The MPLS and Frame Relay Alliance: April 2004 Update

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The MPLS & Frame Relay Alliance

An industry-wide association of networking and telecommunication companies focused on advancing the deployment of multi-vendor multi-service label switching networks and associated applications.

Frame Relay and MPLS: Two Success Stories

- **Frame Relay services are deployed globally**
  - ✓ **14 years since initial FR deployments**
  - ✓ **$US 15B in annual worldwide revenues, still growing by 20% per year**
  - ✓ **Success driven by simplicity and favorable pricing by service providers**
  - ✓ **Many FR services are actually built on ATM infrastructure networks**
    - **Beginning to transition to MPLS infrastructures**
  - ✓ **Frame Relay also moving to a new role – providing access to MPLS-based Layer 3 IP Virtual Private Networks (VPNs)**
    - **Also known as "IP-enabled Frame Relay"**
    - **Any-to-any service**

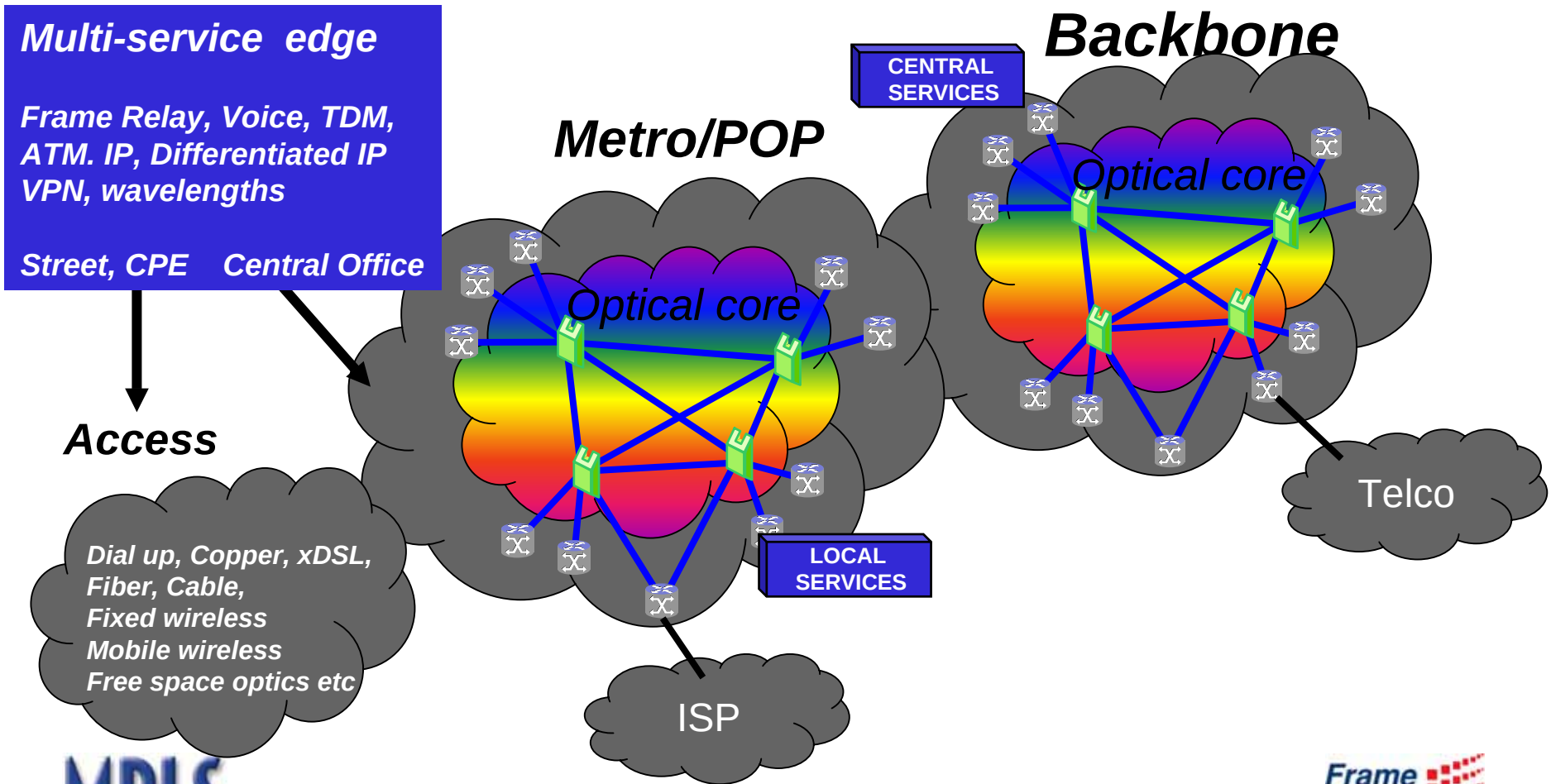
Frame Relay and MPLS: Two Success Stories

- **MPLS has been deployed by most major service providers worldwide**
  - ✓ **Known deployments number in the many hundreds**
  - ✓ **Mainly used for:**
    - **Provide Layer 2 and 3 VPN services**
    - **Enhance IP infrastructures through traffic engineering**
    - **Enhanced Quality of Service capabilities**
  - ✓ **Found in both Internet infrastructure and private IP networks**
- **MPLS began as a service provider infrastructure technology, but is moving to the edge**
  - ✓ **MPLS & FR Alliance working on enhancements to the MPLS User-to-Network Interface specification**
  - ✓ **MPLS is now also found in enterprise networks, for traffic engineering and VPN separation between divisions or departments**

