Network Architectures

Services and Applications for Carrier IP Networks

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Opportunity for IP Services

✝ **Basic Connectivity**

  ✝ Limited revenue potential — "all you can eat" pricing
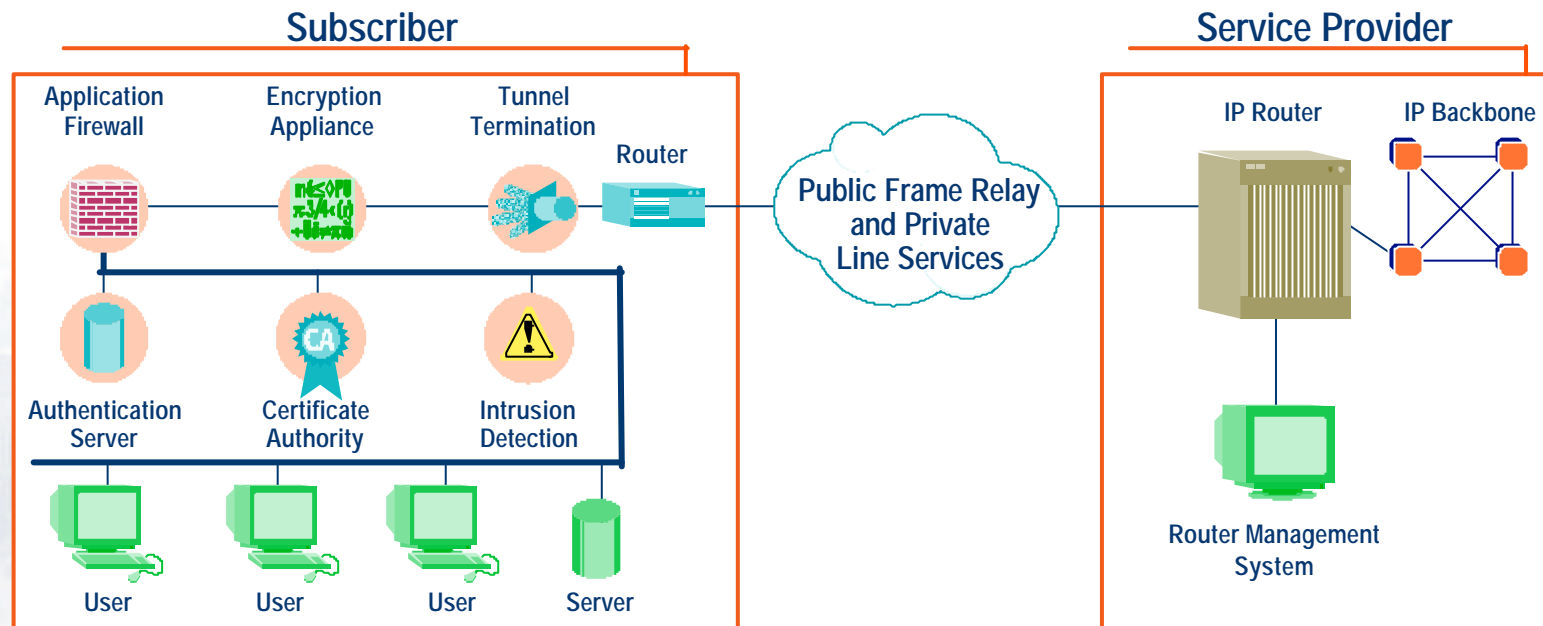 ✝ Internet access is a commodity

