Packet Design

IP Route Analytics—Real World ISP Use Cases and Benefits

Mats Lindmark
Sr. SE Packet Design
lindmark@packetdesign.com

About Packet Design

Packet Design

- Founded 2003 by former Cisco CTO Judy Estrin and former Cisco chief scientist Van Jacobson
- Partnerships and solution integrations with CA, Cisco, Ericsson, HP and Juniper
- Pioneer and Leader in route analytics solutions
- 500+ customer deployments
- Global service providers, enterprises, government and military agencies

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The Gap in Network Management: Understanding the Network "Cloud"

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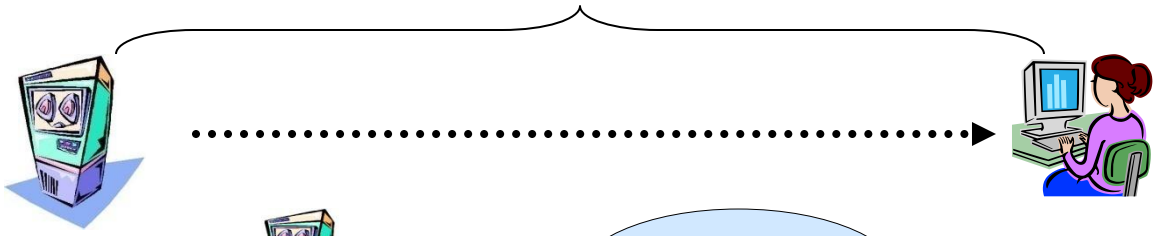
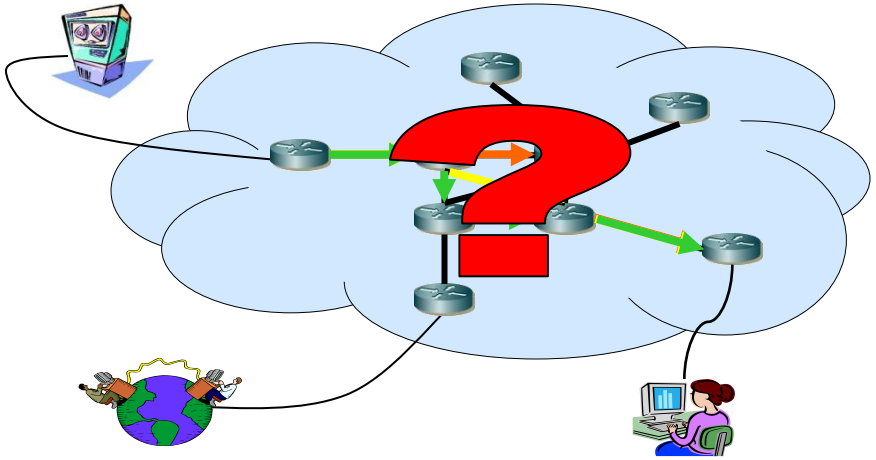
Critical Applications or Services Need:

- Deeper Monitoring
- Faster Troubleshooting
- More Accurate Planning



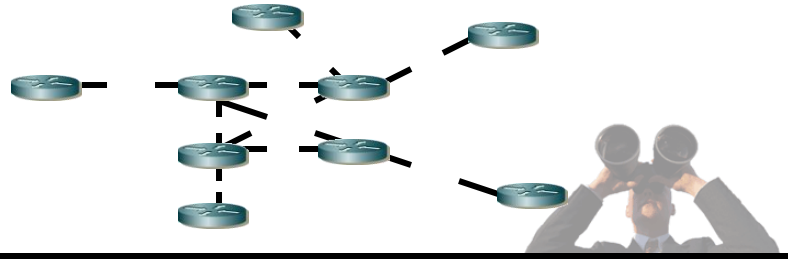
How Does Network Eng Know:

- Which part of the network is carrying the application traffic?
- Where in the network to troubleshoot?
- How to accurately plan the network?
- How to make accurate changes?



Redundant networks:

- Provide greater fault tolerance
- But also make it very difficult to understand which routers are delivering application or service traffic at any time



Existing approaches are insufficient

Lack visibility into IP-layer dynamics, & end-to-end considerations

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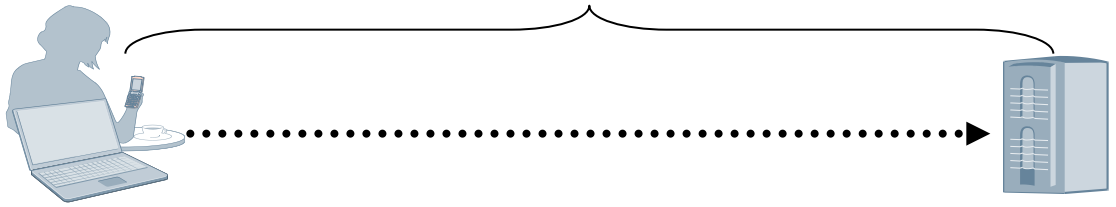
Application Performance Monitoring:

- Focuses on the end points
- Doesn't understand the network behavior in between



The IP Visibility Gap:

