Panel Session

MPLS Commercialization and Evolution

Daniel Awduche
MCI

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MPLS: Contemporary Applications

Based on a relatively simple label switching paradigm

MPLS has evolved into a versatile technology for a variety of purposes

1. Traffic Engineering
2. VPNS (L2 & L3)
3. Unified Network Control
4. Network Consolidation
5. Service Convergence
6. Optical Internetworking

Today, MPLS-based VPNs are among the fastest growing network-based telecommunications services!

This panel features representatives from prominent Network Equipment Suppliers to discuss: "Contemporary applications of MPLS and future directions"

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MPLS: Commercialization and Evolution

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MPLS: Commercialization and Evolution

- MPLS is already a commercial success
  - Deployments too many to track (well in the hundreds)
  - MPLS-based L2 and L3 VPNs will bring in $3.3B US in worldwide 2004 service provider revenues, growing at 30-40%/year (Infonetics)
  - Enterprises also deploying MPLS internally
- However, we ain't seen nothing yet!
  - FRR, L2 endpoint interworking (FR/ATM/Ethernet) over MPLS, ATM control plane interworking, MPLS multicast, MPLS OAM, inter-provider MPLS VPNs, VPN autodiscovery, GMPLS for ASON and SONET/SDH, etc. are all actively being worked or close to finishing in the IETF, MPLS & FR Alliance, and ITU-T
  - As the standardization completes and these standard, interoperable capabilities make their way into products, MPLS will become the *COMPELLING* infrastructure and VPN technology
  - It used to be said that "Ethernet always wins"; in the future we'll say that "MPLS always wins"

MPLS Overview

By John Sax
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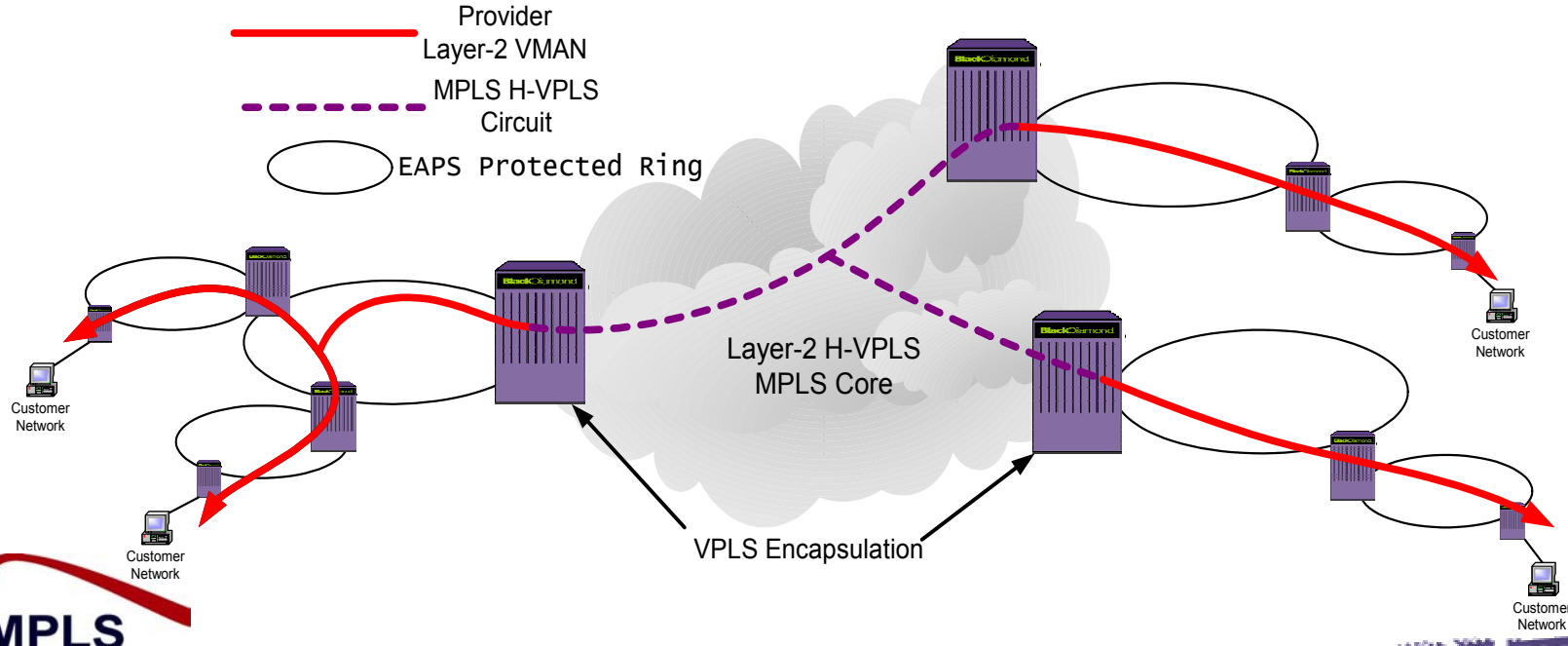
Lucent Technologies
Bell Labs Innovations

