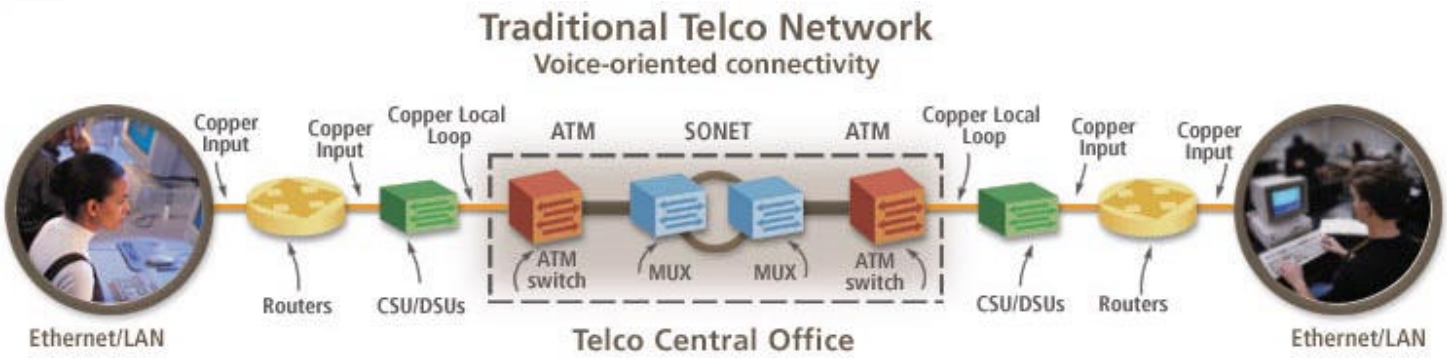
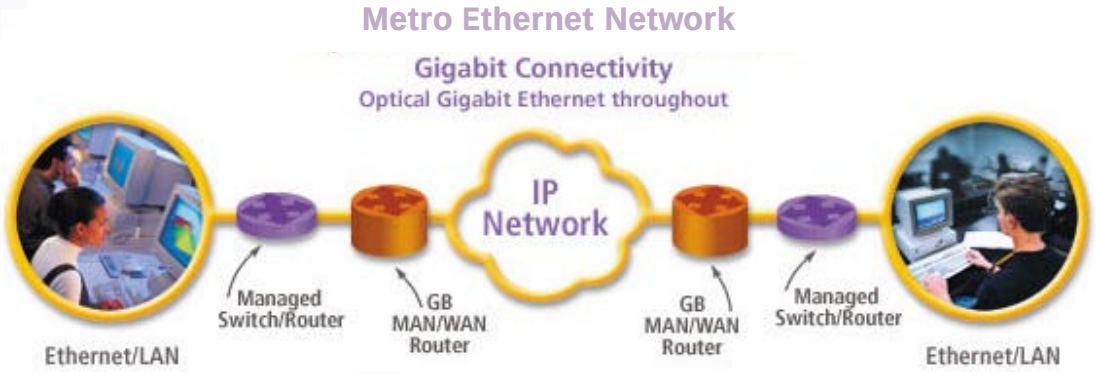
REDECOMEP

Metropolitan Area Network
MEF & Extreme Vision

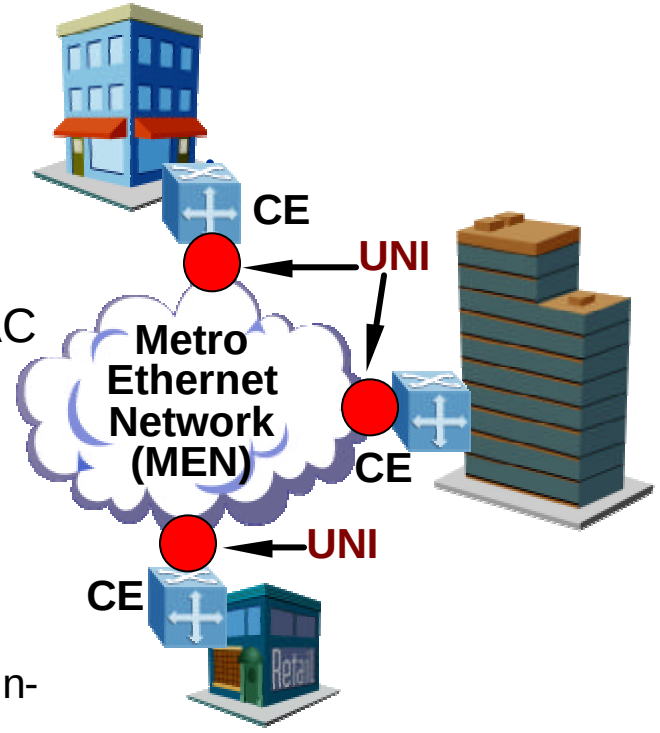
Public Ethernet Networks
Designed for data services





