



Cisco IOS® MPLS Virtual Private LAN Service Business Overview

Enabling Innovative Services

Agenda

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- Announcement
- **Metro Ethernet**
 - Background
- **Virtual Private LAN Service (VPLS)**
 - Relationship to Metro Ethernet
 - Deployment Scenario
 - Relationship to Other Cisco IOS Technologies
 - Future Directions
- **Summary**

What's New?

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✦ Cisco IOS® MPLS Virtual Private LAN Service (VPLS)

Multipoint-to-multipoint support transparent operation (based on split horizon at MPLS PE)

Multipoint-to-multipoint non transparent operation

Circuit multiplexing

Q-in-Q support

MAC-Address learning forwarding & aging

Jumbo frames support

Rate limiting for SLA requirement (per-VLAN basis)

Coexistence of point-to-point & multipoint-to-multipoint support in the same router

✦ Cisco® 7600 Series

Customer-facing interfaces (Customer Edge - Provider Edge)

WS-X6548-RJ-45

WS-X6516-GBIC

Core-facing interfaces (Provider Edge – Provider Edge)

OSM-40C12-POS-MM

OSM-4GE-WAN-GBIC

OSM-10C48-POS

**Industry's
FIRST
Comprehensive
Solution**

✦ Operational Support System (OSS)/Network Management System (NMS)

Enhanced MIB support

Cisco IP Solution Center (ISC) 3.1 enhancements

Agenda

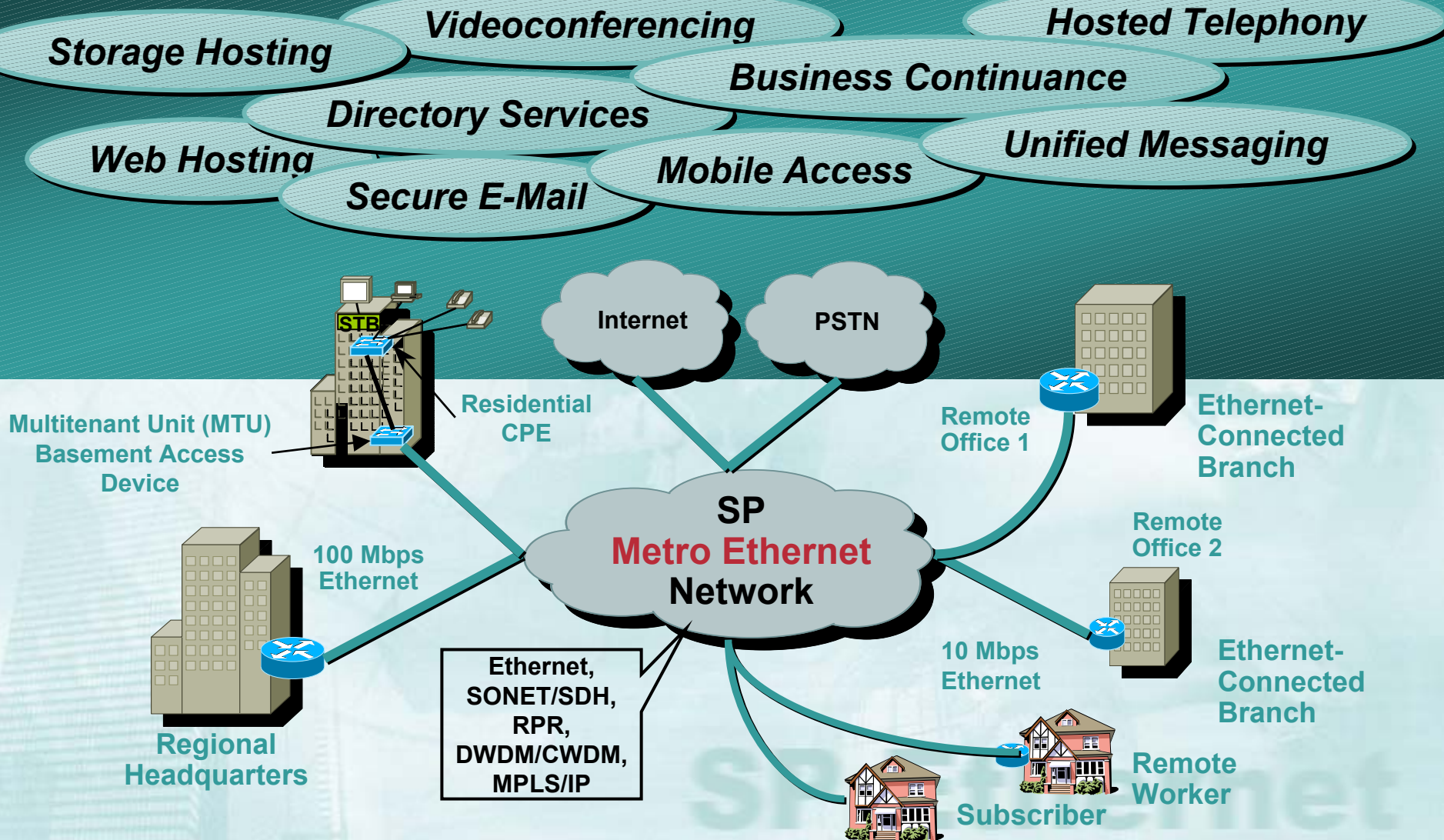
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Metro Ethernet: Emerging Multiservice Access Opportunity

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Metro Ethernet: Business Drivers*

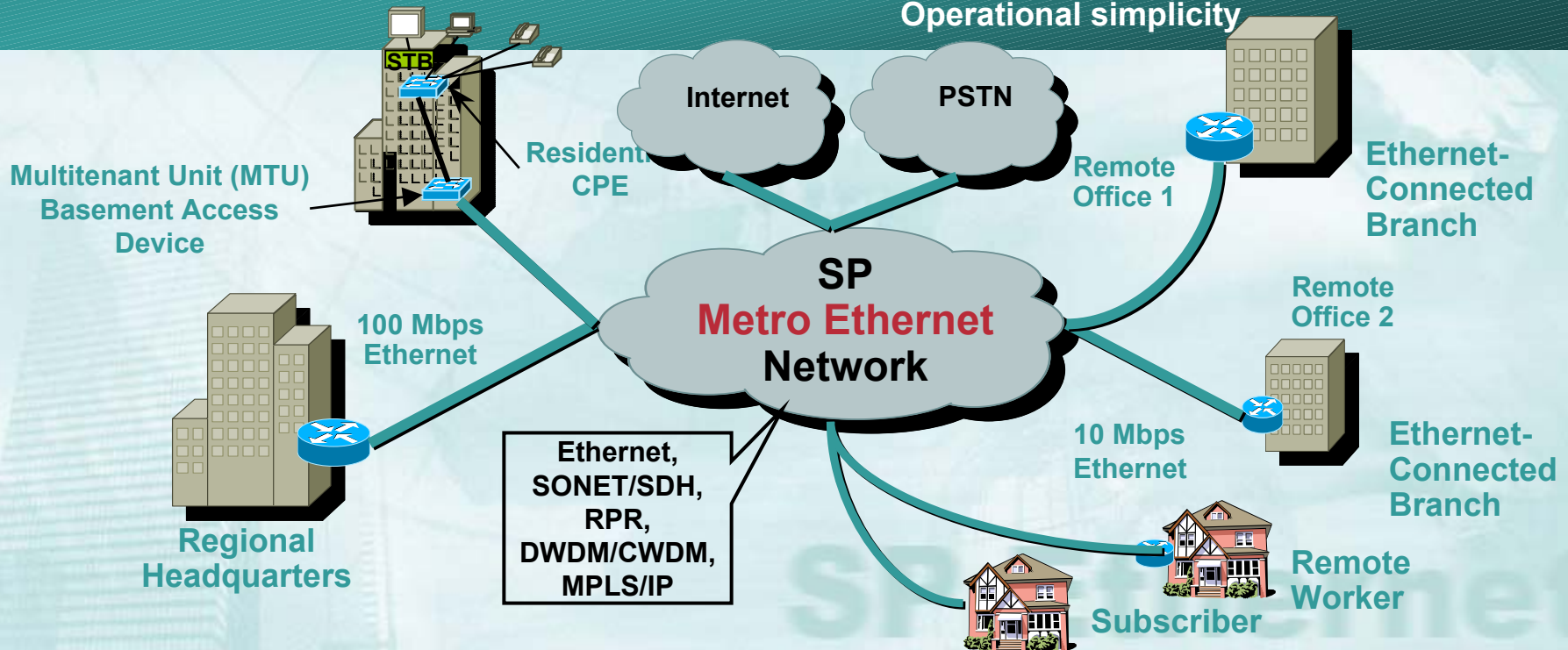
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Service Provider