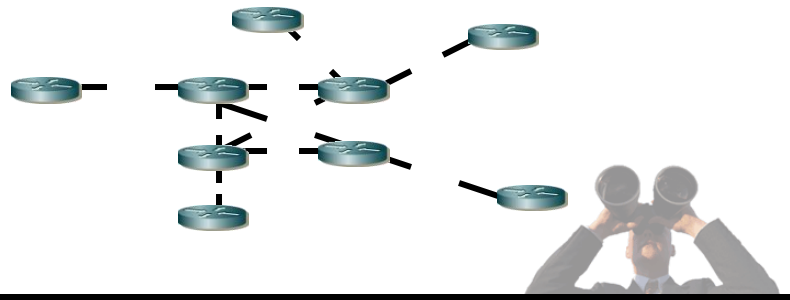
- Real-time IP routing changes that reduce resiliency and impact service delivery
- Forensic history for troubleshooting
- Network-wide effects of planned network changes

The Impact:

- Higher Mean Time to Repair (MTTR)
- Costly maintenance and planning mistakes
- Degraded user quality of experience
- Competitive disadvantage
- Higher CAPEX/OPEX , lower profitability

Traditional SNMP Network Management:

- Only understands device status
- Doesn't see how devices work together
- Doesn't monitor or analyze critical IP signaling plane
- Can't model and predict change impact
- High initial cost and ongoing total cost of ownership



Route Analytics—The Concept

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- **IP Routing protocols already:**
  - **Monitor all router and link status**
  - **Decide all traffic paths in the network**
  - **Constantly communicate the network topology**
- **Leveraging the information in live routing protocols**
  - **Gives real-time, always-updated visibility**
  - **Provides unique Layer 3 intelligence**
  - **Is low-latency and low-overhead**

Route Analytics Technology

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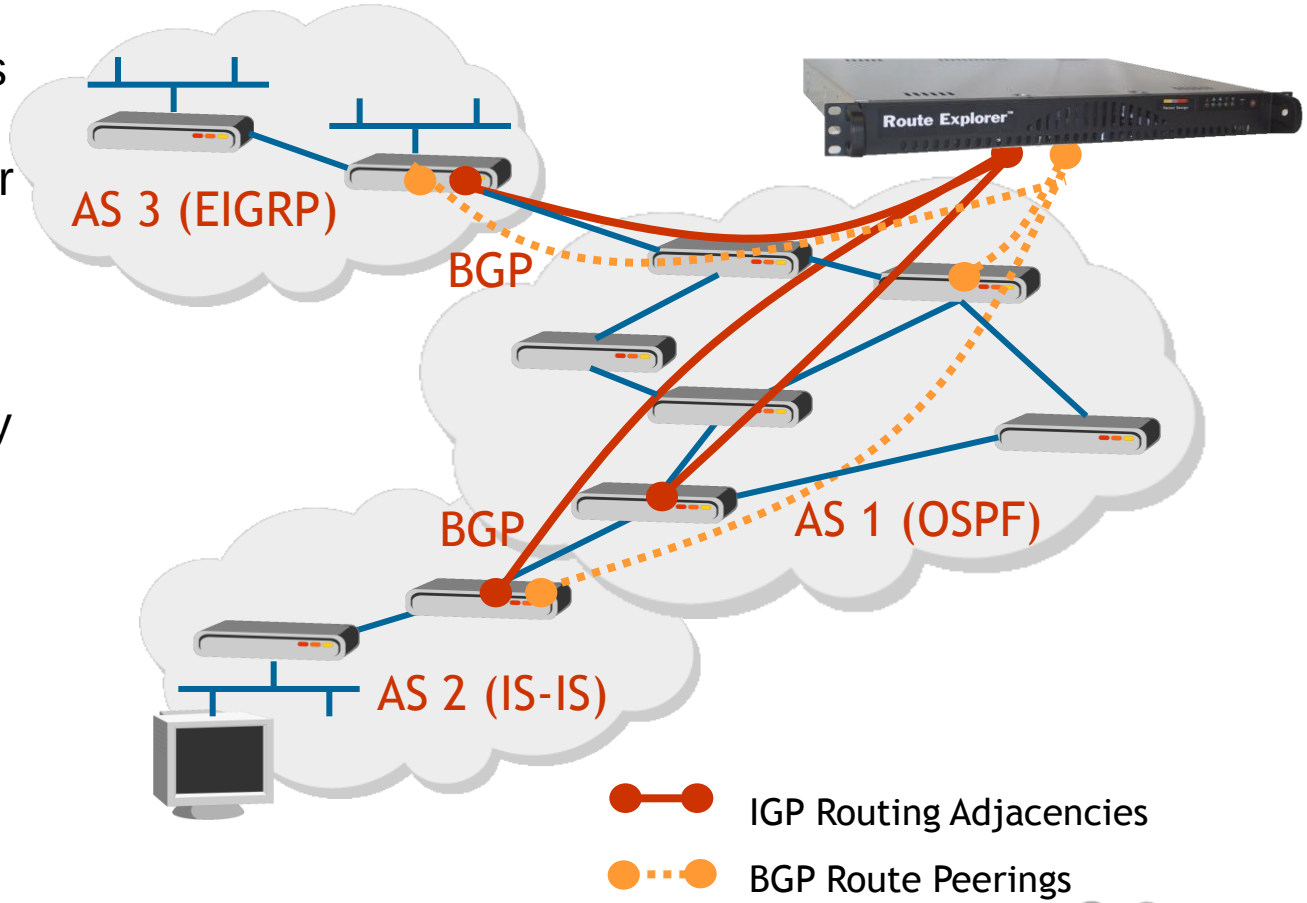
- Peers with and listens passively to routing protocols to learn their view of the network
- Creates 100% accurate model of the actual routed topology
- Records complete routing event history
- Understands all application traffic paths at all times
- Capable of modeling network changes