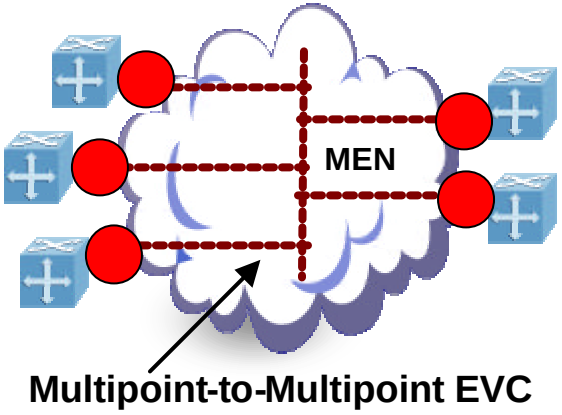
Ethernet Service – Basic Model defined in MEF

- Customer Equipment (CE) attaches to UNI
- CE can be
  - router
  - IEEE 802.1Q bridge (switch)
- UNI (User Network Interface)
  - Standard IEEE 802.3 Ethernet PHY and MAC
  - 10Mbps, 100Mbps, 1Gbps or 10Gbps
- Metro Ethernet Network (MEN)
  - May use different transport and service delivery technologies
    - SONET/SDH, WDM, RPR, MAC-in-MAC, Q-in-Q, MPLS



Ethernet Virtual Connection (EVC) defined in MEF

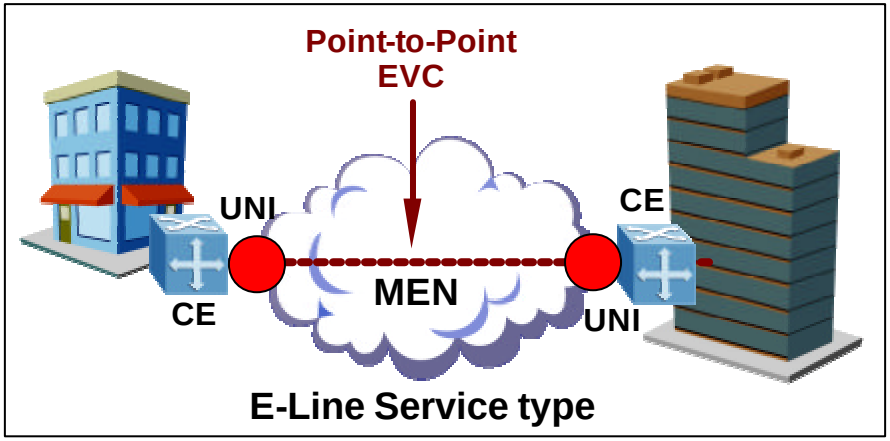
- An EVC is “an instance of an association of 2 or more UNIs”
- EVCs help visualize the Ethernet connections
  - Like Frame Relay and ATM PVCs
- MEF has defined 2 EVC types
  - Point-to-Point
  - Multipoint-to-Multipoint



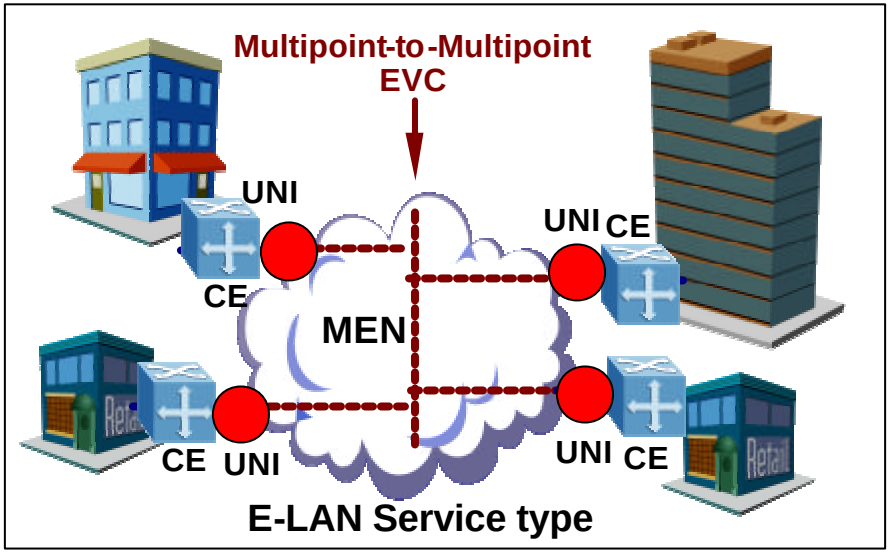
EVCs help conceptualize the service connectivity

E-Line and E-LAN Service Types

- E-Line Service used to create
  - Private Line Services
  - Ethernet Internet Access
  - Point-to-Point VPNs



- E-LAN Service used to create
  - Multipoint VPNs
  - Transparent LAN Service



Metro Service Platform

- Advanced Traffic Management
  - Bi-directional bandwidth control
  - Hierarchical quality of service
  - High performance hardware implementation
- Global Scalability
  - H-VPLS
- Carrier-class Resiliency
  - EAPS v2
  - Routing
- Security

Core & Aggregation Switch Requirements

- Services Networks has special requirements

  1. Resilience to keep the business running with minimum support

  2. Must adapt to growing Network requirements to prevent wholesale hardware upgrades

  3. Must make full use of Ethernet and IP intelligence to simply the security, line rate forwarding of local and inter-network traffic, with flexible and granular traffic classification

