



# *Best Practices for using Logical Router in Multilayer Service Network*

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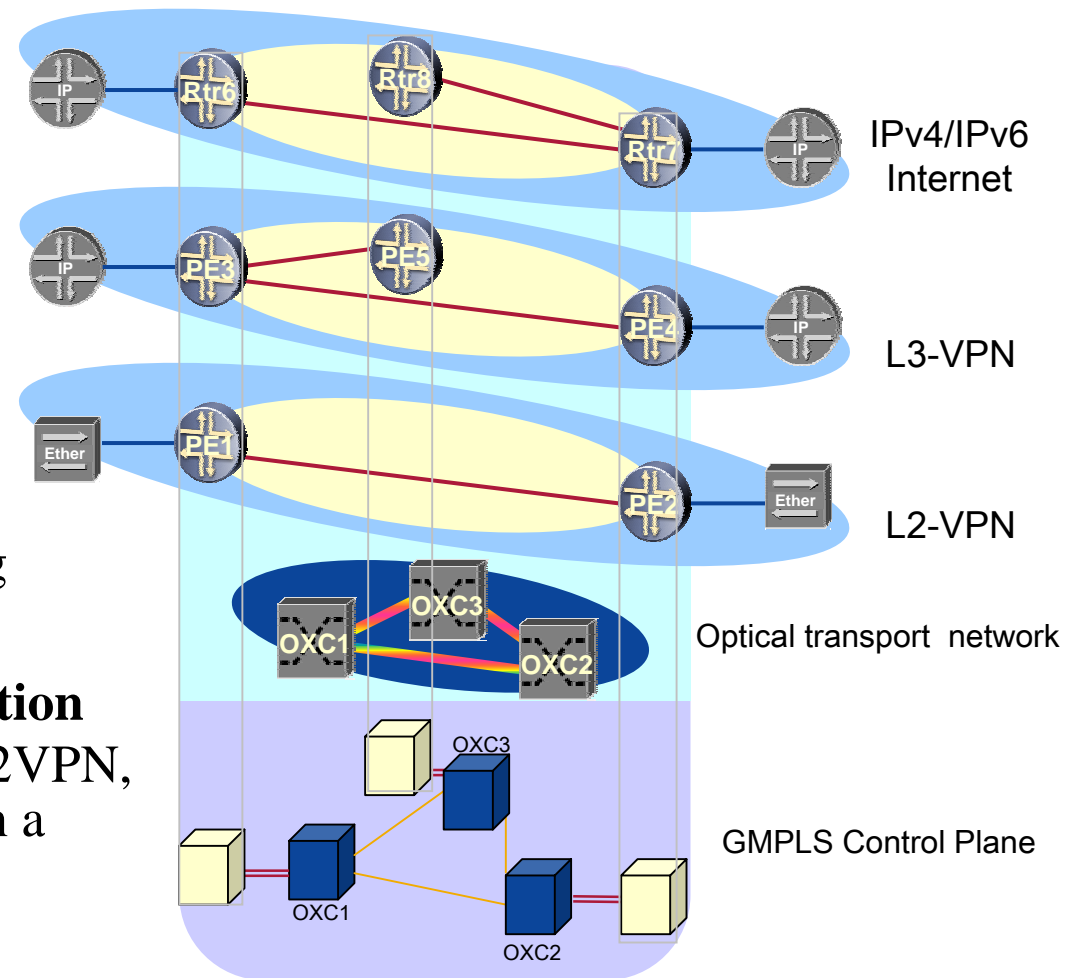


## Agenda

- **Multi-Layer Service Network(MLSN) architecture**
- **JUNOS Logical Router**
- **Case study – SINET3**
- **JUNOScript2.0 for MLSN Provisioning**
- **Multi-Layer Resource Control**
- **Summary**

# What is Multi-Layer Service Network?

- **Optical path cut through control by GMPLS**
  - Dynamic Layer1 path setup in GMPLS based Multi Layer Network
  
- **Multilayer correlation**
  - Correlation for GMPLS optical path layer and MPLS packet path layer provisioning
  
- **Multiple networks accommodation**
  - Multiple services (L1VPN, L2VPN, L3VPN, Internet, IPv6, etc) in a Multilayer Service Network.



