WOCC 2007 Talk

A Management Strategy for MPLS Networks

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Outline

- Introduction
- Life Cycle Management of MPLS Networks
- MPLS Network Management Strategies

Introduction

WANDL Overview

- Founded in 1986
- Headquarters in Piscataway, New Jersey
- Locations
  - Domestic
    - New Jersey, Washington D.C., Illinois, California
  - International
    - United Kingdom, Belgium, Italy, Taiwan, China

WANDL Overview

- Focus is multi-vendor multi-protocol OSS:
  - **Planning:**
    - Network Modeling & Simulation
    - Network Planning, Design, & Analysis
    - Network Optimization
  - **Operations:**
    - Fault, Configuration, & Performance Management
    - MPLS TE/FRR, VPN Management
    - Provisioning Support

Life Cycle Management of MPLS Networks

MPLS Network Management System

- MPLS Network Management System (NMS) needed to effectively manage Life Cycle
  - *Inception → Deployment → Operations → Post Deployment → Improvement/Growth*

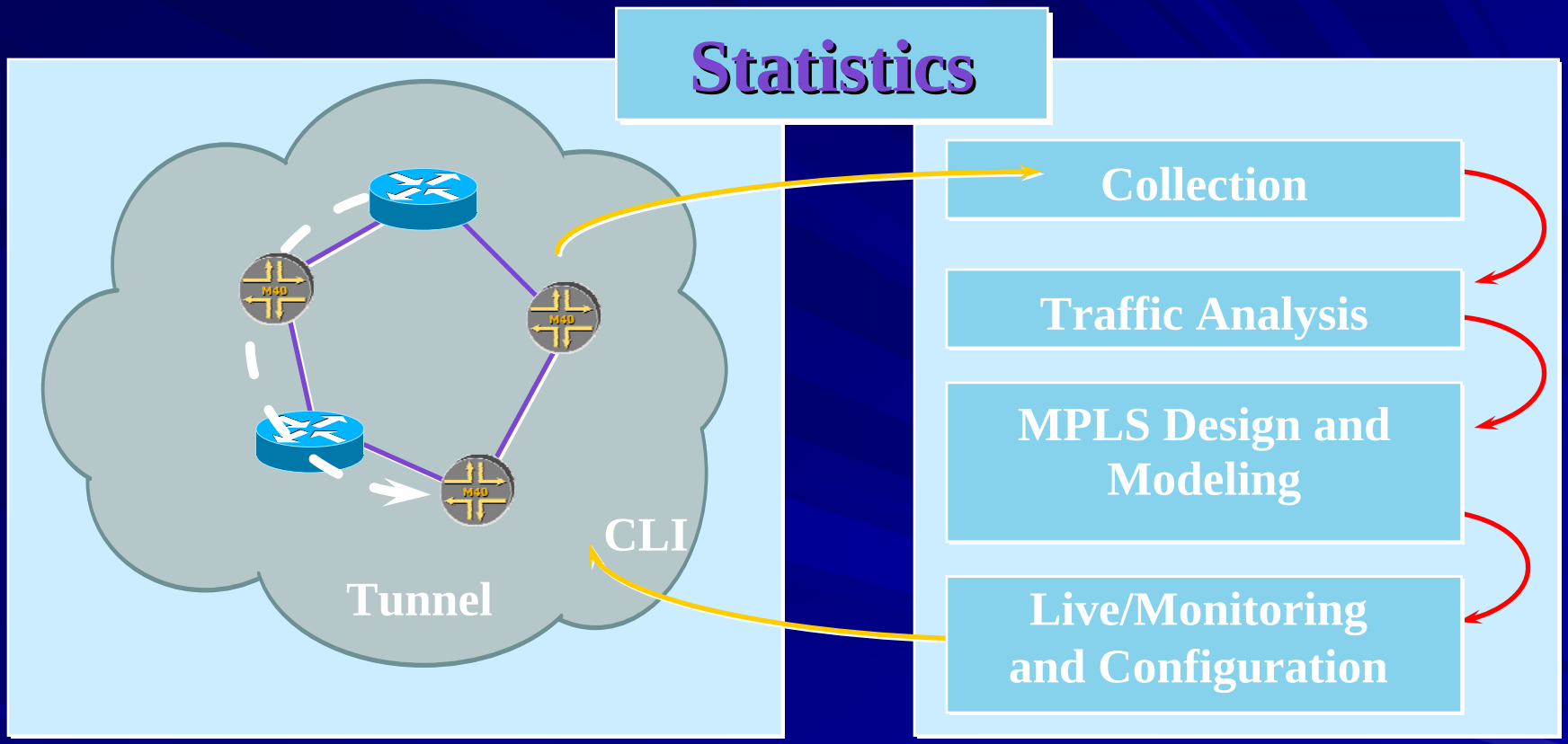
- NMS Desired Characteristics
  - Integrated Online (Real-time) Management and Offline Design & Simulation System
  - Multi-technology support
  - Multi-vendor support
  - High Scalability
  - High Performance
  - Manage changes and growth

Why Integrated Online Management/ Offline Design & Simulation?

- Pro-active (online)
  - Ability to timely report network events
  - Ability to timely alleviate potential bottlenecks
  - Ability to timely allocate resources needed
  - Ability to re-arrange or load balance the network
  - Ability to quickly access the network to diagnose problems
- Predictive (offline)
  - Ability to predict if network can survive when a failure occurs
  - Ability to predict if network can sustain traffic growth in near or long term