MPLS FORUM

Frame Relay Forum
www.frforum.com

The Converged Network Vision



MPLS/FR Alliance Information and Membership

- Founded April 2003 by merging the MPLS Forum and Frame Relay Forum
- Combined vision of FR access to MPLS in the core
- 54 members
- Three primary committees
  - ✓ Marketing Awareness and Education (MAE) Committee
  - ✓ Technical Committee
    - Applications and Deployment Working Group
    - Frame Relay Working Group
  - ✓ Interoperability Committee
- Most recent meeting: San Diego, January 2004 (co-located with ATM Forum)
- Next meeting: Toronto, late April 2004 (co-located with Multiservice Switching Forum and ATM Forum)

MPLS FORUM

Frame Relay Forum www.frforum.com

Alliance Leadership Positions

- **Board members**
  - ✓ Bernard da Costa, Bell Canada, Board Member
  - ✓ Joe Kimball, Sprint, Board Member
  - ✓ Gary Leonard, Riverstone Networks, VP of Marketing
  - ✓ Andrew Malis, Tellabs, Chairman and President
  - ✓ Doug O'Leary, Verizon, Treasurer
  - ✓ Ananda Sen Gupta, Agilent Technologies, Vice Chairman, International Development
  - ✓ David Sinicrope, Ericsson, Secretary
  - ✓ Rick Wilder, Alcatel, VP of Technology
  - ✓ Tom Walsh, Lucent Technologies, Vice Chairman
  - ✓ Ex officio: David Drury, Accipiter Systems, President Emeritus
  - ✓ Ex officio: Roger Ruby, Quick Eagle Networks

Alliance Leadership Positions

- **Technical Committee**
  - ✓ Rao Cherukuri, Cisco Systems, Co-Chair
  - ✓ Dr. John Yu, Hammerhead Systems, Co-Chair and Frame Relay Working Group Chair
  - ✓ Jarrod Siket, Marconi, Vice-Chair
  - ✓ David Sinicrope, Ericsson, Applications and Deployment Working Group Chair
  - ✓ Nikhil Shah, Lucent Technologies, A&D WG Vice Chair
- **Marketing Committee**
  - ✓ Gary Leonard, Riverstone Networks, Co-Chair
  - ✓ Roger Ruby, Quick Eagle Networks, Co-Chair
  - ✓ Sunil Khandekar, Alcatel, Vice Chair
  - ✓ Kimberly Booth, Laurel Networks, Press Relations Working Group Chair
  - ✓ David Christophe, Lucent Technologies, Education Working Group Chair
- **Interoperability Committee**
  - ✓ Ananda Sen Gupta, Agilent Technologies, Chair
  - ✓ Mark Dyga, Laurel Networks, Vice Chair

Market Awareness & Education

- **Tutorials**
  - ✓ **MPLS Introduction** — **full day**
  - ✓ **MPLS VPNs and VPLS** — **½ day**
  - ✓ **Traffic Engineering** — **½ day**
  - ✓ **GMPLS** — **½ day**
  - ✓ **Voice over MPLS** — **½ day**
  - ✓ **Legacy Services Migration to MPLS (FR, ATM, Ethernet, SONET/SDH)** — **½ day**
- **Conferences and exhibitions**
  - ✓ **Almost every MPLS conference globally has an Alliance speaker**
- **Website and Newsletter**

Interoperability Committee

- **Conformance Test Plans**
  - ✓ **LDP**
  - ✓ **RSVP-TE**
- **Interoperability Test Plans**
  - ✓ **LDP**
  - ✓ **RSVP-TE**
  - ✓ **DiffServ Traffic Engineering**
  - ✓ **Layer 3 (BGP/MPLS) VPNs**
  - ✓ **Layer 2 pseudowires and VPNs over MPLS (Martini/PWE3)**
  - ✓ **Virtual Private LAN Service (VPLS)**
  - ✓ **Fast Reroute (FRR)**

Technical Committee

- **MPLS multi-service core**
  - ✓ **Enables service providers a migration path to MPLS**
    - **Tunnel legacy services over MPLS**
    - **Network and Service Interworking**
  - ✓ **Builds upon and conforms to IETF and ITU-T specifications**
    - **Fills in "missing pieces" and/or provides source material**
- **MPLS service edge**
  - ✓ **MPLS UNI**
  - ✓ **MPLS/PNNI signaling interworking**
  - ✓ **Interworking between FR, ATM, and Ethernet over MPLS networks**
  - ✓ **FR/MPLS network interworking (joint work with ITU-T Study Group 17)**

Technical Committee Work Items

Technical Committee Work Item &Description	Target Straw Ballot Complete	Target Final Ballot Complete
*** I.366.2 Voice Trunking Format over MPLS** Using MPLS to carry packetized ITU I.366.2 Voice formatted traffic. Similar to the way AAL2 is transported by ATM.	Jan 2003	Aug 2003
FR/MPLS Network Interworking Frame relay to frame relay service offered using MPLS as a backbone transport. Cooperative effort with the IETF and ITU-T SG 17.	Q2 2004	Q2 2004
LSP Connection Service Definition Definition of native MPLS LSP transport service.	Q2 2004	Q2 2004
ATM and Frame Relay to MPLS Control plane interworking This allows signaling service interworking between ATM, FR, and MPLS networks.	Q3 2004	Q4 2004

