

# Demonstration of MPLS and IPv6 transport over GMPLS-controlled optical networks

T. Otani, S. Okamoto, H. Tanaka and M. Suzuki  
KDDI R&D Laboratories, Inc.

A. Sayeed, R. Trowel and M. Tatipamula  
Cisco Systems, Inc.

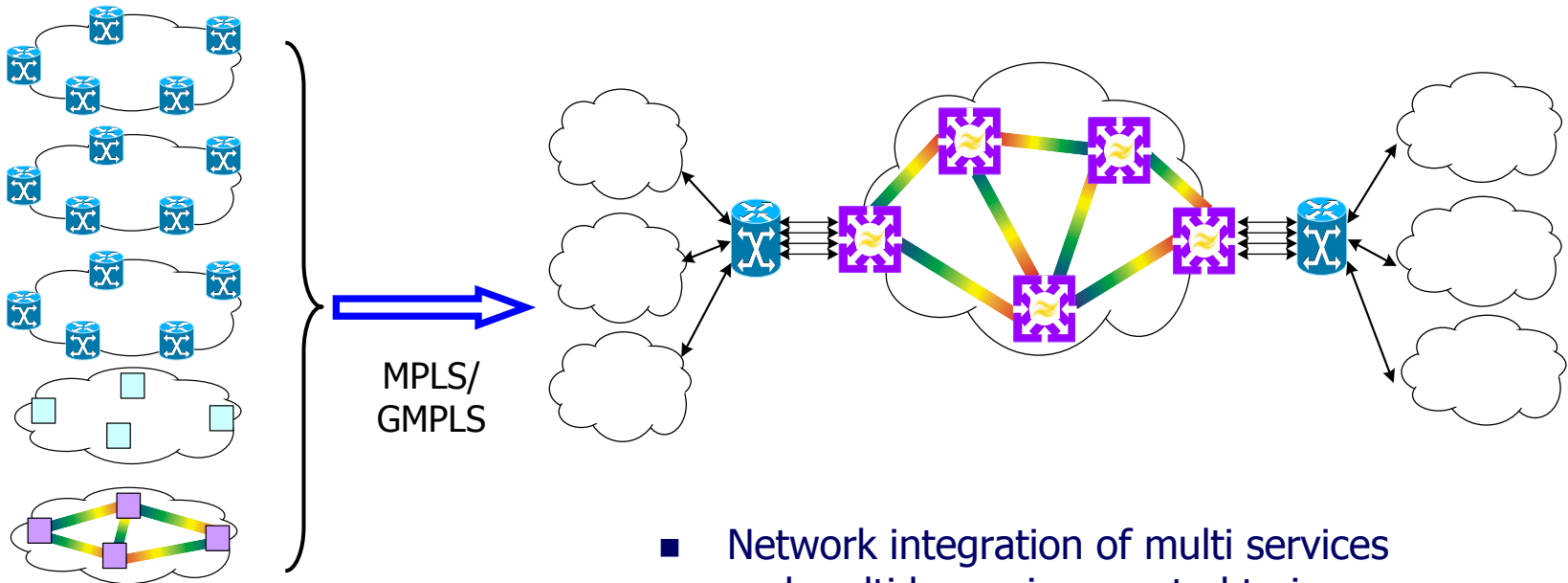


# Overview of this presentation

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- Background
- Integrating IP/optical networks
  - Network migration
  - Advantages of GMPLS networks
- Demonstration of MPLS/IPv6 transport over GMPLS networks
  - MPLS/GMPLS
  - IP/GMPLS
- Conclusions