MPLS Network Management Strategies

MPLS Management

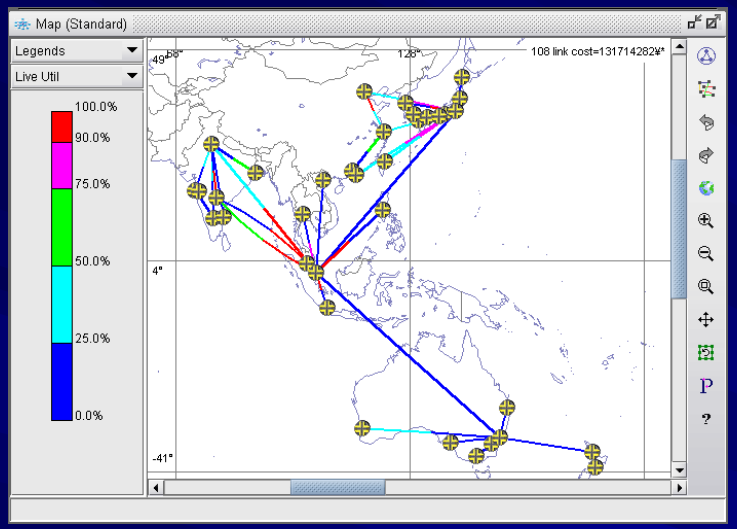


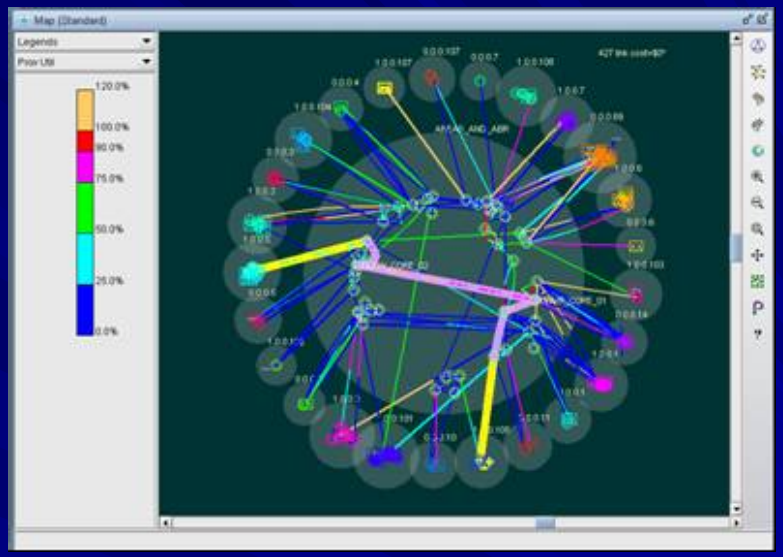
MPLS Network **MPLS Management System**

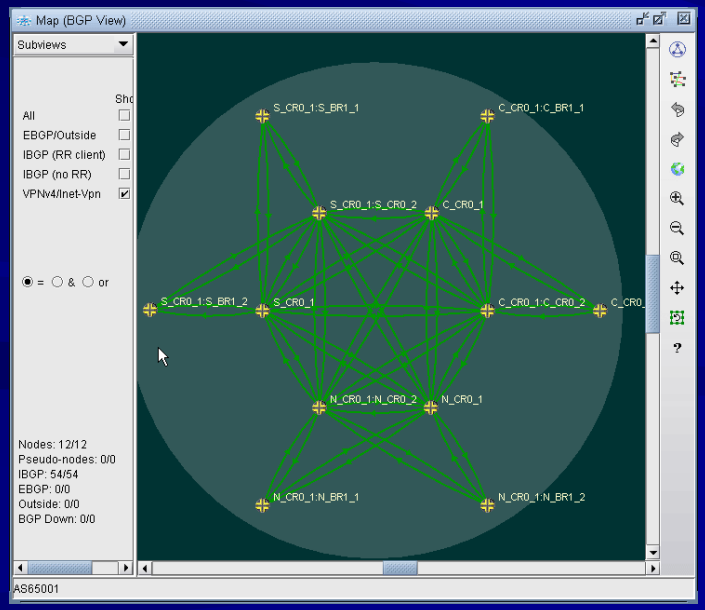
Network Data Collection

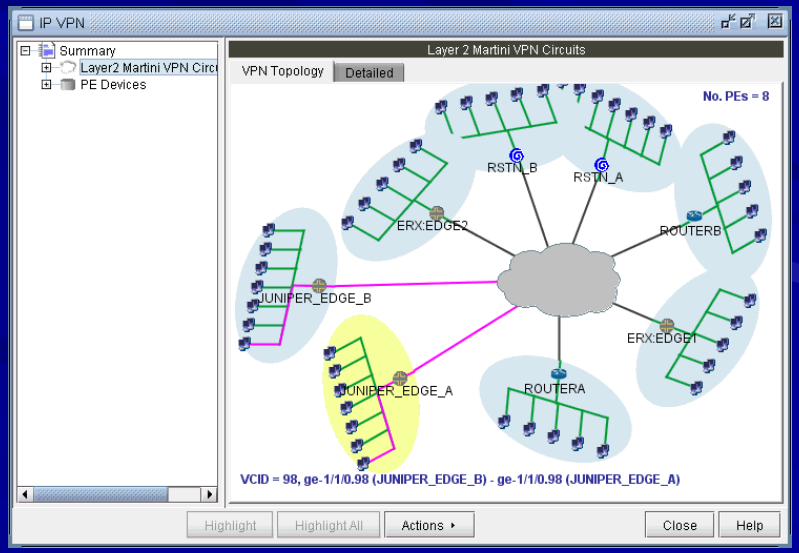
- Types of data collected: SNMP, Configuration
- Configuration data:
  - Auto-discover the network *or* Import a set of config files
  - Intelligent parser to extract Nodes, Interfaces, Tunnels, VPNs, routing configuration, etc

Model Construction and Visualization









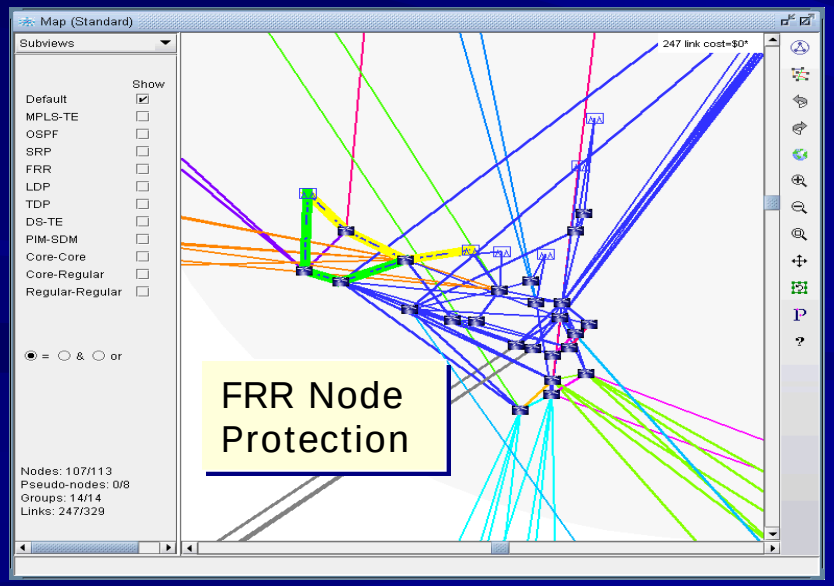
MPLS Design & Modeling

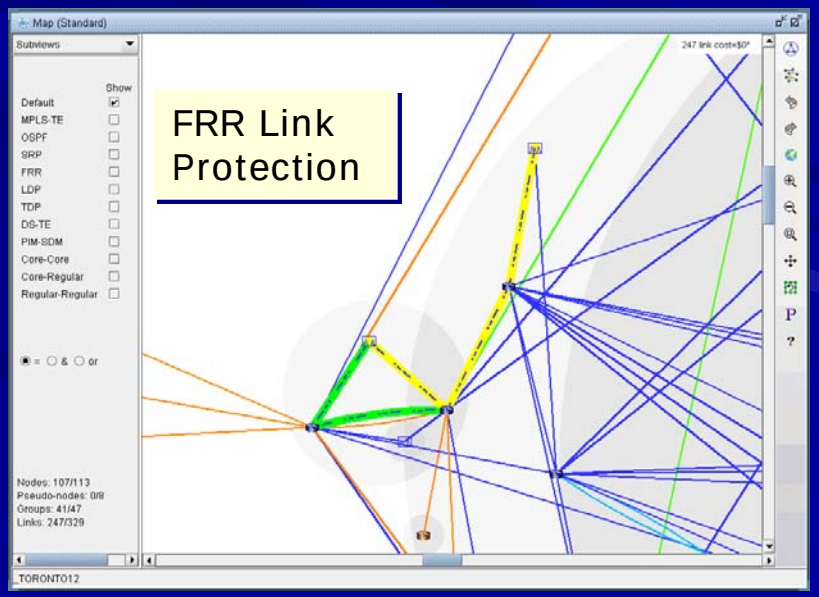
Considerations

- Network design & capacity planning
  - Satisfy traffic demands, resiliency requirements, reduce cost, improve efficiency
- Survivability and resiliency
  - Simulate failure scenarios, analyze peak utilization
  - Design diverse paths, FRR
- Optimization
  - Optimize tunnel paths
  - Size tunnels

