The MPLS/FR Alliance: Update July 2003
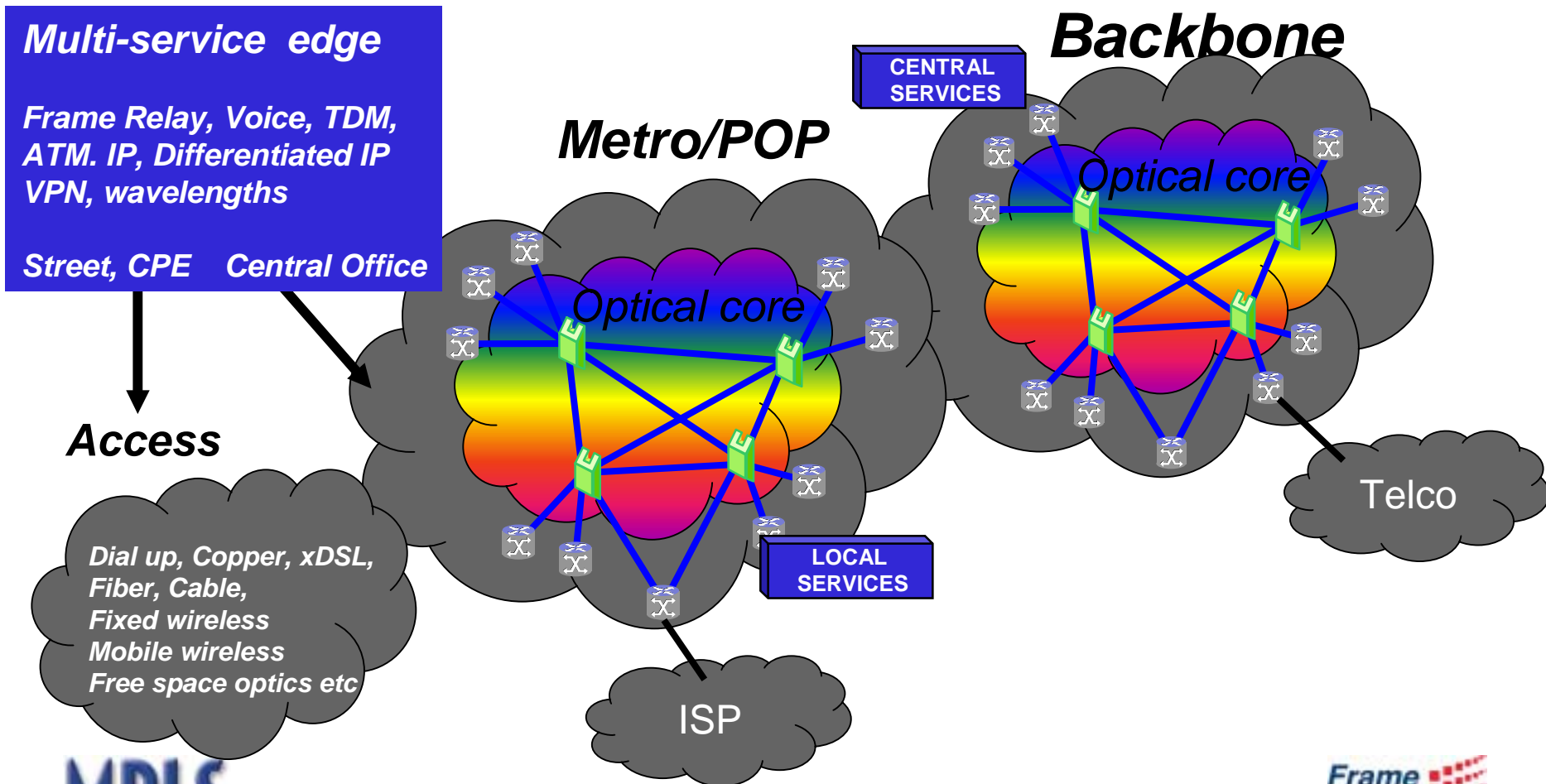
Andrew G. Malis
Chairman and President

Research Fellow, Tellabs
Andy.Malis@tellabs.com

The MPLS/FR 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.