  4. Performance

- Additional features support more general deployment

Innovation

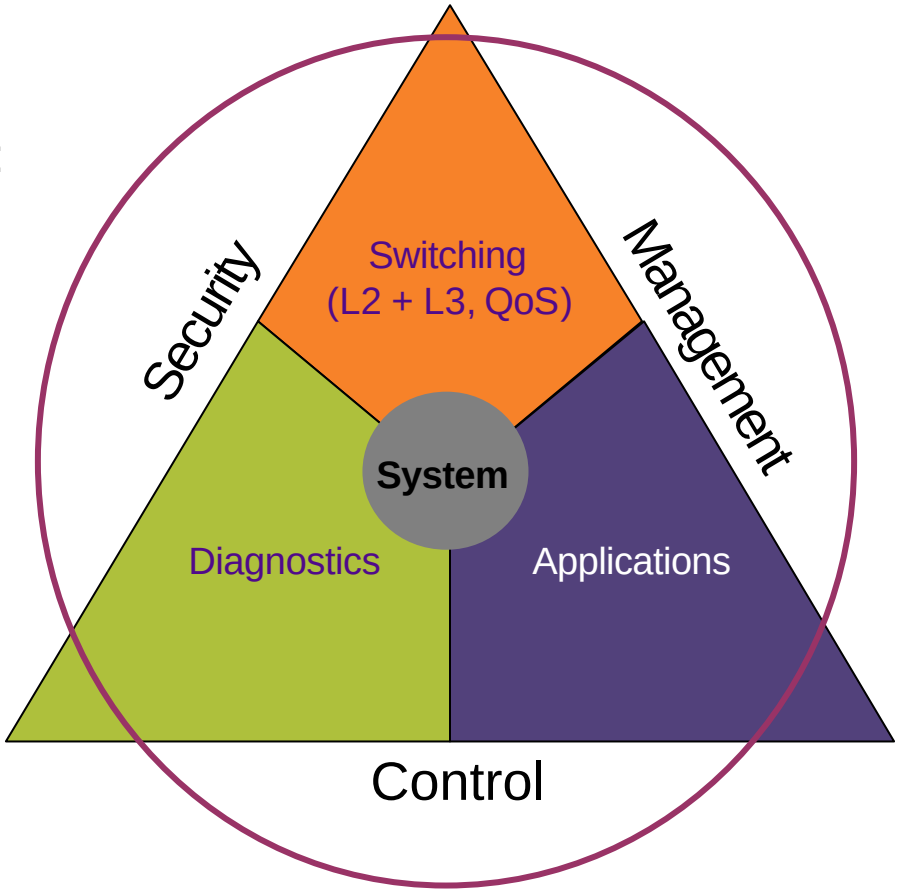
ExtremeWare XOS

Revolutionizing the Network Operating System

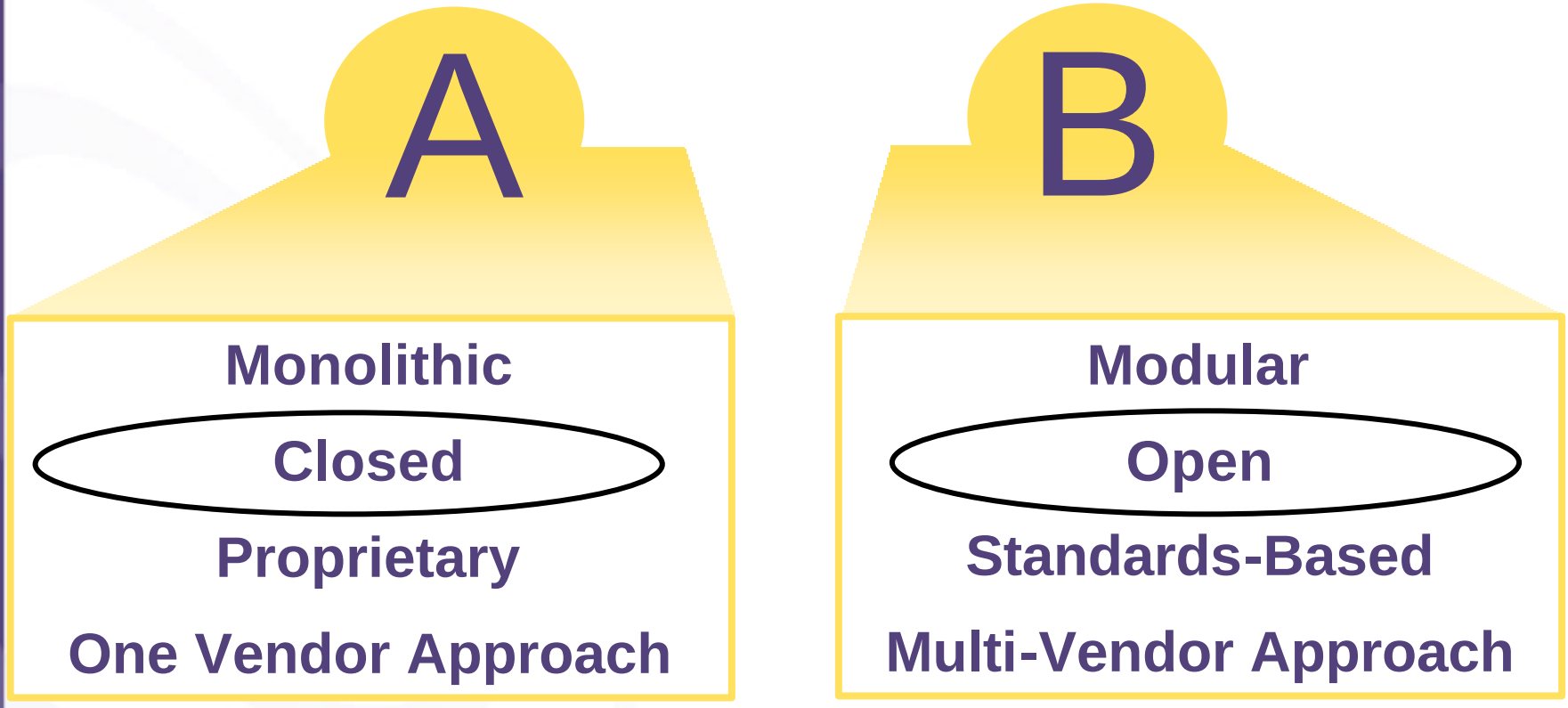
Attacking traditional challenges

What is ExtremeWare?

- The ExtremeWare OS defines:
  - Common feature set
  - Common look and feel
  - Common protocol engines
- ExtremeWare provides features for:
  - Enterprise and metro
  - Edge, aggregation and core
  - Fixed configuration, modular and distributed platforms
- Must delivery:
  - High performance
  - High availability
  - Security
  - QoS
  - Wire-peed Multicast
  - Low costs