Design/Simulate Protection Tunnels

- Design path, link, and node protection
  - Specify primary tunnels to be protected
  - Set site/link/facility diversity level
- Verify computed protection tunnel (FRR or bypass or detoured)

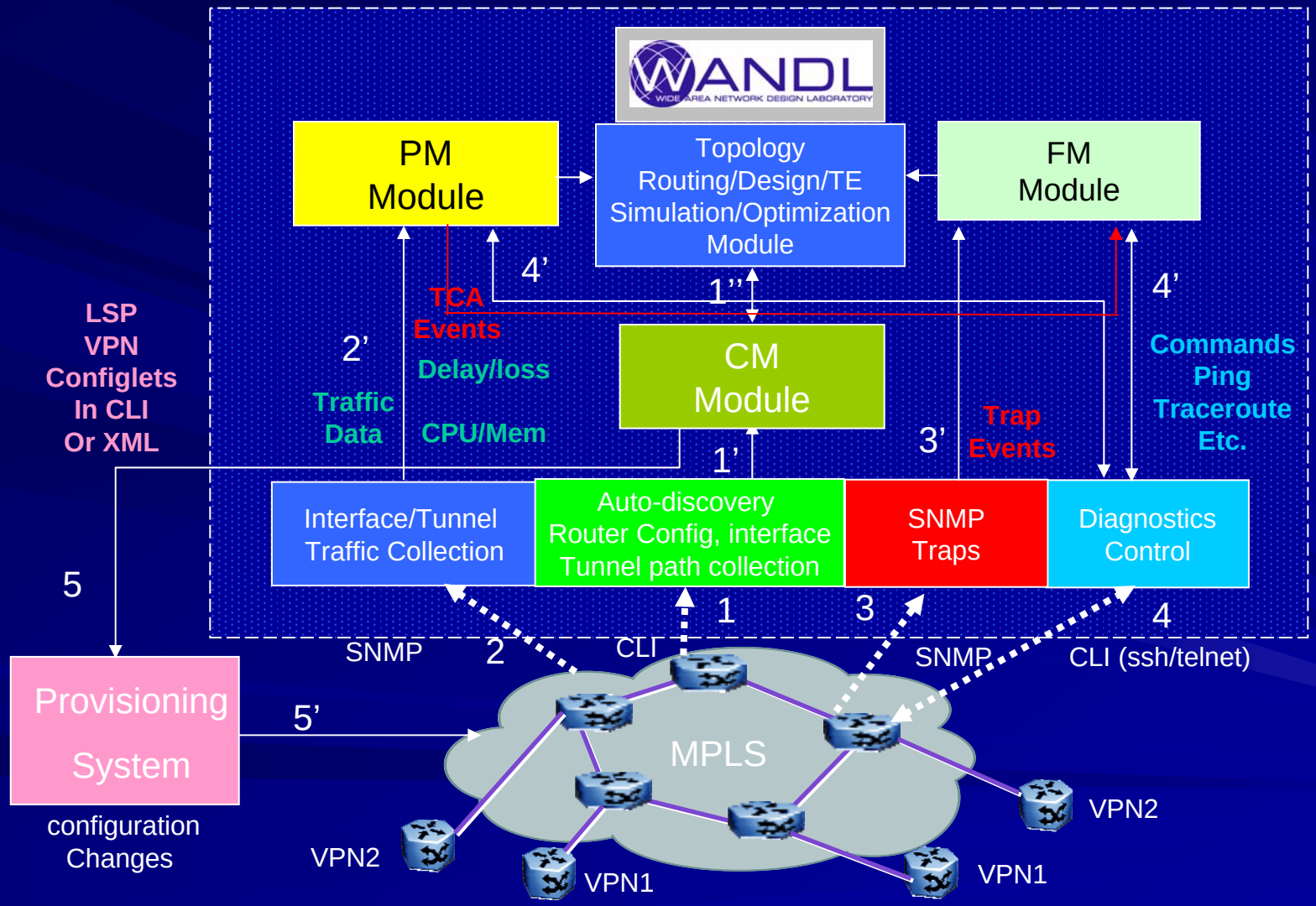




Live/Online Management and Monitoring

- MPLS TE/FRR Management
- MPLS VPN Management

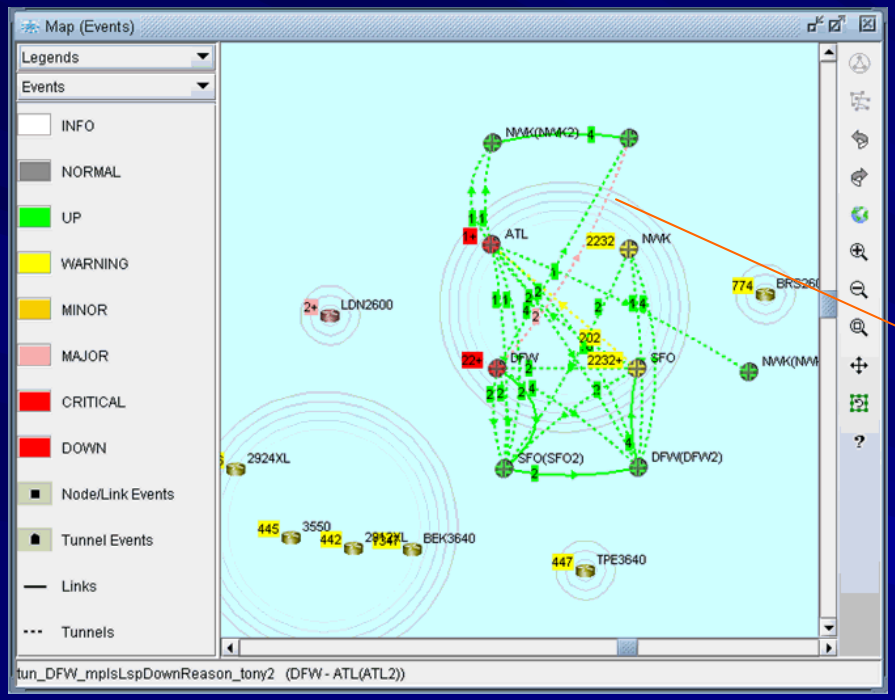
FCAPS/Management Flow

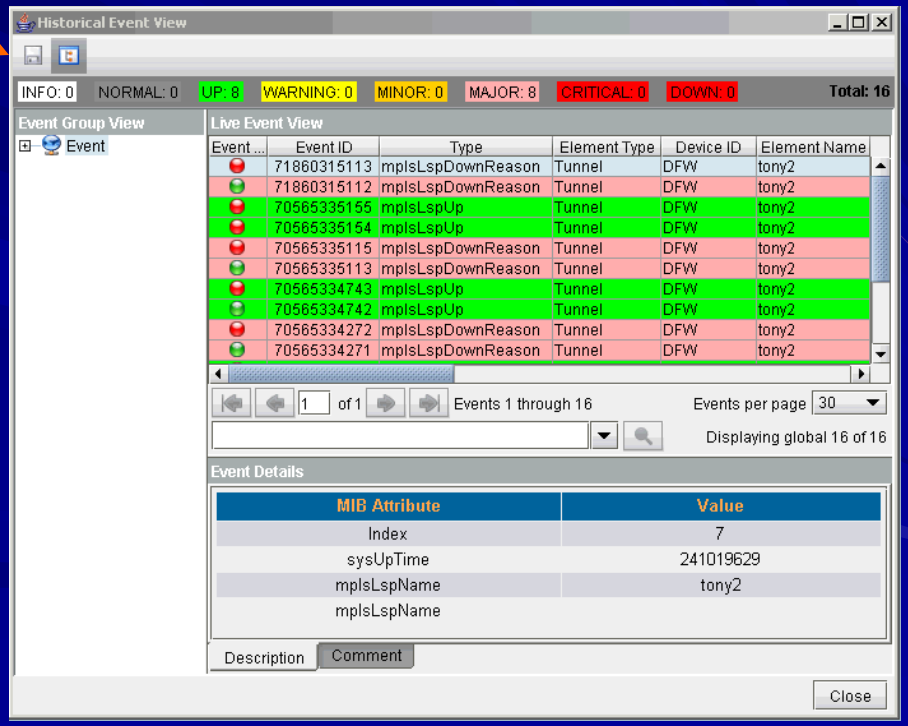


MPLS TE/FRR Management

- LSP statistics and traffic
- LSP routes, status changes
- LSP FRR protection
- LSP events
- LSP diagnostics
- LSP configuration and change management