The Converged Network Vision

Multi-service edge

Frame Relay, Voice, TDM, ATM. IP, Differentiated IP VPN, wavelengths

Street, CPE   Central Office

Access

Dial up, Copper, xDSL, Fiber, Cable, Fixed wireless Mobile wireless Free space optics etc

Metro/POP

Optical core

Backbone

CENTRAL SERVICES

Optical core

LOCAL SERVICES

Telco

ISP

MPLS FORUM

Frame Relay Forum
www.frforum.com

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**
- **56 members as of July 2003**
- **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: Northern Virginia, July 2003 (co-located with ATM and BCD Forums)**
- **Next meeting: London, October 2003 (co-located with ATM and BCD Forums)**

Alliance Leadership Positions

- **Board members**
  - ✓ **Bernard da Costa, Bell Canada, Board Member**
  - ✓ **Joe Kimball, Sprint, Board Member (Roger Ruby is acting in Joe's place while Joe is on active duty in the Gulf)**
  - ✓ **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, Masergy Communications, VP of Technology**
  - ✓ **Tom Walsh, Lucent Technologies, Vice Chairman**
  - ✓ **Ex officio: David Drury, Accipiter Systems, President Emeritus**

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, TiMetra Networks (soon to be 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**

Published Frame Relay Forum Implementation Agreements

- **FRF.1.2, PVC User-to-Network Interface (UNI) Implementation Agreement, July 2000**
- **FRF.2.2, Frame Relay Network-to-Network Interface (NNI) Implementation Agreement, March 2002**
- **FRF.3.2, Frame Relay Multiprotocol Encapsulation Implementation Agreement, April 2000**
- **FRF.4.1, SVC User-to-Network Interface (UNI) Implementation Agreement, January 2000**
- **FRF.5, Frame Relay/ATM PVC Network Interworking Implementation, December 1994**
- **FRF.6.1, Frame Relay Service Customer Network Management Implementation Agreement, September 2002**
- **FRF.7, Frame Relay PVC Multicast Service and Protocol Description, October 1994**
- **FRF.8.1, Frame Relay / ATM PVC Service Interworking Implementation Agreement, February 2000**
- **FRF.9, Data Compression Over Frame Relay Implementation Agreement, January 1996**
- **FRF.10.1, Frame Relay Network-to-Network SVC Implementation Agreement, September 1996**
- **FRF.11.1, Voice over Frame Relay Implementation Agreement, March 1999**
- **FRF.12, Frame Relay Fragmentation Implementation Agreement, December 1997**
- **FRF.13, Service Level Definitions Implementation Agreement, August 1998**
- **FRF.14, Physical Layer Interface Implementation Agreement, December 1998**
- **FRF.15, End-to-End Multilink Frame Relay Implementation Agreement, August 1999**
- **FRF.16.1, Multilink Frame Relay UNI/NNI Implementation Agreement, May 2002**
- **FRF.17, Frame Relay Privacy Implementation Agreement, January 2000**
- **FRF.18, Network-to-Network FR/ATM SVC Service Interworking Implementation Agreement, April 2000**
- **FRF.19, Frame Relay Operations, Administration and Maintenance Implementation Agreement, March 2001**
- **FRF.20, Frame Relay IP Header Compression Implementation Agreement, June 2001**

Published MPLS Forum Implementation Agreements

- **MPLS Forum 1.0: Voice over MPLS – Bearer Transport, July 2001**

- **MPLS Forum 2.0.1: MPLS PVC User to Network Interface, May 2003**

- **MPLS Forum 3.0: LDP Conformance Test Plan, December 2002**

- **MPLS/FR Alliance 4.0: TDM Transport over MPLS using AAL1, June 2003**

Market Awareness & Education

- **Tutorials**
  - ✓ MPLS Introduction   full day
  - ✓ MPLS Virtual Private Networks   ½ day and full day
  - ✓ Traffic Engineering   ½ day
  - ✓ GMPLS   ½ day
  - ✓ VoMPLS   ½ day

- **½ day tutorial debuted in February 2003**
  - ✓ Legacy Service Migration to MPLS (FR, ATM, Ethernet, Sonet/SDH)

