



PRESENTS

NETWORLD INTEROP

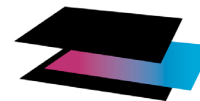


Challenges With MPLS and IP Routing Applications

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NETPLANE

CONTROL PLANE SOFTWARE
FOR NEXT GENERATION NETWORKS

Key Issues and Applications

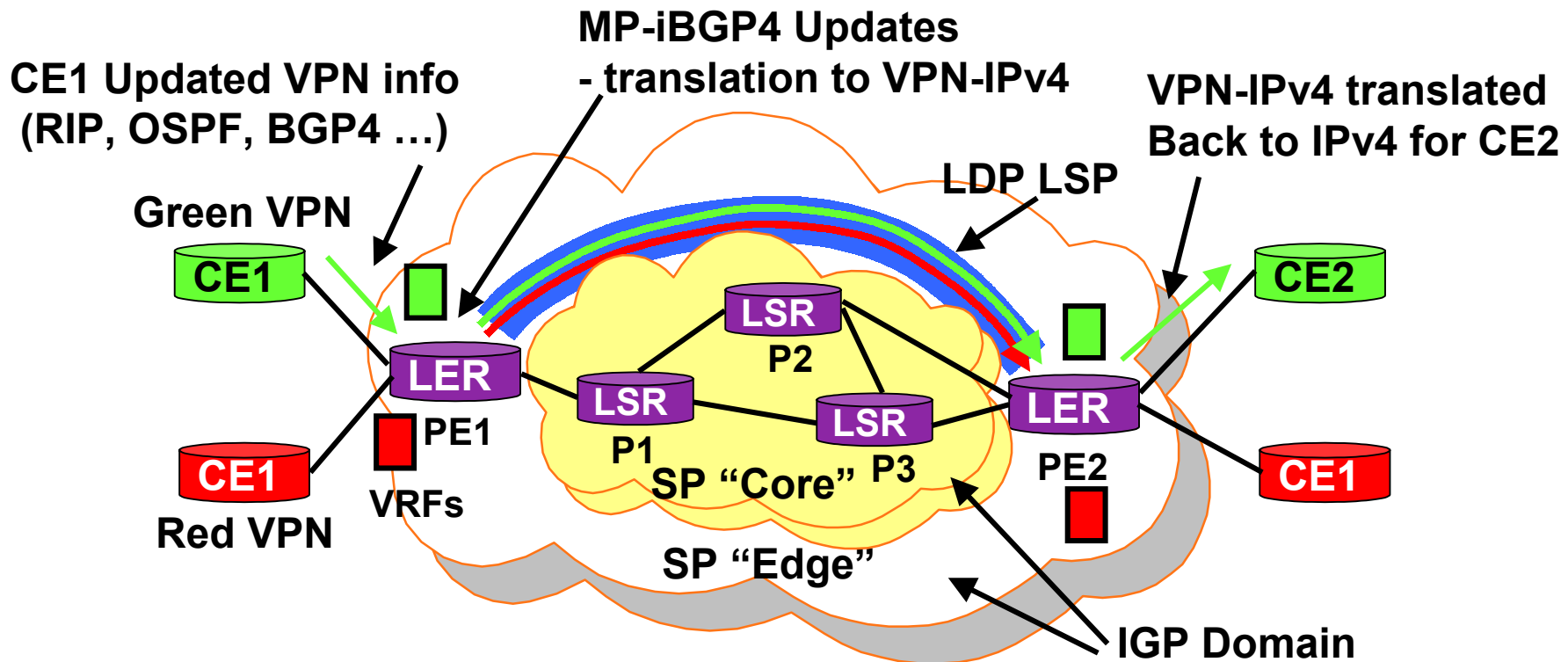
- Application and standards development focus
 - Layer III Virtual Private Networks (L3 VPNs)
 - Layer II tunneling
 - Optical signalling and routing
- Implementation challenges
 - Control plane - data plane complexity
 - Translating routing concepts into data plane applications
- System level design considerations
 - Scalability vs complexity
 - Redundancy and resiliency

Focus On Service Provider Revenue Generating Opportunities

BGP/MPLS VPNs (RFC 2547 bis*)

