DISA
DEFENSE INFORMATION SYSTEMS AGENCY
The IT Combat Support Agency

Multiprotocol Label Switching

MPLS 101

Global Packet Transport Rollout

Chris Medley

MPLS, Program Manager

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Multiprotocol Label Switching (MPLS)?

It's a Technology

Services

Protocol

MPLS Layer-3 VPNs (AKA Private IP)

VPN

- **Virtual Private Networks(VPN)**
  - **Traffic segregation**
    - Flows can be encrypted (Type III or Type I) by user
    - MPLS VPNs are not natively encrypted

- **MPLS VPN**
  - **Layer-3 VPN segregate IP traffic domains**
    - Virtual Route Forwarding (VRF) Instances
    - Label Assignment and Forwarding
    - VRF instances and label-switched path (LSP) flows keep Layer-3 VPN traffic isolated through the provider network
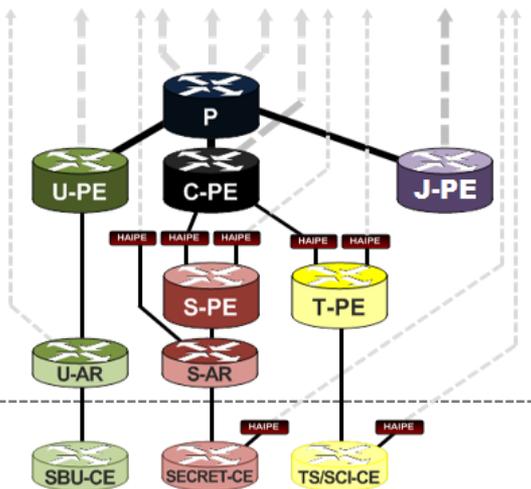
Layer-2 Transport / VPN

- **Ethernet Private Line Service**
  - Point to Point Pseudowires
  - No IP routing or signaling with external network
- **Virtual Private LAN Service (VPLS)**
  - Point to Multipoint Pseudowires
- **Any Transport over MPLS (AToM)**
  - Common framework to encapsulate and transport supported Layer 2
  - ATM (AAL5), Ethernet, Frame Relay
- **Circuit Emulation**
 - Structure Agnostic TDM over Packet (SAToP)

Layer-2 Transport

Transport Demand Reduction

Dual routers decrease overall long-haul demands on transport

- Customers' diversity requirements were driving the need to provision connections around the Service Delivery Point (SDP)
- Efficient and effective monitoring, planning and building of Provider Edge (PE) router bandwidth capabilities helps insure a robust and available network
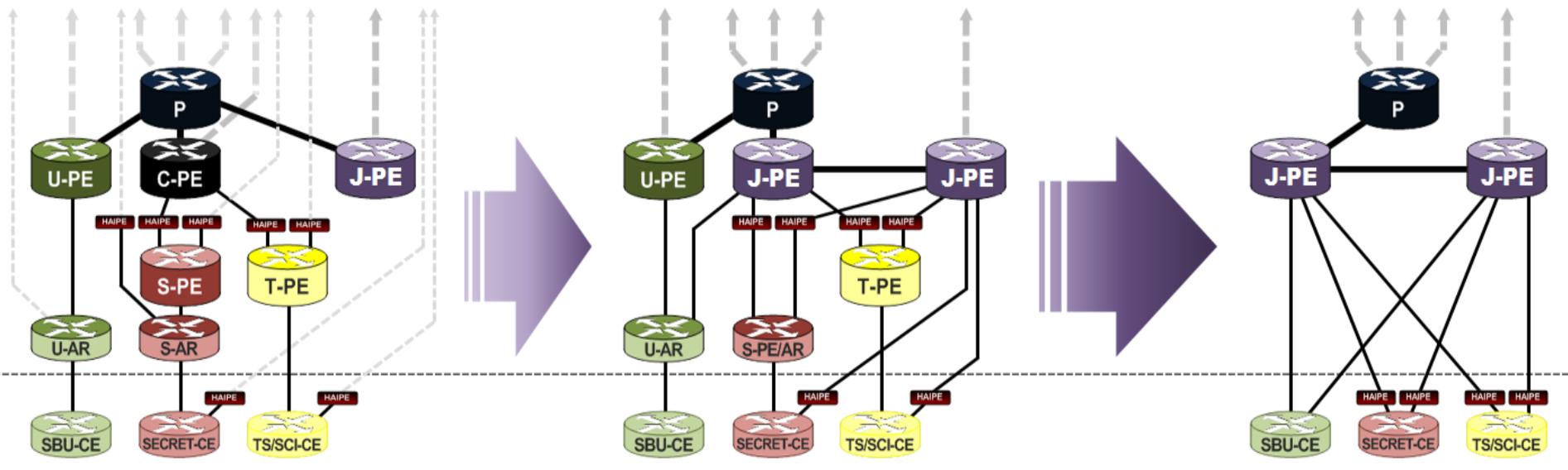
Cost Avoidance

- Cost for bandwidth is lower on larger leases
- Fewer leases will be required
- Port demand is reduced for government owned transport