- **New ½ day tutorial under development**
  - ✓ Layer 2 VPNs and Virtual Private LAN Services

- **Conferences and exhibitions**
  - ✓ Almost every MPLS conference globally has had an Alliance speaker

- **Website and Newsletter**
  - ✓ In January 2003, new website and newsletter were launched

Interoperability Committee

- **Conformance Test Plans**
  - ✓ **LDP - Completed, now published as MPLS Forum 3.0**
  - ✓ **RSVP-TE – Completed straw ballot, approved by TC for BoD review prior to Final Ballot**

- **Interoperability Test Plans**
  - ✓ **LDP – To be sent to Straw Ballot at Virginia meeting**
  - ✓ **RSVP-TE - To be sent to Straw Ballot at Virginia meeting**
  - ✓ **BGP/MPLS VPNs - to be sent to Straw Ball at Virginia meeting**
  - ✓ **L2oMPLS (Martini/PWE3) - modifications to reflect recent changes and detailed test cases**
  - ✓ **Virtual Private LAN Service (VPLS), Fast Reroute (FRR) – work continuing on test plans**

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 PWE3 and PPVPN and ITU-T SG 13 work**
    - • **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. Both 1:1 as well as Port mode.	**Oct 2003**	**Jan 2004**
LSP Connection Service Definition Definition of native MPLS LSP transport service.	**Aug 2003**	**Jan 2004**
PNNI/MPLS Interworking This allows signaling service interworking between ATM and MPLS networks, by translating between ATM PNNI signaling as defined by the ATM Forum and MPLS LDP signaling as defined by the IETF.	**Aug 2003**	**Jan 2004**

www.frforum.com

Technical Committee Work Items
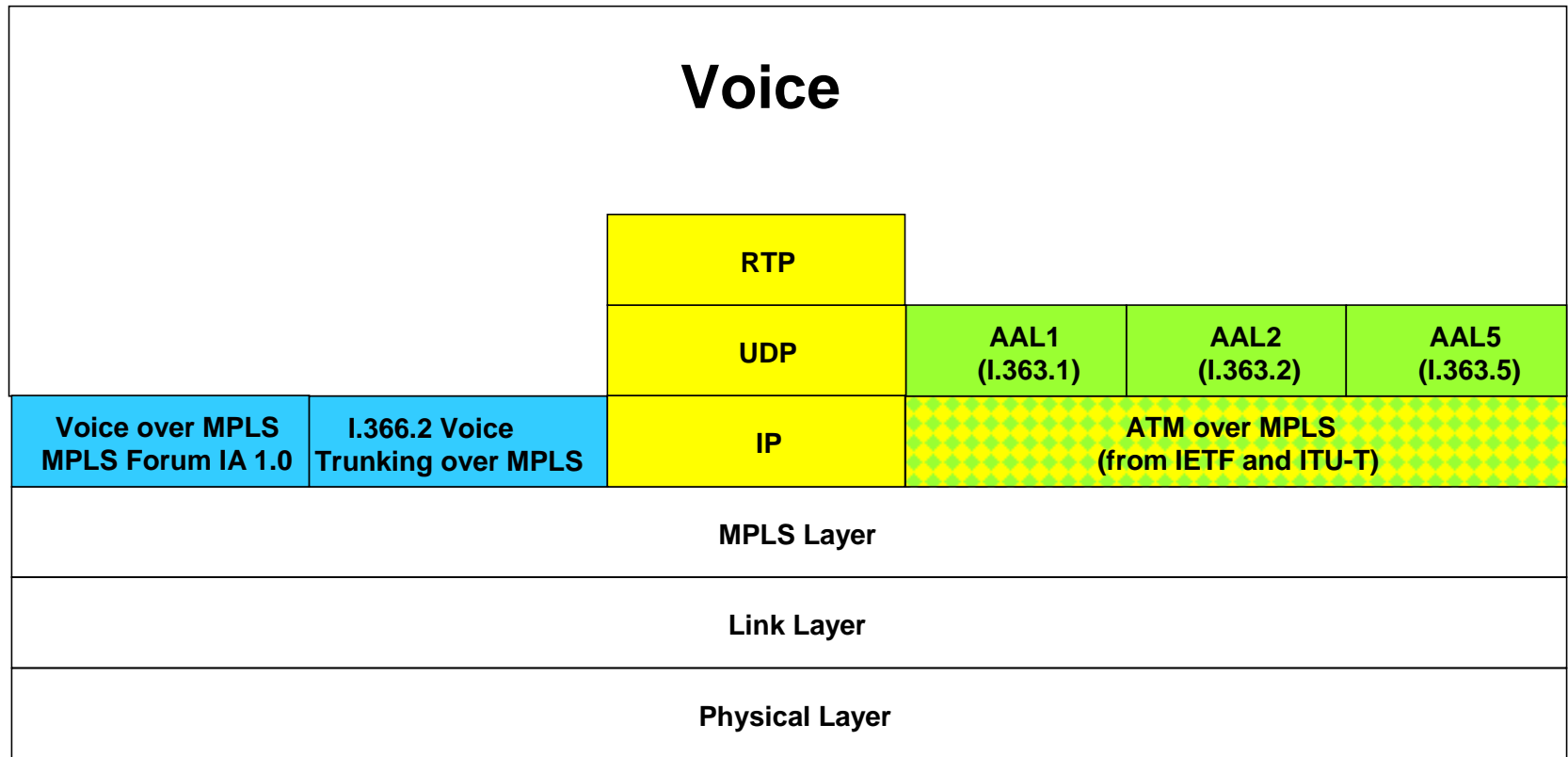
UNI QoS Proxy Admission Control Service Definition **Definition of a service provided on the MPLS UNI that allows a CE to request resources of the provider network.**	**Oct 2003**	**Jan 2004**
UNI QoS Proxy Admission Control Protocol **UNI protocol modifications to support the UNI QoS Proxy Admission Control Service Definition**	**Oct 2003**	**Apr 2004**
ATM/FR/Ethernet Service Interworking **Transport of ATM, Frame Relay and/or Ethernet over MPLS without requiring the same service on both ends of the connection.**	**Oct 2003**	**Apr 2004**
SONET over MPLS **Implementation specification for transport of SONET/SDH over MPLS**	**Jan 2004**	**Jul 2004**
HDLC over MPLS **Implementation specification for transport of HDLC over MPLS**	**Jan 2004**	**Jul 2004**

