TE Explorer delivers unprecedented real-time, visibility into RSVP-TE traffic engineered networks, helping service providers and mobile operators ensure the availability and performance of critical service traffic flowing over traffic engineering (TE) tunnels. TE Explorer leverages Packet Design’s industry-leading route analytics technology to provide a comprehensive traffic engineering management solution, including real-time TE tunnel monitoring, historical analysis, easy to use network modelling and simulation, and capacity planning reports. TE Explorer fills an important gap in IP/MPLS network management, dramatically lowering mean-time-to-repair (MTTR), optimizing capital expense (CAPEX) investments, and increasing service assurance and competitiveness.

The Need for Real-Time Traffic Engineering Management

Service providers and mobile operators are deploying MPLS Traffic Engineering based on the RSVP-TE label distribution protocol to ensure increasingly sensitive services with high bandwidth and low data loss requirements, such as VoIP, video, and cloud computing. Understanding the operation of TE tunnels and the interaction of traffic engineering with underlying IGP (OSPF, IS-IS and EIGRP) routing, as well as BGP Internet and MPLS VPN service routing, is critical for service assurance.

While existing traffic engineering management solutions claim to provide comprehensive visibility, in reality they deliver only static snapshot views of TE tunnel status based on occasional SNMP polling or router configuration file downloads. Important dynamics such as changes to tunnel paths, tunnel bandwidth utilization, as well as problems such as links that are unprotected by Fast Re-Route (FRR) or other mechanisms, go undetected. Traditional tools don’t provide historical analysis so that engineers can see how TE tunnels have changed over time, making troubleshooting harder and more time-consuming. Finally, traditional tools don’t provide any insight into how traffic engineering interoperates with underlying routing and higher layer services, without comprehensive, dynamic management visibility, network engineers must “fly blind”, the result being much higher MTTR and operations costs, less accurate planning and unacceptable service impacts.

TE Explorer Benefits

- Ensure critical services that rely on traffic engineered tunnels for optimal traffic delivery.
- Monitor real-time TE tunnel status, Fast Re-Route tunnel protection, and tunnel bandwidth availability and traffic utilization.
- Quickly detect and troubleshoot RSVP-TE tunnel problems that would otherwise go undetected by traditional network management solutions.
- Resolve historical or intermittent problems once and for all. Complete historical data and the ability to rewind network state to any previous point in time enable forensic troubleshooting.
- Analyze TE tunnel traffic utilization to catch emerging trends that could lead to congestion and service disruptions.
- Accurately model traffic engineering and other routing and traffic changes and avoid costly maintenance and planning mistakes.
- Small deployment footprint, minimal network load, low management overhead and continuous auto-discovery deliver fast time to value and a low total cost of ownership (TCO).
Real-Time, Dynamic Traffic Engineering Analysis

TE Explorer extends Packet Design’s real-time route analytics technology, which works by passively recording routing protocols, such as OSPF, IS-IS and BGP to compute, monitor and analyze network-wide routing behavior. TE Explorer integrates support for RSVP-TE traffic engineered tunnels into the routing map, delivering a dynamically updated view of network-wide routing and traffic engineering, including the ability to analyze traffic flow details.

Routing & TE Topology Visualization
- View an accurate map of IP routing and TE architecture to understand and monitor network health
- Detailed “Tunnel Inspector” views of specific tunnel paths, including secondary LSPs, FRRs and contextual routing topology

Real-Time Monitoring and TE Tunnel Dynamics
- Monitor and detect changes to traffic engineered tunnel paths, protection and utilization
- TE tunnels are updated in real-time based on routing changes, traps, log messages, re-optimization timers and lightweight polling

Comprehensive TE Reporting and Analysis
- Reports on all tunnels by head-end, mid-point and tail-end routers. Analysis of primary, secondary and FRR tunnels
- Identify routers and links with high concentrations of TE tunnels
- Analyses of anomalous tunnel conditions, such as long-lived FRRs, inactive primary tunnels or active tunnels with suboptimal constraints

Troubleshoot with Rewindable History
- Rewind the entire routing, TE and traffic map and analyze network status at the time a problem was occurring
- Visualize and analyze historical tunnel status, paths, changes, traffic levels and determine root causes faster

Accurate Simulation of Changes on an Always Up-to-Date Network Model
- Simulate changes in routing, traffic engineering, or traffic flows for future planning or failure analysis
- Model individual or full-mesh tunnels with flexibility to specify any key tunnel attribute and analyze the impact of tunnel changes