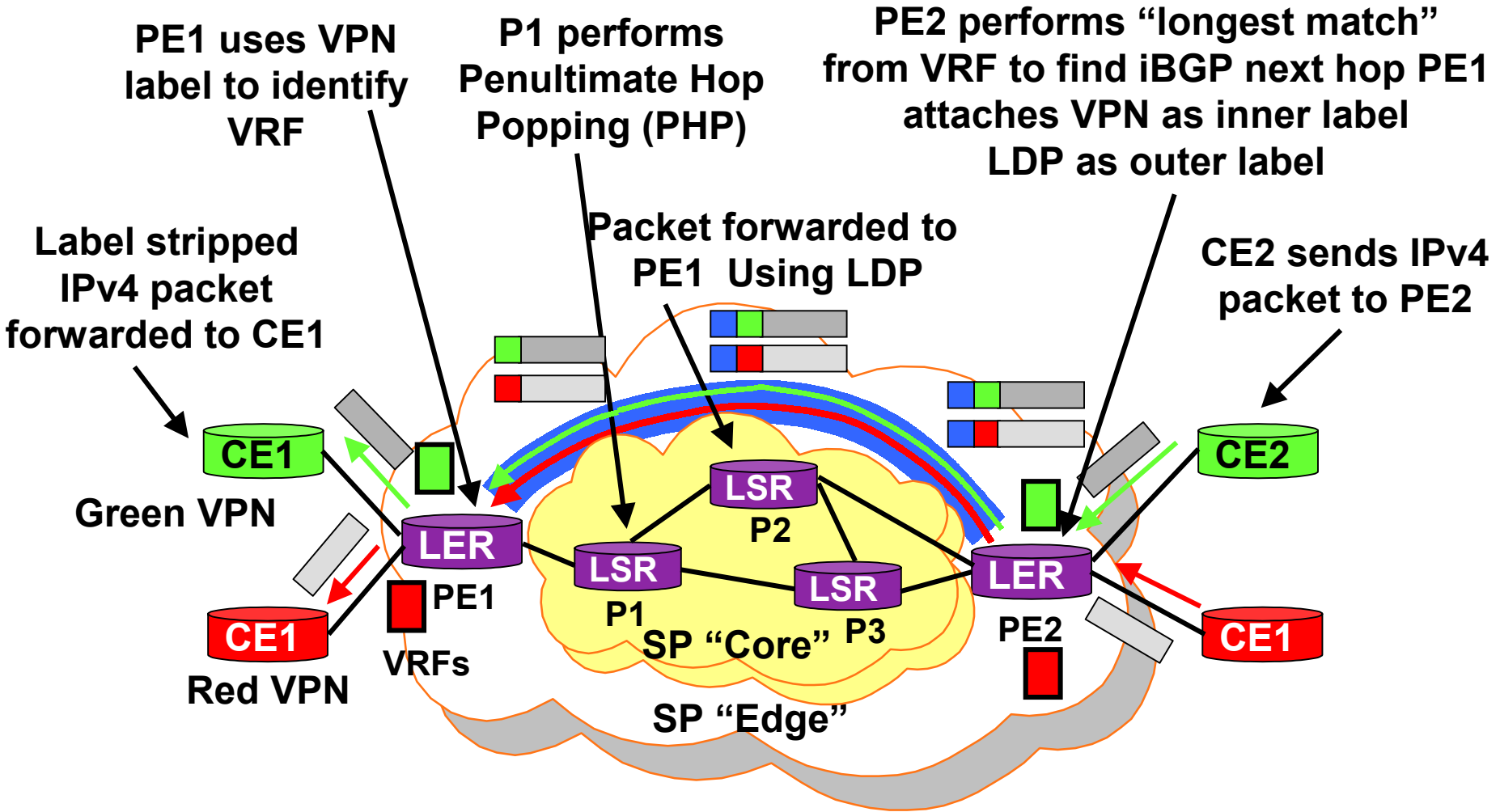
- Actively deployed in major carrier networks (ATT, Swisscom)
 - Cisco/Juniper driven
- Deliver network based VPN services over shared IP network
 - Security – access controlled via VPN Routing and Forwarding (VRFs) – customer isolation
 - Scalability – Provider core routers not VPN aware
 - Addressing – Customer overlap
 - Configuration – No special changes for customer side
- Constrained distribution of routing information
 - Multi-Protocol BGP updates
 - Extended BGP community attributes
 - Multiple routing/forwarding instances at Provider Edge