## *JUNOS Logical Router(LR)*

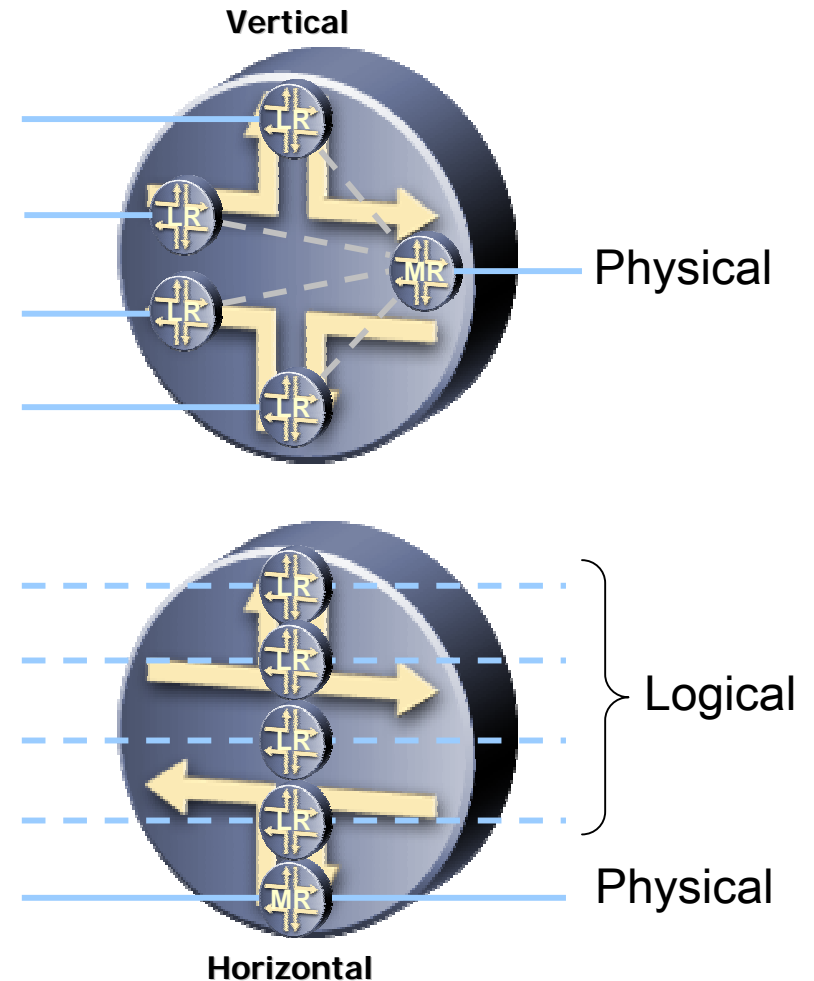
- **Introduced in JUNOS 6.0 (Q3 2003).**
- **Isolates routing protocols and interfaces. Provides great hardware reuse with shared uplinks and efficient inter-LR forwarding (lt- tunnel).**
- **Deployed by our customers for service separation, additional security, managed service, substitute for physical router.**
- **Most protocol features can be configured on every LR.**
  - IPv4,IPv6,Multicast,VPLS,L2VPN,L3VPN,6PE,6VPN, DiffServ TE, P2MP TE, etc
- **GMPLS signaled by LR master.**

## *Drivers for Multilayer Service Network with Logical Router*

- **Save CAPEX and OPEX:**
  - Share expensive forwarding plane.
  - Converge separate services into shared backbone.
  - Collapse multiple routers in a POP into a single physical router.
  
- **Separate services:**
  - Dedicated routing process per Logical router(LR).
  - Security between services (public IP vs. private IP).
  - Fault isolation between services.
  - Different service and core groups need to manage the same physical router(MR: Master/main router).