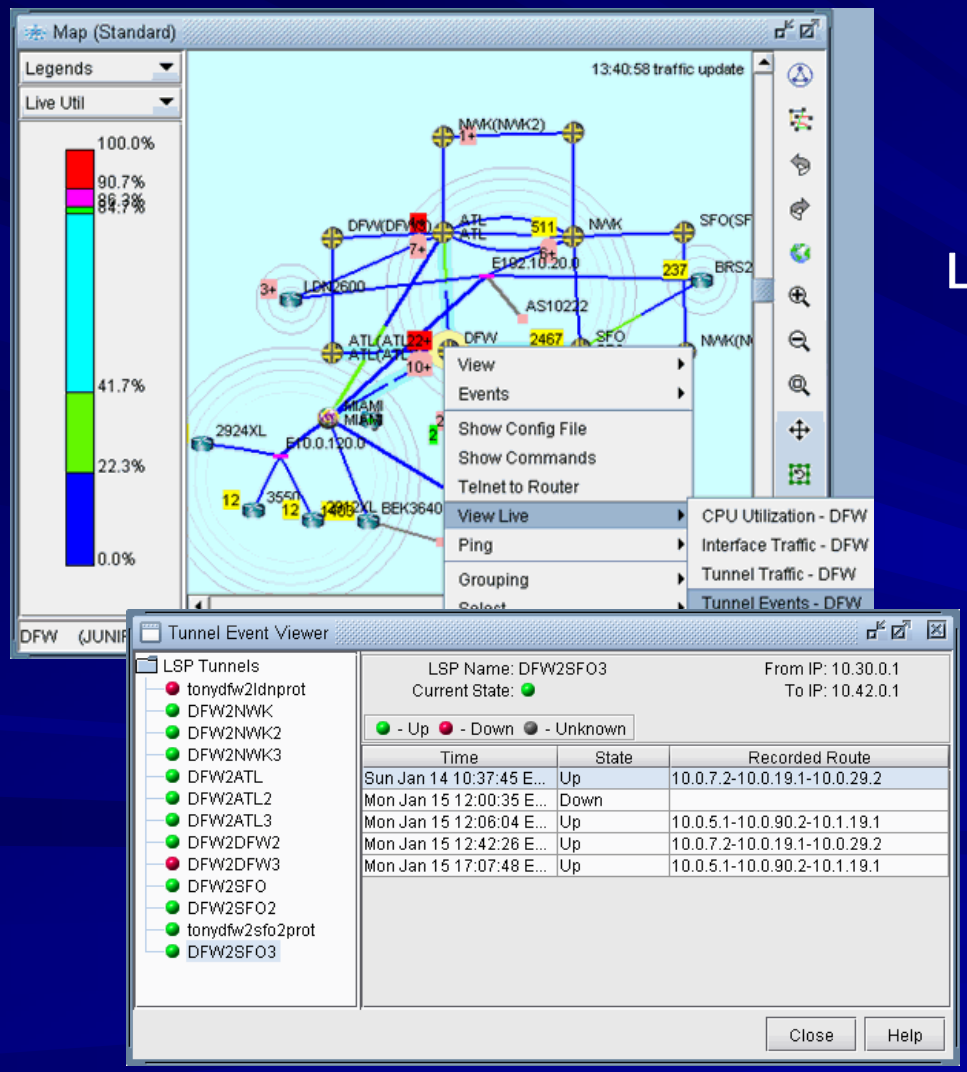
Fault Management



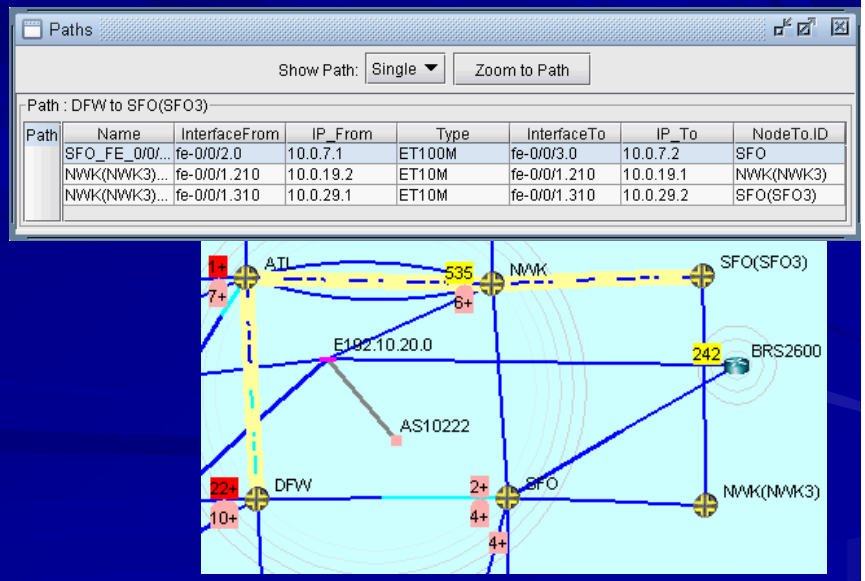


Fault Management

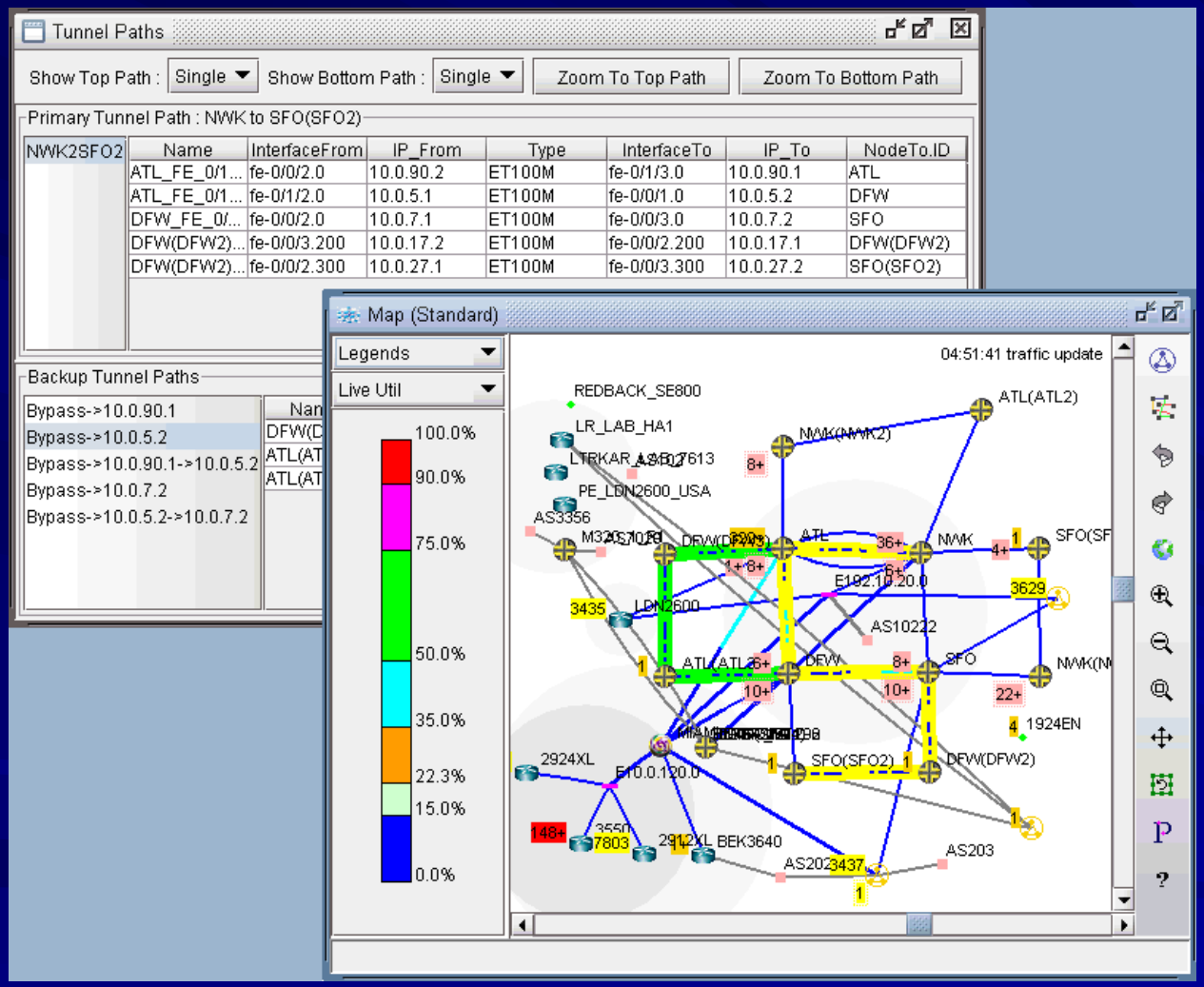
MPLS TE Management



LSP Status and Route changes



MPLS FRR



Visualize FRR
Protection tunnel

MPLS TE Management

Table of Tunnels on/thru DFW_FE_0/0/2.0

68/68 items

ID	NodeA	I...	NodeZ	IP_Z	Dir	Prov	Worst	4/23 13:20	4/23 13:25	4/23 13:30	4/23 13:35	4/23 13:40	4/23 13:45	4/23 13:50	4/23 13:55	4/2
vpnasfo2atl	SFO		ATL	10.20.0.1	AZ	0	50.77M	289.4K	440.0	440.0	6.584M	50.58M	50.38M	49.84M	11.79M	272
vpnaatl2sfo	ATL		SFO	10.40.0.1	ZA	0	30.61M	30.37M	21.28M	32.00	24.00	8.000	8.997M	30.37M	30.57M	30.
dave	NWK		SFO	10.40.0.1	ZA	2.000M	2.160K	800.0	1.248K	1.400K	1.192K	512.0	2.056K	456.0	1.232K	896
NWK2SFO2	NWK		SFO(SFO2)	10.41.0.1	ZA	0	824.0	784.0	736.0	672.0	720.0	768.0	752.0	824.0	768.0	728
benNWKDFW2	NWK		DFW(DFW2)	10.31.0.1	ZA	0	712.0	680.0	608.0	632.0	656.0	688.0	656.0	712.0	648.0	672
SFO2DFW	SFO		DFW	10.30.0.1	AZ	0	536.0	256.0	328.0	328.0	328.0	528.0	328.0	256.0	256.0	328
SFO2ATL3	SFO		ATL(ATL3)	10.22.0.1	AZ	0	232.0	160.0	232.0	232.0	224.0	160.0	224.0	160.0	160.0	224
SFO2DFW3	SFO		DFW(DFW3)	10.32.0.1	AZ	0	200.0	128.0	192.0	192.0	192.0	128.0	200.0	128.0	128.0	192
SFO2ATL2	SFO		ATL(ATL2)	10.21.0.1	AZ	0	192.0	128.0	192.0	192.0	128.0	128.0	128.0	128.0	128.0	192
SFO2ATL	SFO		ATL	10.20.0.1	AZ	100.0K	0	0	0	0	0	0	0	0	0	0
dste-sfo2atl	SFO		ATL	10.20.0.1	AZ	2.000M	0	0	0	0	0	0	0	0	0	0
RSFOATL_1	SFO		ATL	10.20.0.1	AZ	2.000M	0	0	0	0	0	0	0	0	0	0
vpnbsfo2atl	SFO		ATL	10.20.0.1	AZ	0	0	0	0	0	0	0	0	0	0	0
SFO2_2NWK	SFO(SFO2)		NWK	10.10.0.1	AZ	0	0	0	0	0	0	0	0	0	0	0
SFO2_2DFW	SFO(SFO2)		DFW	10.30.0.1	AZ	0	0	0	0	0	0	0	0	0	0	0

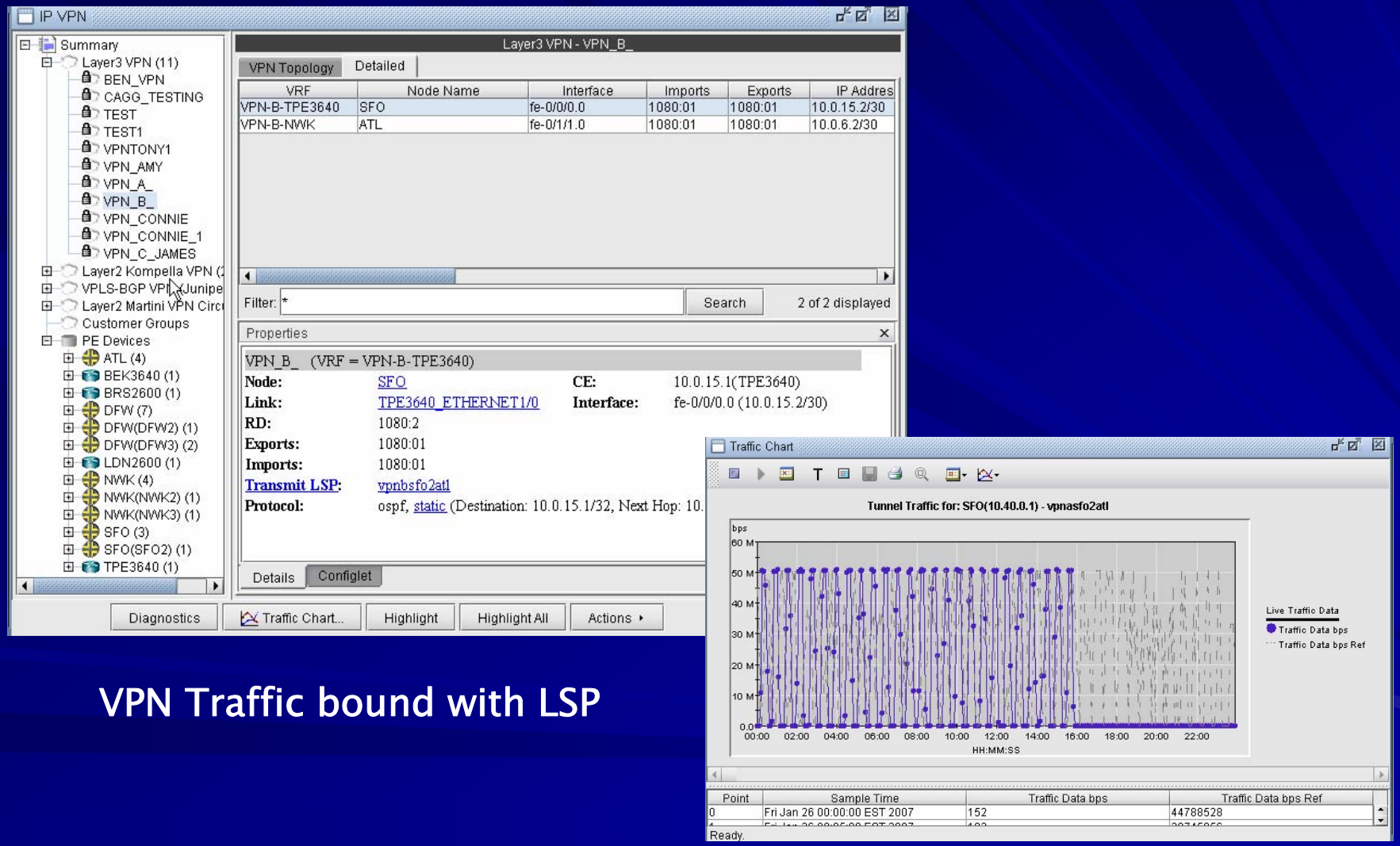
Adv Filter... Save... Close

Examine link traffic contribution from tunnels

MPLS VPN Management

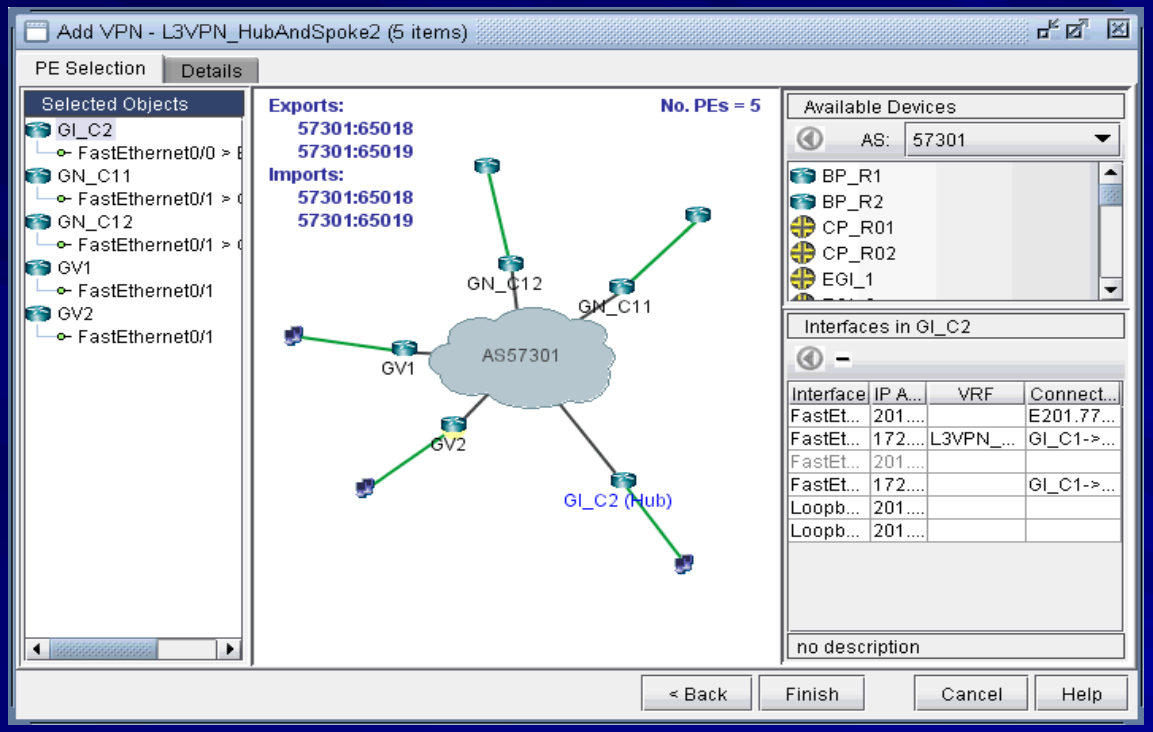
- VPN topology discovery
- VPN views
- VPN traffic
- VPN diagnostics
- VPN SLA
- VPN events
- VPN model/configuration