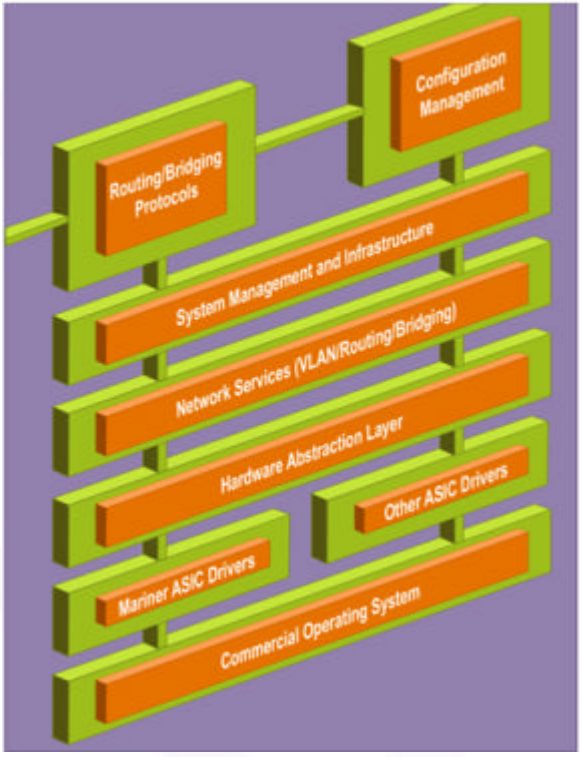
Alternate Paths to Convergence



Similar to the computing industry in the early 80's!

Similar to the computing Industry after that!

ExtremeWare XOS Architecture

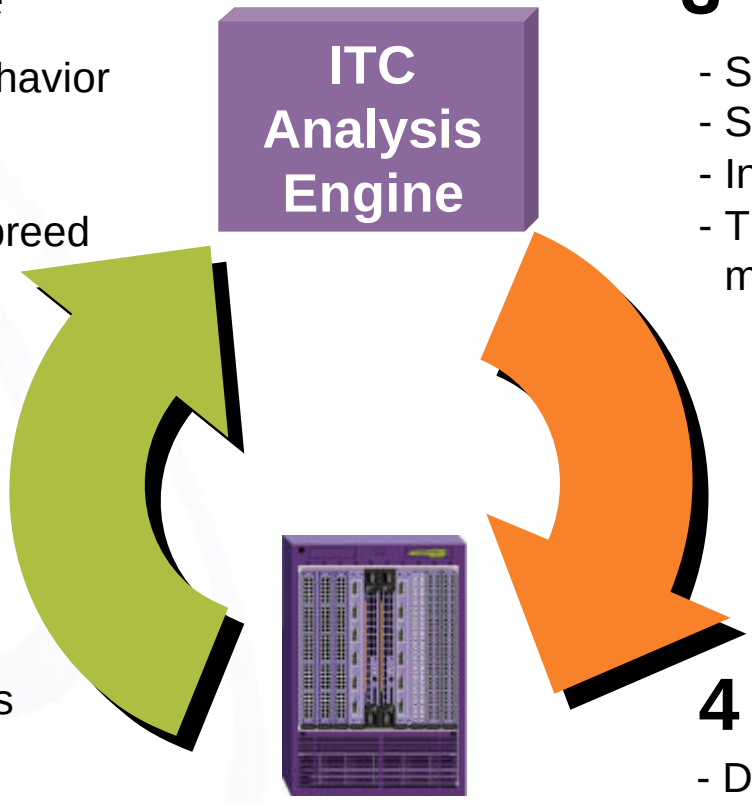


- **Highly Available Operating System**
  - **Memory protection**
  - **Process Monitoring and Restart**
  - **Hitless failover**
  - **Hitless upgrades for dual management**
  - **Module upgrades**
  - **DoS Protection**
- **Extensible for continued uptime**
  - **Dynamic loading of extensions**
    - **Can follow technology / security evolution**
  - **Flexible configuration management and APIs based on XML with scriptable CLI (TCL)**