Relationships w/Other Bodies

- **IETF**
  - ✓ **Alliance work based on IETF RFCs and/or ITU-T Recommendations**
  - ✓ **Only do 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**
  - ✓ **Held co-located meetings in January and July 2003, more co-located meetings planned**

- **Metro Ethernet Forum**
  - ✓ **Jointly announced a formal liaison relationship, working in concert on FR/ATM/Ethernet interworking**

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

			Voice				
			RTP				
			UDP	**AAL1 (I.363.1)**	**AAL2 (I.363.2)**	**AAL5 (I.363.5)**	
Voice over MPLS MPLS Forum IA 1.0	**I.366.2 Voice Trunking over MPLS**		**IP**	**ATM over MPLS (from IETF and ITU-T)**			
MPLS Layer							
Link Layer							
Physical Layer							

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)**

- **Upcoming: NGN 2003, Boston, October 2003**
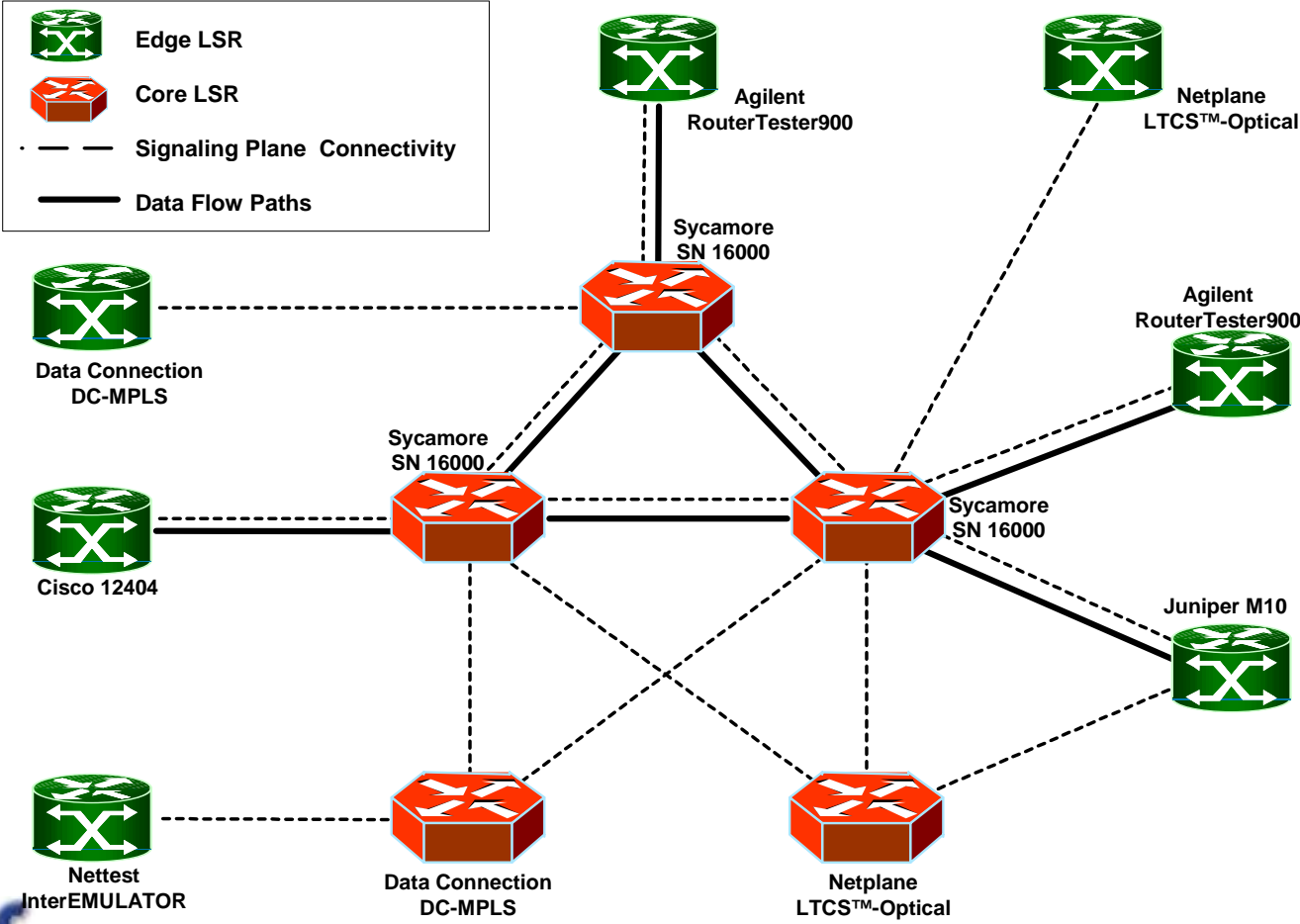 - ✓ **MPLS Service quality enabling features**