Convergence
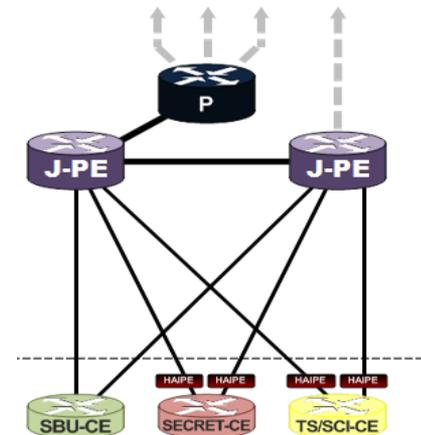
Increased Agility and Fewer Attack Surfaces

MPLS and the Net-Centric Vision

DISA

- **DoDIN net-centricity has been IP based – Everything over IP (EoIP)**
  - Enterprise applications are IP based
  - Shared nature of IP and Internet explosive growth has required ever increasing methods to mitigate security risks

- **MPLS provides a shared medium that maintains separation from risks associated with customer IP and layer-2 traffic**
  - DISN services converging onto the Joint–Provider Edge (J-PE)
  - All IP is within Layer-3 VPN, Layer-2 transport, circuit emulation

Everything over MPLS (EoM) enables realization of the Net-Centric Vision

MPLS Labelling

Multi-Protocol Label Switching is an underlying and overriding transport methodology for forwarding packet data over a network. MPLS assigns labels to data packets on ingress into the domain and forwards the data throughout the network based upon the label.

Provides a simplified forwarding method for data flows across a packet network
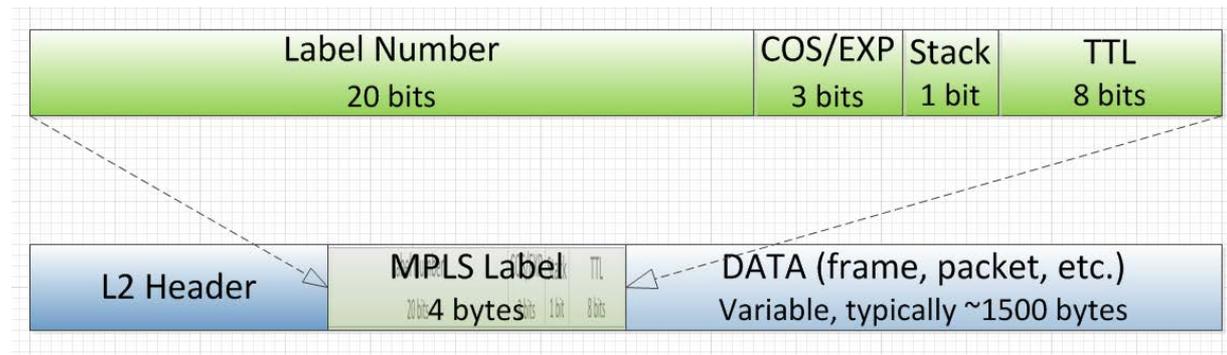
– Label Switching versus Packet Switching
  • Label numbers is 20 bits = ~1 million labels

MPLS Header
Label, Class of Service (CoS), Stack, and Time to Live (TTL)

Label Switched Paths (LSP)
Label Edge Router (LER) and Label Switch Router (LSR)
Signaling used in IP networks
LDP, RSVP-TE, mBGP

Label Number		COS/EXP	Stack	TTL
20 bits		3 bits	1 bit	8 bits

L2 Header	MPLS Label		DATA (frame, packet, etc.)
	4 bytes	TTL	Variable, typically ~1500 bytes

Joint-Provider Edge (J-PE) Router Equipment

- **Router Features**
  - MPLS (of course)
  - Common Technology Levels
  - Multi-Terabit Backplane
  - 100 Gigabit Link Capabilities
  - High-Density Interfaces
  - Circuit Emulation

- **Port Management**
  - Limit Interface Types
  - Encourage Sub-Interface Use
  - Discourage Circuit Emulation
  - Stay Away From Vendor "features"

MPLS – The Project

Project Description/Scope

- Global implementation of a high-speed standardized routing platform.
- Enabling: Joint Regional Security Stack (JRSS), Common Mission Network Transport (CMNT), Army Network Modernization (Net Mod-C), NIPRNet Virtual Routing and Forwarding (NIPR VRF), SIPRNet Access Migration (SAM), Navy Tactical Wide Area Network (NTWAN), and many other DoD efforts.
- Integrating: Advanced MPLS and IP routing technologies by installing two diverse J-PE (Joint Provider edge) suites in specific locations.
- Results: Complete in FY19; replacing seven legacy Defense Information System Network (DISN) platforms.

Measures of Success/Status:

- Installation of MPLS-capable IP Transport routers across the DISN at 375 sites

IE Goal/Priority:

- Evolve the Joint Information Environment and Operate / Assure the Enterprise
- DISA Strategic Plan 2015-2020 Goal - Provide Global Infrastructure
- DISA Center for Operations key objectives: Optimize the design/Build and implementation of the network

Task Origin: DISN Technical Evolution Plan; accelerated by DoD CIO

Estimated Overall Project Completion Date: EST FY2019 - Fully Funded

Multi Protocol Label Switching

Questions?

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