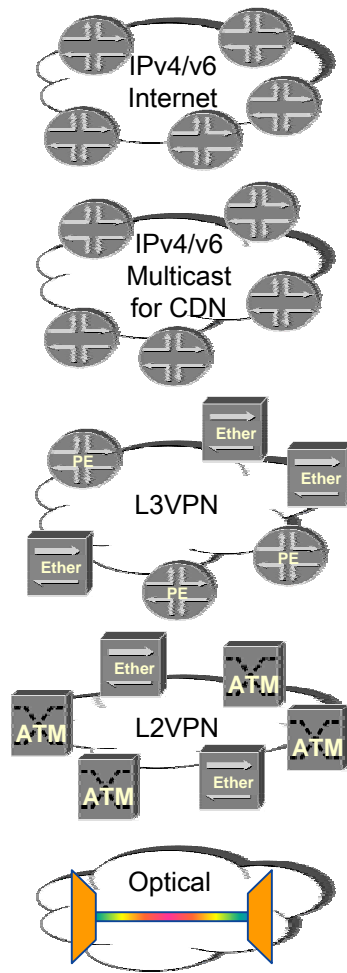
## Network Consolidation model

- **Vertical consolidation:**  
Combine logical routers and collapse interconnected router functions into a single router
  - Vertical Edge consolidation
    - Interconnect between different services,  
e.g. VPLS<->L3VPN, etc
  - Vertical POP consolidation
    - Managed CPE service in IDC
- **Horizontal consolidation:**  
Combine unconnected logical router functions into a single router
  - Horizontal consolidation for different networks
  - Isolating different services
  - **Multi-Layer Service Network**



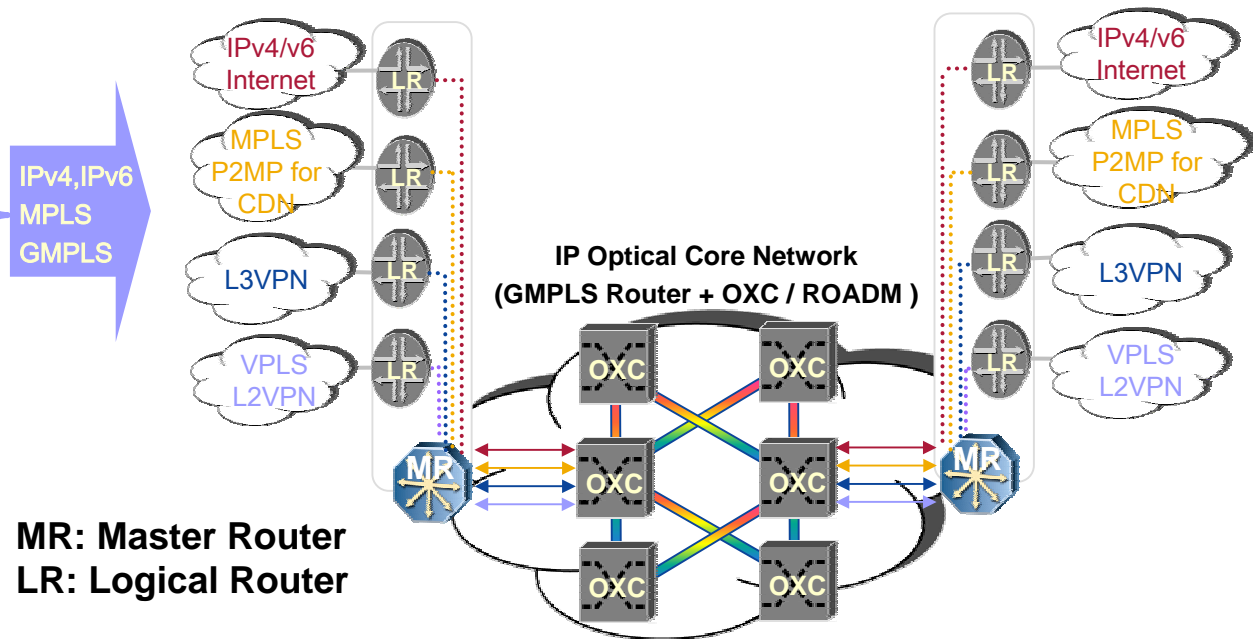
(LR: Logical Router, MR: Main/Master Router)

# Logical Router in Multi-Layer Service Network



## Key features:

- Service domain virtualization using Logical Router
- Multi Layer TE (Each TE is managed by each Logical Router)
- Each service operator manages each Logical Router
- Pseudo I/F for converged forwarding plane
- Each Layer1 path is managed by MR with GMPLS