Limits of Traditional Netflow Analysis

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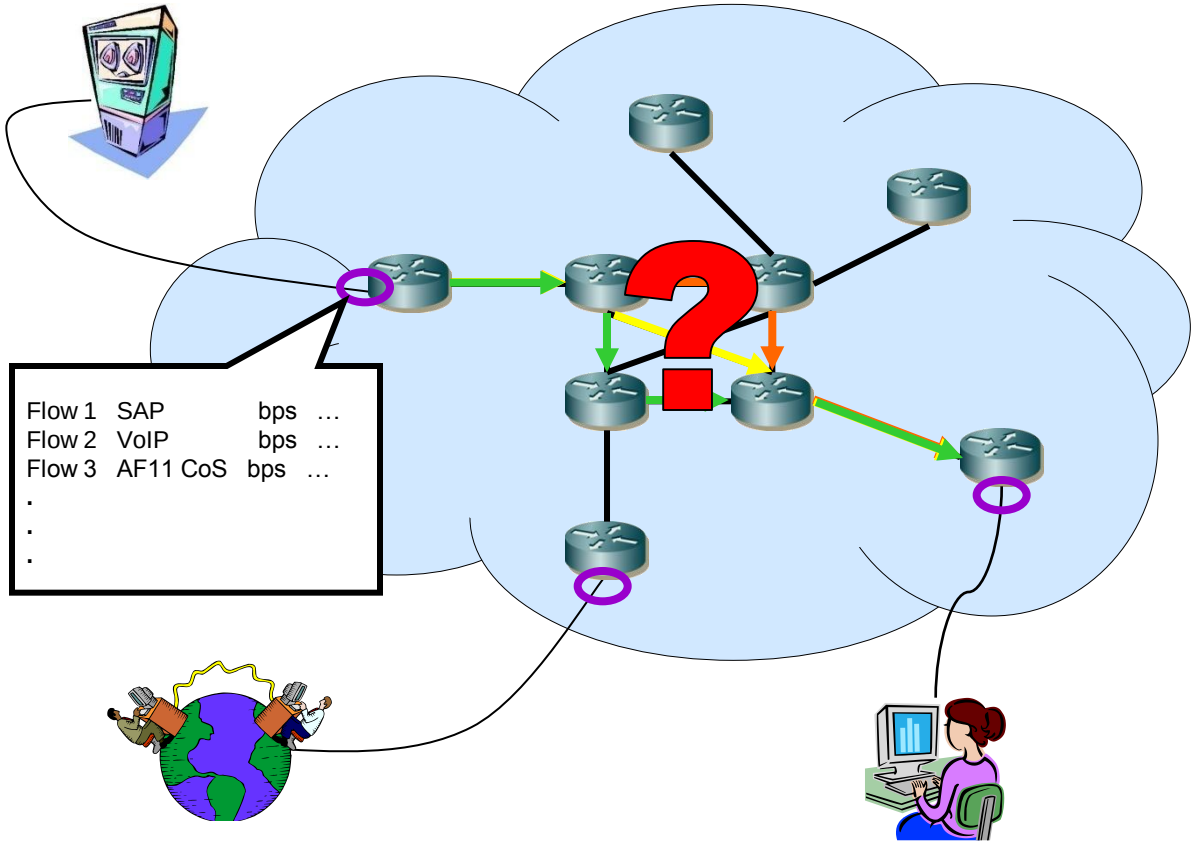

- Typical Netflow analysis only provides per-interface views of traffic
- Impossible from one interface to know the path traffic takes through the network
- Only a fraction of interfaces are instrumented due to overhead
- Blind to network dynamics

Combination of Netflow with Live Routing Analysis

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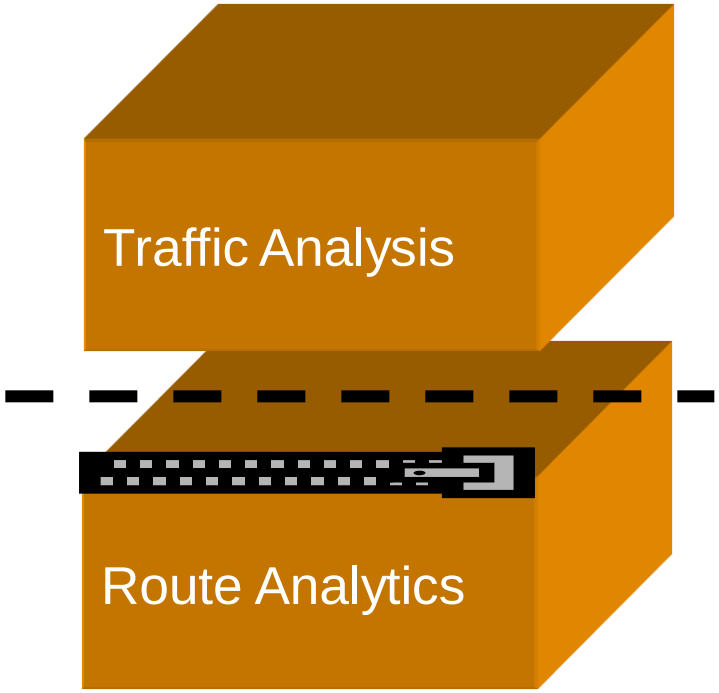