Extensibility Example: Security - Interactive Threat Containment as the Solution, Enforcement

2 - Analyze

- Baseline normal behavior
- Identify anomalies
- Generate alerts
- Latest and best of breed



3 - Respond

- Shutdown hosts
- Shutdown ports
- Initiate detailed monitoring
- Throttle large movements of data

1 -Measure

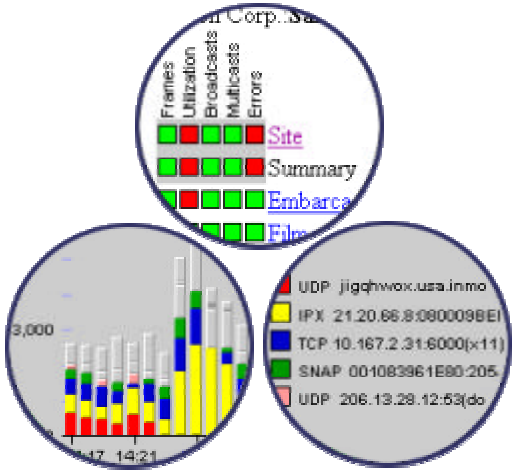
- Pre-filter data
- Maintain counters
- Sample flows
- ID traffic bursts
- ID state changes

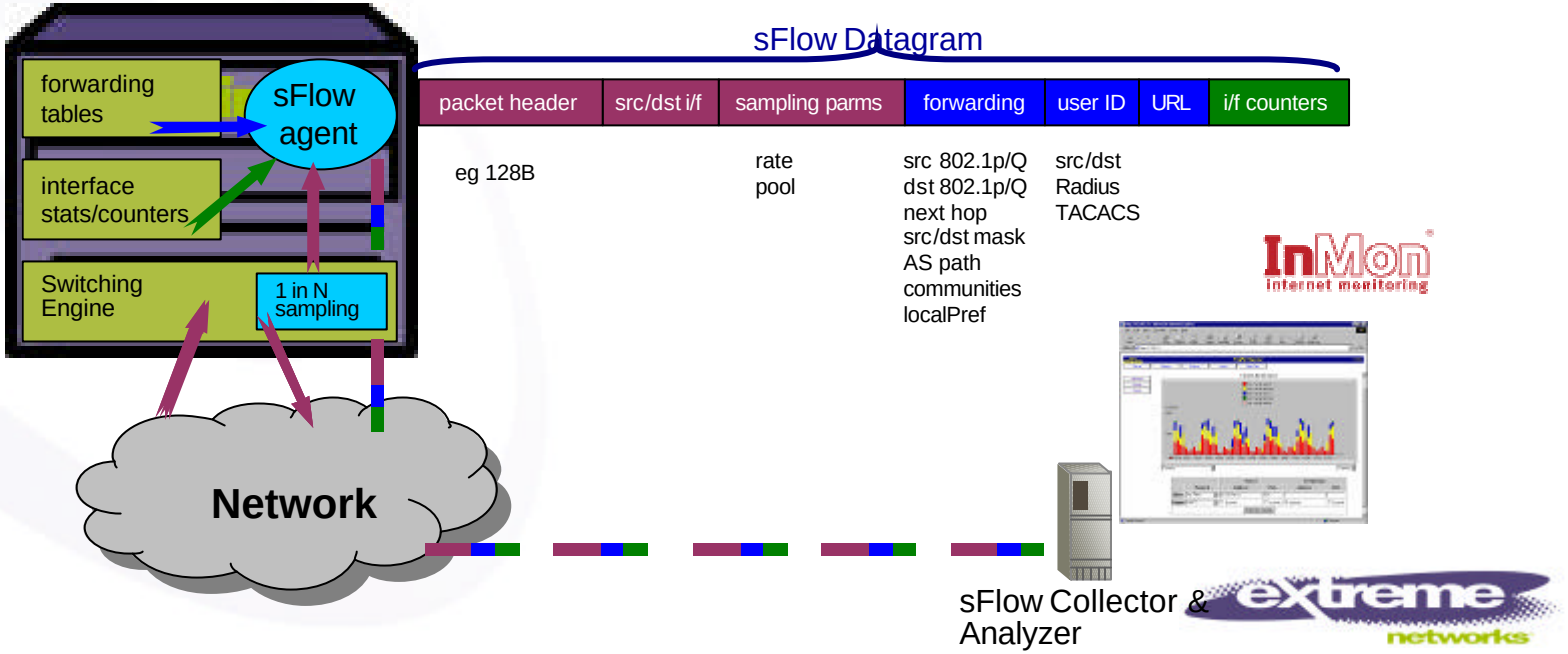
4 - Enforce

- Deep & extensive ACLs
- Rate limiting
- Traffic marking

sFlow Traffic Analysis

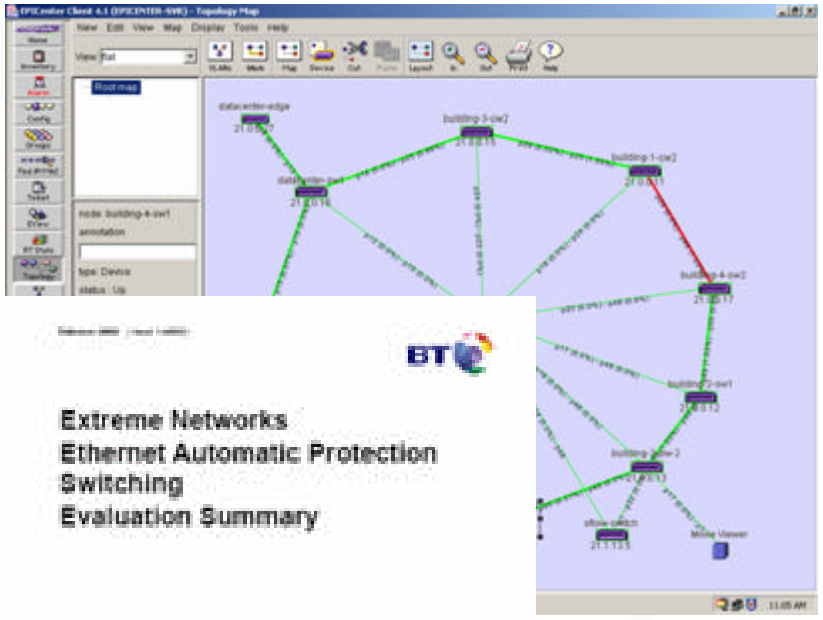
- Protocol for traffic accounting:
  - Usage-based billing
  - Baselining
  - Troubleshooting
  - Security (Attack Identification)
- Defined in RFC 3176
- Similar to Netflow
  - But takes samples and extrapolates network traffic profile





EAPS (RFC 3619)

Ethernet Automatic Protection Switching



Network Working Group
Request for Comments: 3619
Category: Informational

S. Shah
M. Yip
Extreme Networks
October 2003

Extreme Networks'
Ethernet Automatic Protection Switching (EAPS)
Version 1

Status of this Memo

This memo provides information for the Internet community. It does not specify an Internet standard of any kind. Distribution of this memo is unlimited.

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Abstract