Layer III VPN Control Plane Components



- CE1 updates peer PE1 (any routing mechanism)
- PE1 translates IPV4 into VPN-IPv4 (red/green VPNs)
 - Assigns VRF labels
- Distribute via MP-iBGP4 updates
- PE2 translates VPN-IPv4 back to IPv4
 - sets VPN-IPv4 label into VRF
 - Forwards IPv4 update to CE2

Layer III VPN Data Plane Forwarding



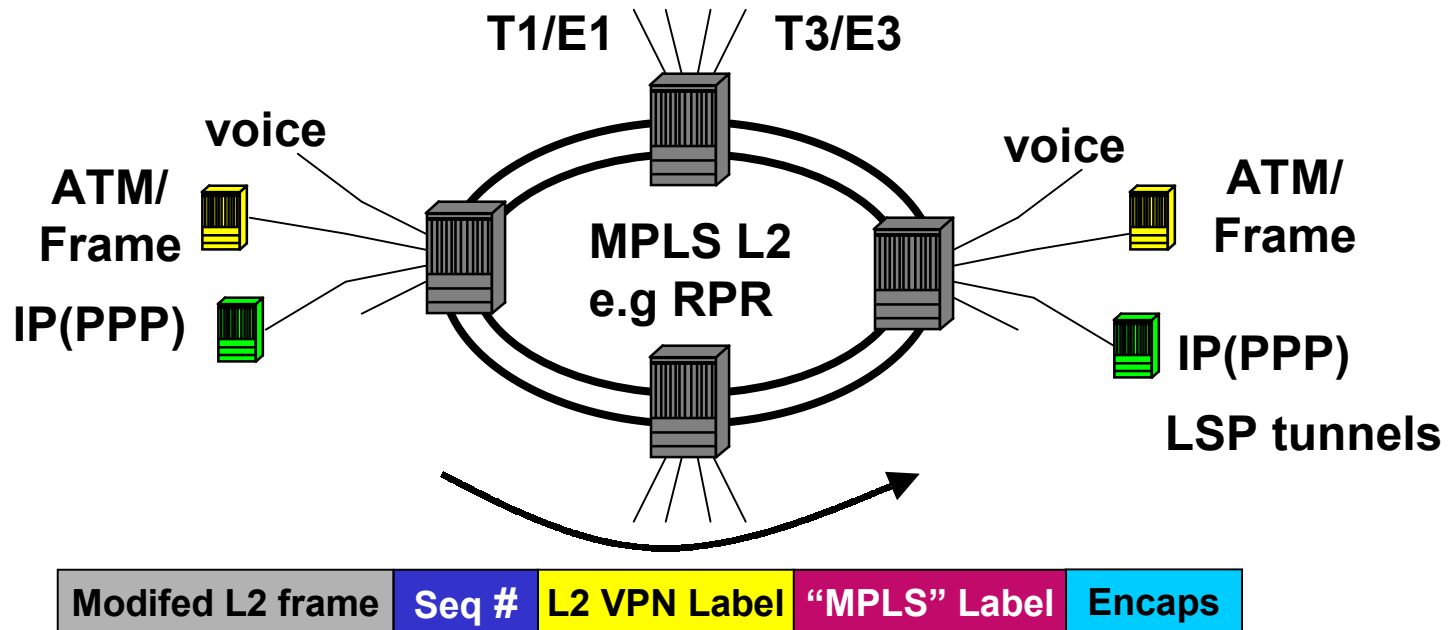
PE Scalability Issues

System Design Considerations

- Scalability
 - Multiple control plane routing instances
 - Multiple forwarding and label manipulation tables (VRFs)
 - Address lookups and translation
 - CE's "identified" by "sub-interface" – physical/logical
- Complex information translation
 - VPNs identified by VPN-IPv4 addressing
 - Route Distinguisher (RD) – VPN-IPv4 uniqueness
 - Route Target (RT) – filtering and access
 - Route Origin (RO) – defining next hop characteristics
 - Overlapping IPv4 addresses mapping to label stacks
- Additional functionality
 - Introduction of Traffic Engineering constraints
 - Redundancy and resiliency support – LII tunneling