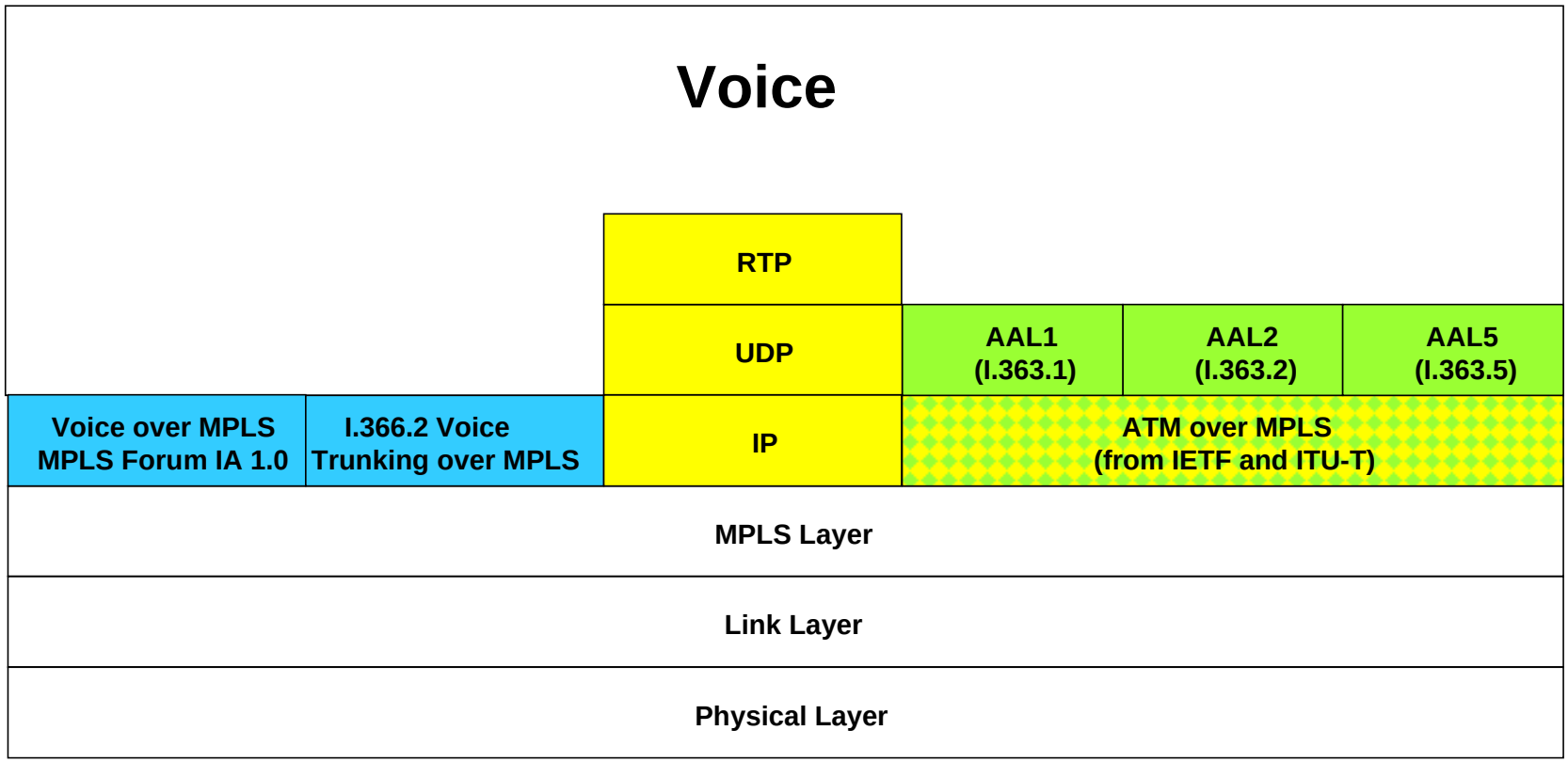
Technical Committee Work Items

UNI QoS Proxy Admission Control Service Definition Definition of a service provided on the MPLS UNI that allows a CE to request resources of the provider network.	Q2 2004	Q2 2004
UNI QoS Proxy Admission Control Protocol UNI protocol modifications to support the UNI QoS Proxy Admission Control Service Definition	Q2 2004	Q3 2004
Multiservice Interworking over MPLS Transport of ATM, Frame Relay and/or Ethernet over MPLS without requiring the same service on both ends of the connection.	Q3 2004	Q4 2004
SONET over MPLS Implementation specification for transport of SONET/SDH over MPLS	Q2 2004	Q3 2004
HDLC over MPLS Implementation specification for transport of HDLC over MPLS	Q2 2004	Q3 2004
TDM over MPLS – Raw Encapsulation Implementation specification for raw TDM transport over MPLS	Q2 2004	Q3 2004

Relationships w/Other Bodies

- **IETF**
  - ✓ Alliance work based on IETF RFCs and/or ITU-T Recommendations
  - ✓ Concentrate on technical work that does not fit in IETF charter, such as MPLS test plans, PNNI interworking, VoMPLS, etc.
  - ✓ Strong common participation between IETF and Alliance
- **ITU-T**
  - ✓ Achieved A4 and A5 liaison status with ITU-T
  - ✓ Communicating with Study Groups 11, 13, 15, and 17 regarding such topics as MPLS OAM, MPLS/PNNI signaling interworking, VoMPLS carriage and signaling
- **ATM Forum**
  - ✓ In October 2001, began a program of joint conference calls
  - ✓ In January 2003, began a series of co-located meetings (four to date), meeting cross-participation is invited and encouraged
- **Multiservice Switching Forum**
  - ✓ Formal liaison relationship
  - ✓ Working jointly on SUPERCOMM SUPERDemo 2004 and GMI 2004
- **Metro Ethernet Forum**
  - ✓ Formal liaison relationship
  - ✓ Working in concert on FR/ATM/Ethernet interworking