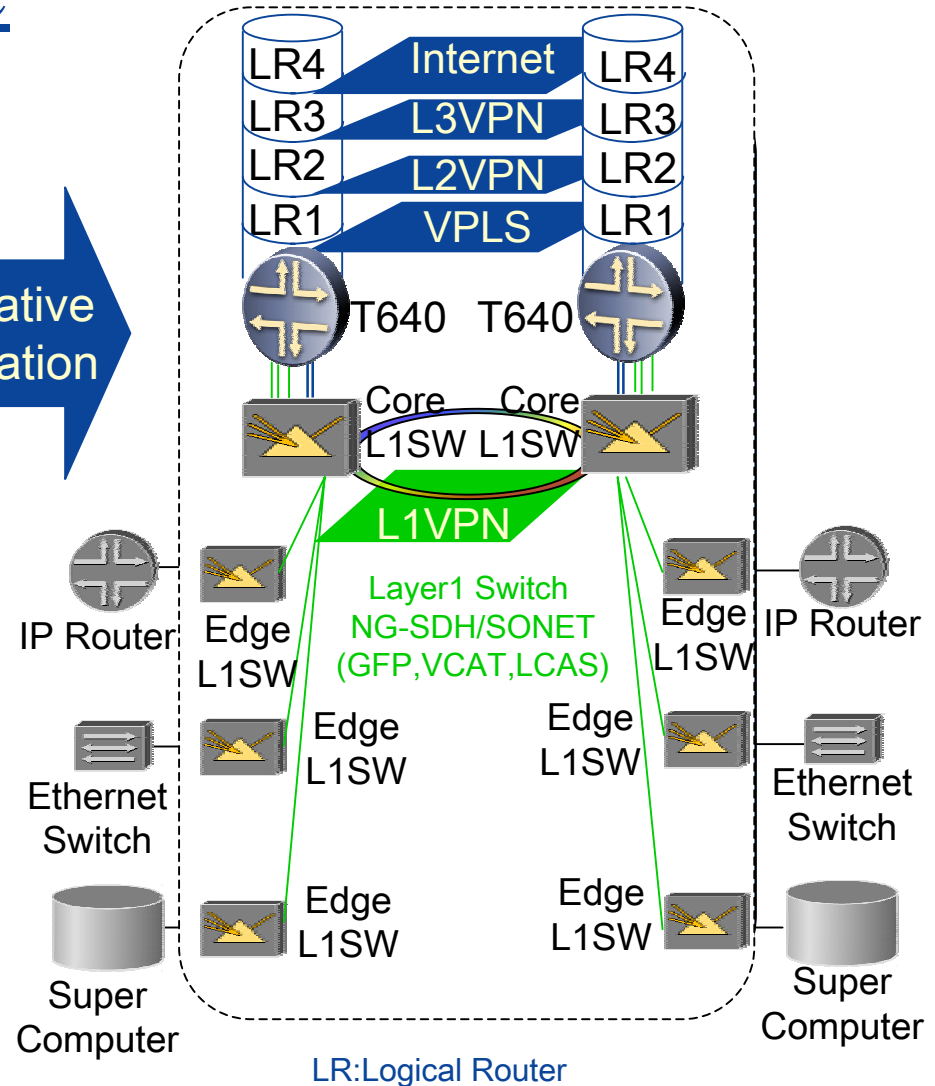
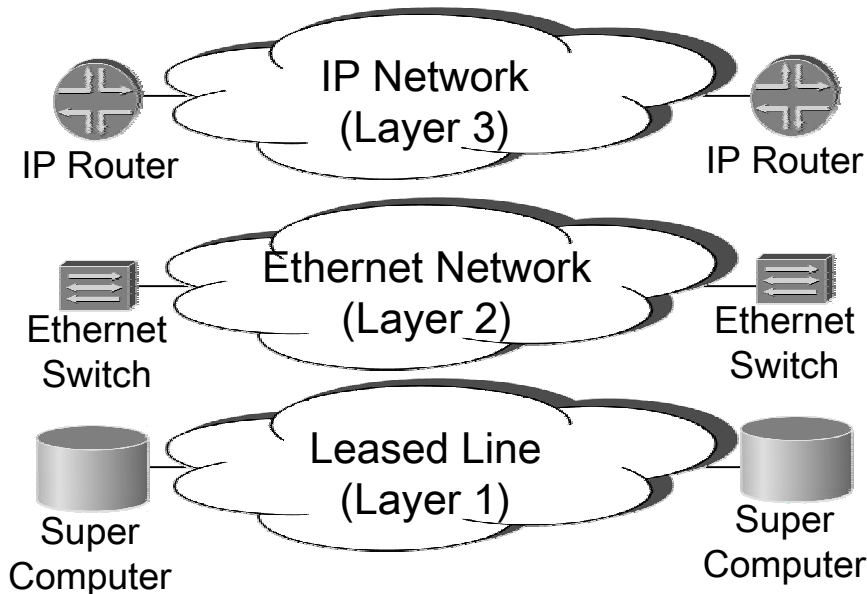
MR: Master Router  
LR: Logical Router