- Revenue growth
 - New, differentiated services
 - Expanded enterprise penetration
- Cost efficiencies
 - Network convergence
 - Flexible bandwidth provisioning
 - Best value for increased bandwidth

Enterprise

- Business demands
 - Increased productivity
 - Peer-to-peer applications
- Service expectations
 - Scalable bandwidth (from 1Mbps to 1Gbps)
 - Customized services
 - Multipoint connectivity
 - Operational simplicity

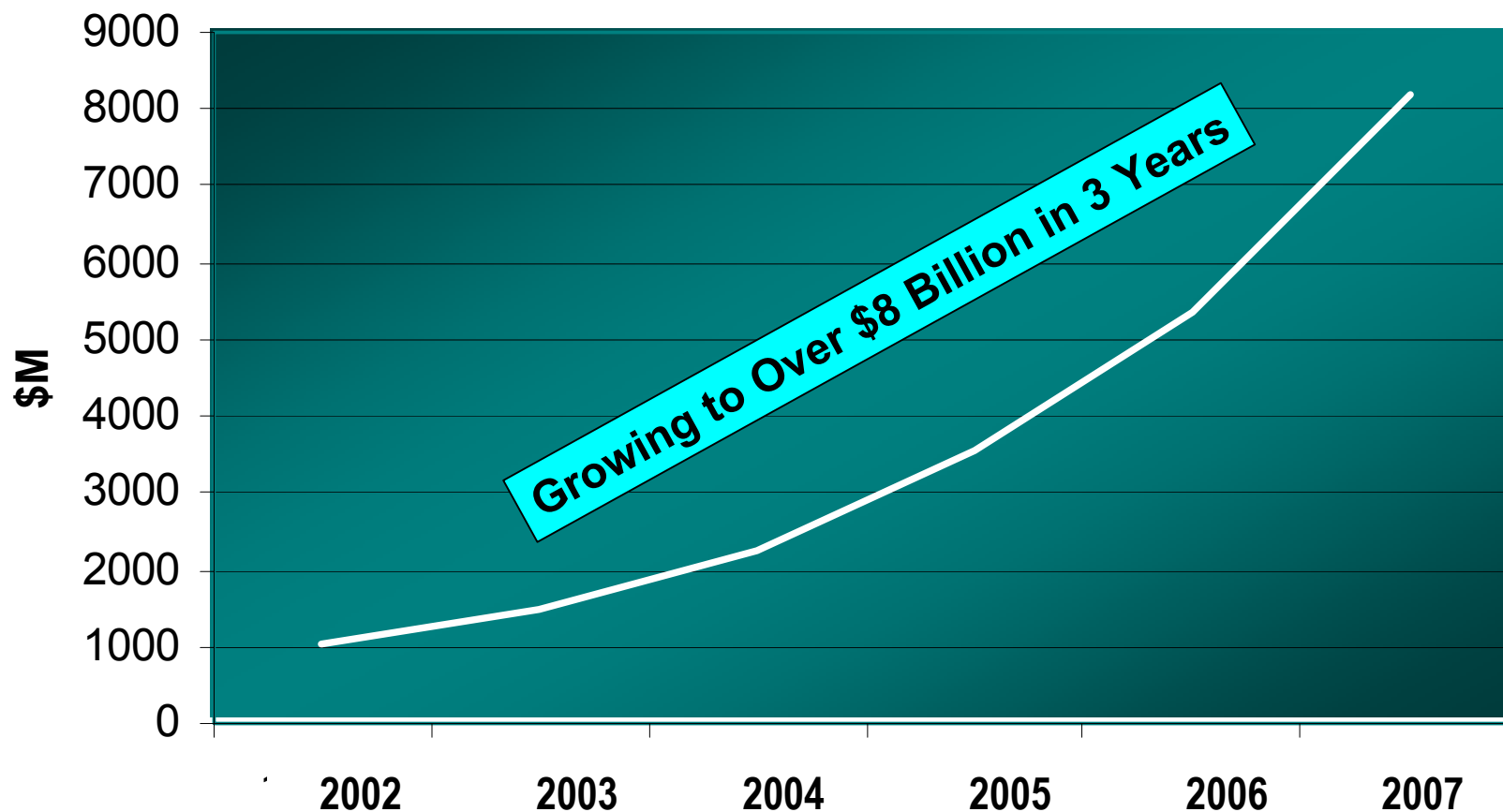


*Cisco VPLS Statement of Direction http://www.cisco.com/en/US/products/hw/routers/ps368/products_white_paper09186a00801df1df.shtml

Metro Ethernet: Revenue Opportunity

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Worldwide Metro Ethernet Services Revenue 2002-2007*

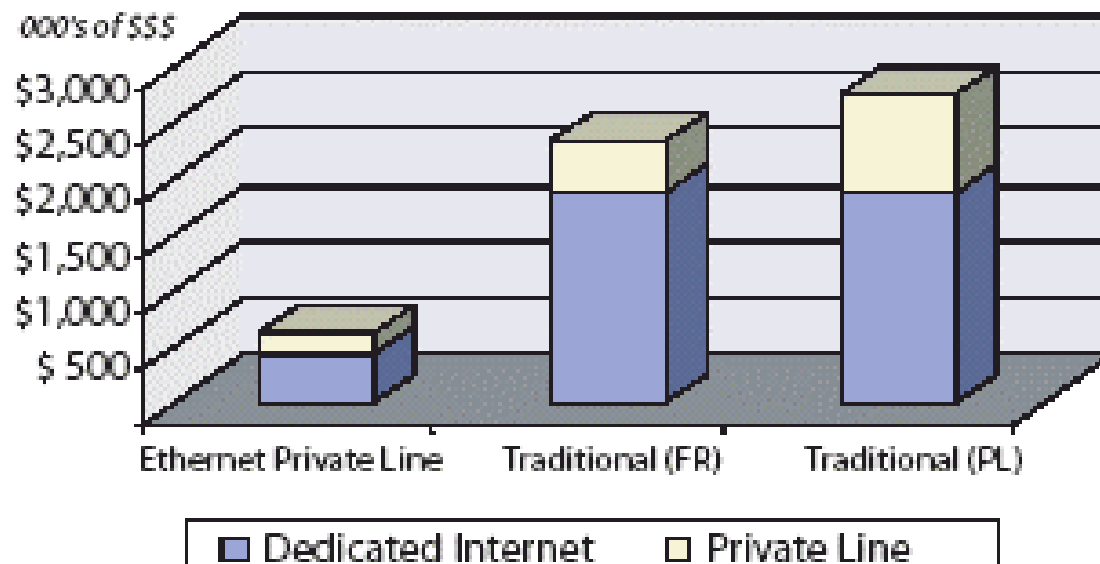


* Combines IDC US & Asia Reports, 2002 & 2003

Metro Ethernet: Cost Savings for Enterprise Customers

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3-Year Total Cost Comparison



3-Year Total Savings

% Savings over Traditional Metro (Frame Relay)

\$\$\$	\$1,700,052
%	73%

Savings over Traditional Metro (Private Line)

\$\$\$	\$2,129,481
%	77%

*'Metro Ethernet Services for Enterprises' White Paper, Metro Ethernet Forum, Oct. 2002