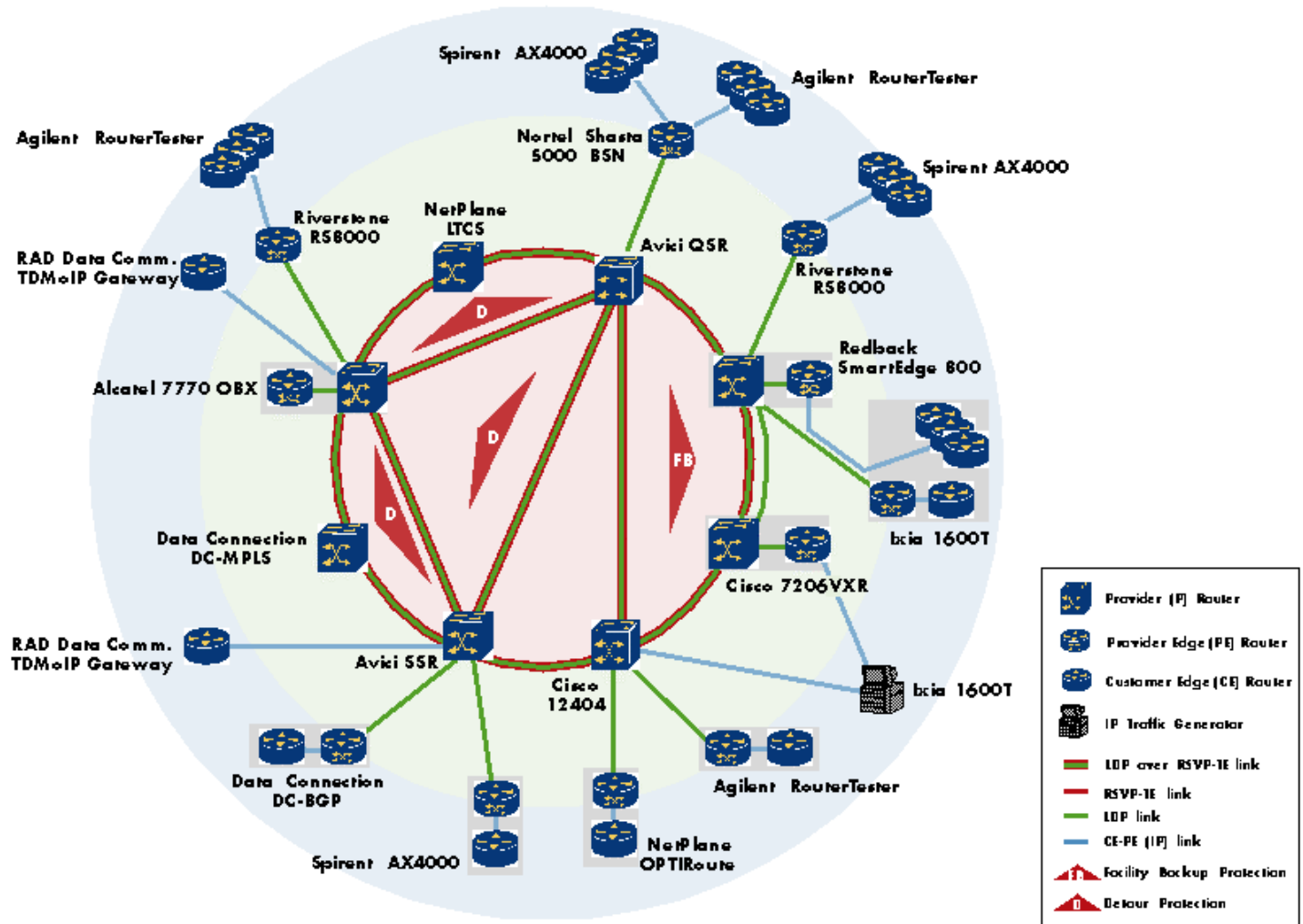# SUPERCOMM SUPERDemo 2002: MPLS TE, Layer 2 and 3 VPNs