Path-Aware Traffic Analysis

- Actual topology including **real-time** routing changes
- Actual traffic loads across ***all links***; not subset of links
- ***End-to-end*** view of all traffic flows; not isolated, link-by-link statistics
- Supports "what-if" ***modeling on "as running" network***
- Full ***historical data*** for forensic analysis
- Small footprint; minimal net load; ***highly scaleable***

Integrated Routing and Netflow Visibility

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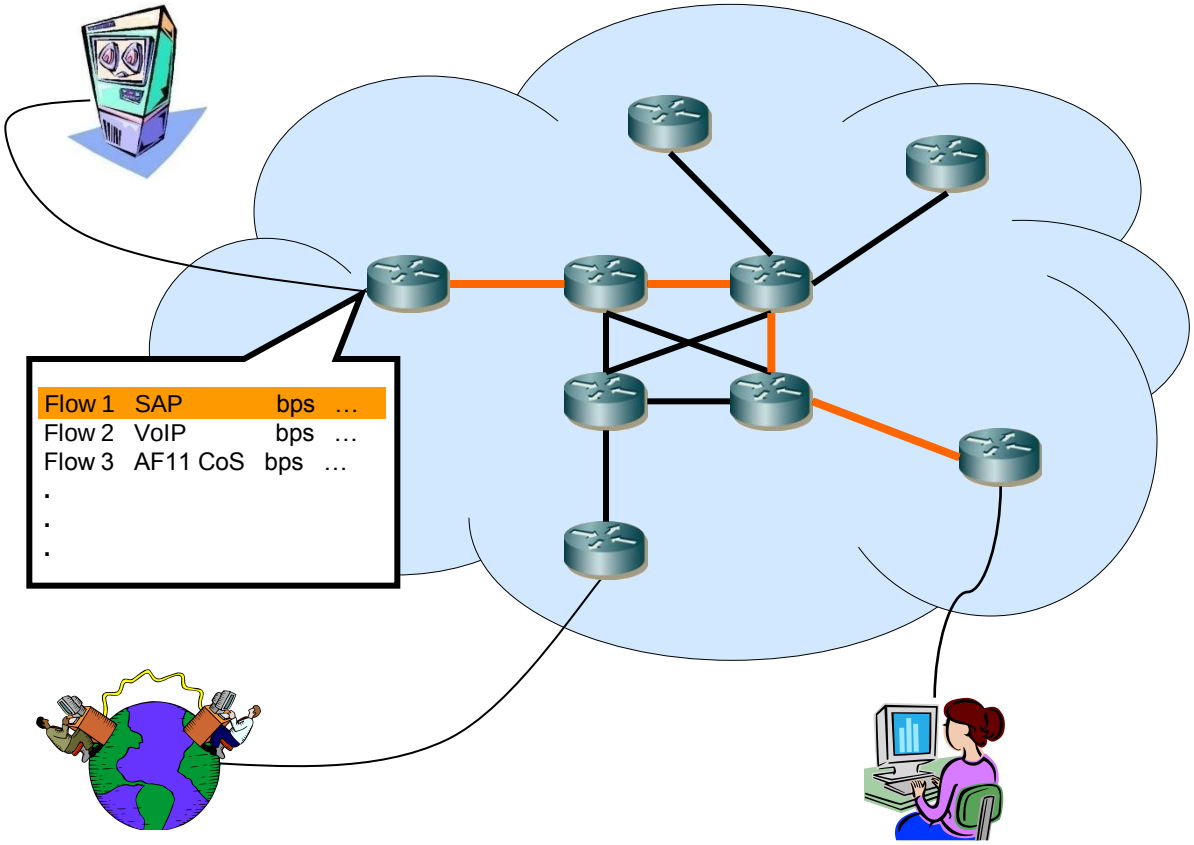

- Collects flow data at key network locations
- Computes traffic flows across topology