SP Ethernet

The Ethernet Advantage

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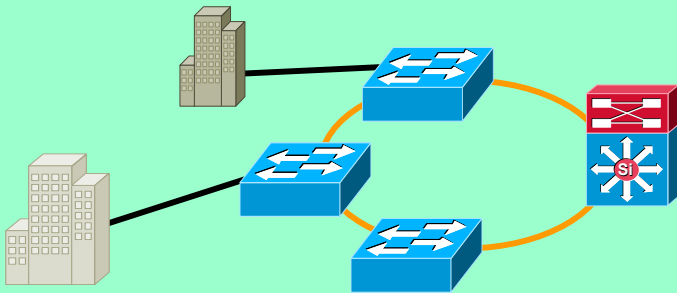
- Connectionless, IP aware-operation
- Distributed intelligence
- Inexpensive, scalable bandwidth options
- L2 VPNs
 - Point-to-point
 - Multipoint
- L3 VPNs
- High speed transport enables innovative services and applications
 - Storage, IP video conferencing
- Value added services
 - IP Telephony
 - IP video conferencing
 - High speed, bBusiness class Internet
 - Managed Security
 - Managed Storage



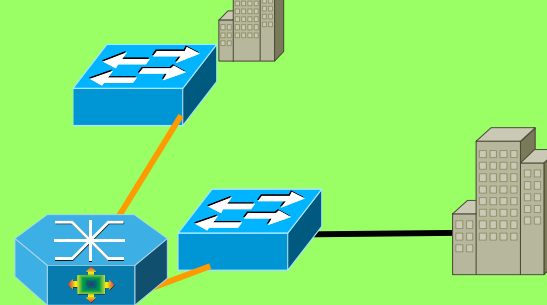
Metro Ethernet: Existing Architectures Based on L2 Switching

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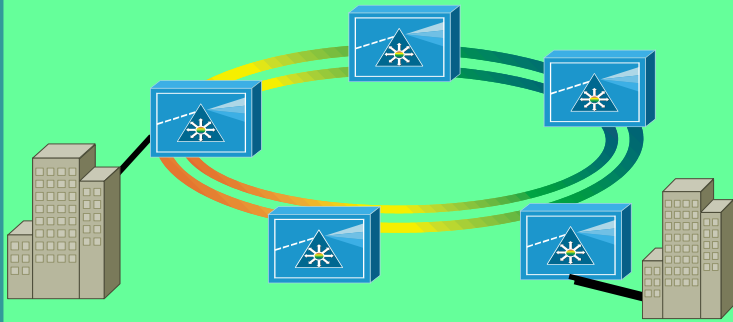
Architecture A: GE Ring



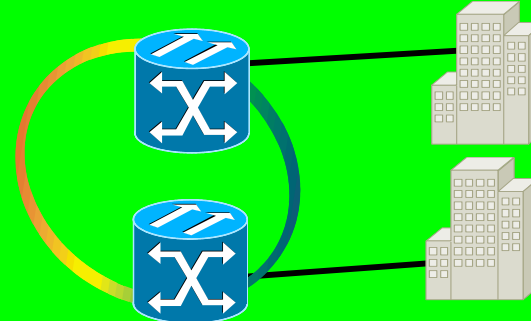
Architecture B: Hub & Spoke



Architecture C: DWDM/CDWM



Architecture D: SONET/SDH Ring



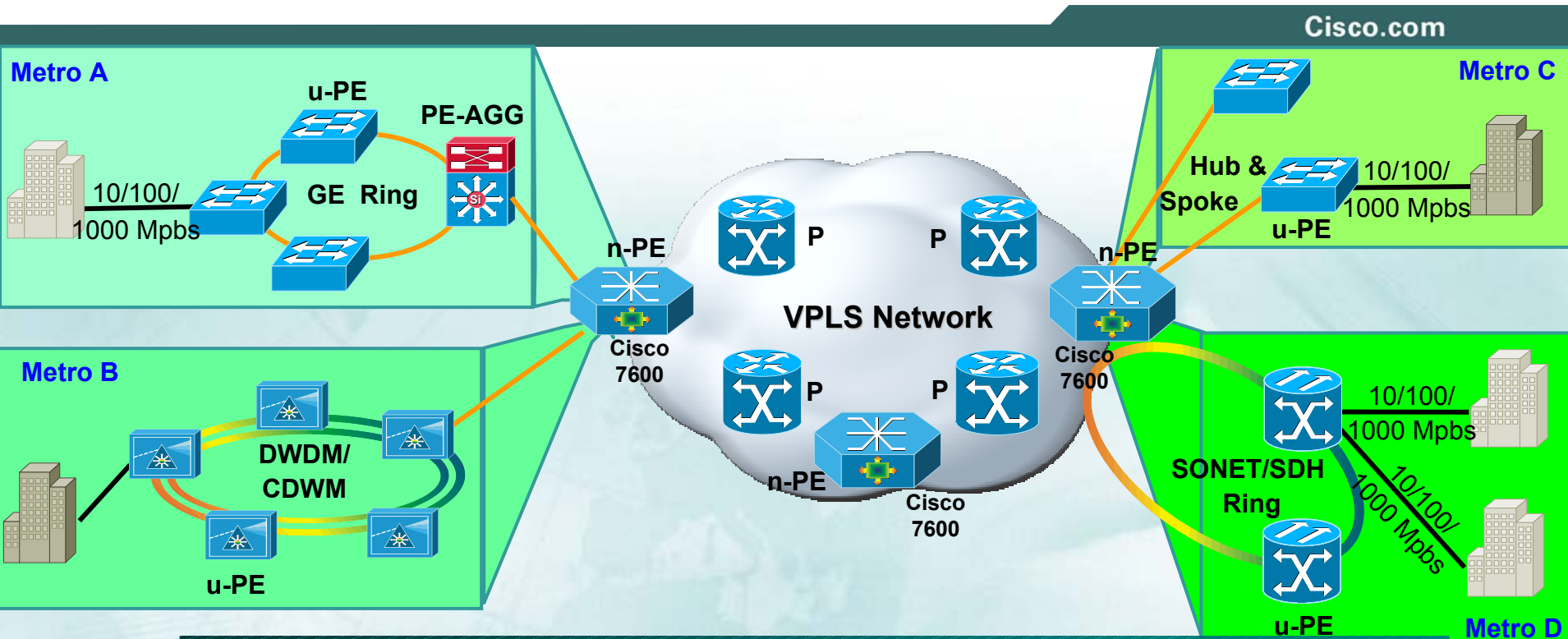
Strengths

- Multipoint topologies
- Supports transparency
- Relatively low CapEx
- High bandwidth

Weaknesses

- Limited scalability
 - Number of customers
 - Location of customers
- Limited service definitions
 - L2 VPN only for now

VPLS Overview for Metro Ethernet



- Delivers Ethernet-based multipoint L2 VPN service
- Enhances L2 VPN scalability (geographic sites & no. of customers)
- Uses existing SP MPLS Core
- Supports operational speeds of 1 Gbps to 10 Gbps
- Is on track for IETF standardization: Draft Lasserre Kompella
- Uses familiar Ethernet user network interface

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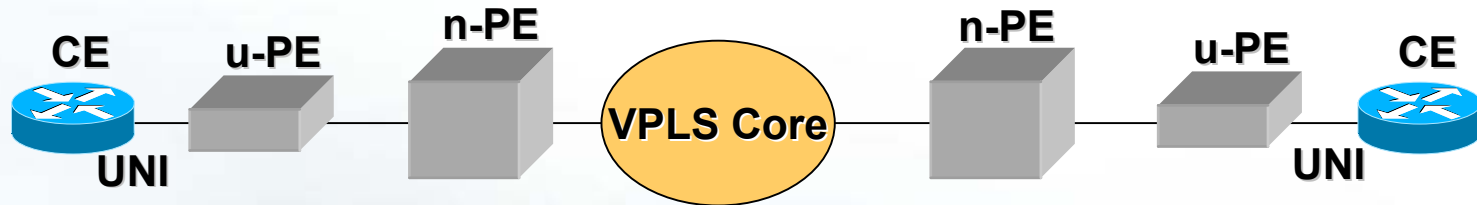
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VPLS Terminology

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CE Customer Equipment

PE Provider Edge

u-PE User-Facing Provider Edge (Provider Edge Customer-Located Equipment)

n-PE Network Provider Edge (Provider Edge Point of Presence)

UNI User Network Interface

Q-in-Q SP Ethernet encapsulation where a 2nd 802.1Q header is added for customer identification

CE-VLAN VLAN (tag) between CE and UNI

PE-VLAN VLAN (tag) within Service Provider Network

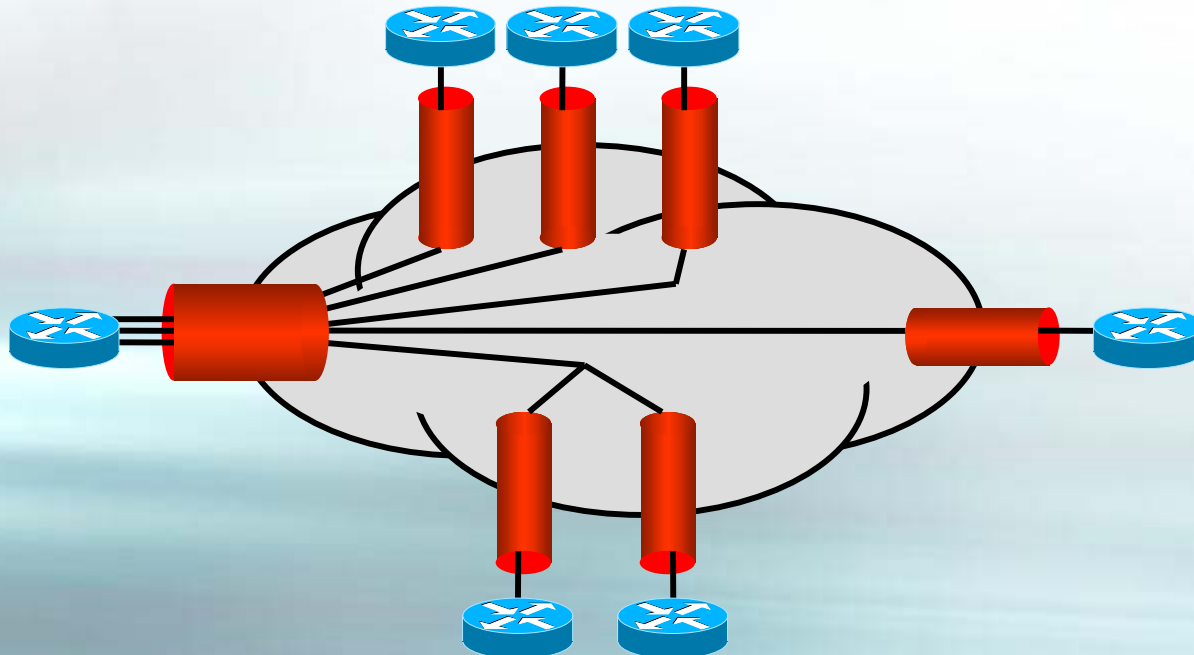
VEC Virtual Ethernet Circuit (Logical circuit between 2 UNIs. UNIs are based on Ethernet technology. Also referred to as EVC.)

VSI Virtual Switch Instance (Association of multiple VECs in a n-PE where forwarding decisions between associated VECs can occur based on Ethernet Switching mechanisms.)

VPLS Concepts: Point-to-Point Services

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Point-to-Point Service Types
Ethernet Relay Service (ERS)
Ethernet Wire Service (EWS)



- Similar to Frame Relay for point-to-point services
- Circuit multiplexing allowed for ERS but not for EWS
- SP assigns VLAN value for ERS, but not for EWS
- Supported by original EoMPLS standard (Martini Draft)

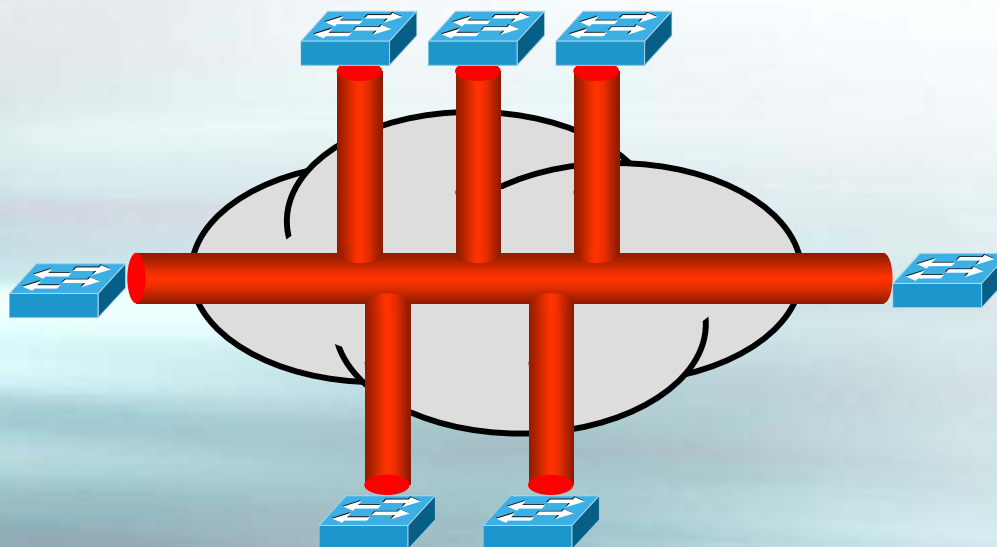
VPLS Concepts: Multipoint-to-Multipoint Services

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Multipoint Service Types

Ethernet Multipoint Service (EMS)

Ethernet Relay Multipoint Service (ERMS)



- End customer sees service as an Ethernet broadcast domain
- End customer has transparency to Ethernet protocol with EMS, but not with ERMS
- Circuit multiplexing allowed for EMS, but not for ERMS
- End customer can connect Layer 2 or Layer 3 Ethernet devices

Metro Ethernet: Different L2 VPN Service Options

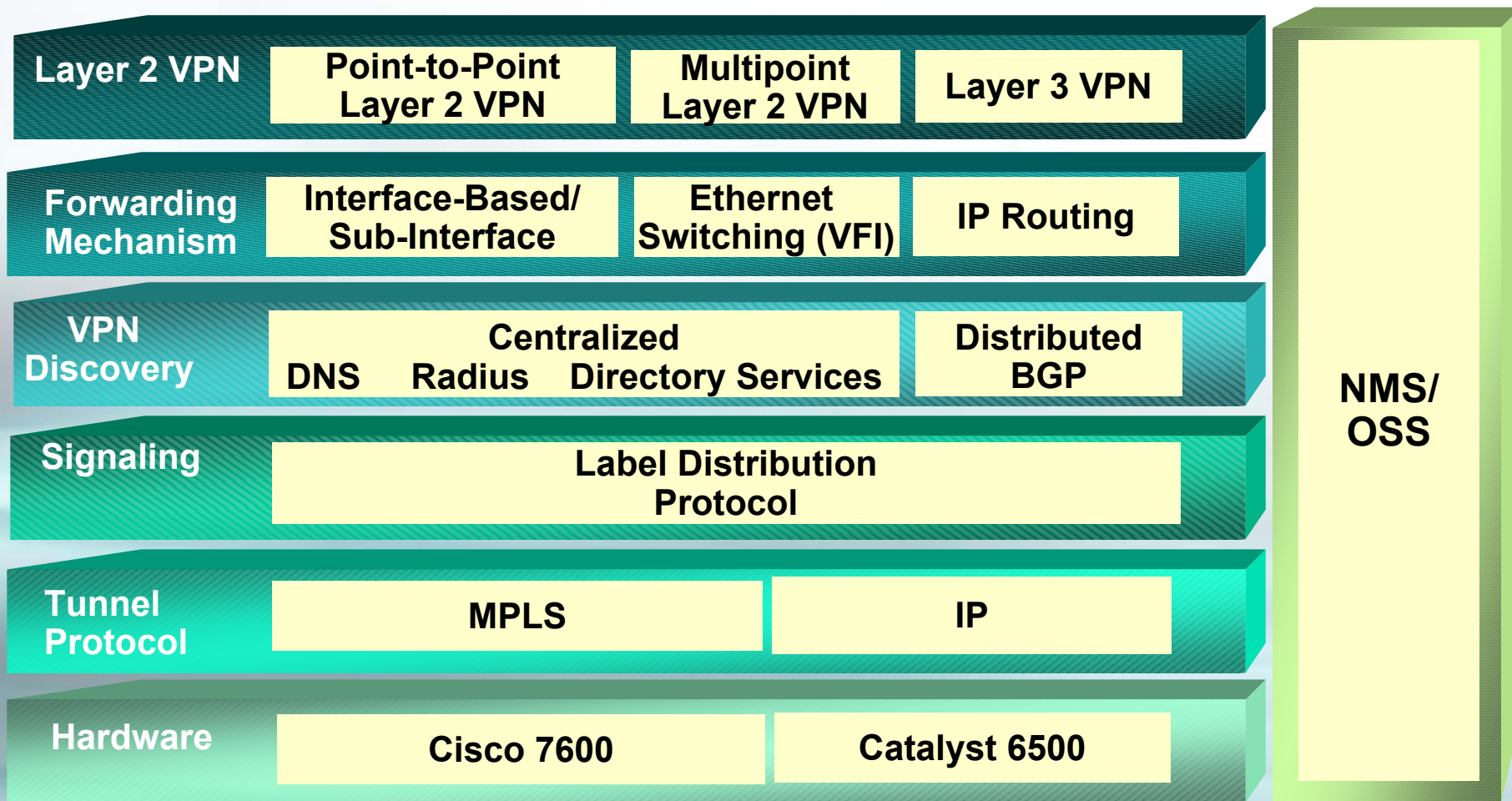
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Service Definition	Point-to-Point (PtP)	Multipoint (Mpt)
Multiplexed Services	Ethernet Relay Service	Ethernet Relay Multipoint Service
Transparent Services	Ethernet Wire Service	Ethernet Multipoint Service

*VPLS supports
these multipoint
services*

Cisco VPLS Building Blocks

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A Comprehensive Solution: Robust, Flexible, Scalable, Manageable

Agenda

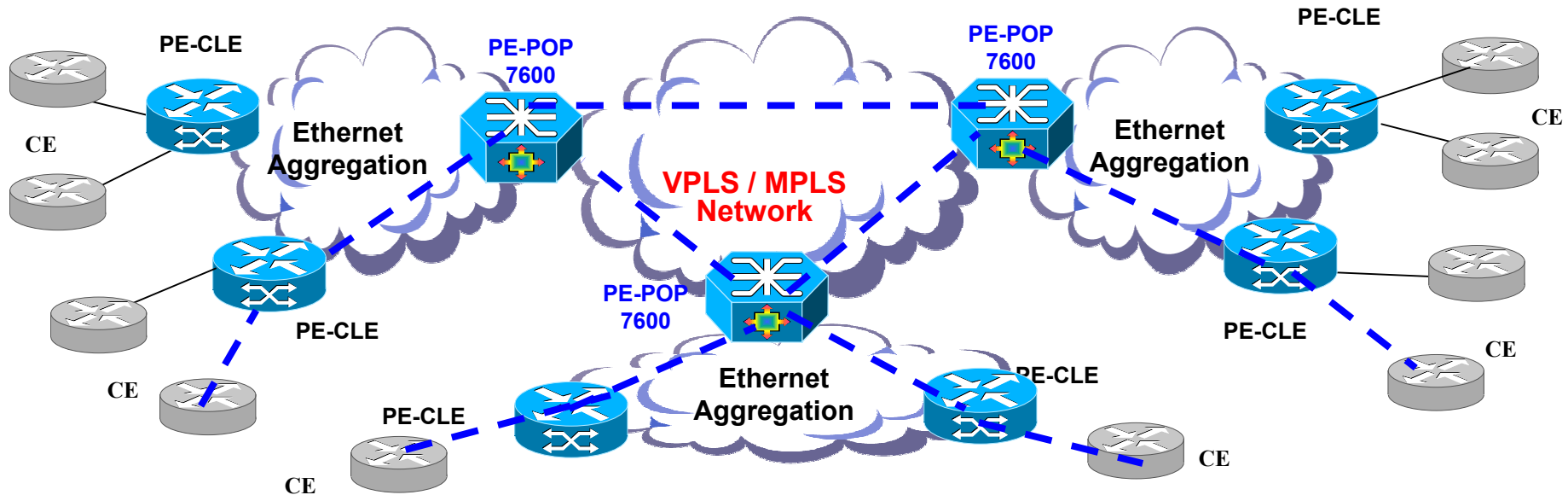
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VPLS: Typical Deployment Scenario

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Benefits of VPLS:

Improves scalability and reliability of traditional Switched Ethernet networks

Simplifies provisioning for multipoint services for both SP and end user

Takes advantage of outstanding price/performance of GE and 10GE

VPLS is under evaluation in over 45 major service providers worldwide

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Policy-Based QoS for VPLS

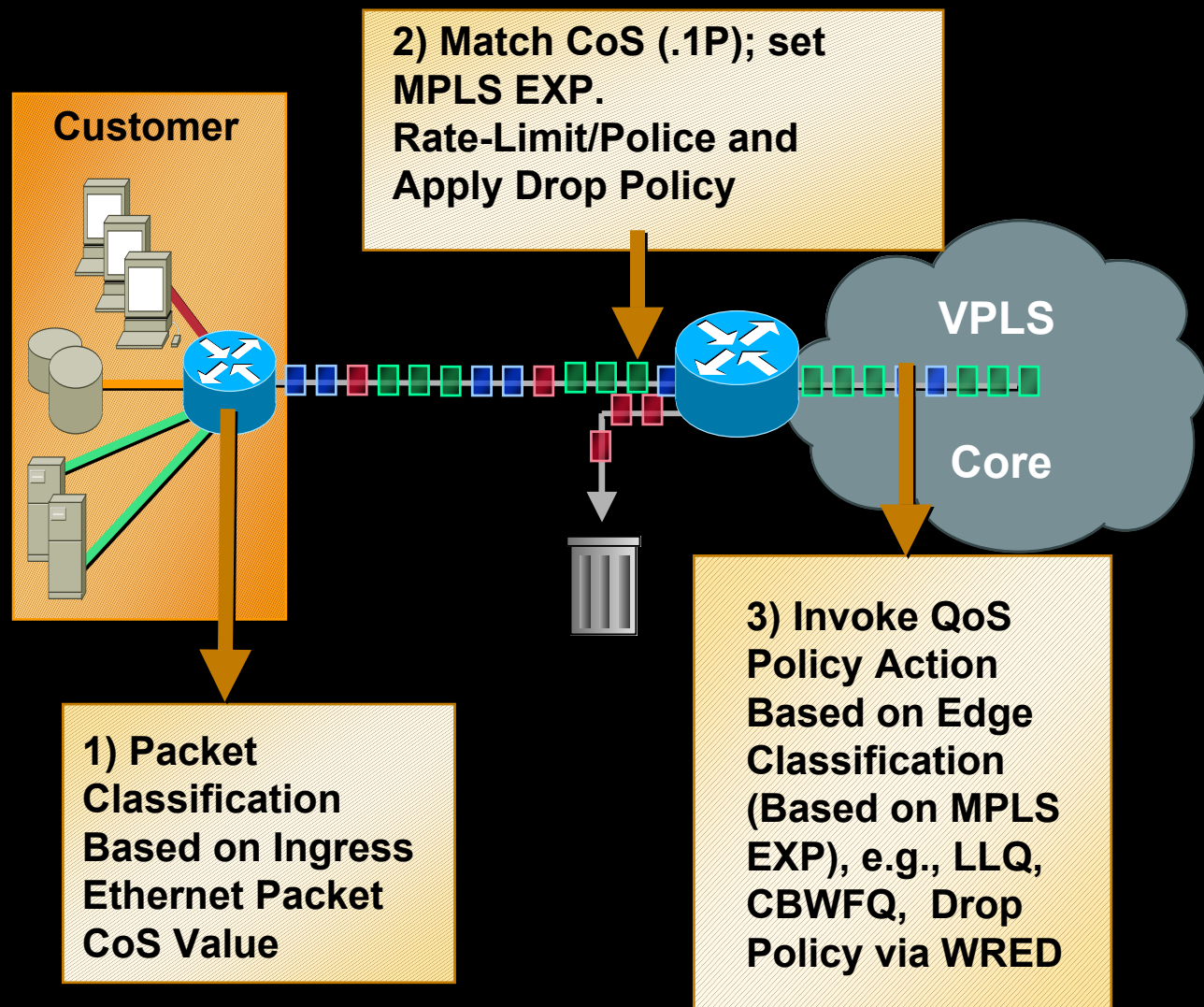
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- **New policy-based QoS application**

- QoS policy (profile) pre-definition
- QoS implemented as separate service
- Constraint matrix-based implementation to validate end-to-end Implementation

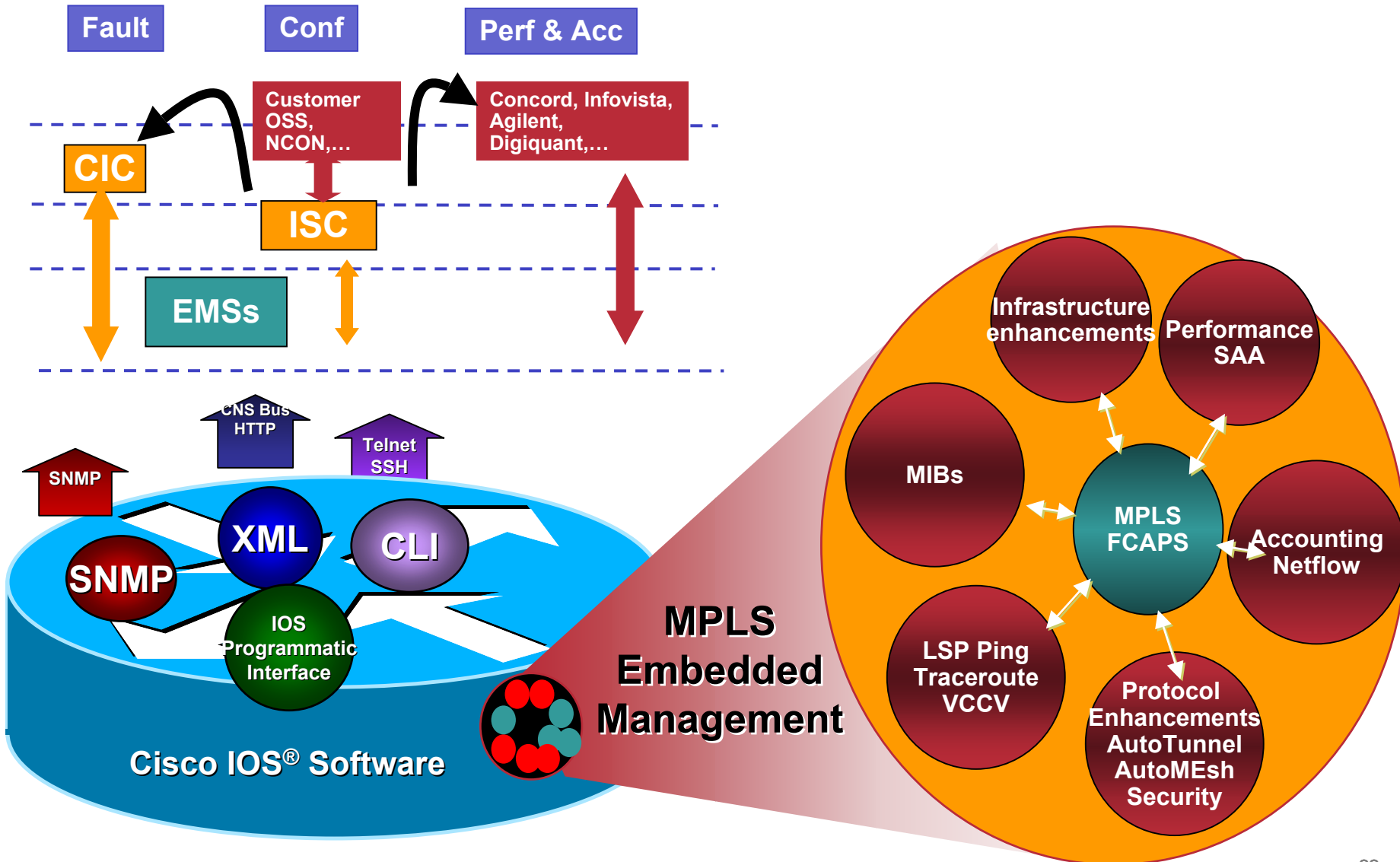
- **QoS design**

- QoS on access circuits
- QoS definition for core based on smart template utility
- QoS based on DiffServ architecture
- QoS implemented using MQC and non-MQC



Cisco IOS Management Available to VPLS

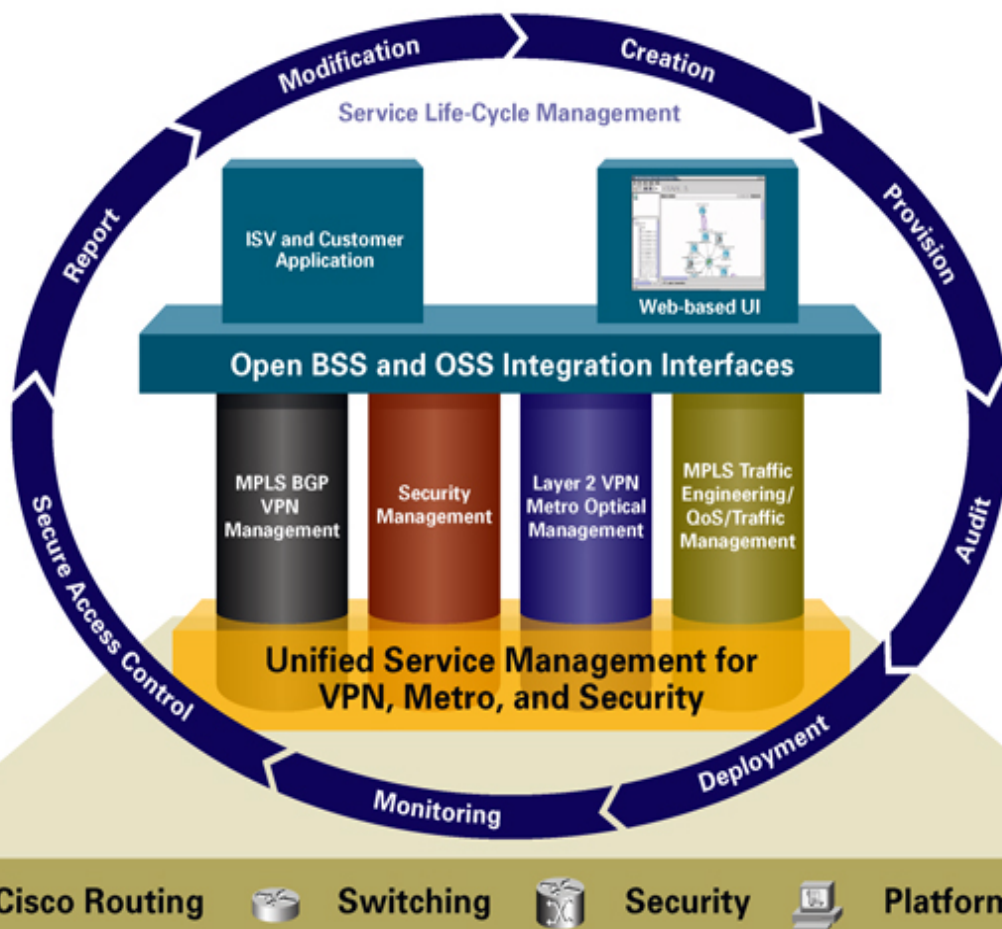
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Unified MPLS Management

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Cisco IP Solution Center



Integrated network management platform to manage:

- **Metro Ethernet Services** (switched as well as Ethernet transport over MPLS Core) services.
- **MPLS BGP VPN** services
- **AToM** (ATM/FR transport over MPLS) services
- **Diffserv/IP/ MPLS CoS** treatment for MPLS services above

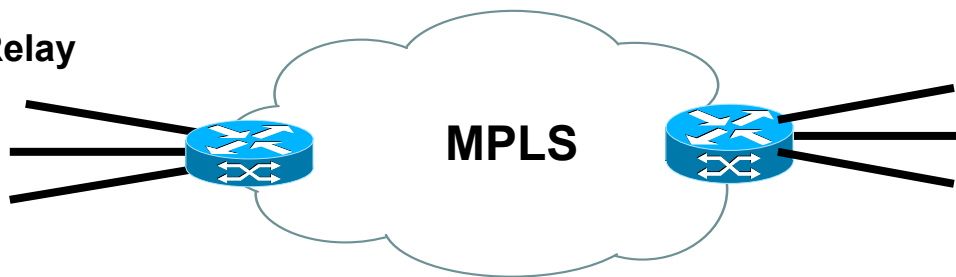
VPLS:

One of Many Cisco IOS MPLS Service Types

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	Point to Point	Multipoint
Layer 2	PWES, including Ethernet over MPLS ATM/Frame Relay over MPLS HDLC & PPP over MPLS L2 VPN Interworking L2TPv3	VPLS
Layer 3	GRE IPSec	MPLS L3 VPN

ATM/Frame Relay
Ethernet
PPP
Cisco HDLC
IP



ATM/Frame Relay
Ethernet
PPP
Cisco HDLC
IP

Cisco 7600 Metro Ethernet Router for VPLS

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- **Unique Multilayer Forwarding Architecture**

- Layer 2 Ethernet switching

- IPv4, IPv6

- MPLS L3 VPN

- EoMPLS, VPLS

- PPPoEoV (MWAM)

- **Outstanding Price/Performance**

- 30 – 200+ Mpps routing performance

- Up to 720 Gbps bandwidth

- **Scalable & Diverse Physical Connectivity**

- Leased-line interfaces from DS0 to OC-48/STM-16

- High-density Ethernet from 10Mbps to 10Gbps

- High density for T3/E3, OC-3/STM-1 and OC-12/STM-4

- **Outstanding Investment Protection**

- Support for Cisco® 7500 port adapters

- Support for Catalyst® 6000 LAN Modules

- **Versatile Range of Network Services**

- Per-subscriber QoS, including ACL, LLQ TS, and Layer 4-7 CDN

- Service blades: Firewall, IP Sec, NAM, SSL Term

Cisco 7603



Cisco 7606



Cisco 7609



A comprehensive solution: Robust, flexible, scalable, manageable

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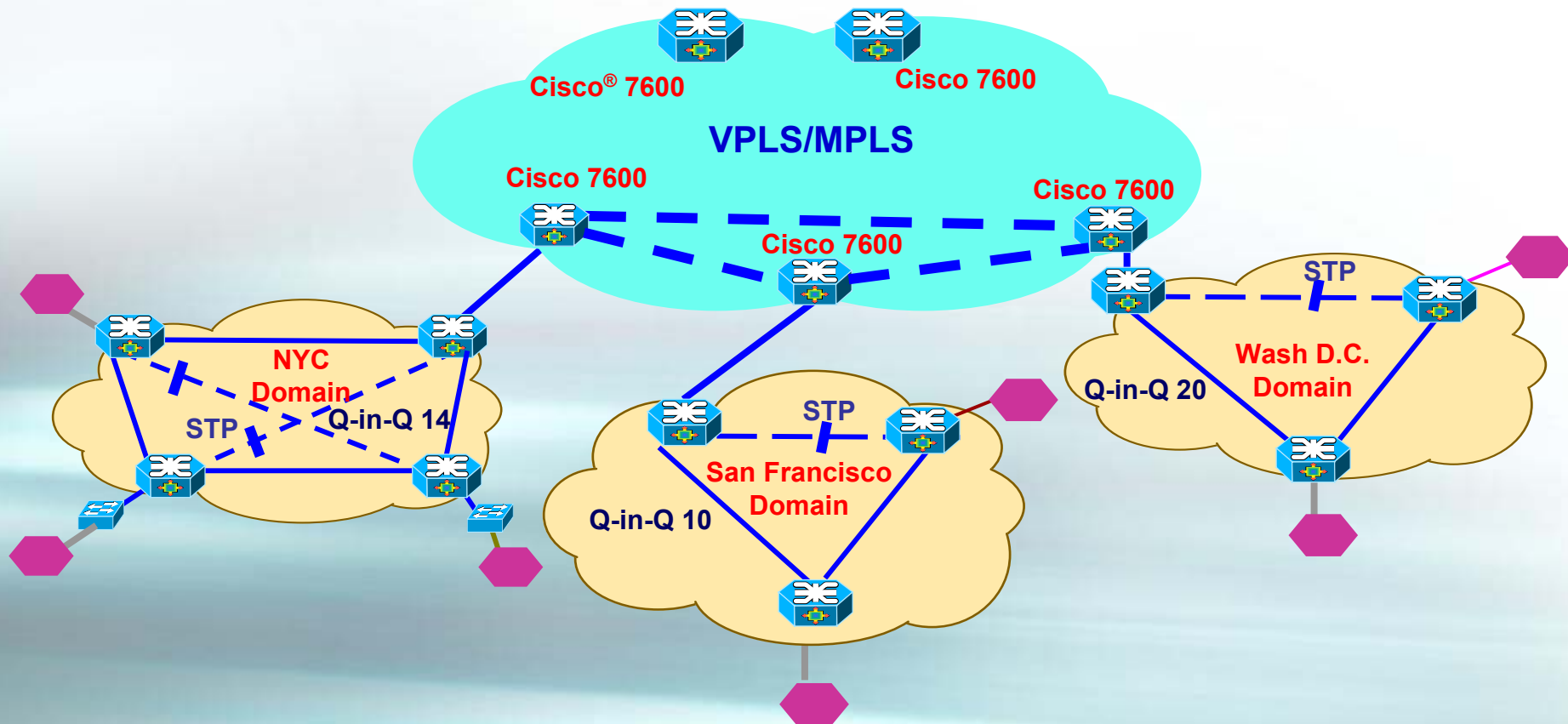
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VPLS Typical Deployment

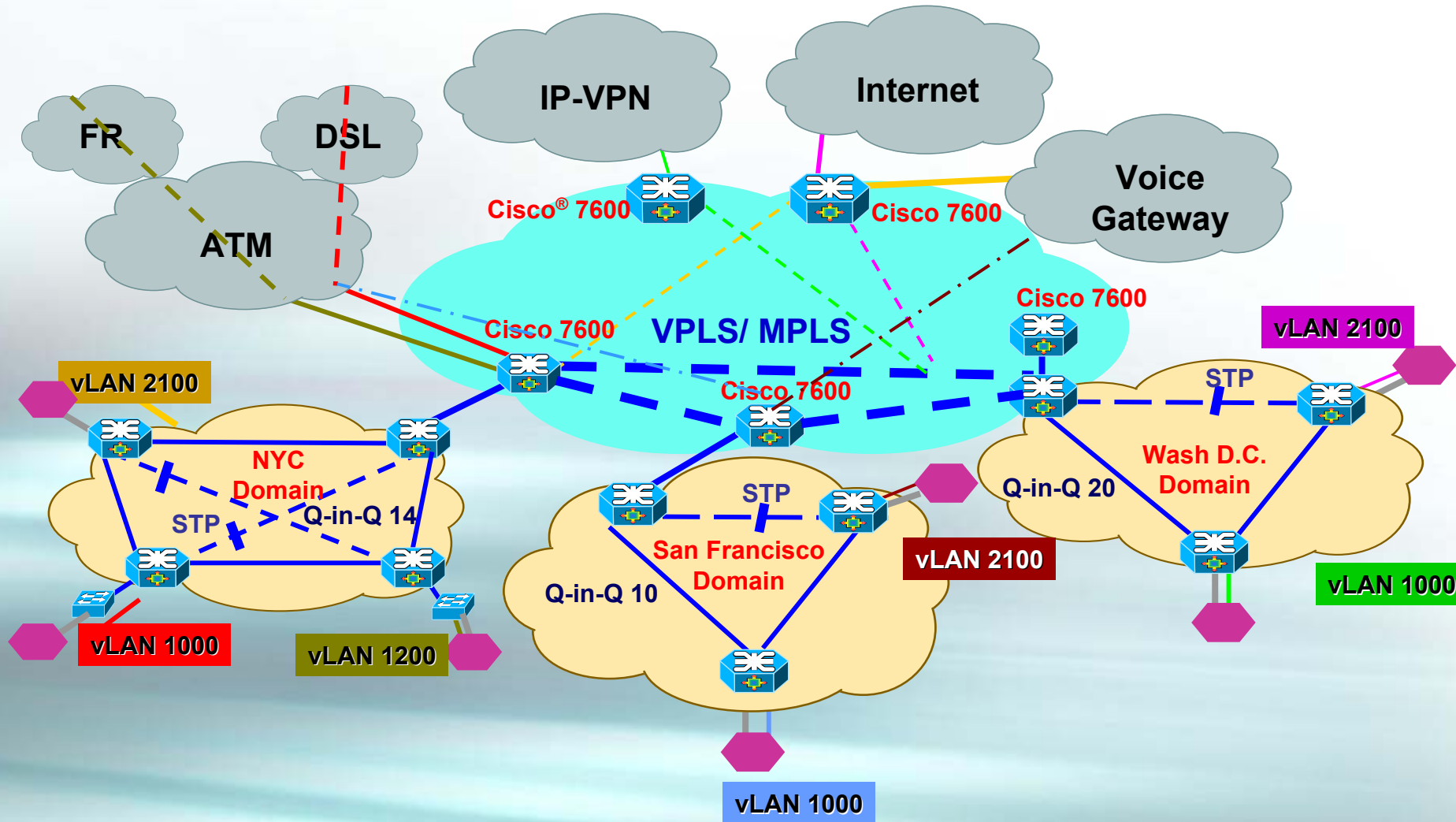
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A comprehensive solution: Robust, flexible, scalable, manageable

Integration of VPLS with Multiservice Access

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A comprehensive solution: Robust, flexible, scalable, manageable

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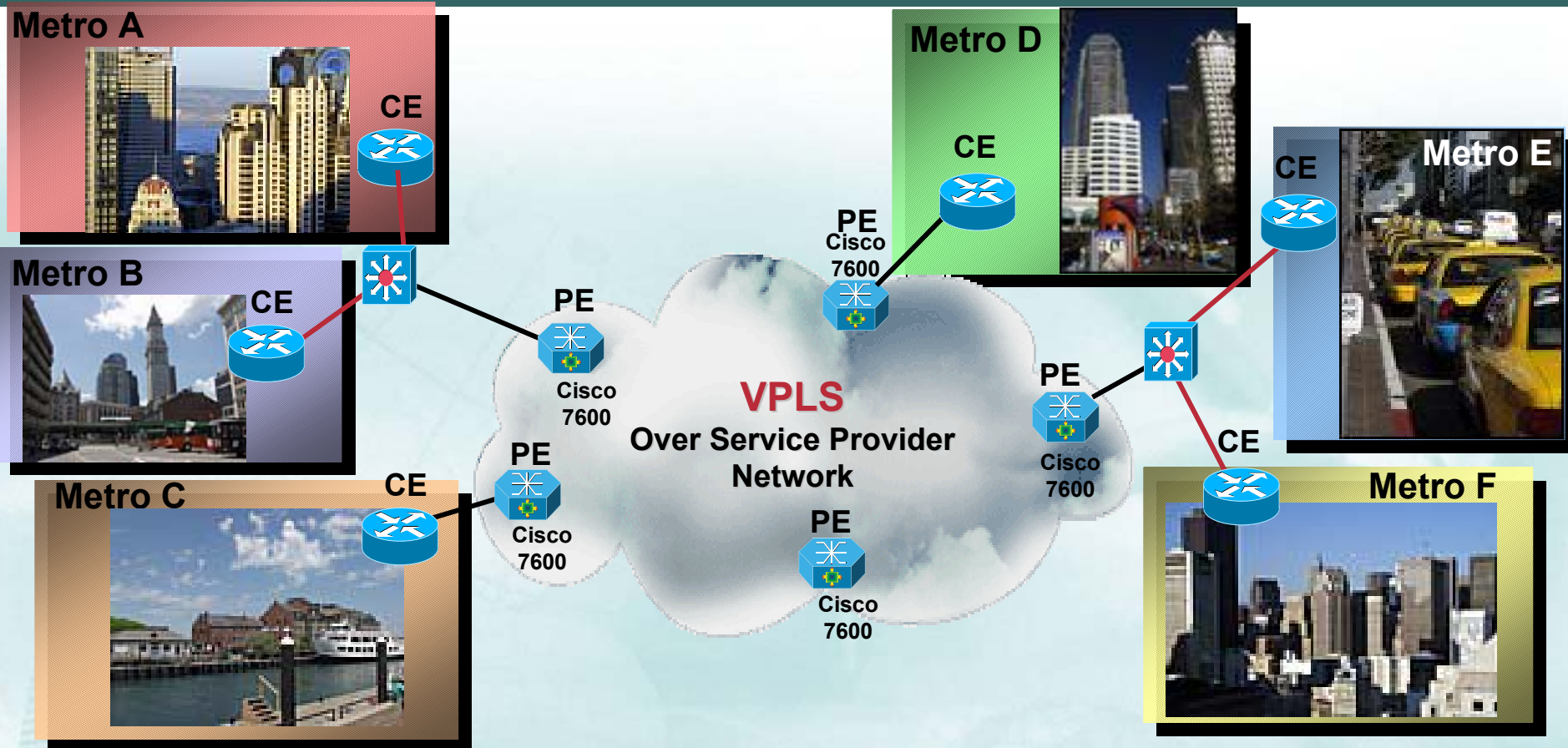
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Cisco VPLS Summary

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Cisco IOS® MPLS Virtual Private LAN Service (VPLS) with Cisco® 7600 enables flexibility in deploying and managing innovative services that increase productivity and operational efficiencies by connecting geographically dispersed sites as one giant LAN over high-speed Ethernet in a robust and scalable IP/MPLS network.

World-Class Customer Support

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- **2000** technical support professionals
- **1600+** support engineers* (400 with CCIE® certification) on 24 hours
- **630+** depots and **10,000** field engineers in **120** countries*
- **85,000+** assisted cases/month
- **321,000** customer issues resolved/month
- **75%** TAC Web resolved: of **25%** assisted, **64%** were Web-initiated
- **98%** material availability
- **92%** orders submitted online, **55%** “no touch”
- **60%** change orders submitted online

Customer Advocacy Mission

Accelerate customer success with Cisco® through innovative services and world-class people, partners, process, and tools.



* Internal & Outsource Partners

Cisco Leads in the MPLS Market

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Americas

EMEA

AsiaPac/Japan

Some **200** Customers (MPLS Core & Layer2/3 Edge)



Cisco IOS MPLS

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Smarter
The foundation for more
services and more
revenues

**Enabling
Innovative
Services**

Faster
A flexible QoS framework
to enable migration to a
converged infrastructure

Lasting
Extensibility to different
transports with standards-
based open architecture
for investment protection