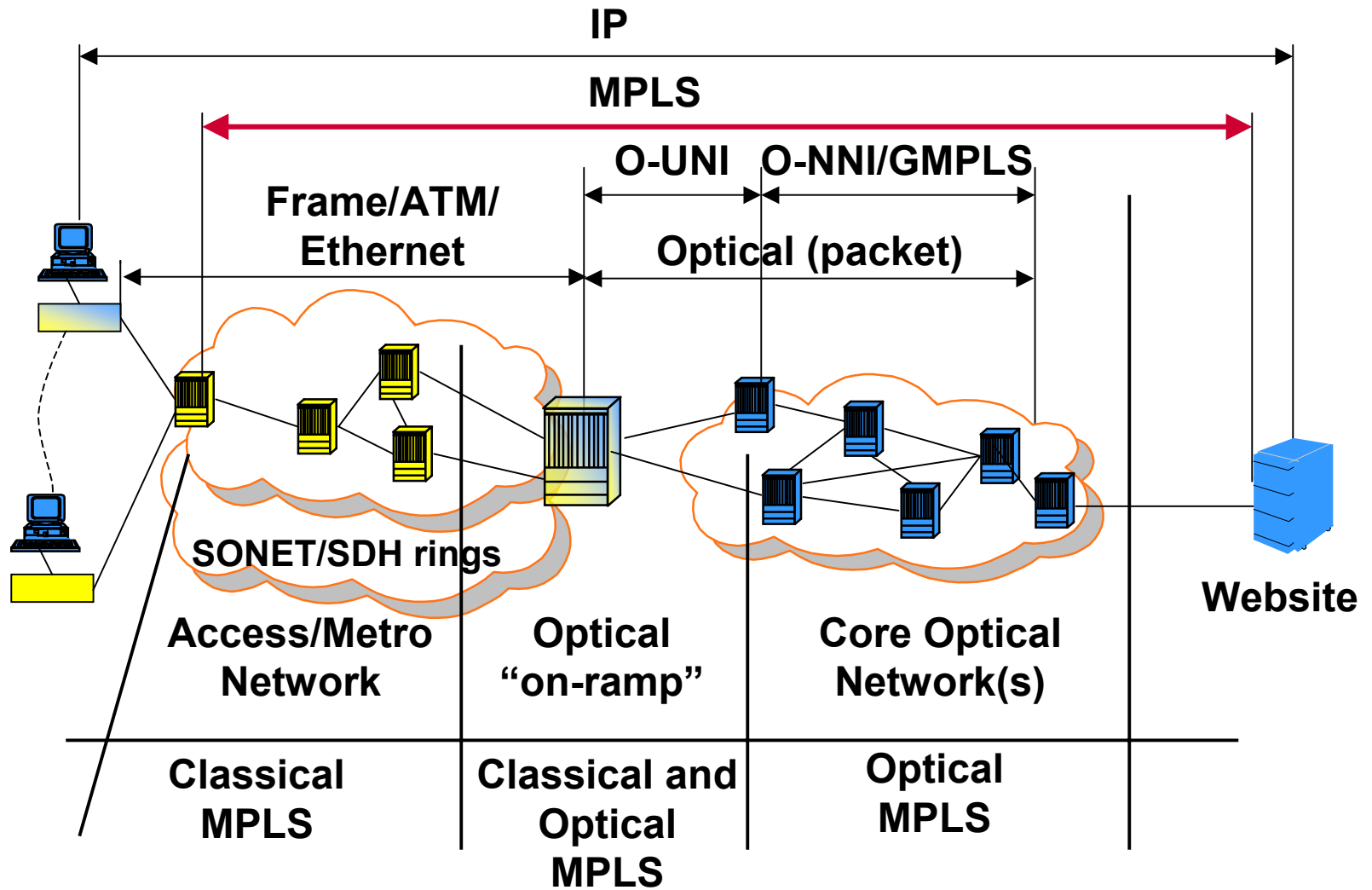
Line Card – Switch Fabric – Line Card Issues