**SINET3** [http://www.sinet.ad.jp/?set\\_language=en](http://www.sinet.ad.jp/?set_language=en)

# Multilayer Service Network



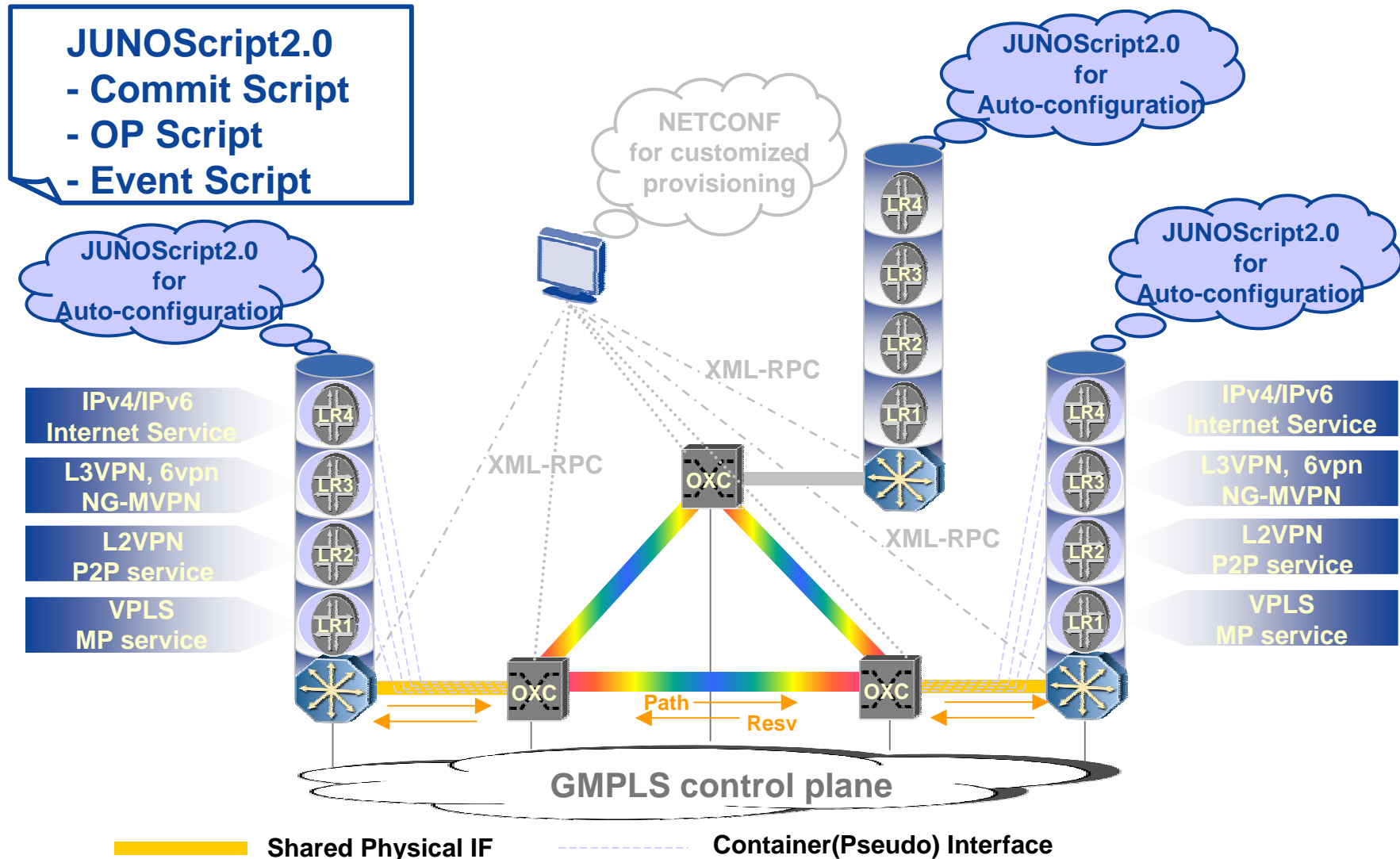
PREDECESSOR NETWORKS



## *MLSN Provisioning*

- **Concern**
  - Operation & Provisioning complexity
- **Solutions**
  - Adopting more Plug&Play protocols
    - BGP based VPNs (L3VPN, VPLS/RFC4761, L2VPN-kompera, NG-MVPN)
    - MPLS auto mesh
    - IPv6 link local address
    - IPv4 Unnumbered TELink
    - GMPLS
    - etc
  - JUNOScript2.0
    - Auto-configuration for each service
    - Customized command for easy operation
    - Event-driven/Time-drivien operation