MPLS Overview

- MPLS is not just a protocol it is a set of solutions
  - Standards bodies working on extensions and architectures to solve real problems
    - VPLS, Layer 3 VPNs, ATM over MPLS …
    - Part of the evolution in IP networks
    - Strong feedback loop between standards and implementation
  - This is in keeping with the traditional way IP protocols have been developed
  - A weak area is network management support
- The answer to the question "is MPLS ready for prime time?" is "it depends on the application"

Extreme Networks' MPLS Deployment Perspective

- MPLS VPLS addresses the L2 scalability issue
- QinQ and H-VPLS are compatible network scalability
- L2 VPLS cross connects scale with better performance, at significantly lower cost than alternatives



Nortel Networks MPLS Position Statement

- Nortel Networks is providing carrier grade platforms using standards based MPLS solutions. These solutions are optimized for fast, profitable service creation and service delivery across data, optical, wireless and voice networks using a flexible networking architecture.
- Nortel Networks is applying the technology of our industry-leading multiservice switches with MPLS, combining the multiservice and traffic management capabilities of ATM with the scalability of packet networks to create a best-of-breed service provider network.
- Key drivers toward MPLS deployment include:
  - Cost reduction through data network convergence: MPLS facilitates the convergence of disparate Frame Relay, ATM, Ethernet and IP networks onto a single infrastructure to reduce capital and operational expenses.
  - Integration of voice, video and data services: MPLS' traffic management capabilities enable this services "triple play" on a common backbone.
  - New Service offerings including Virtual Private Routed Networks, Virtual Private Wires and Virtual Private LAN Services based MPLS core networks.
  - MPLS' flexibility, high availability and multi-service support enables service providers to offer enhanced SLAs, increasing revenue and margins.

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Vendor Perspectives on MPLS

By Eric Brendel
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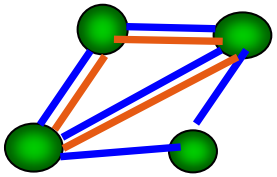
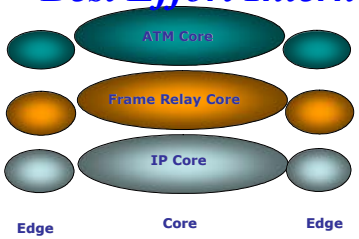
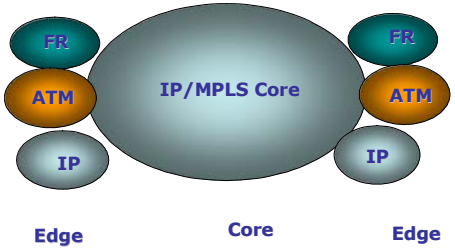
Evolution to the Reliable IP/MPLS Converged Core

	Enterprise Focused	*Best Effort Internet*	*Business-class Internet*
Core Network Focus			
Services	•Network Interconnection •Multi-protocol •Multi-Networks, Services •Enterprise Focused	•IP Based Services •Internet Services (Web, Email) •Traffic Growth Explosion •Multiple Networks for Multiple services	•Business-Critical Services (ATM, Frame, VPN) •Voice and realtime services •Multiple Services on a converged IP/MPLS core
Characteristics	•General Purpose • Point-to-point •Different technologies for different services •Software Based Routers	•Reachability and Global Connectivity •IP Purpose Built Routers • Hardware Based Forwarding	**Chiaro's Focus** •Highly Available Platforms for Continuous Operation • Fast Convergence •In-service upgrades •Stable Routing and Forwarding •Scalability (Data and Control) •QoS for real-time services

'94 '98 '04 '05

MPLS Commercialization & Evolution Position Statement

Carrier-class reliability is the most significant hurdle to the evolution of legacy IP networks into a next-gen service platform

- Economic requirement for Service Providers to build a single converged IP/MPLS network to support legacy and emerging services
- A reliable IP/MPLS Core network to support MPLS VPNs must be carrier grade
  - Stateful Protocol Protection, Hitless Software Upgrades, Continuous Forwarding & Routing
- Diffserv –TE provides the necessary QoS to support legacy services from converging networks and new real time services
- MPLS OAM features & functionality is critical to making IP/MPLS networks easier to deploy and faster to troubleshoot
- Evolving MPLS Services features and scalability must utilize Customers' investment to be cost effective
  - New features shouldn't require new hardware

MPLS – The Future is Now!

By Bill Kine
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SPIRENT™ Communications

Testing MPLS
State of the Industry

- "Proof of Concept" Testing is Complete
  - 2547, Martini, VPLS VPNs are all feasible
- MPLS Testing is moving to the next step
  - Performance Testing
  - Scalability Testing
  - Deployment Scenarios
  - Traffic Engineering
  - Application Layer Testing
- End-Users are also Testing MPLS Architectures

Kireeti Kompella, Juniper Networks

- MPLS is vital, alive, on the right cusp of maturity and active evolution
- MPLS has delivered on its promises -- it is widely deployed, and carries high-revenue services
- MPLS is not confined to core networks -- it is the technology of choice for metro Ethernet networks
  - MPLS makes up for Ethernet's many deficiencies
- MPLS enables 'operational convergence'
  - Has led to auto-discovery, self-provisioning, self-healing networks
- GMPLS proves that MPLS is even more flexible and extensible than first imagined