MPLS Forum SUPERDemo Network Topology
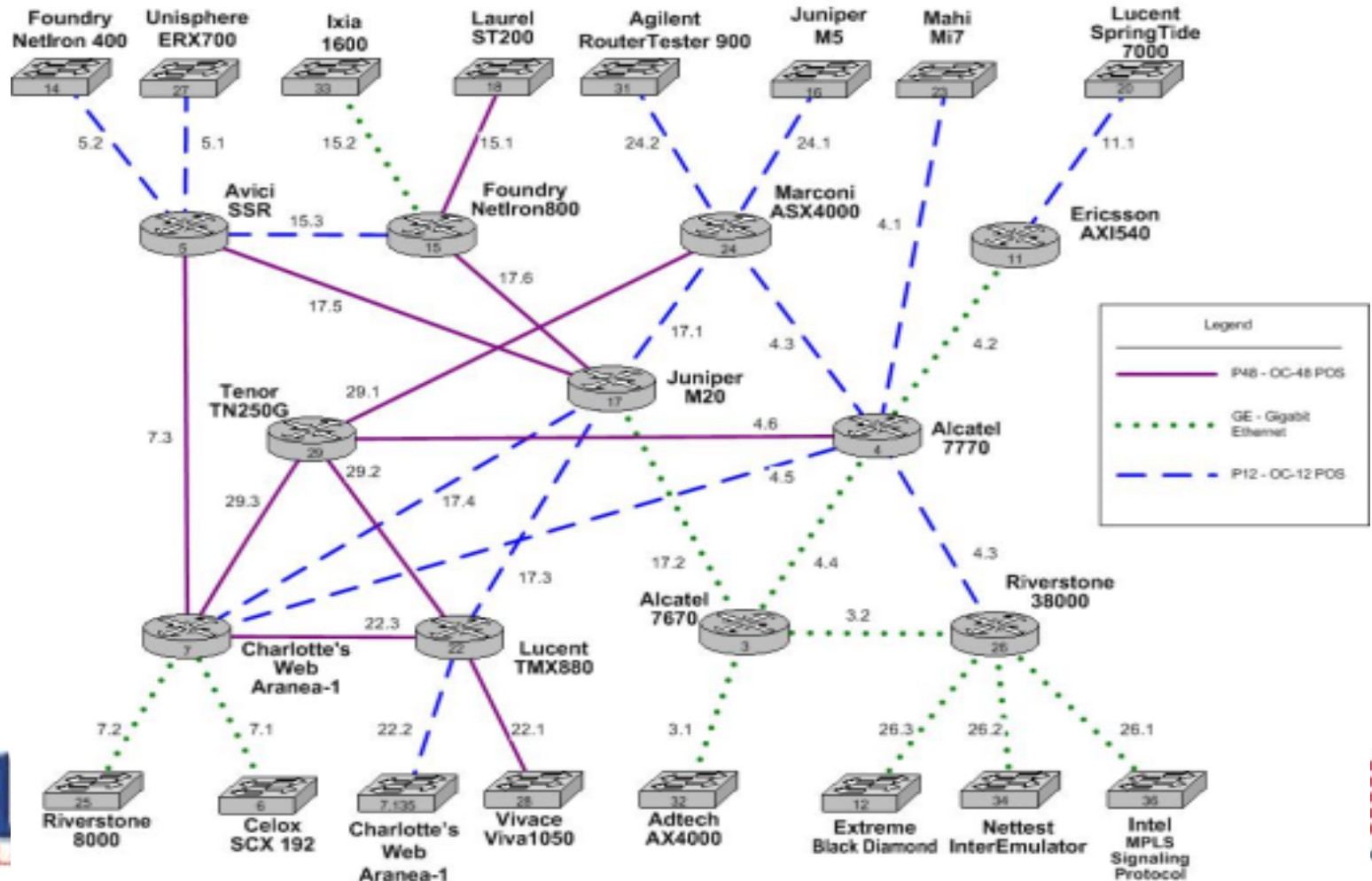
Next Generation Networks 2002: GMPLS Interoperability

Legend:
- Edge LSR
- Core LSR
- Signaling Plane Connectivity
- Data Flow Paths

Agilent RouterTester900

Netplane LTCS™-Optical

Sycamore SN 16000

Data Connection DC-MPLS

Agilent RouterTester900

Sycamore SN 16000

Cisco 12404

Sycamore SN 16000

Juniper M10

Nettest InterEMULATOR

Data Connection DC-MPLS

Netplane LTCS™-Optical

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 SR-Series Service Router**
- **Vivace Viva1050**