Voice Services over MPLS (ITU-T Y.1261)

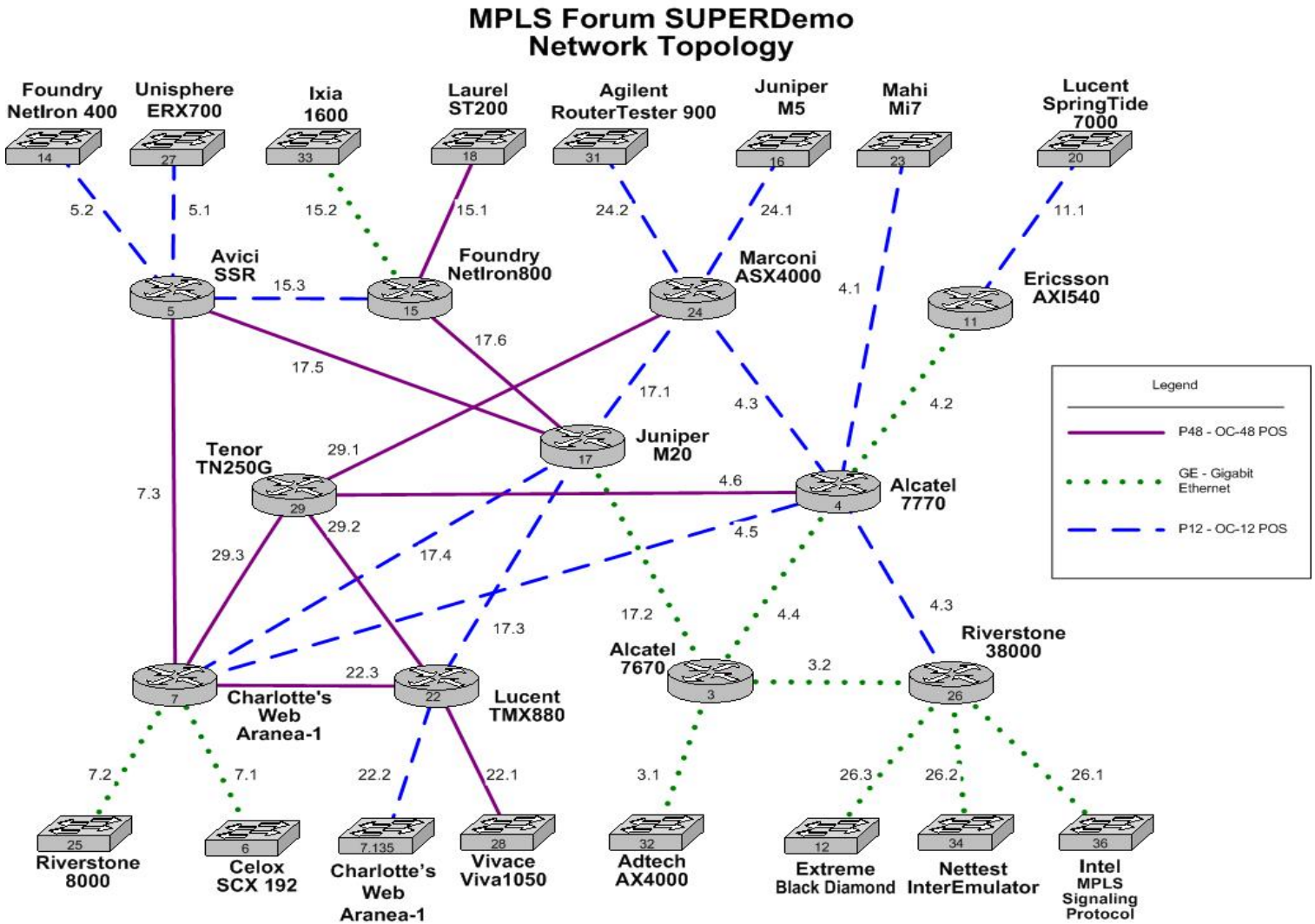


Legend: Alliance IETF ITU-T

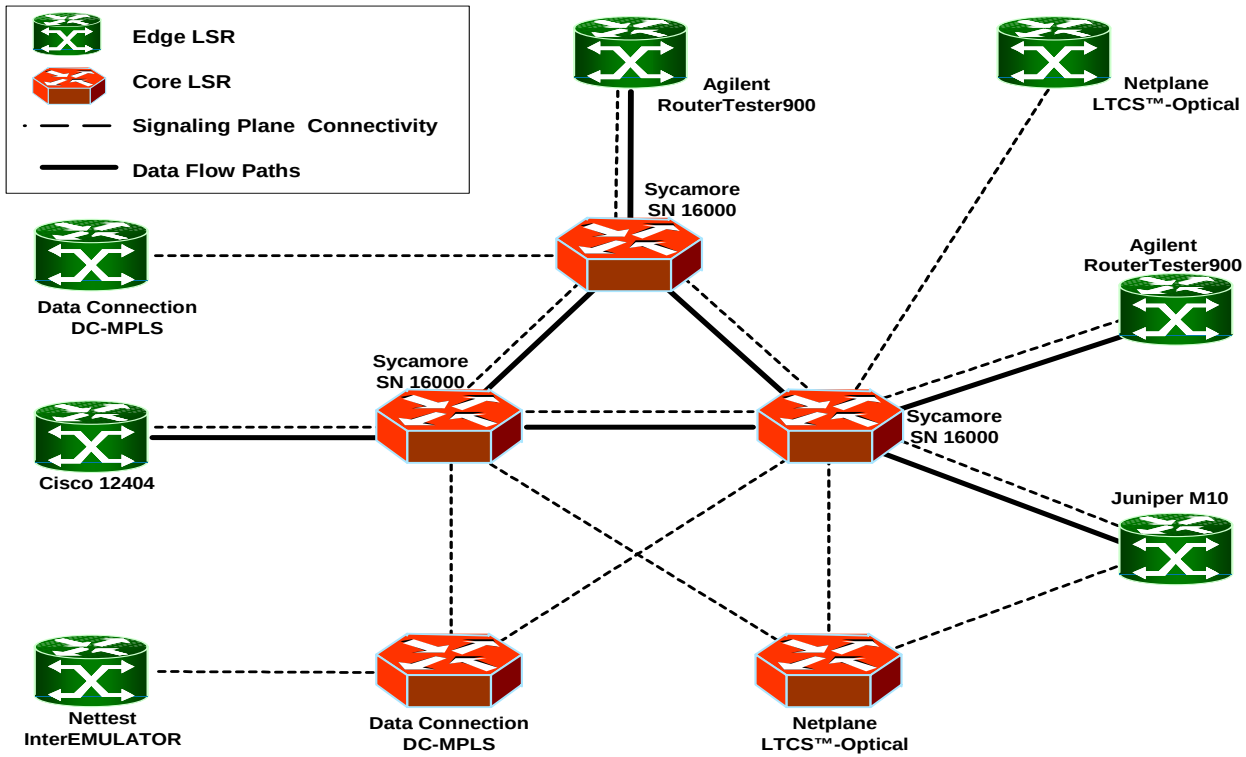
Public Interoperability Events

- **SUPERCOMM (Atlanta), June 2002**
  - ✓ **MPLS traffic engineering, Layer 2 and 3 Virtual Private Networks (VPNs)**
- **Next Generation Networks (Boston), October 2002**
  - ✓ **Generalized MPLS (GMPLS)**
- **MPLS World Congress (Paris), February 2003**