✝ **Managed Customer Premises-based IP Services:**

  ✝ Lengthy time to market: Need for "truck roll" constrains profitability by delaying service turn-up
  ✝ Revenue potential limited by high operational, management and maintenance costs
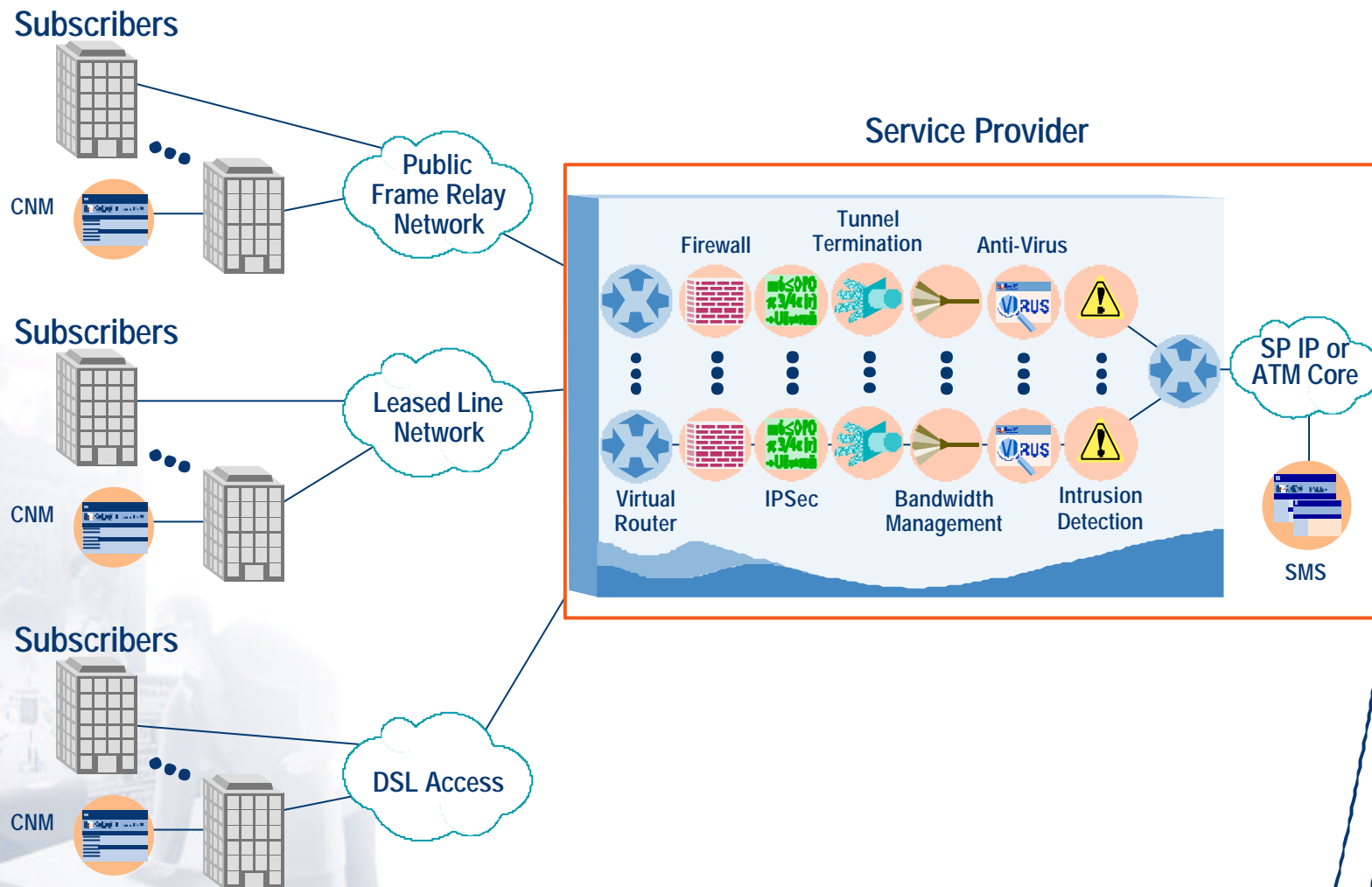 ✝ Lack of point product integration results in sluggish performance and dissatisfied subscribers

✝ **Managed Network-based IP Services**

  ✝ Centralized service creation, delivery and management results in immediate turn-up and reduced operational costs
  ✝ New revenue opportunities with customized service packages

Apricot 2001
www.cosinecom.com
February, 2000

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Current Customer Network

Subscriber

Service Provider

Application Firewall

Encryption Appliance

Tunnel Termination

Router

IP Router

IP Backbone

Public Frame Relay and Private Line Services

Authentication Server

Certificate Authority

Intrusion Detection

User

User

User

Server

Router Management System

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Network Based Service Delivery: Scalable IP Services Layered Over Basic Connectivity

Subscribers

CNM

Public Frame Relay Network

Subscribers

CNM

Leased Line Network

Subscribers

CNM

DSL Access

Service Provider

Firewall

Tunnel Termination

Anti-Virus

Virtual Router

IPSec

Bandwidth Management

Intrusion Detection

SP IP or ATM Core

SMS

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Where do Services fit into the Network?