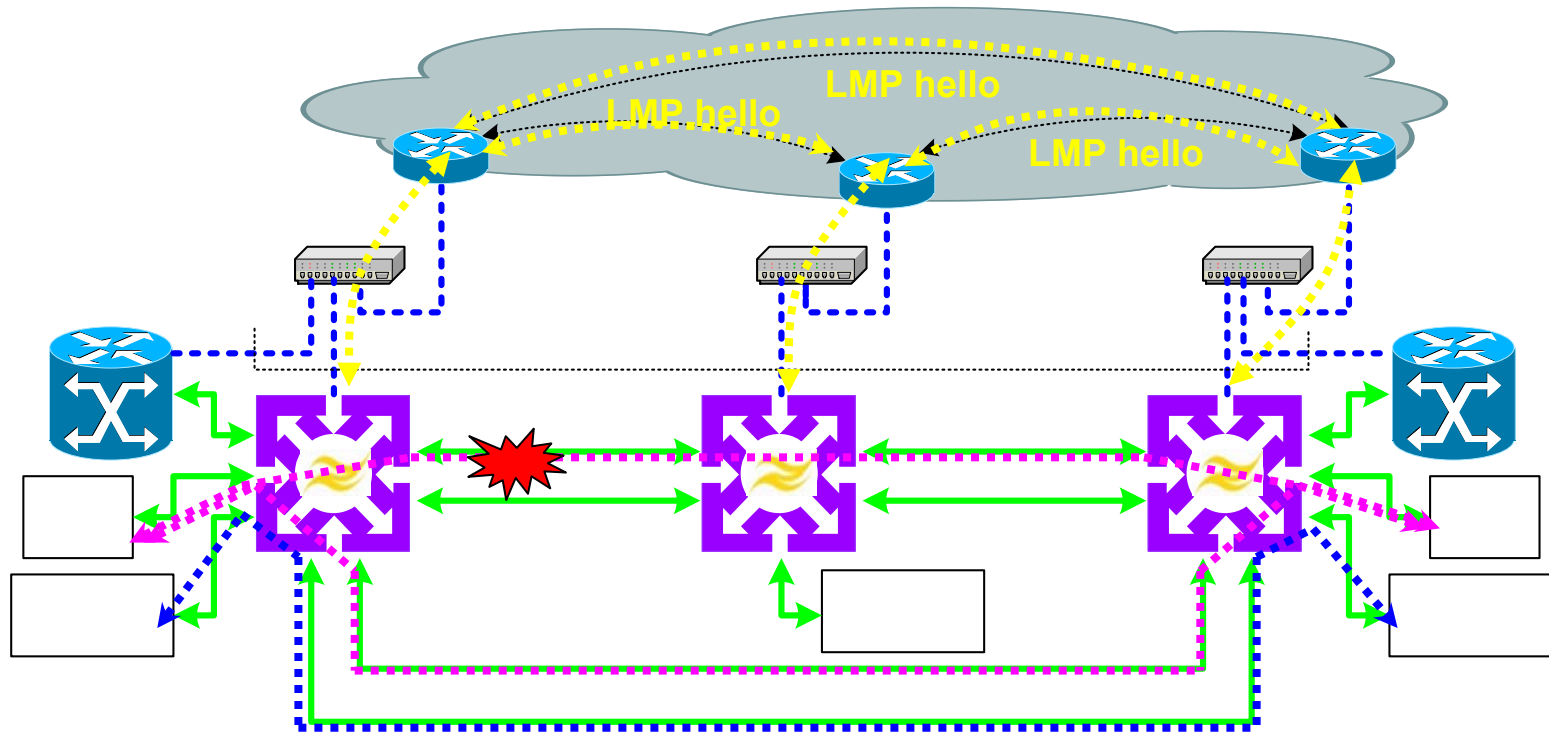
# Background



- A network per a service and per an operational division
  - Service specific functions
  - Equipment specific skills
  - Merger of companies

- Network integration of multi services and multi layers is expected to improve
  - Operational efficiency
  - Resource utilization of backbone bandwidth
  - Network resiliency