This document describes the Ethernet Automatic Protection Switching (EAPS) (tm) technology invented by Extreme Networks to increase the availability and robustness of Ethernet rings. An Ethernet ring built using EAPS can have resilience comparable to that provided by with fewer constraints (e.g., ring

- **Proven sub-50ms failover times**
- **Featured on all Extreme product lines**
- **Designed for Carriers/ISP –**
  Essential for Convergence in the Enterprise!

http://www.extremenetworks.com/libraries/ prodpdfs/products/ ExtremeEAPS_ewx.pdf

IPv6 ExtremeWare XOS - Details

- RFC 2460, Internet Protocol, Version 6 (IPv6) Specification
- RFC 2461, Neighbor Discovery for IP Version 6, (IPv6)
- RFC 2462, IPv6 Stateless Address Auto configuration - Router Requirements
- RFC 2463, Internet Control Message Protocol (ICMPv6) for the IPv6 Specification
- RFC 2466, MIB for ICMPv6
- RFC 1981, Path MTU Discovery for IPv6, August 1996 - Router requirements
- RFC 3513, Internet Protocol Version 6 (IPv6) Addressing Architecture
- RFC 3587, Global Unicast Address Format
- RFC 2464, Transmission of IPv6 Packets over Ethernet Networks
- RFC 2710, IPv6 Multicast Listener Discovery v1 (MLDv1) Protocol
- RFC 3810, IPv6 Multicast Listener Discovery v2 (MLDv2) Protocol
- RFC 2740, OSPF for IPv6
- RFC 2080, RIPng
- RFC 2893, Configured Tunnels
- RFC 3056, 6to4
- Static Unicast routes for IPv6
- Telnet over IPv6 transport
- SSH-2 over IPv6 transport
- Ping over IPv6 transport
- Traceroute over IPv6 transport

MAN Services to Customers with MPLS:

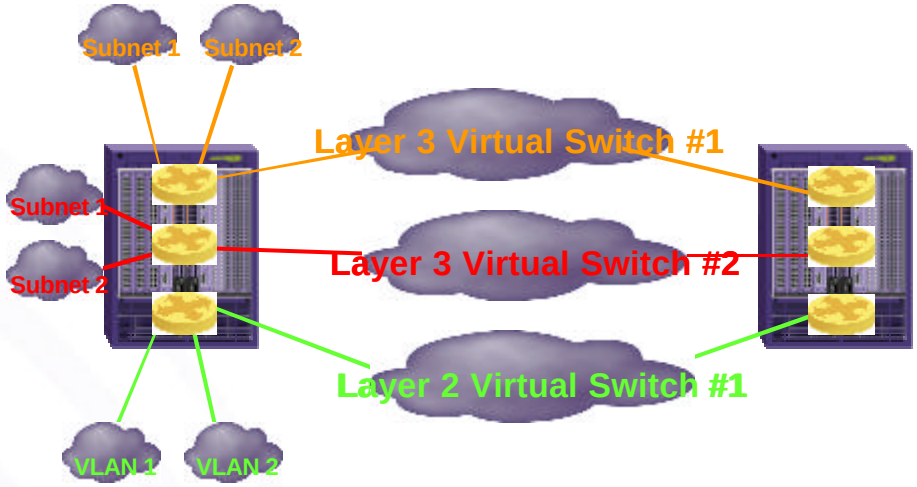
- **Service #1: Internet access**

  Can follow standard routed path or a traffic engineered LSP

- **Service #2: Point-to-Point Layer 2 VPN's**
  - "Martini draft" used to set up "virtual circuits" between customer sites
  - RSVP-TE used to traffic engineer load distribution
  - RSVP-TE used to reserve bandwidth (for SLA fulfillment)
    - DiffServ mapping to EXP bits: Provide QoS

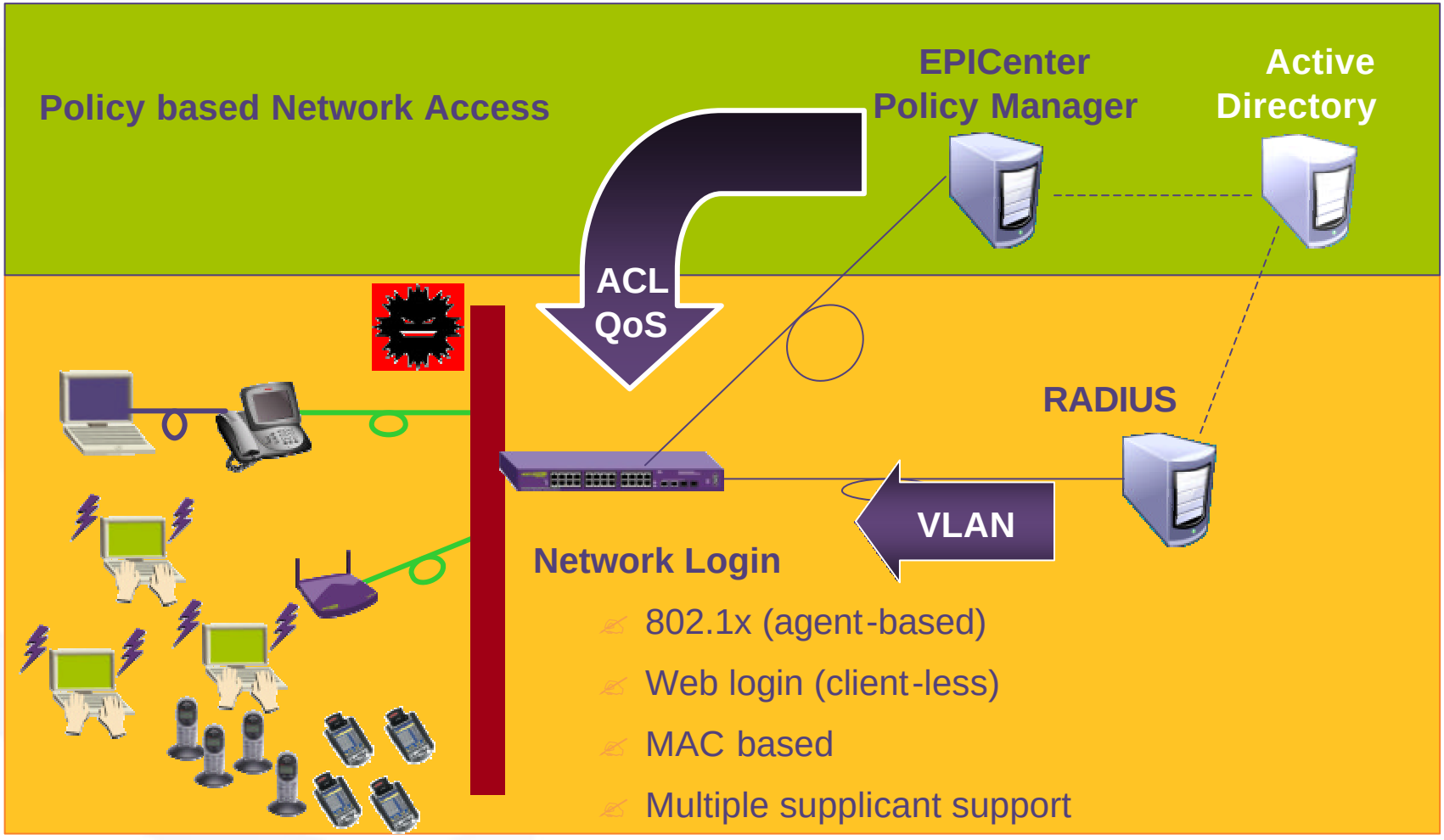
- **Service #3: Multipoint Layer 2 VPN's**
  - New "lasserre/vkompella/martini/**stokes**" draft to setup VPLS/HVPLS
    - L2 learning done on MPLS tunnels
  - Support for full-mesh or hub-and-spoke VPN connectivity models
  - RSVP-TE used to traffic engineer load distribution
  - RSVP-TE used to reservice bandwidth (for SLA fulfillment)
    - DiffServ mapping to EXP bits: Provide QoS