Edge

Access Concentration

Service Processing

Internet

Remote Office

Remote Office

Remote Office

Frame Relay Switch

M13 Mux

DSLAM

Service Processing Switch

Service Processing Switch

SP IP, MPLS or ATM Core

Service Management System

Dial-up RAS

Dial-up User

Laptop

Corporate Headquarters

Customer Network Management System

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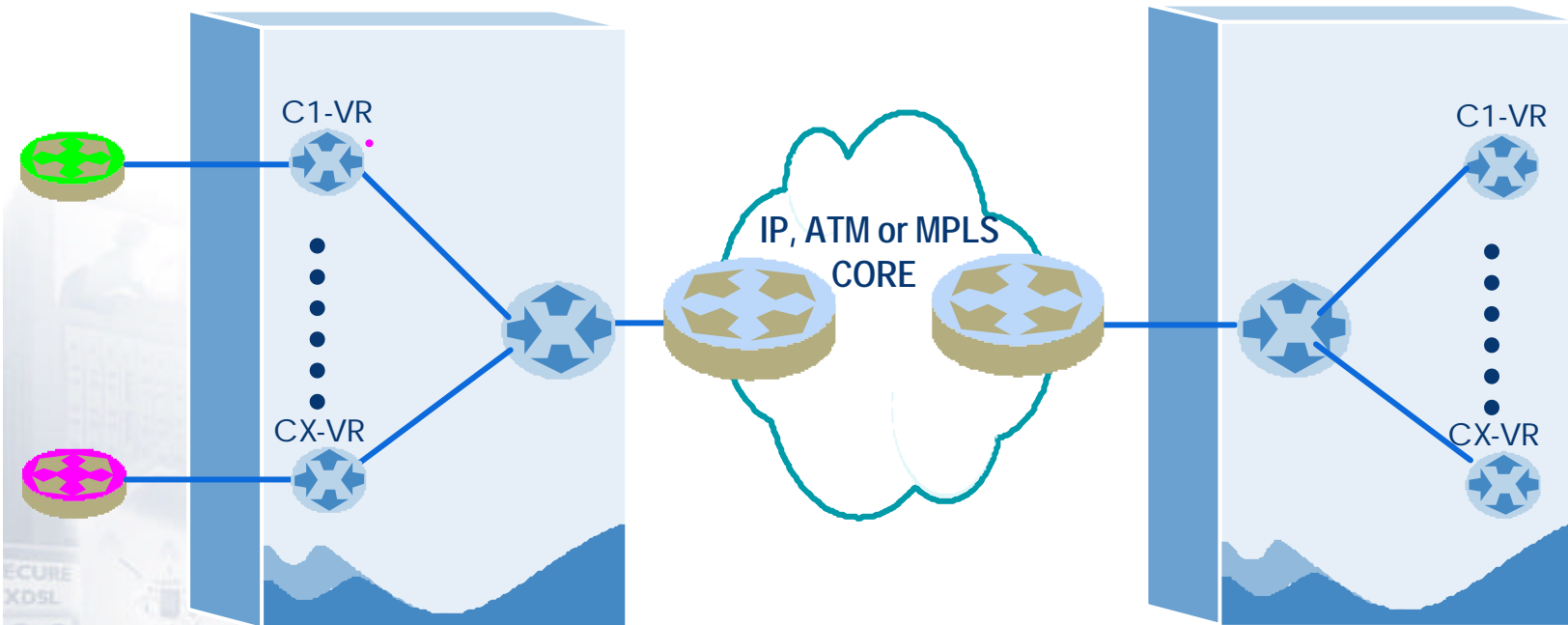COMMUNICATIONS
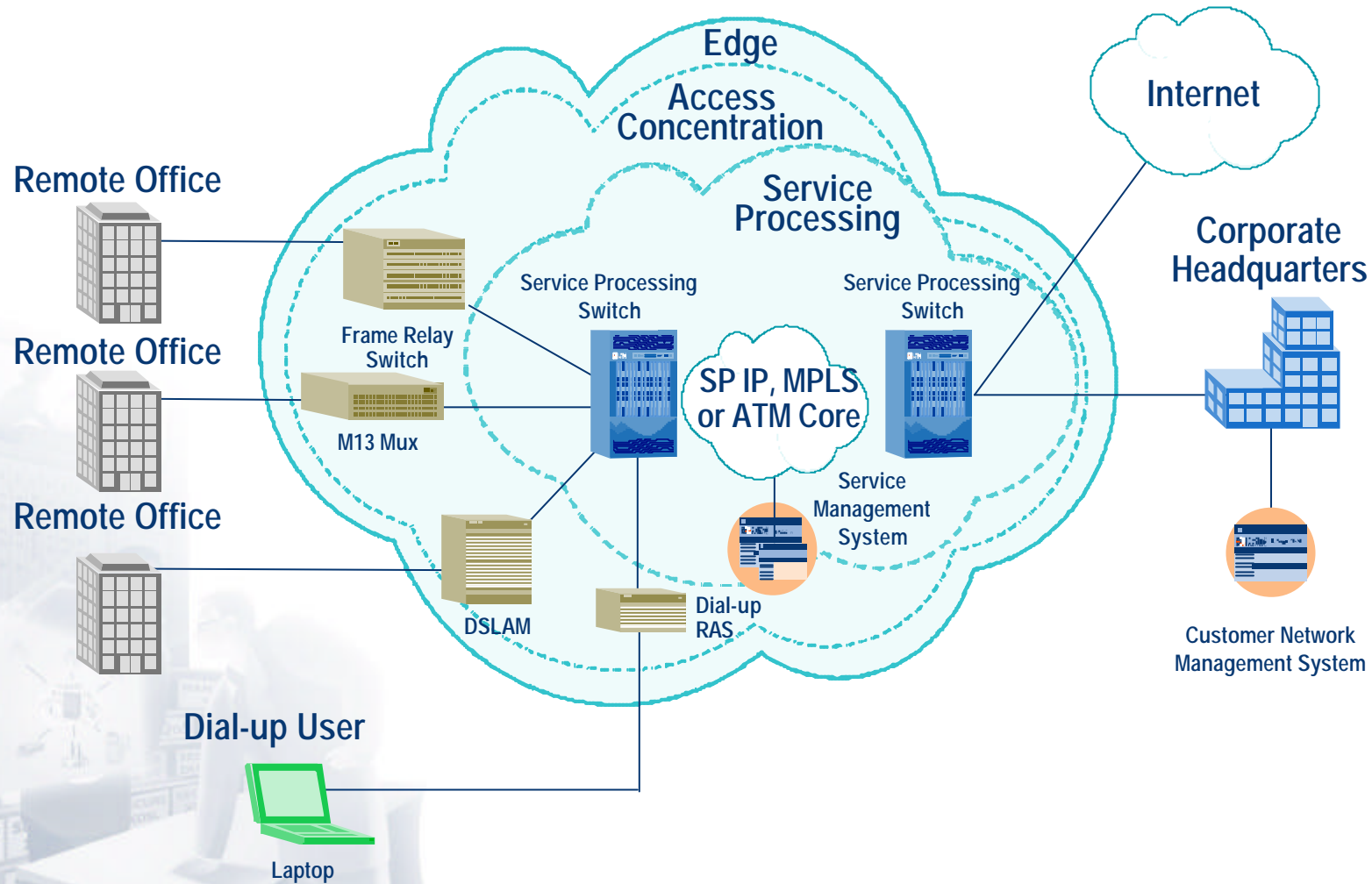
Virtual Routing:
The building block for Value Added Services