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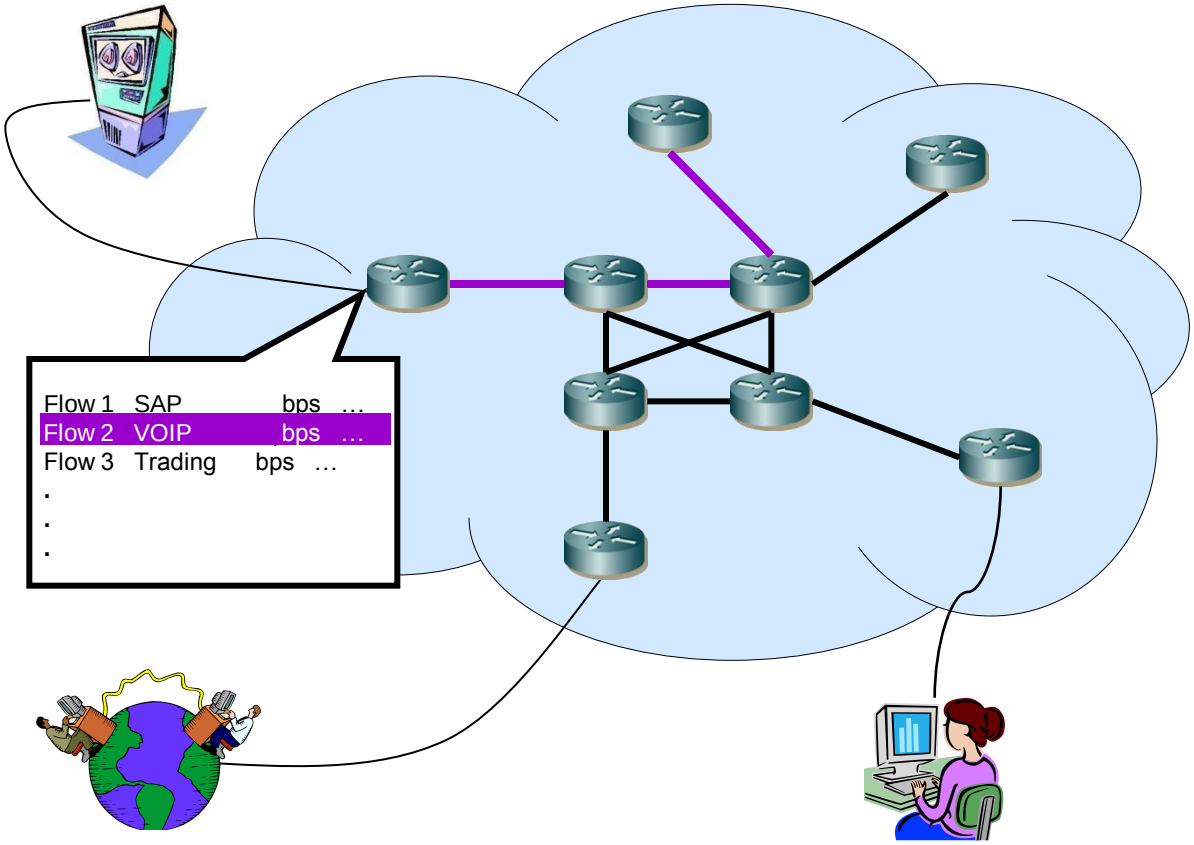

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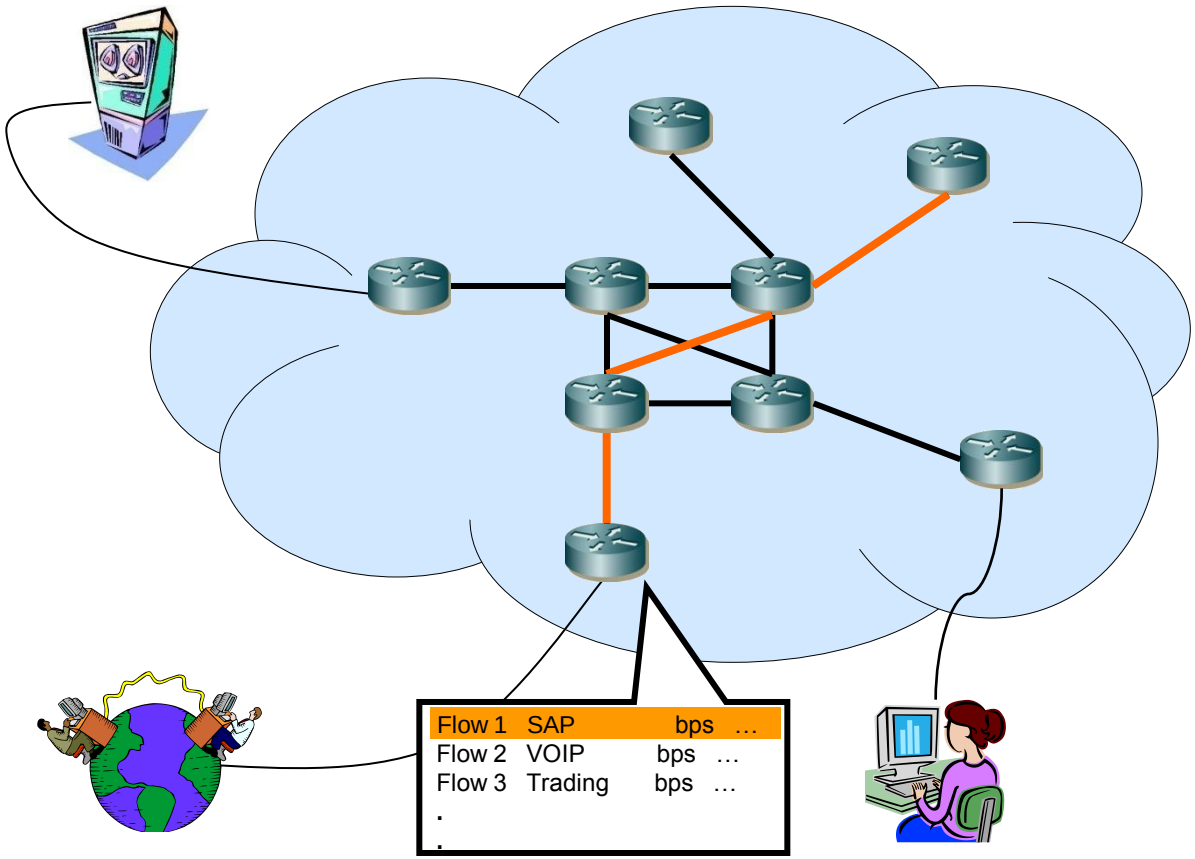

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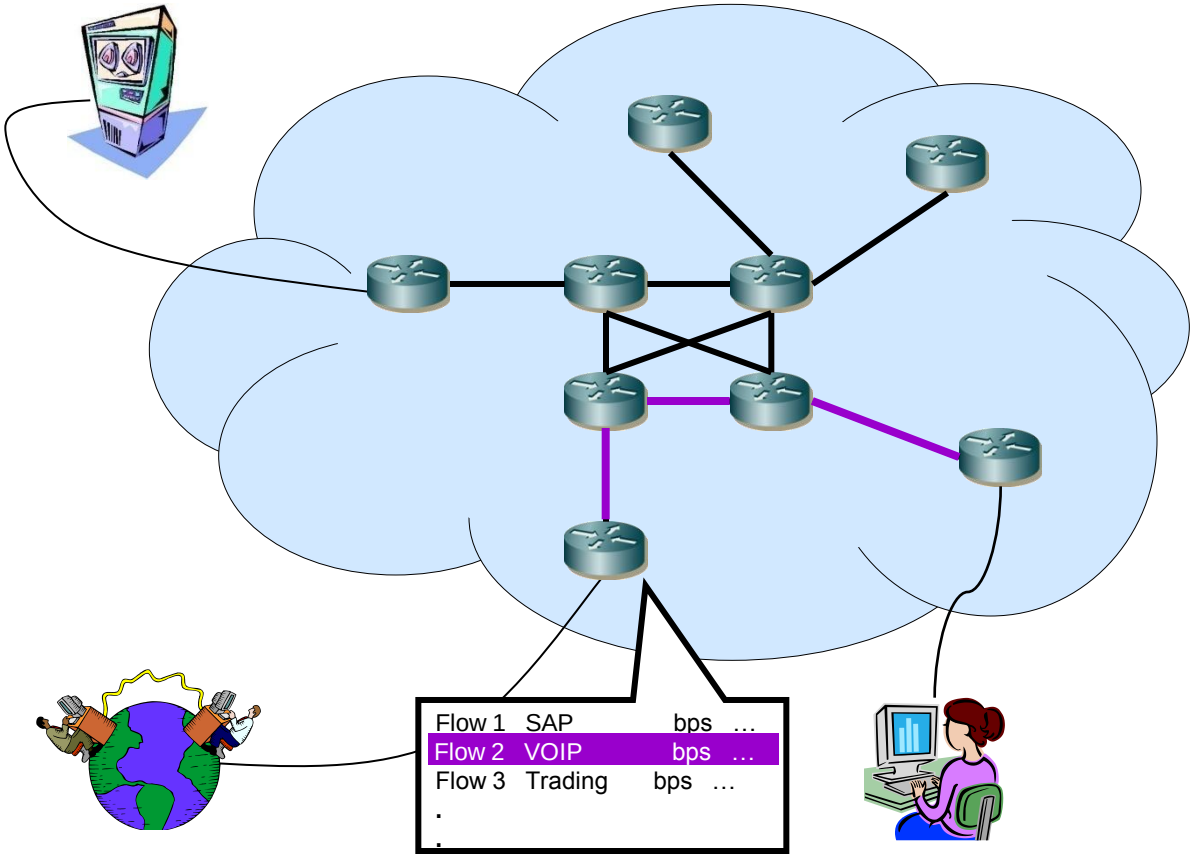

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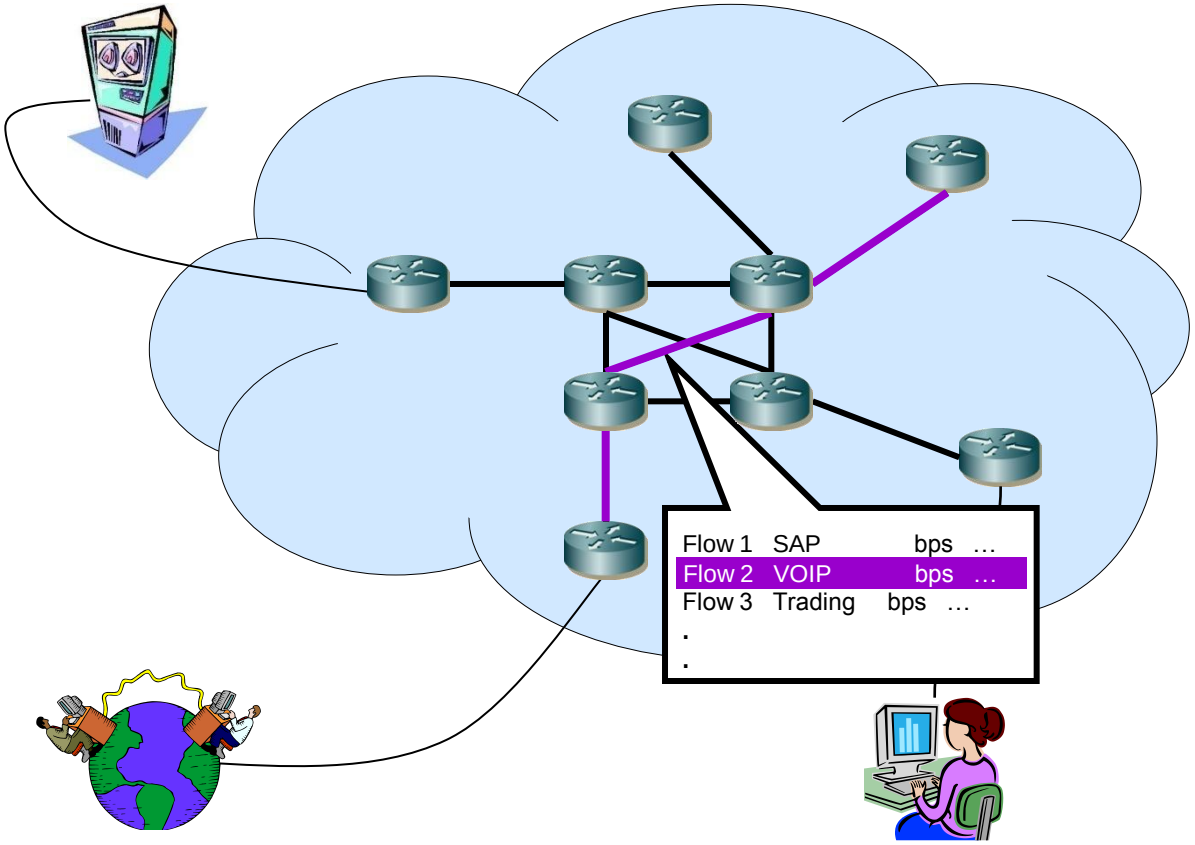

- Collects flow data at key network locations
- Computes traffic flows across topology
- Displays applications, CoS and utilization for ***every link***

Integrated Routing and Netflow Visibility

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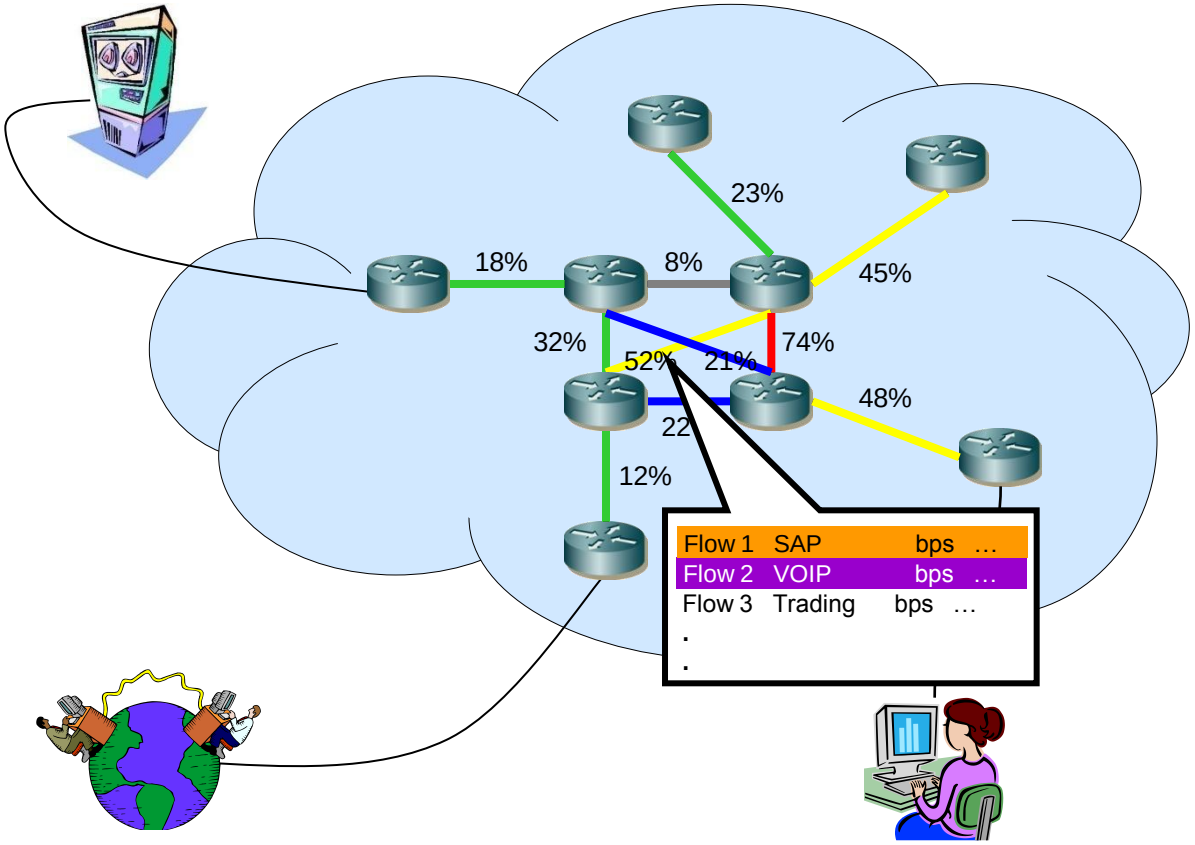

- Collects flow data at key network locations
- Computes traffic flows across topology
- Displays applications, CoS and utilization for ***every link***
- Stores complete traffic and routing history for analysis, diagnostics, and planning

VPN Route Analytics

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- **Route analytics that understands the extended version of BGP routing protocol, which acts as the service layer control plane for MPLS VPNs**
- **Baselines, Monitors and Analyzes:**
  - Per-Customer VPN Reachability
    - "Are all the customer VPN, BGP, IGP (OSPF, IS-IS, EIGRP) routes functioning properly?"
  - Per-Customer VPN Privacy
    - Fundamental selling point of MPLS VPNs
    - "Are all customer VPN Route Distinguishers properly configured?"
  - Per-Customer VPN Policy
    - "Is the customer's desired routing architecture working?"
    - (Full-mesh, hub and spoke, partial mesh, etc.)