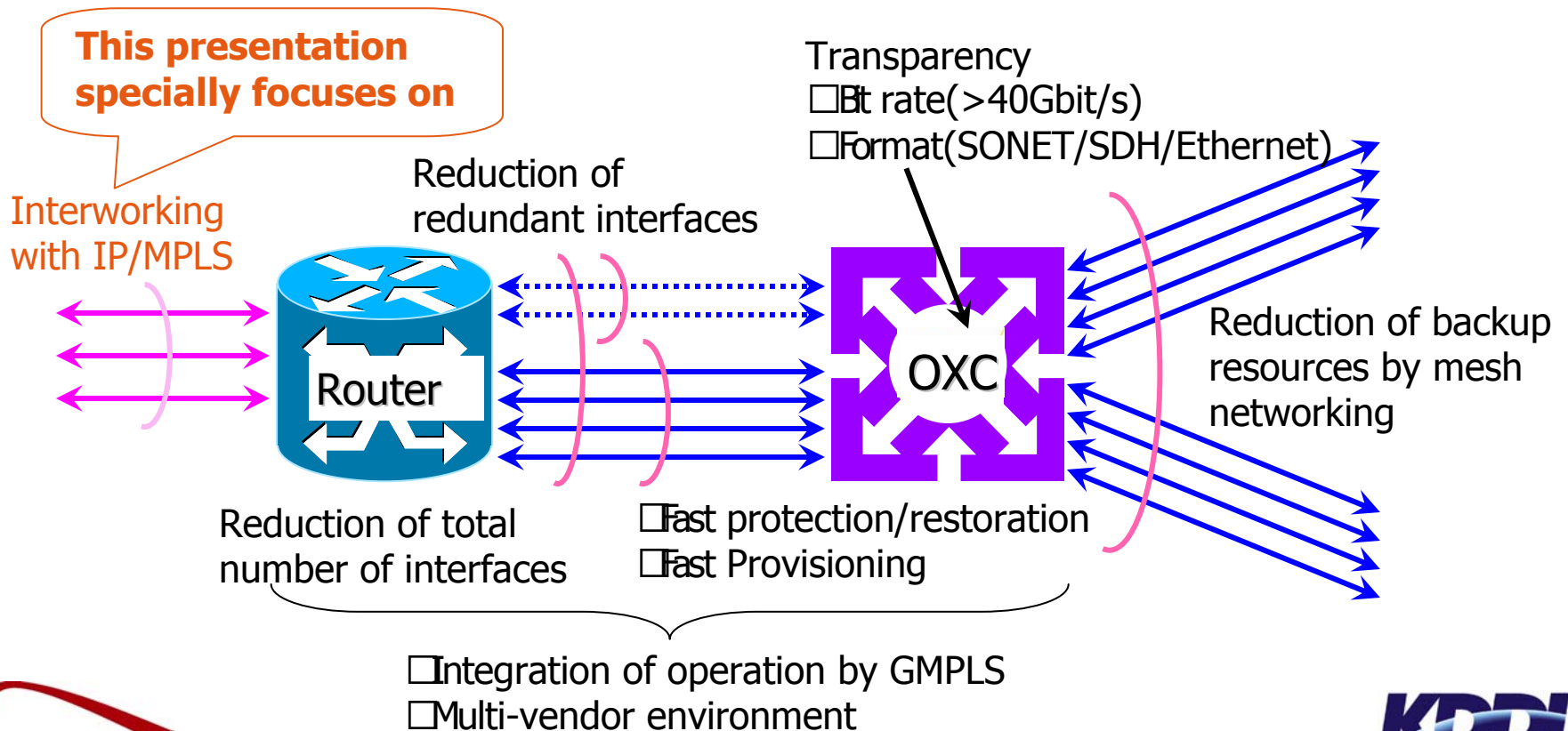
# Field trial configuration



- KDDI's backbone network
- Existing WDM link (STM-16)
- EDFA-based WDM links including regenerators