Efficient, Comprehensive, Scalable Data Collection
- A single TE Explorer appliance can manage an entire service provider network, including thousands of TE tunnels
- Multiple, vendor-specific collection techniques maximize efficiency and completeness of data in heterogeneous network environments
Speed Tunnel Problem Detection and Root Cause Analysis

Traffic engineering problems can severely impact critical services, making timely problem detection a must-have for network operators. TE Explorer monitors and alerts on TE tunnels that go down, are flapping, or are rerouted in real-time, and identifies root causes such as router or link failures, re-optimization or preemption. Engineers can quickly view tunnel status through comprehensive reports on tunnels, FRRs, headend and midpoint routers, and TE links. Graphical topology visualizations help engineers to easily understand the precise path of tunnels. In addition, the History Navigator allows engineers to “rewind the network” and perform all analyses against the network state at the time problems were occurring, increasing the intuitiveness of troubleshooting and speeding root cause analysis.

Proactively Ensure TE Tunnel Protection

Traffic engineering is meant to provide predictable and resilient network behavior in the case of infrastructure failures. With TE Explorer, engineers can ensure that protection mechanisms such as secondary tunnels, FRRs as well as protection constraints such as Shared Resource Link Groups (SRLGs) are properly deployed. Engineers can perform comprehensive analyses of tunnel protection:

- View secondary tunnel status
- Analyze the root cause for active secondary tunnels
- Visualize primary vs. secondary tunnel path diversity
- Track Node, Link or Bypass FRR protection schemes
- Find tunnels and links that lack protection
- Visualize FRR tunnel paths in case of node or link failures
- View all configured SRLGs
- Identify primary tunnels that share a SRLG with secondary tunnels
- Identify links that share a SRLG with the FRR that protects them

Analyze Tunnel Bandwidth and Utilization

When combined with Traffic Explorer, TE Explorer provides network-wide tunnel traffic utilization monitoring and alerting, along with extensive TE tunnel bandwidth analyses:

- View up-to-date tunnel bandwidth and traffic utilization and easily find tunnels with available bandwidth or high utilization that is exceeding reserved bandwidth
- Know precisely which tunnels are consuming bandwidth or which flows are causing congestion
- Understand the traffic utilization and tunnel bandwidth impact of secondary tunnels and FRRs in the event of link failures
Accurately Model Traffic Engineering Changes and Avoid Costly Service Impacts

A large percentage of service-affecting problems are caused by misconfigurations. The deployment of traffic engineered tunnels increases network complexity, as well as the potential for costly maintenance and planning mistakes. TE Explorer allows engineers to model new tunnels, as well as network changes that impact TE tunnels, providing valuable insight into planned changes, such as:

- Optimal paths for new tunnels including all intermediate routers and links
- Lists of pre-empted tunnels due to modeled network changes, including their current and previous paths
- Links that will experience high traffic utilization or low available bandwidth (BW)
- How to achieve diverse load-balancing tunnels given path constraints

Model Individual or Full-Mesh Tunnels with the Flexibility to Specify Any Key Attribute

![Diagram](specify_head_tail_routers_explicit_tunnel_path_ERO.png)

Specify head & tail routers with explicit tunnel path (ERO)

![Diagram](specify_head_tail_routers_constraints.png)

Specify head & tail routers with constraints: reserved BW, priority etc.

![Diagram](specify_head_tail_routers_number_diverse_load_balancing_tunnels.png)

Specify head & tail routers with number of diverse load balancing tunnels

![Diagram](design_full_mesh_tunnels_core_routers.png)

Design full-mesh tunnels between core routers with constraints: auto-bandwidth, SRLG etc.

Easy to Use Capacity Planning Reports Optimize Network Investments

TE Explorer enables engineers to accurately project future capacity needs and efficiently plan for required network upgrades. Network planners can analyze current and projected utilization of tunnels, identify tunnels with insufficient reserved bandwidth for future needs, and see when critical links will need an upgrade.

Low Total Cost of Ownership and Rapid ROI

TE Explorer’s ease of deployment, high degree of automation and low overhead mean that it delivers uniquely valuable network management visibility with a very low Total Cost of Ownership (TCO). TE Explorer’s network-wide, dynamic traffic engineering visibility delivers a rapid return on investment (ROI) by increasing the speed, efficiency and accuracy of network operations, engineering and planning processes, leading to a higher quality of user experience, lower MTTR and operations costs, and optimized CAPEX investments.