



# Multicast MPLS and 6PE implementation status and it's mechanism

MPLS Japan

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# MPLS Multicast and LSR MIB

- Multicast and LSR MIB
- draft-ietf-mpls-lsr-mib-09.txt is published
- No big difference between -08 and -09
- Cross connect provide support for label merge and MPLS multicast

# LSR MIB

- mplsInterfaceConfTable
- mplsInterfacePerfTable
- mplsInSegmentTable
- mplsInSegmentPerfTable
- mplsOutSegmentTable
- mplsOutSegmentPerfTable
- mplsXCTable
- mplsLabelStackTable
- mplsTrafficParamTable

# mplsInterfaceConfTable

- mplsInterfaceConfIndex (K)
- mplsInterfaceLabelMinIn
- mplsInterfaceLabelMaxIn
- mplsInterfaceLabelMinOut
- mplsInterfaceLabelMaxOut
- mplsInterfaceTotalBandwidth
- mplsInterfaceAvailableBandwidth
- mplsInterfaceLabelParticipationType

# mplsInSegmentTable

- mplsInSegmentIfIndex (K)
- mplsInSegmentLabel (K)
- mplsInSegmentNPop
- mplsInSegmentAddrFamily
- mplsInSegmentXCIndex
- mplsInSegmentOwner
- mplsInSegmentTrafficParamPtr
- mplsInSegmentRowStatus
- mplsInSegmentStorageType

# mplsOutSegmentTable

- mplsOutSegmentIndex (K)
- mplsOutSegmentIfIndex
- mplsOutSegmentPushTopLabel
- mplsOutSegmentTopLabel
- mplsOutSegmentNextHopIpAddrType
- mplsOutSegmentNextHopIpAddr
- mplsOutSegmentXCIndex
- mplsOutSegmentOwner
- mplsOutSegmentTrafficParamPtr
- mplsOutSegmentRowStatus
- mplsOutSegmentStorageType

# mplsXCTable

- mplsXCIndex (K)
- mplsXCInSegmentIfIndex (K)
- mplsXCInSegmentLabel (K)
- mplsXCOutSegmentIndex (K)
- mplsXCLspId
- mplsXCLabelStackIndex
- mplsXCIsPersistent
- mplsXCOwner
- mplsXCRowStatus
- mplsXCStorageType
- mplsXCAdminStatus
- mplsXCOperStatus

# Example

iif=1 ilabel=16, oif=10 olabel=100 nexthop=10.0.0.1, opcode=SWAP

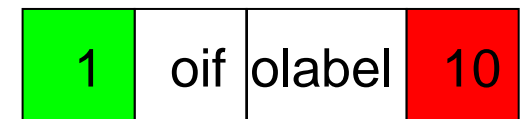
InSegment



XC



OutSegment

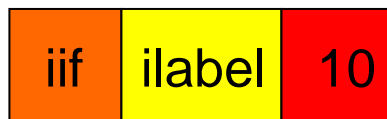




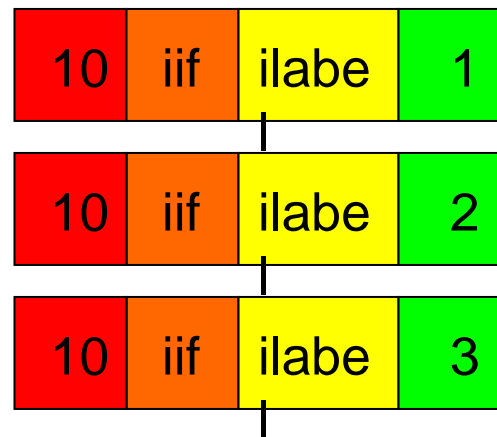
# Multicast MPLS

iif=1 ilabel=16, oif=10 olabel=100 nexthop=10.0.0.1,opcode=SWAP  
oif=11 olabel=101 nexthop=11.0.0.1,opcode=SWAP  
oif=12 olabel=102 nexthop=11.0.0.1,opcode=SWAP

InSegment



XC



OutSegment



# Label merge

iif=1 ilabel=16, oif=10 olabel=100 nexthop=10.0.0.1,opcode=SWAP

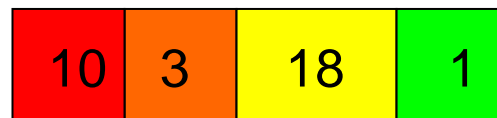
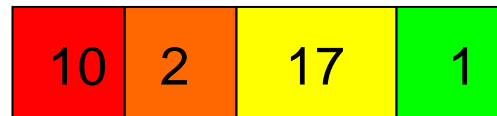
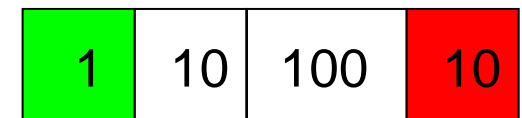
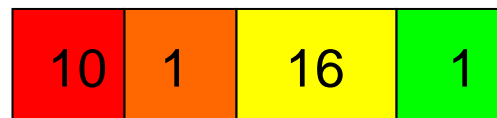
iif=2 ilabel=17

iif=3 ilabel=18

InSegment

XC

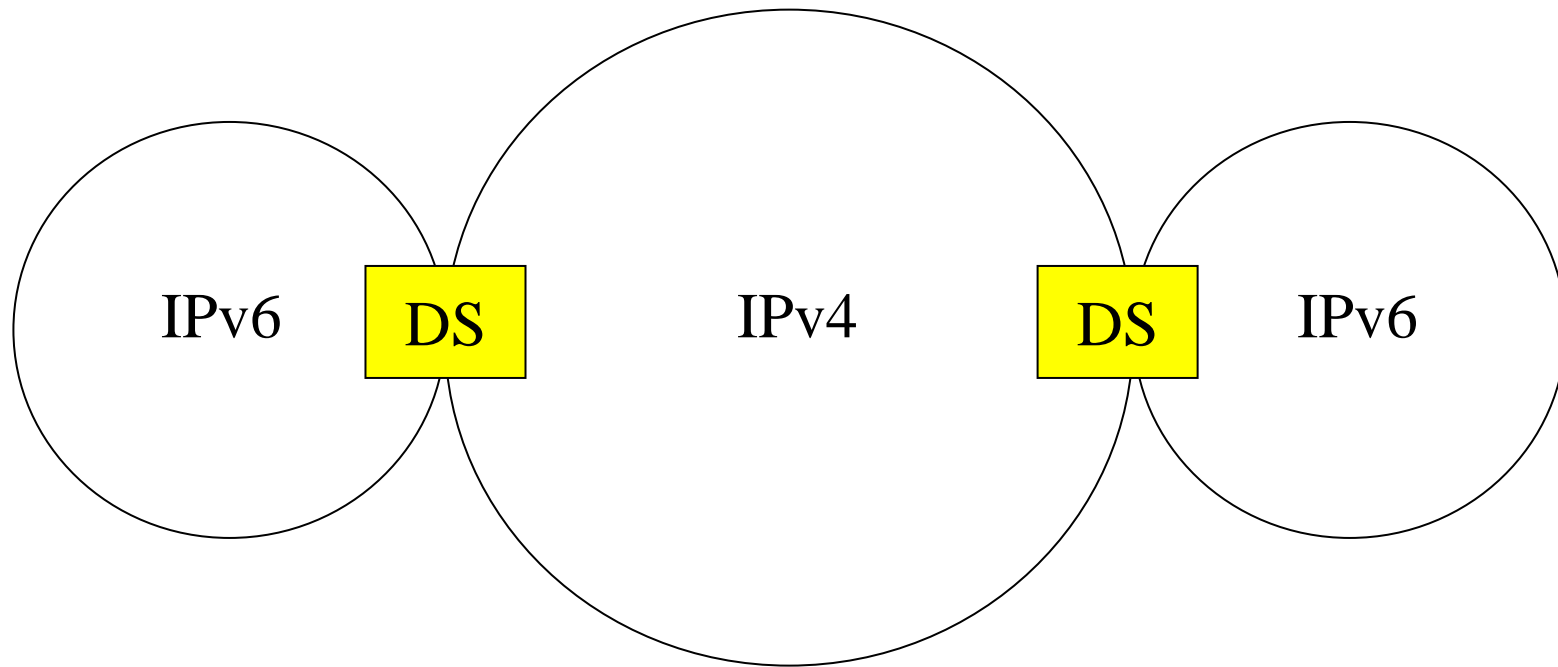
OutSegment



# 6PE

- IPv6 Provider Edge
- IPv6 across over IPv4 clouds
- draft-ietf-ngtrans-bgp-tunnel
- Tunneling over IPv4...
- Dual stack BGP router (DS-BGP)

# Overview



# Draft status

- nguyen-bgp-tunnel-00 published Oct00  
accepted as working group project at IETF-49
- bgp-tunnel-00 published 09Jan01
- bgp-tunnel-01 published 05Mar01
- bgp-tunnel-02 published 11Jun01
- bgp-tunnel-03 published 21Nov01
- bgp-tunnel-04 published 15Jan02  
changed to Standards Track Jan02  
issued last call 13Feb02, closed 27Feb02  
waiting on IDR comments from Sue Hares to finalize

# Tunneling/tunneling

- MP-BGP over IPv4
  - Tunneling over IPv4/GRE tunnels
  - Tunneling over MPLS LSPs
- MP-BGP over IPv6
- MPLS/BGP VPNs

# MP-BGP over IPv4

- MP-BGP runs on IPv4 stack
- Next Hop is IPv4 mapped IPv6 address
- Not limited LSP tunneling
- IPv4/GRE tunnel

# MP-BGP over IPv6

- MP-BGP runs on IPv6 stack
- BGP connection is established over IPv6 tunnel over IPv4
- BGP Next Hop is tunnel end IPv6 address



# 6PE

- MP-BGP over IPv4 using LSP tunneling
- Label stack is not really needed but..
- RFC3107 Carrying Label Information in BGP
- AFI is 2, SAFI is 4
- Capability negotiation must announce both IPv6 unicast and IPv6 carrying label

# Packet format

RFC2858

Address Family Identifier(2 octets)
Subsequent Address Family Identifier(1 octets)
Length of Next Hop Network Address(1 octets)
Network Address of Next Hop(variable)
Network Layer Reachability Information(variable)

RFC3107

Length(1 octets)
Label(3 octets)
Prefix(variable)

# Configuration

- IPv4 address is used for peering
- send-label for RFC3107

```
router bgp 100
  no bgp default ipv4-unicast
  neighbor 10.0.0.1 remote-as 100
  neighbor 10.0.0.1 update-source lo
  address-family ipv6 unicast
  network 3ffe:506::/32
  neighbor 10.0.0.1 activate
  neighbor 10.0.0.1 send-label
  exit-address-family
```