# Advantages of GMPLS integration

## ■ Introduction of an integrated IP/optical network



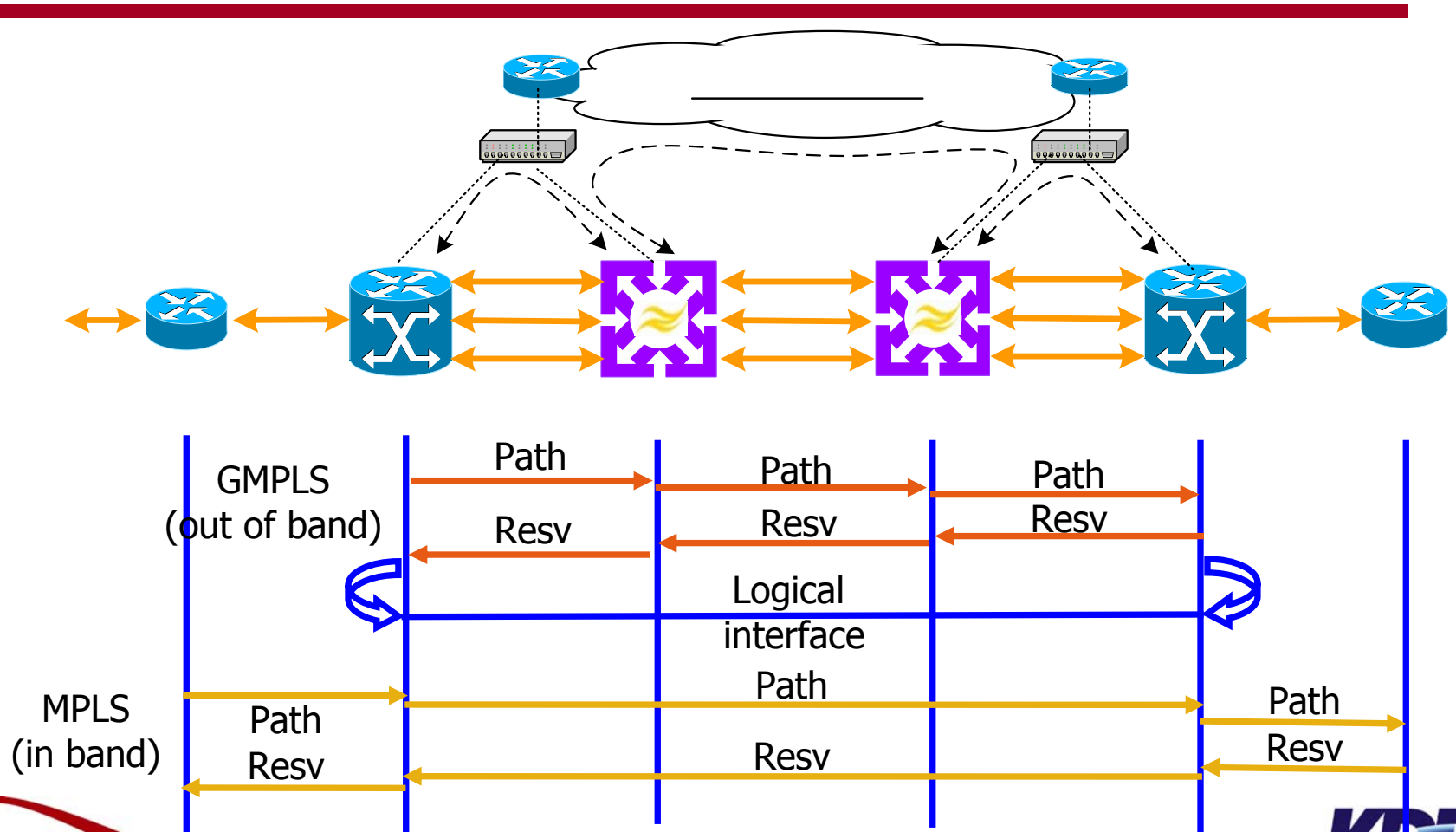
# Service transport over GMPLS networks

- Service migration from GMPLS point of view
  - MPLS interworking with GMPLS
    - Major services are based on MPLS
      - IP-VPN
      - Ethernet-VPN
    - Legacy services can be transported using MPLS
      - ATM
      - FR
  - IP interworking with GMPLS
    - GMPLS is usually based on IPv4
      - IPv4 as well as IPv6 is to be supported.
    - BGP-4 is to be transported over GMPLS