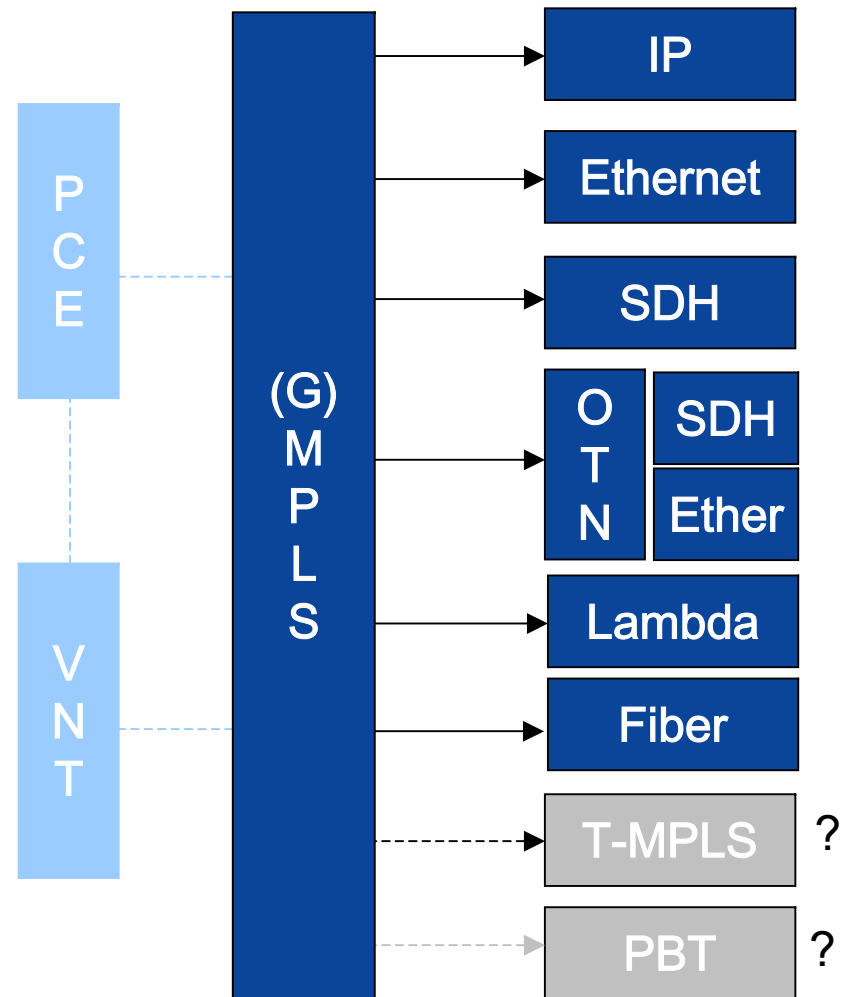
# JUNOScript for plug & play provisioning



## Ideal of multi-layer resource control

### ■ Control plane

- (G)MPLS, resource control to each layer (IP, Ethernet, SDH, OTN, etc)
- Inter-Layer PCE, etc
- Virtual Network Topology management
- Further study.....



## Summary

- ***Benefit of MultiLayer Service Network***
  - *Save CAPEX & OPEX by sharing platform & network*
  - *Keep dedicated routing policy for each service network layer*
- ***JUNOS Logical Router design for MultiLayer Service Network***
  - *Horizontal consolidation*
  - *Converged forwarding plane*
  - *Dedicated routing process for each LR(network service)*
- ***JUNOScript2.0***
  - *JUNOS automation for safe operation , provisioning and maintenance for backbone network, and to reduce OPEX.*
- ***Multi-Layer Resource Control***
  - *GMPLS helps multi-layer resource control to automate restoration and assists with connection provisioning for both packet and Optical layers.*

**Thank you!**  

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