TE Explorer

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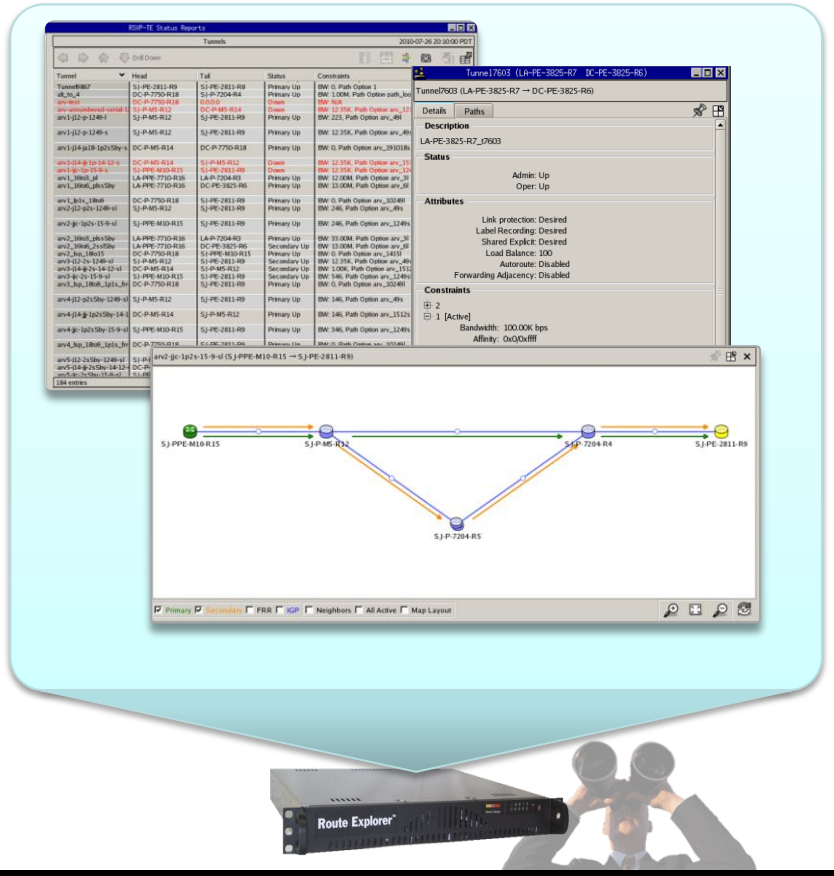
Packet Design introduces comprehensive solution to manage Traffic Engineering enabled networks

- Network-wide tunnel visibility enabling reliable service delivery over RSVP-TE tunnels
- Leverages powerful Route Analytics platform to monitor, analyze and engineer TE tunnels
- Software license update to Route Explorer product suite



TE Explorer: Key Features

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- **Dynamic tracking of TE tunnels across the network**
  - Leverages Route Analytics platform to provide near real-time tunnel status information
  - Efficient data collection via vendor-optimized mechanisms
- **Comprehensive functionality covering all aspects of tunnel management**
  - Detailed info on tunnel status, protection, bandwidth & usage
  - Real-time monitoring, visualization, historical analysis and modeling capabilities
- **Fully integrates with other 'layer-3 technologies'**
  - Uses Route Analytics to correlate with dynamics of IP layer, various MPLS services such as VPNs

Four Key Benefit Areas of Route Analytics

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Faster Problem Resolution
Real-Time Monitoring

Strengthen Change Management Processes

Capacity Planning/ Peering and Transit Savings

Network Continuity Risk Mitigation

When there's a Service Issue

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Faster Problem Resolution
Real-Time Monitoring

Today's Situation

- Where to look?
- Delayed, deferred, lurking problems
- Short and long-term network and service impact, SLA and subscriber churn costs

With Route Analytics

- Rewind and Troubleshoot
- Localize specific path/VPN
- Analyze routing/traffic
- Resolve or hand off

Real-Time/Network-Wide Monitoring

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Faster Problem Resolution
Real-Time Monitoring

Today's Situation

- Wait SNMP polling cycles
- Don't catch layer 3 issues
- Only see traffic in a few places
- React to customer calls

With Route Analytics

- Real-time routing alerts
- See traffic impacts everywhere
- Respond faster, mitigate, resolve

Strengthen Change Mgmt Processes

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Strengthen Change Management Processes

- **Today's situation**
  - Change processes are input based
  - Don't know network-wide impact
  - SLA's intact? Any service impact?
  - "The Butterfly Effect"
- **With Route Analytics**
  - Always-updated network map
  - Model/simulate routing/traffic changes
  - Accurate, easy enough to use every day

Capacity Planning

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Capacity Planning/ Peering and Transit Savings

- **Today's situation**
  - Very limited visibility, no core visibility
  - Highly abstract planning
  - Large effort required
  - Hidden capacity/service impacts
  - Out of plan capital expenses
- **With Route Analytics**
  - Network-wide, bottom-up accurate routing and traffic basis for planning
  - Highly accurate
  - Self-maintaining model
  - Easy to use