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

SuperDemo Test Network Topology
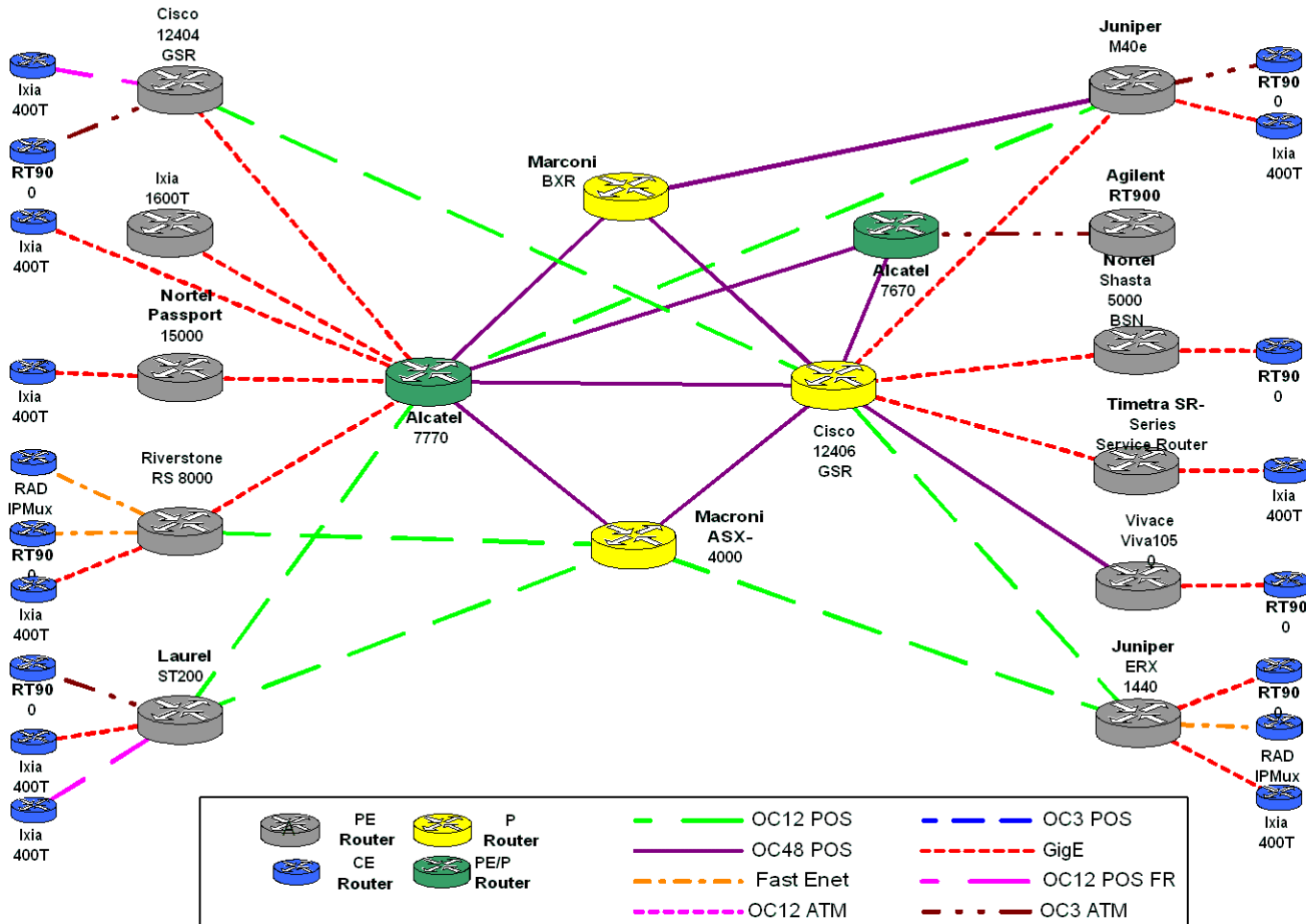
The SUPERDemo in Action

Scalability Results

Service Type	Scalability Number achieved per PE	Participating companies
BGP/MPLS VPN	250	11
FR over MPLS Transport	500	6
ATM over MPLS Transport	500	6
Ethernet/VLAN over MPLS Transport	700	8
VPLS	1	4

The Results

- **Interoperability achieved!**

- **Scalability achieved!**

- **Resiliency tested!**

- **A few issues were identified – read the white paper:**
  http://www.mplsforum.org/tech/superdemo_2003.pdf

Summary

- **Frame Relay is a $15B/year industry, still growing at 20%/year**
- **MPLS is now a proven success (over 200 known service provider deployments)**
- **MPLS in wide use for traffic engineering**
- **New MPLS applications (VPNs, QoS, multimedia) are undergoing development and deployment**
- **Interoperability and conformance testing continue to be crucial as new applications are standardized**
- **The MPLS/FR Alliance has a key role in MPLS and FR development**
- **Please join us!**

Thank You!

http://www.mplsforum.org
http://www.frforum.org