MPLS and Layer II Integration



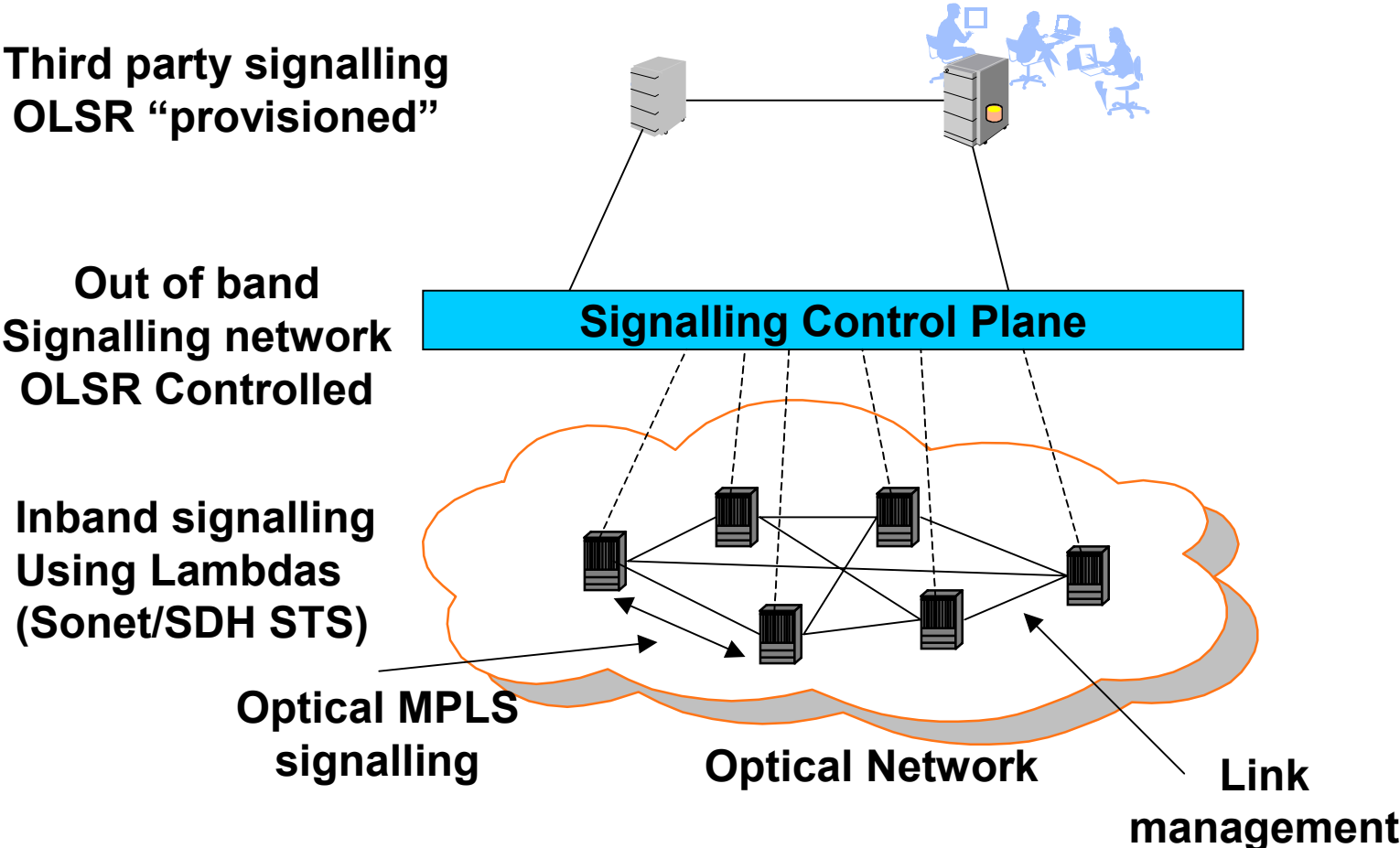
- Utilize concepts for IP VPNs
- Simplify to one dynamic technology
- Migration strategy to preserve existing services
- MPLS/routing to apply QoS/Cos concepts
 - e.g. circuit emulation

NetPlane Market View



Common Routing And Signalling Control Plane

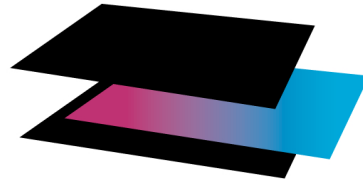
Optical Control Plane Requirements



Data Communication Network (DCN) Type Opportunities

NetPlane Systems

- **Leading supplier of IP technology for next generation networks**
 - 60+ MPLS customers – deployed in tier 1 IXC
 - First carrier class IP routing solution
 - Expanding into the optical control plane
- **Focus on customer time to market**
 - Value added components
 - Redundancy, distribution, tooling
- **Experience and depth**
 - 300+ customers worldwide
 - 200+ man years of development and testing portable protocol software
 - 1,000,000+ lines of code
 - Industry forums/standards bodies, IETF, OIF, MPLS Forum, ATMF



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**CONTROL PLANE SOFTWARE
FOR NEXT GENERATION NETWORKS**

Thank You

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