† **Each VR acts is equivalent to an independent hardware router**

† **Fully secured, no break-in capability e.g. Telnet**

† **Routing Protocols;**

  † Static, RIP, OSPF, BGP4, ISIS

† **Services applied at the VR Level**

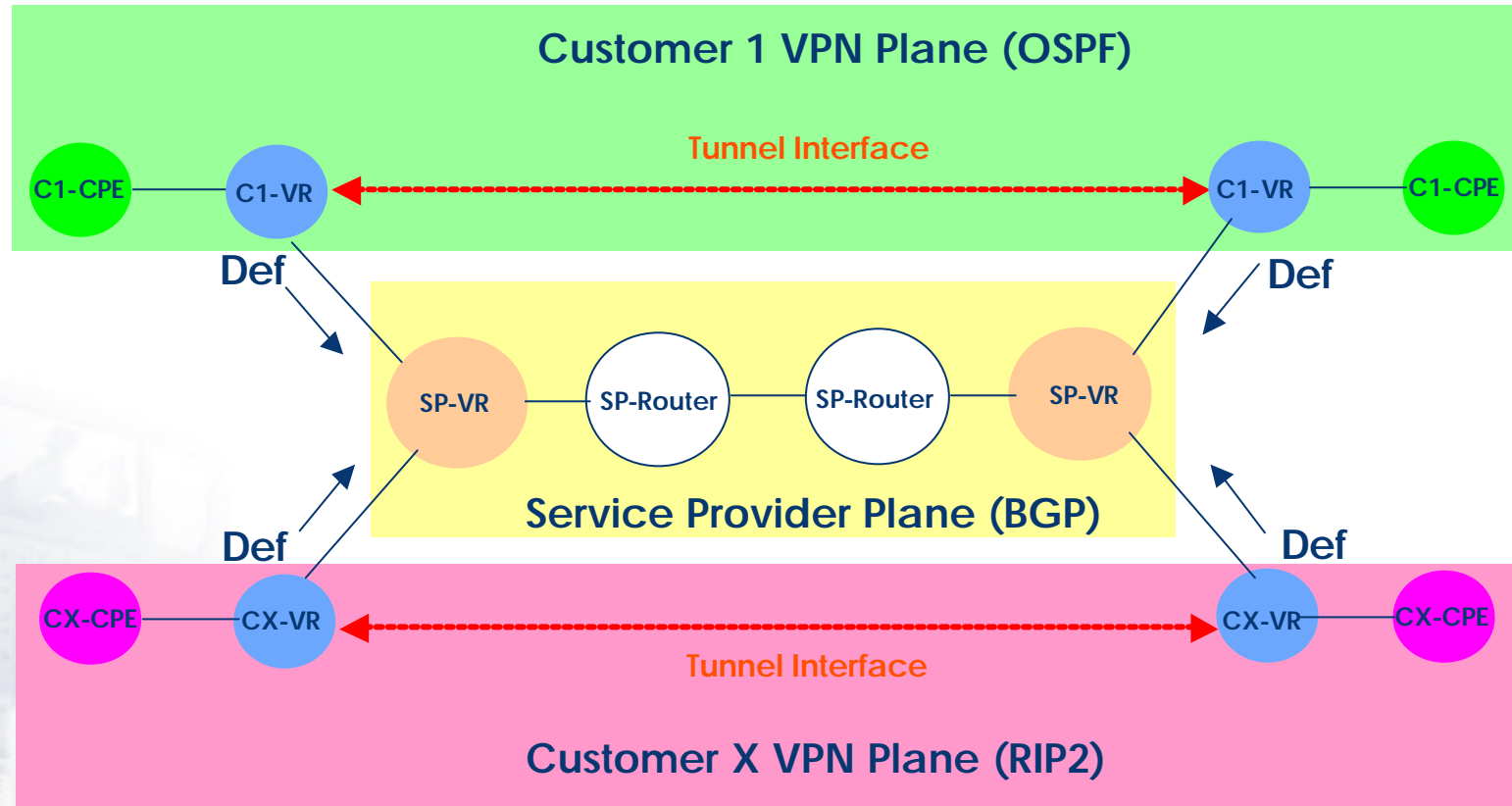† **Definable Servers per VR**

  † RADIUS

  † Syslog

  † DHCP
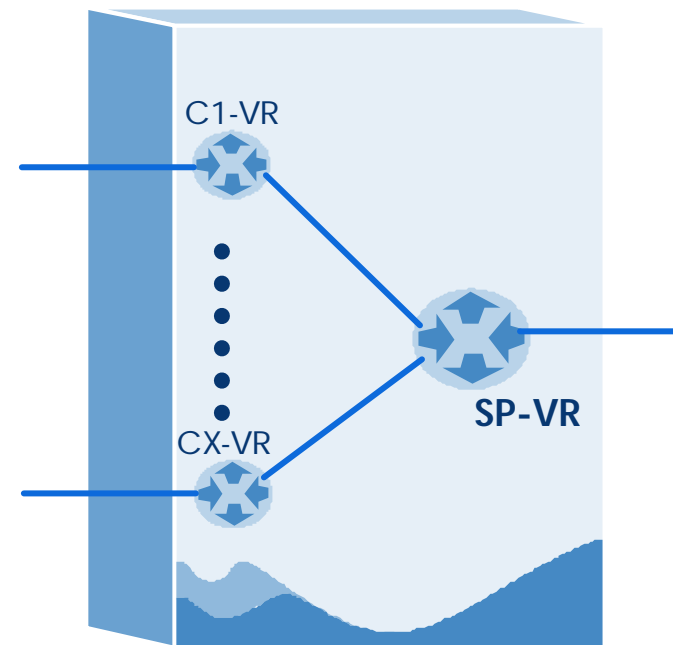
C1-VR

CX-VR

SP-VR

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Virtual Routing (VR)
– Separation of Subscriber/Provider Routing

C1-VR

CX-VR

IP, ATM or MPLS
CORE

C1-VR

CX-VR

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Virtual Routing (VR)
– Separation of Subscriber/Provider Routing

Customer 1 VPN Plane (OSPF)

Tunnel Interface

C1-CPE — C1-VR ