**Frame Mode MPLS**

<table>
<thead>
<tr>
<th>Protocol Header</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
</tr>
<tr>
<td>16</td>
</tr>
<tr>
<td>24</td>
</tr>
<tr>
<td>32</td>
</tr>
<tr>
<td>Label</td>
</tr>
<tr>
<td>TC</td>
</tr>
<tr>
<td>S</td>
</tr>
<tr>
<td>TTL</td>
</tr>
</tbody>
</table>

**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

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**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**

<table>
<thead>
<tr>
<th>LDP</th>
<th>TDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hello Address 224.0.0.2</td>
<td>255.255.255.255</td>
</tr>
<tr>
<td>Hello Port UDP/646</td>
<td>UDP/711</td>
</tr>
<tr>
<td>Adjacency Port TCP/646</td>
<td>TCP/711</td>
</tr>
<tr>
<td>Proprietary No</td>
<td>Cisco</td>
</tr>
</tbody>
</table>

**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

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**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
```

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**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 ...
```