  - ✓ **BGP/VPN Scalability, MPLS Fast Reroute (FRR)**
- **SUPERCOMM (Atlanta), June 2003**
  - ✓ **Frame Relay, ATM, Ethernet/VLAN over MPLS, Virtual Private LAN Services (VPLS), MPLS Fast Reroute (FRR)**
- **MPLS World Congress, Paris, February 2004**
  - ✓ **MPLS Features Enabling Service Guarantees**
- **Next upcoming event:**
  - ✓ **SUPERCOMM SUPERDemo, June 2004**

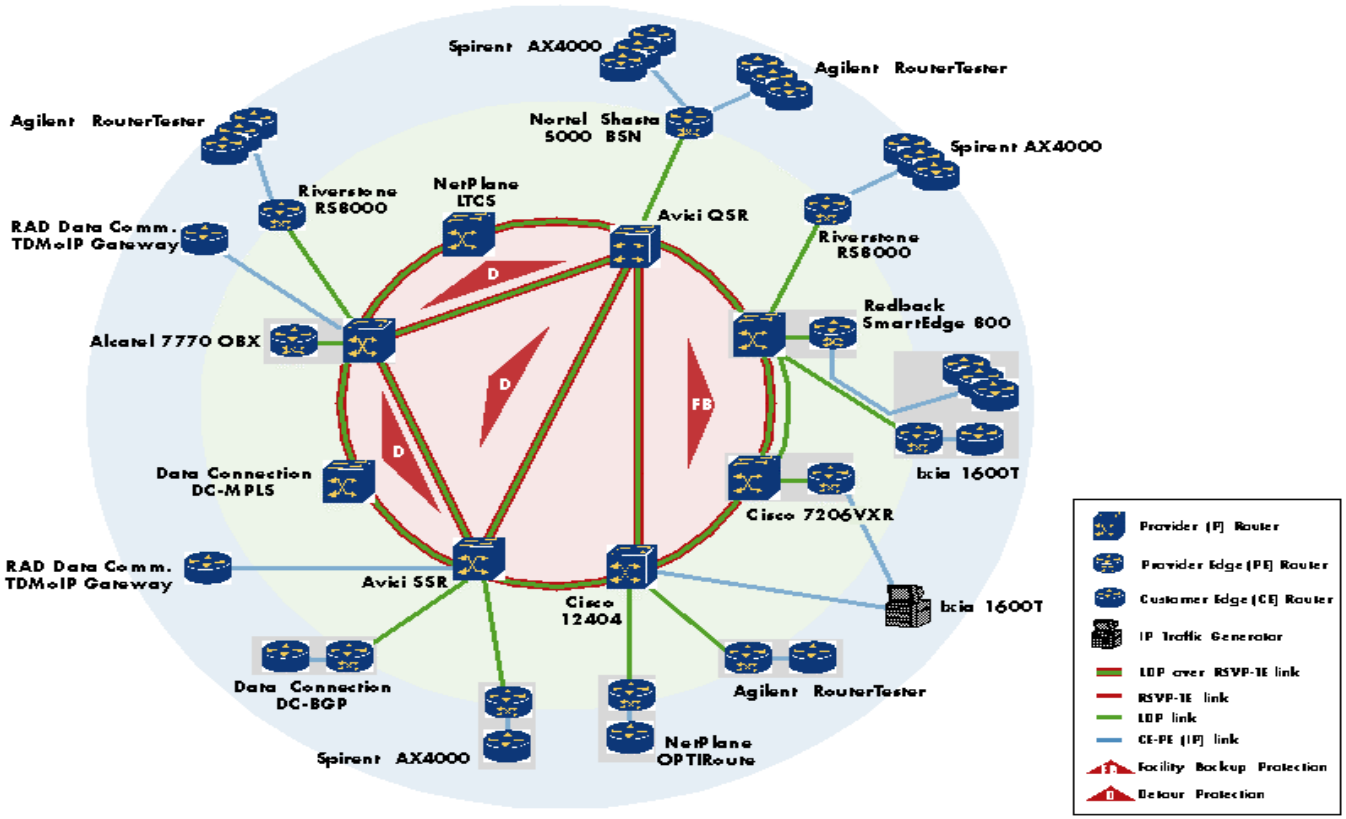
SUPERCOMM SUPERDemo 2002: MPLS TE, Layer 2 and 3 VPNs



