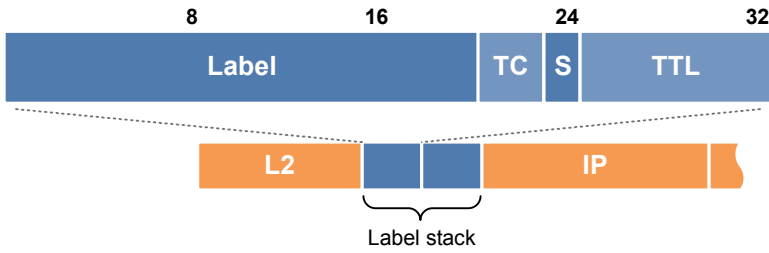


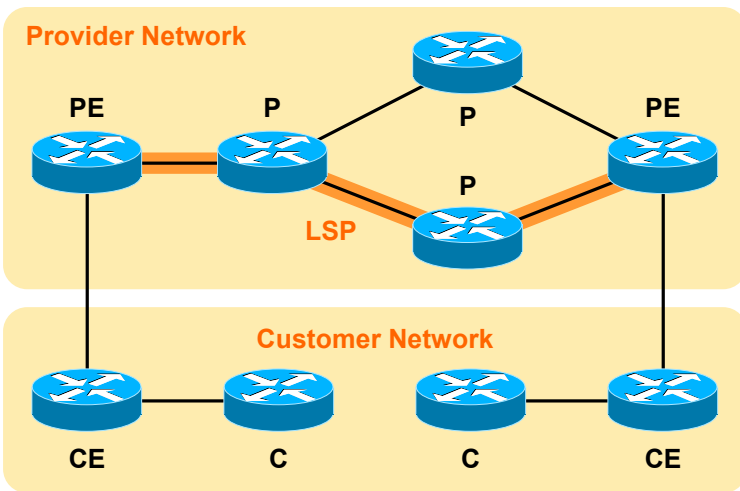
FRAME MODE MPLS

Protocol Header



- Label** (20 bits) · Unique label value
- Traffic Class** (3 bits) · CoS-mapped QoS marking
- Bottom of Stack** (1 bit) · Indicates label is last in the stack
- Time To Live** (8 bits) · Hop counter mapped from IP TTL

Label Switched Path



- Customer (C)** · IP-only routers internal to customer network
- Customer Edge (CE)** · C routers which face PE routers
- Provider Edge (PE)** · LSRs on the MPLS-IP boundary
- Provider (P)** · MPLS-only LSRs in provider network

MPLS Configuration

```
! Enable CEF
ip cef

! Select label protocol
mpls label protocol ldp

! Enable MPLS on IP interfaces
interface FastEthernet0/0
ip address 10.0.0.1 255.255.255.252
mpls ip
! Raise MPLS MTU to accommodate multilabel stack
mpls mtu 1512
```

Conceptual Components

- Control Plane**
Facilitates label exchange between neighboring LSRs using LDP or TDP (includes the LIB)
- Forwarding/Data Plane**
Forwards packets based on label or destination IP address (includes the FIB and LFIB)

Label Protocols

	LDP	TDP
Hello Address	224.0.0.2	255.255.255.255
Hello Port	UDP/646	UDP/711
Adjacency Port	TCP/646	TCP/711
Proprietary	No	Cisco

Terminology

- Label Distribution Protocol (LDP)**
Standards-based label distribution protocol defined in RFC 3036
- Tag Distribution Protocol (TDP)**
Cisco's proprietary predecessor to LDP
- Label Switching Router (LSR)**
Any router performing label switching (MPLS)
- Label-Switched Path (LSP)**
The unidirectional path through one or more LSRs taken by a label-switched packet belonging to an FEC
- Forwarding Equivalence Class (FEC)**
A group of packets which are forwarded in an identical manner, typically by destination prefix and/or traffic class
- Label Information Base (LIB)**
Contains all labels learned by an LSR via a label distribution protocol
- Forwarding Information Base (FIB)**
Routing database for unlabeled (IP) packets

Label FIB (LFIB)
Routing database for labeled (MPLS) packets

Interim Packet Propagation
An LSR temporarily falls back to IP routing while waiting to learn the necessary MPLS label(s)

Penultimate Hop Popping (PHP)
The second-to-last LSR in an LSP removes the MPLS label so the last LSR only has to perform an IP lookup

Troubleshooting

show mpls interfaces	show mpls ldp bindings [detail] (LIB)	show ip cef [detail] (FIB)
show mpls ldp neighbors	show mpls forwarding-table [detail] (LFIB)	debug mpls [...]