information
type number	(Optional) Lists the interface type and number for which to display FIB entries

Step 2: Configure MPLS on Frame Mode Interface

- Configure CEF.
- Configure MPLS on a frame mode interface:
  - Enable label switching on a frame mode interface.
  - Start LDP or TDP label distribution protocol.
- (Optional) Configure the MTU size in label switching.

- TDP is a Cisco-proprietary protocol (TCP port 711)
- LDP is the industry standard (UDP port 646)
- They work the same but are not compatible
  - LDP and TDP manage the allocation and distribution of labels between MPLS neighbors

Commands for Configuring MPLS on a Frame Mode Interface

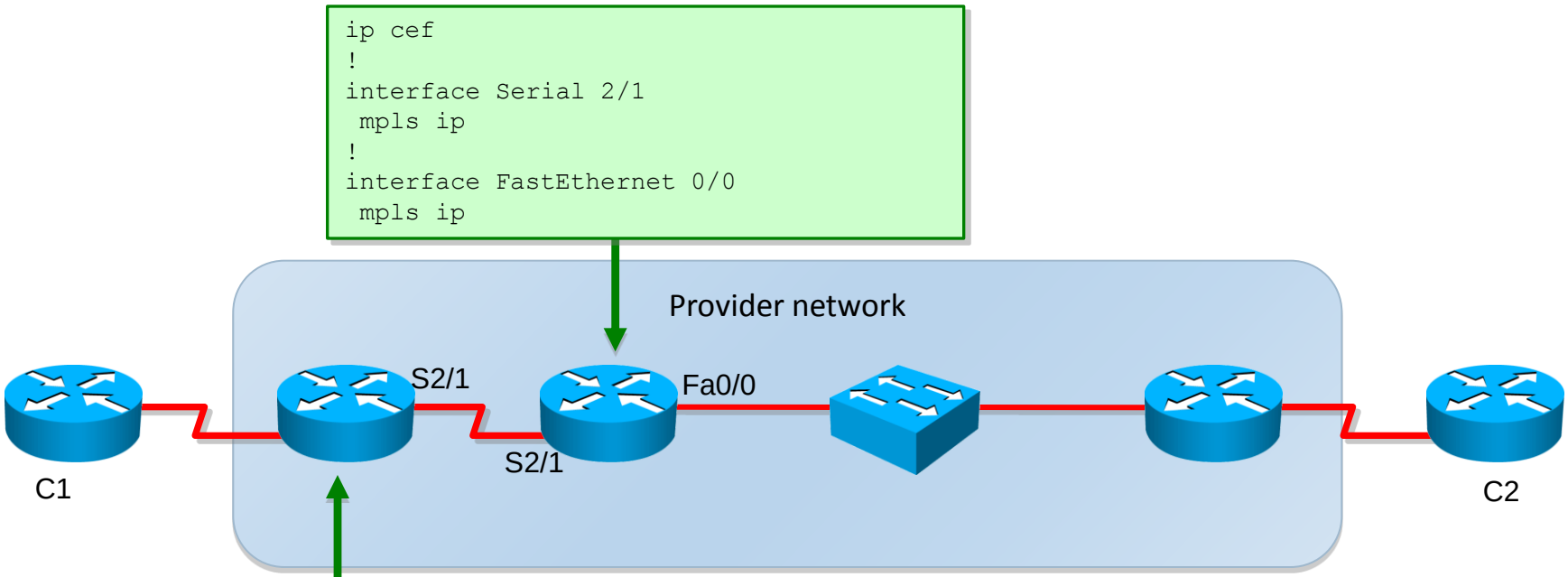
```
Router(config-if)#mpls ip
```

- Enables label switching on a frame mode interface
- Starts LDP on the interface

```
Router(config-if)#mpls label protocol [tdp | ldp | both]
```

- Starts selected label distribution protocol on the specified interface

Configuring MPLS on a Frame Mode Interface: Example 1

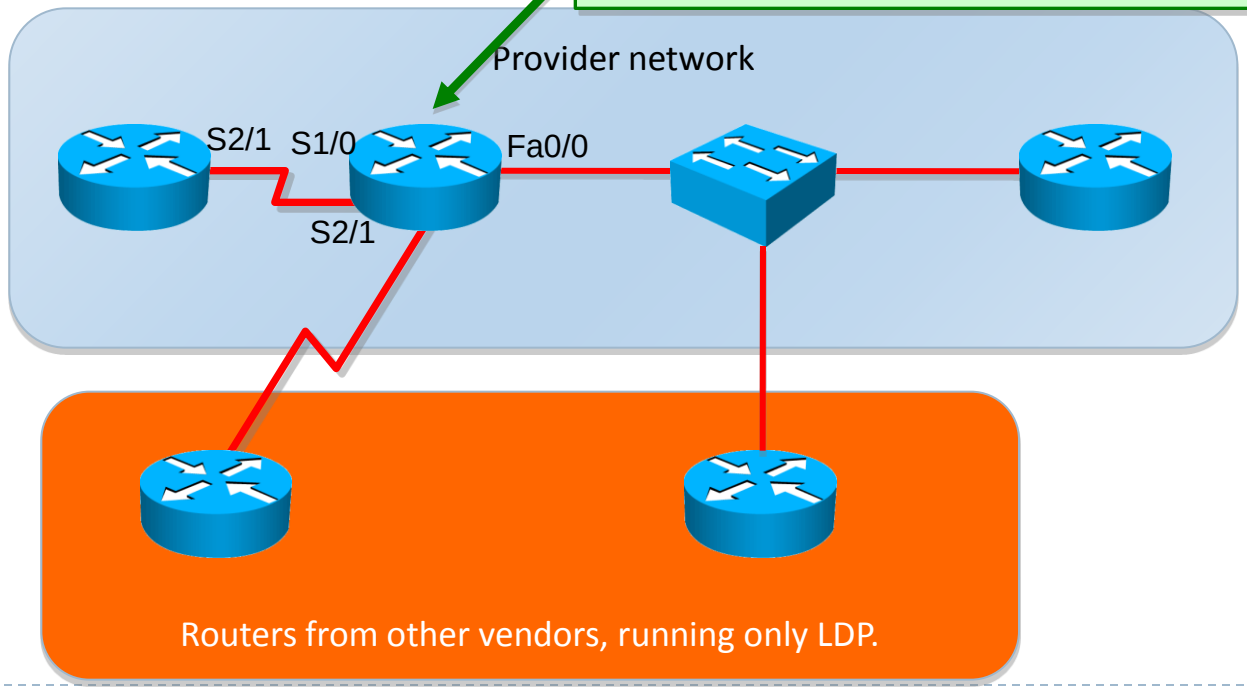



```
ip cef
!
interface Serial 2/1
 mpls ip
!
interface Serial 3/1
 ip access-group NoLDP in
!
ip access-list NoLDP deny udp any any eq 646
ip access-list NoLDP permit ip any any
```

Service providers use ACLs to block customers from using either TDP or LDP with their routers.

Configuring MPLS on a Frame Mode Interface: Example 2

```
ip cef
!
interface Serial 1/0
 mpls ip
 mpls label protocol tdp
!
interface Serial 2/1
 mpls ip
 mpls label protocol ldp
!
interface FastEthernet 0/0
 mpls ip
 mpls label protocol both
```



Step 3: Configure the MTU Size in Label Switching

- Configure CEF.
- Configure MPLS on a frame mode interface (`mpls mtu 1512`)
- Configure the MTU size in label switching:
  - Increase MTU on LAN interfaces.
  - What is the default MTU size on Ethernet interfaces?
- The MTU size represents the payload of a frame or the size of an IP packet.
- MPLS introduces one or more labels between L2 and L3 headers.
- The MTU must be increased to accommodate the new labels.
  - 1504 for one label, 1508 for two labels, and so on.
  - Switches might also need configuration to support jumbo frames
- The MTU size is automatically increased on WAN interfaces.

Summary

- MPLS provides a blend of Layer 2 switching and Layer 3 routing to forward packets using short, fixed-length labels.
- MPLS provides fast routing for large networks. Only the edge routers perform a routing lookup, and core routers forward packets based on the labels. These two functions mean faster forwarding of packets through the SP network.
- The most recent and preferred Cisco IOS platform switching mechanism is Cisco Express Forwarding (CEF), which incorporates the best of the previous switching mechanisms.
- To support multiple protocols, MPLS divides the classic router architecture into two major components: control plane and data plane.

Summary

- There are four steps for label allocation and distribution in a Unicast IP routing network and MPLS functionality, including label allocation and distribution. The following steps detail what happens:
  - The routers exchange information using routing protocol.
  - Local labels are generated.
  - Local labels are propagated to adjacent routers.
  - Every LSR builds data structures based on received labels.

- When a router receives an IP packet, the lookup done is an IP lookup. When a router receives a labeled packet, the lookup is done in the LFIB table of the router.

- Using Penultimate Hop Popping (PHP), an LSR removes the outermost label of an MPLS-tagged packet before passing the packet to an adjacent Edge LSR. The process reduces the load on the Edge LSR.

Summary

- VPNs allow you to use the shared infrastructure of a SP to implement your private networks. There are two implementation models: overlay and peer-to-peer.
- The MPLS VPN architecture offers SPs a peer-to-peer VPN architecture that combines the best features of overlay VPNs with the best features of peer-to-peer VPNs.
- MPLS VPNs use a 32-bit prefix called the route distinguisher (RD) to convert non-unique 32-bit customer IPv4 addresses into 64-bit unique addresses that can be transported.
- MPLS works by prepending packets with an MPLS header, containing one or more “labels.” This is called a label stack.

The end, finally!!!