Next Generation Networks 2002: GMPLS Interoperability



MPLS World Congress 2003: Fast Reroute Protection, L3 VPN Scalability



SUPERCOMM SUPERDemo 2003

- **Focus on demonstrating multivendor interoperability in the following areas:**
  - ✓ **Frame Relay over MPLS**
  - ✓ **ATM over MPLS**
  - ✓ **Ethernet/VLAN over MPLS**
  - ✓ **Virtual Private LAN Services (VPLS)**
  - ✓ **MPLS Fast Reroute (FRR)**
- **New interoperable, scalable services while offering service guarantees**

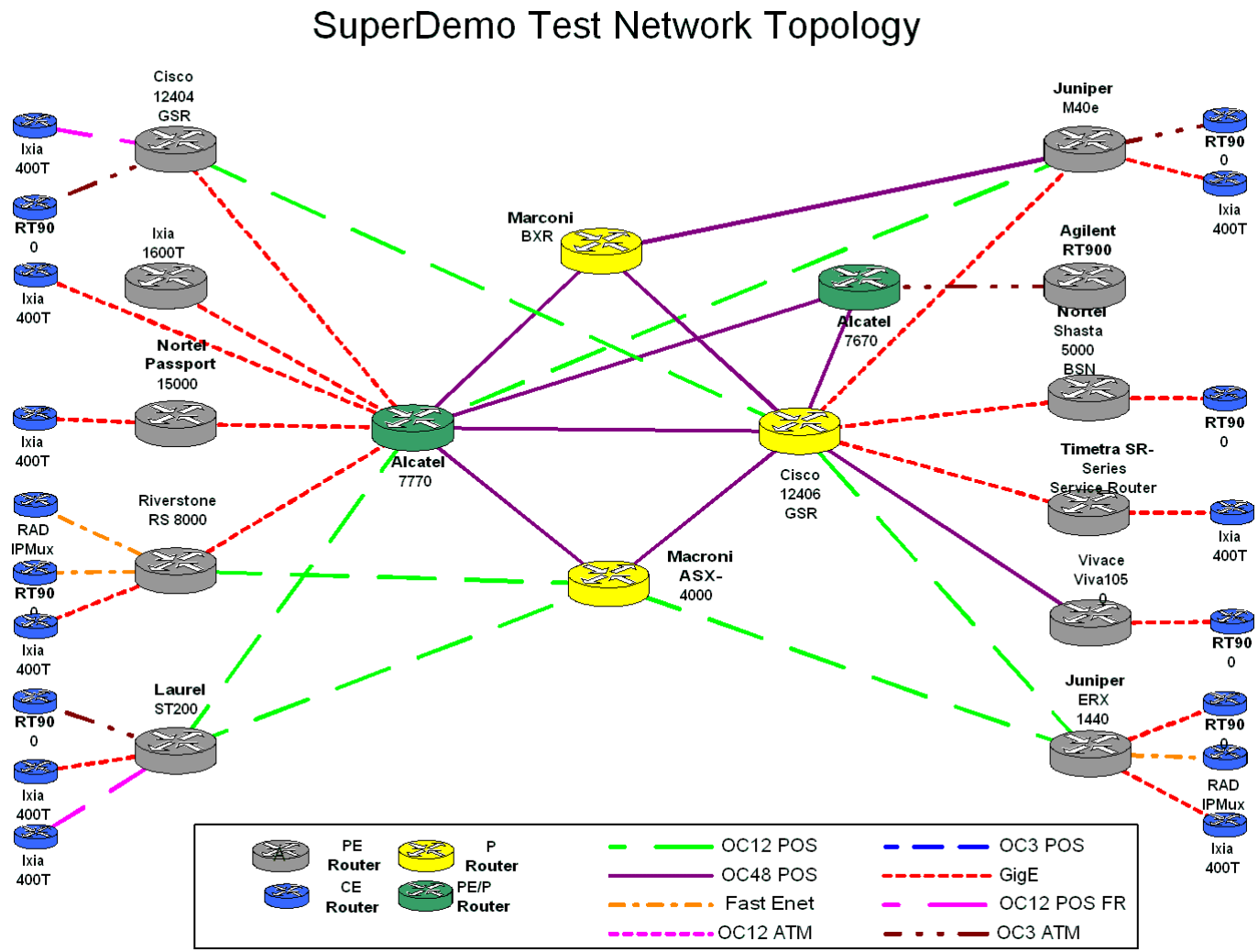
18 Participating Products

- Alcatel 7670 Routing Switch Platform (RSP)
- Alcatel 7770 Optical Broadband Exchange (OBX)
- Agilent RT900
- Cisco GSR 12404
- Cisco GSR 12406
- Ixia 400Tand 1600T
- Juniper M40e
- Juniper ERX 1440
- Laurel ST200
- Marconi BXR-48000
- Marconi ASX-4000
- Nortel Passport 15000
- Nortel Shasta 5000 Broadband Service Node (BSN)
- RAD IPmux
- Riverstone RS 8000
- TiMetra Service Router (now Alcatel 7750 SR)
- Vivace Viva1050 (now Tellabs 8820 Multi-service Switch Router)

Test Scenarios

- **Fast Reroute was tested in the core**
- **Three MPLS service scenarios tested in isolation and then implemented across a core MPLS network:**
- **Layer 2 point to point Transport services:**
  - ✓ **ATM (Cell and AAL5 modes)**
  - ✓ **Frame Relay (Transport mode)**
  - ✓ **Ethernet (Port and VLAN modes)**
- **Virtual Private LAN service (VPLS)**
- **BGP/MPLS VPN service**

SUPERCOMM 2003 Topology



The SUPERDemo in Action

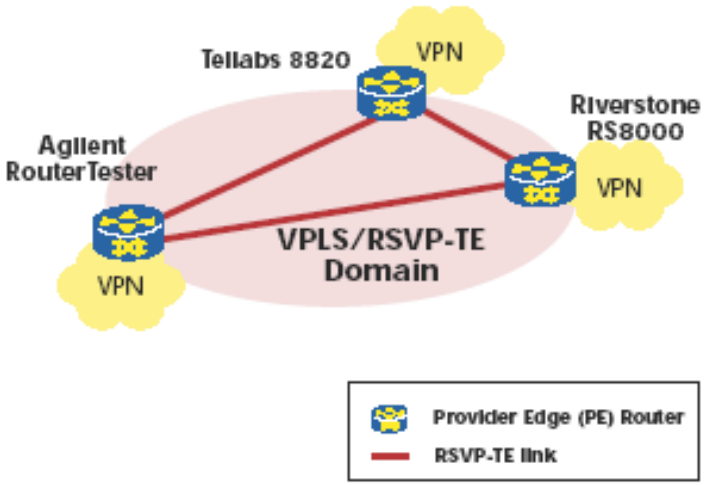
MPLS World Congress 2004

- **Event theme: MPLS Features Enabling Service Guarantees**
- **Organized by MPLS & FR Alliance and EANTC (European Advanced Networking Test Center, Berlin)**
- **Technical goals:**
  - ✓ **Verify interoperability of MPLS DiffServ-Aware Traffic Engineering, OSPF-TE, and ISIS-TE**
  - ✓ **Demonstrate Layer 2 and 3 VPNs and voice services over the TE-enabled backbone**
- **12 vendors, 14 participating products**
- **Hot stage on January 26-30, 2004 at EANTC**
- **Public Demo February 10-13, 2004**