MPLS VPN Management



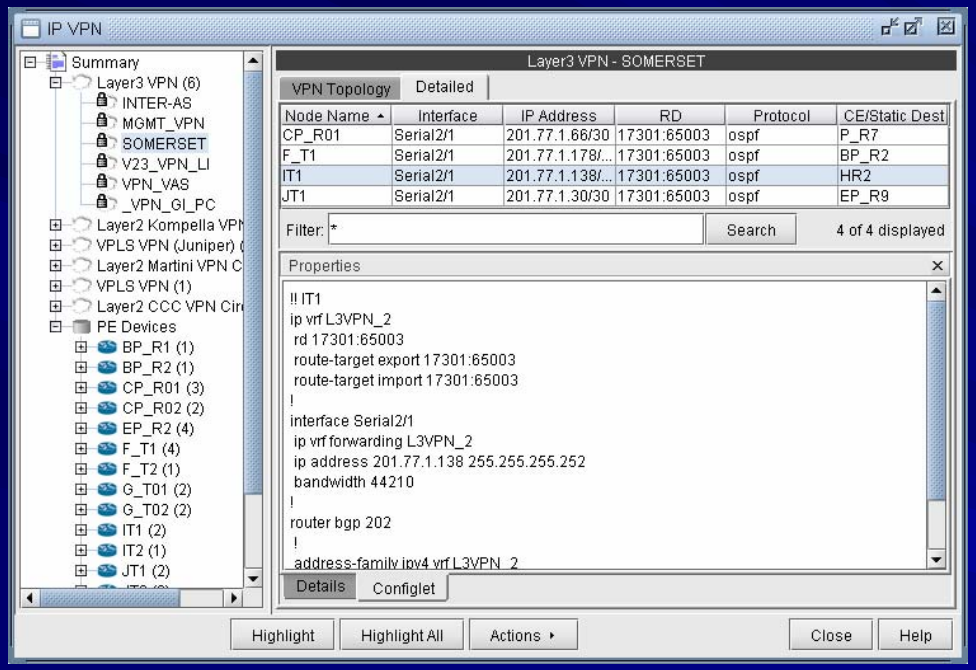
VPN Traffic bound with LSP

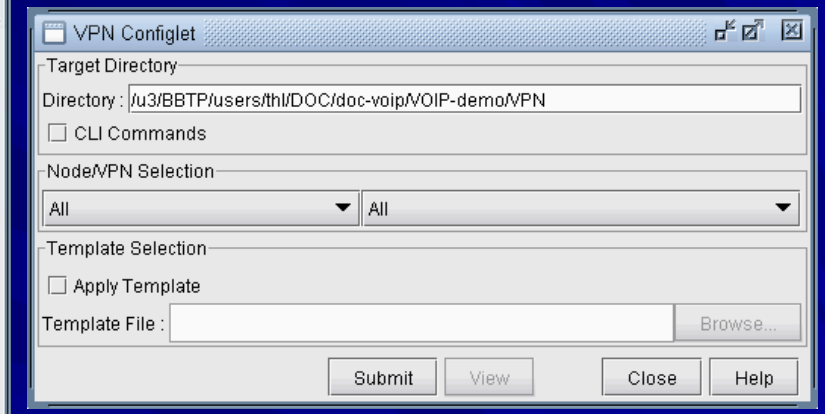
MPLS VPN Configuration



VPN Configuration Management

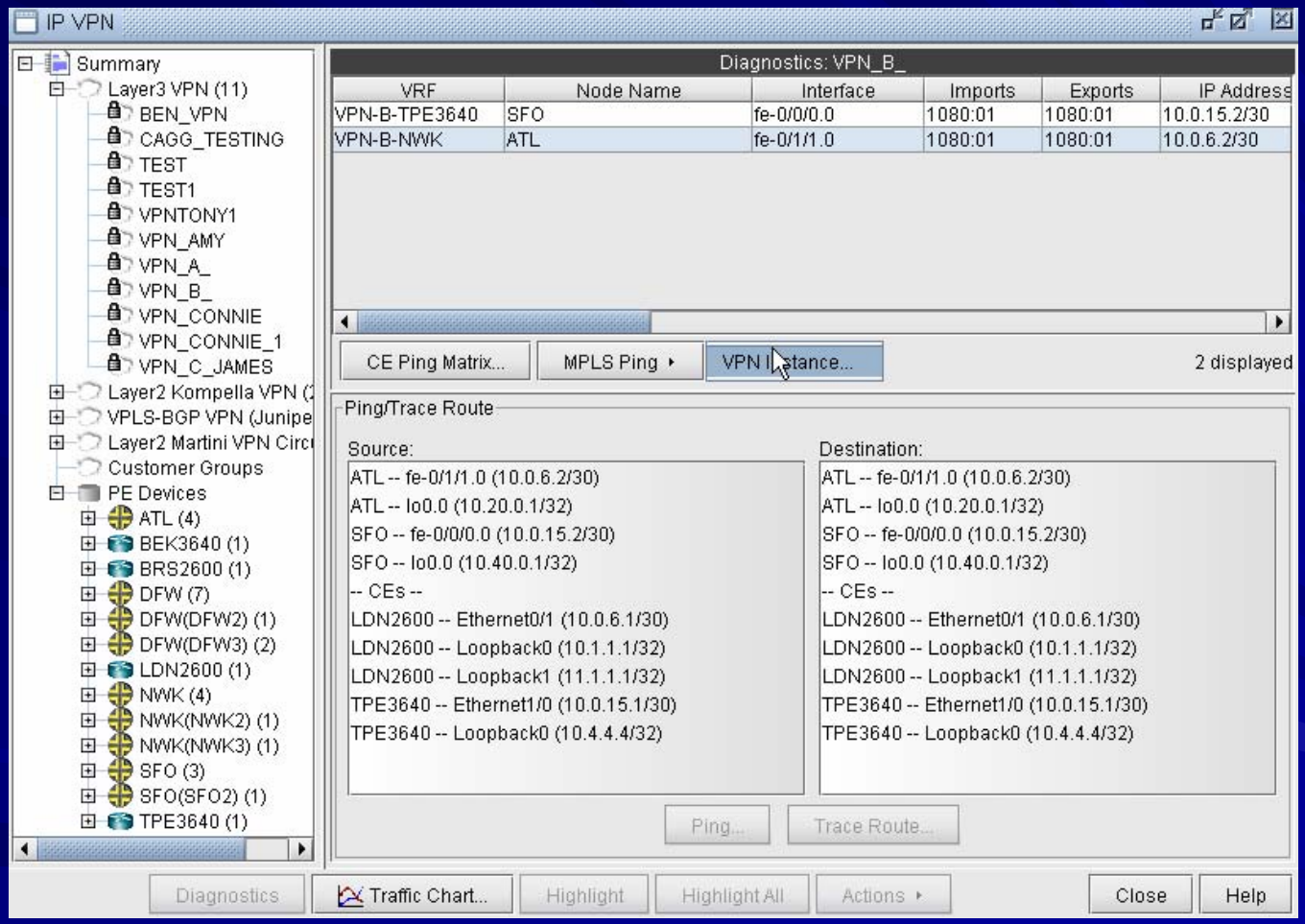
MPLS VPN Management





VPN Configlet Generation

VPN Diagnostics



VPN SLA: Delay, Loss, Jitter

WANDL

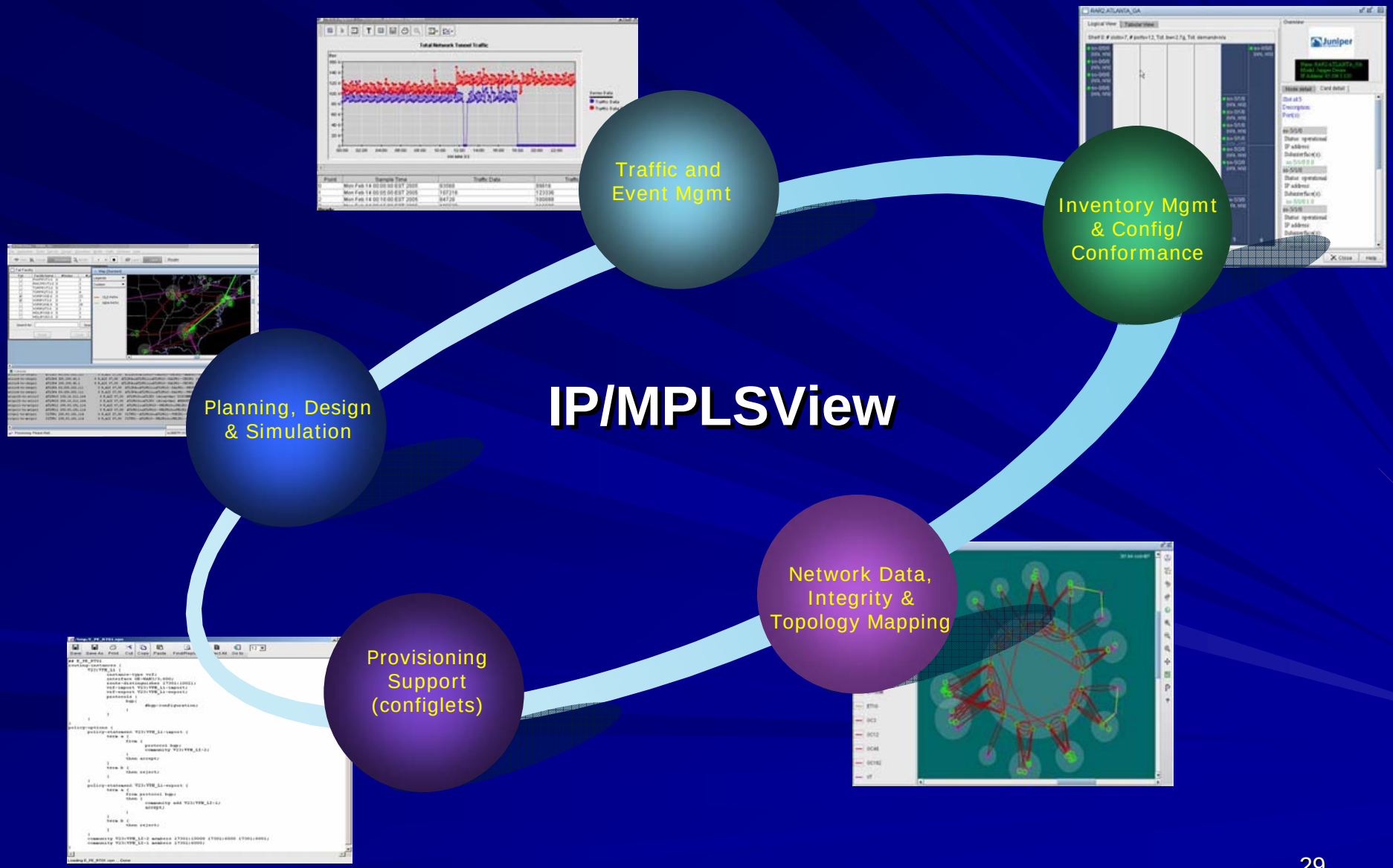
IP/MPLSView 5.0.0 Released on Jan 26 2007
Current User: admin
Last Login:

Main | Live Network | Network Reports | Web Client | Admin | Logout | Help

Live Network
- APAC1 (1 nodes)
- CORE (4 nodes)
  - ATL
  - DFW
  - NWK
  - SFO
- EMEA1 (1 nodes)
- EMEA2 (1 nodes)
- SOUTH (5 nodes)
- UNGROUPED (10 nodes)

Test Name: jitter-rich-test		Owner: rich	
Round Trip Delay Information:			
Most Recent Round Trip Delay	683 µs	Sum of All Round Trip Delays	3328 µs
Min Round Trip Delay	637 µs	Max Round Trip Delay	683 µs
Avg Round Trip Delay	666 µs	StdDev Round Trip Delay	15 µs
Egress Round Trip Delay Information:			
Most Recent Egress Round Trip Delay	0 µs		
Min Egress Round Trip Delay	0 µs	Max Egress Round Trip Delay	0 µs
Avg Egress Round Trip Delay	0 µs	StdDev Egress Round Trip Delay	0 µs
Ingress Round Trip Delay Information:			
Most Recent Ingress Round Trip Delay	0 µs		
Min Ingress Round Trip Delay	0 µs	Max Ingress Round Trip Delay	0 µs
Avg Ingress Round Trip Delay	0 µs	StdDev Ingress Round Trip Delay	0 µs
Jitter information:			
Jitter of the Round Trip Delays	46 µs	Jitter of the Egress Round Trip Delays	0 µs
Jitter of the Ingress Round Trip Delays	0 µs		
Timestamp for when the most recent probe result was determined:		2007-1-26,17:31:21.0,+0:0	
The result of the most recent probe:		responseReceived	

Roles of IP/MPLSView



WANDL's IP/MPLSView

- Single Platform accommodates Multi-vendors and Multi-Technologies
- Integrated Functionality
  - Online management and monitoring, with offline planning, simulation, design and optimization
  - Integrated Fault, Configuration, Performance Management
- High Scalability
  - System can handle large sized router networks
- High Performance
  - Network-wide integrity checking, routing simulation and failure simulation

Thank you for attending!
Questions?
Please visit WANDL booth

http://www.wandl.com/

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