System Infrastructure: Virtual Switching



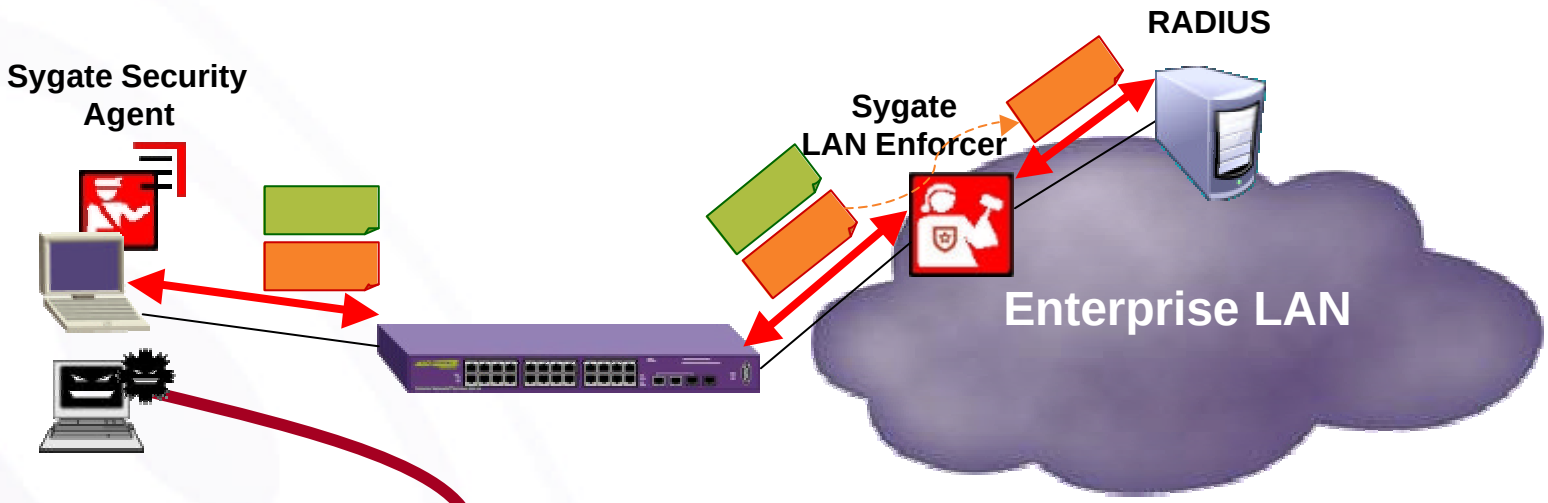
- **Virtual Switching Provides:**
  - Security: Total Isolation between users on different Virtual Switches / network security zones
  - Availability: If one virtual switch is attacked, others will be unaffected
  - ROI: One device programmed for one or multiple domains
- **Saves money in component costs by collapsing the network**
- **Phased approach: L3 today - Supports overlapping IP address spaces**
  - **L3 Virtual Switching = L3 switching + Virtual Routing**
  - **3 internal VRs + 8 user configurable VRs on BD10K**
  - **Virtual Switch can be chosen on a "per port" basis**
  - **Future: overlapping VLAN spaces (L2), optional multiple VRs per port**

Intelligent Network Access …



… With End Point Integrity (host integrity)

Example: Extreme – Sygate Solution

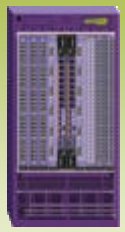


User Auth	Host Integrity	Action
Pass	Pass	Corporate VLAN
Pass	Fail	Quarantine VLAN
Fail	Pass	Close Port
Fail	Fail	Close Port

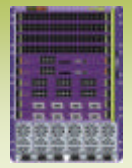
Comprehensive Portfolio

Scalability

BlackDiamond 10K



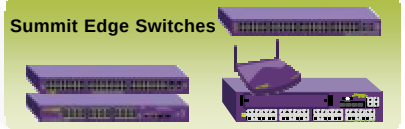
BlackDiamond 8810



BlackDiamond 6800

Alpine

Summit Edge Switches



Summit Edge & Aggregation Switches

PRODUCTS OF THE YEAR

Performance and Features

Consistent User Interface and Management Across all Platforms

Summary: Critical Success Factors in the Metro

- **Enhanced cost effective delivery of end-user services**
  - Transparent LAN Service (TLS or E-LAN)
  - High-speed Internet access (E-Line)
  - VPN services (Security/trusted/encrypted)
  - Support for:
    - Voice
    - Storage
    - Triple play applications
    - Grid computing
    - Colaboration
- **Organization, Accounting, Management and Provisioning (OAM&P)**
  - Ability to monitor and maintain Service Level Agreements (SLAs)
- **Investment Support**
  - Ability to shorten service delivery lead times
  - Ability to reduce complexity
  - Interoperability

Networking innovations for deploying voice and other demanding applications.

Thank you!!!