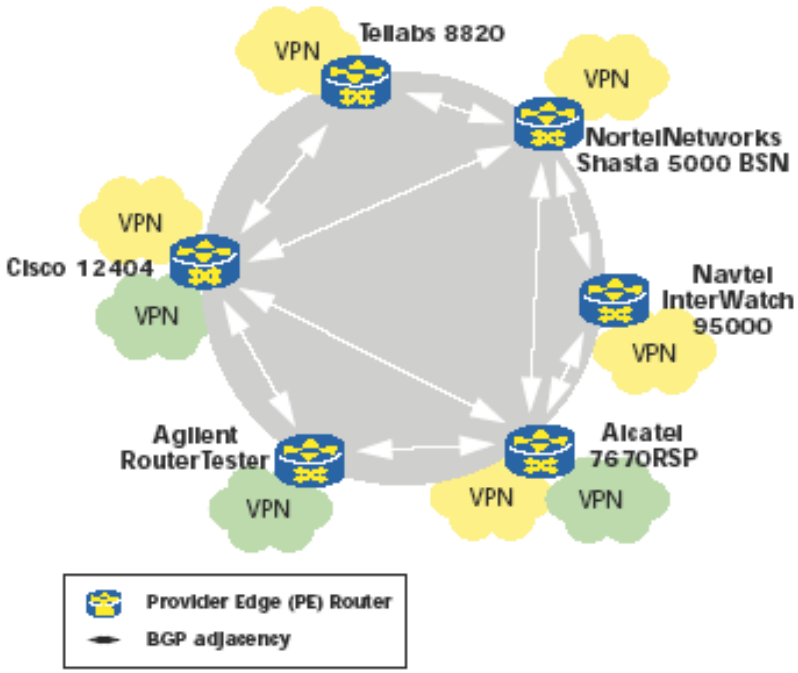
Test Areas

- **DiffServ over MPLS and MPLS Traffic Engineering**
  - ✓ Constraint-based RSVP-TE tunnels
  - ✓ DiffServ AF and EF per-hop behavior at ingress, transit, and egress routers
  - ✓ Different AF/EF class types
  - ✓ Prioritization during overload
  - ✓ Path Preemption
- **Constraint-Based Routing (OSPF-TE, ISIS-TE)**
  - ✓ Route selection based on available bandwidth
  - ✓ Interaction between preemption and constraint-based routing
- **Layer 2 VPNs, BGP/MPLS VPNs, VPLS, Voice applications**
  - ✓ Applications for the core network under test
- **Tests are based on Alliance documents:**
  - ✓ mpls2003.149.02 MPLS DiffServ-TE Interoperability Test Suite
  - ✓ mpls2003.092.00 VPLS Interoperability Test Suite
  - ✓ mpls2003.091.01 Layer 2 VPN Interoperability Test Suite
  - ✓ mpls2002.038.01 BGP/MPLS VPN Interoperability Test Suite

Test Networks

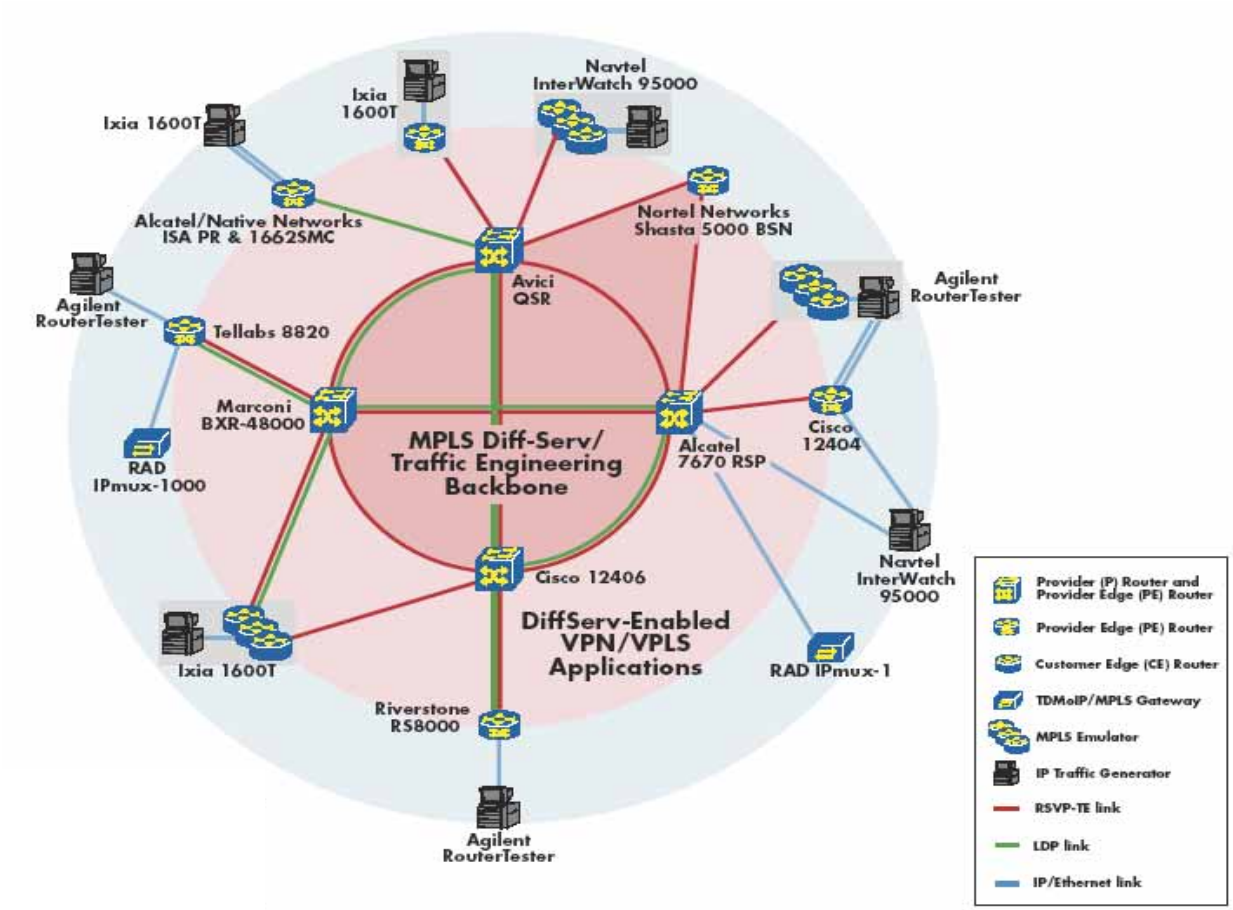


VPLS Test Network



BGP/MPLS VPN Test Network

Network Topology



Conclusion

- **Frame Relay and MPLS are both successes in the marketplace**
  - ✓ **FR is a major part of the telecom industry**
  - ✓ **MPLS in wide use for Layer 3 VPNs and traffic engineering**
  - ✓ **New applications (L2 VPNs, VPLS, enhanced QoS, multimedia) are undergoing development and deployment**
- **Frame Relay standardization largely complete, although interworking with MPLS is a current work item**
- **MPLS standardization is still very active – many innovative ideas from both service providers and vendors**
- **Interoperability and conformance testing continue to be crucial as new applications are standardized**
- **The Alliance is working to expand our international presence and participation, especially in Asia**
  - ✓ **Collaboration with MSF on GMI 2004 (held in Asia, Europe, and USA)**

Thank You!

http://www.mplsforum.org