**Today's  
focuses**

# MPLS over GMPLS (1)

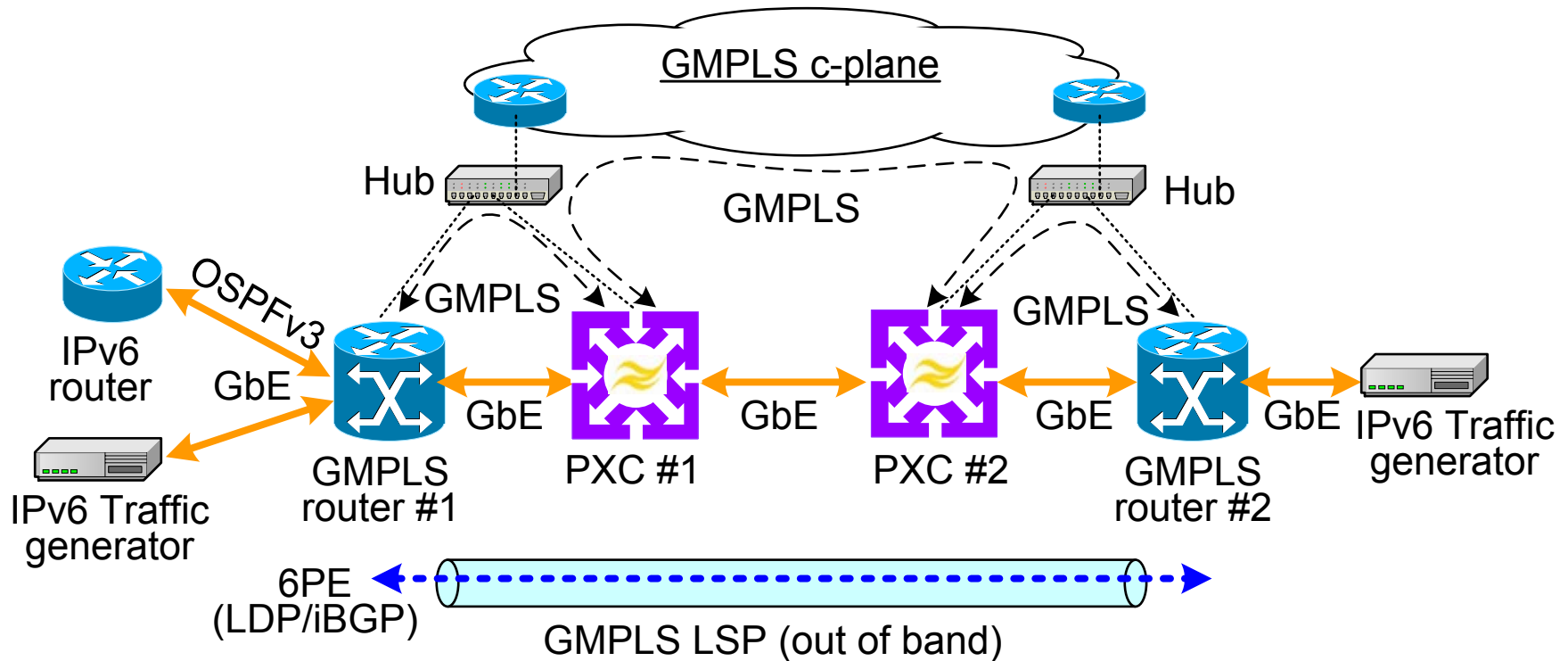


# MPLS over GMPLS (2)

- MPLS LSP creation over a GMPLS LSP
  - A (bidirectional) GMPLS LSP is created between GMPLS routers.
    - LSPs can be created with GbE, 2.5G and 10G bandwidth
    - The tunnel is logically numbered as IPv4 addresses.
  - A MPLS LSP is created between PE routers.
    - LSPs can be created specifying logically created interfaces.
- IP traffic restoration by GMPLS
  - IP traffic can be restored within GMPLS restoration time (700ms)
    - The MPLS signaling storm can be avoided by GMPLS restoration (and protection).



# IPv6 over GMPLS (1)



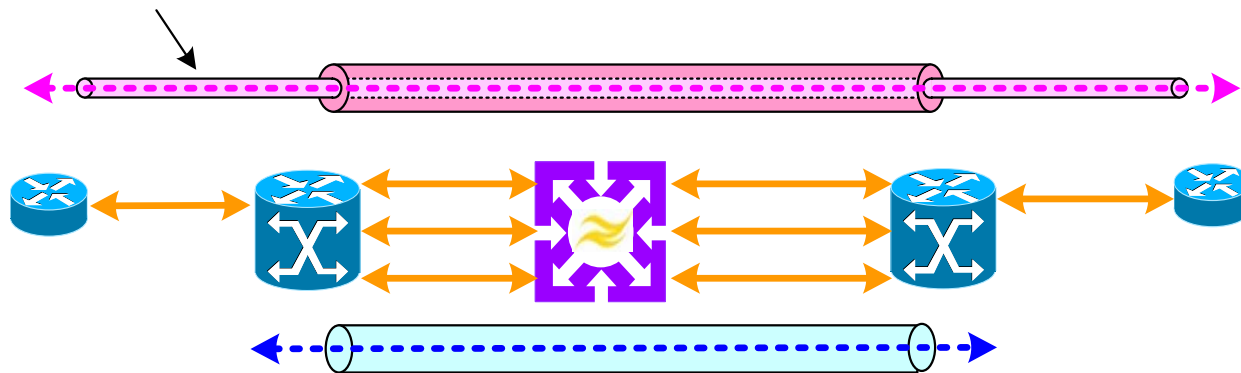
# IPv6/GMPLS (2)

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- IPv6 transport over GMPLS
  - Assisted by the 6PE function on GMPLS routers
    - An iBGP session over GMPLS tunnels
    - A LDP session encapsulating IPv6 packets over GMPLS tunnels
  - IPv6 packets can be transmitted over GMPLS
- OSPFv3 with GMPLS routers
  - Interoperability under the multi-vendor environment
  - Reachability confirmed by ICMPv6

# BGP over GMPLS

- BGP-4 over GMPLS
  - GMPLS LSP creation between GMPLS routers (w/o OSPF-TE)
  - BGP-4 session establishment over a GMPLS LSP
    - Different ASes are connected over a GMPLS core
  - BGP-4 session establishment over a MPLS LSP



# Future investigation and challenge

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- Actual operational migration
- Control of multi layers
  - Dynamic interaction between (IP/)MPLS/GMPLS
- Interoperability
  - To assure multi-vendor environment

# Conclusion

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- Service creation over GMPLS network
- Demonstration of MPLS/IPv6 transport over GMPLS networks
  - MPLS/GMPLS
  - IPv6/GMPLS
  - BGP-4/GMPLS
- GMPLS network is ready for the deployment for a carrier's environment.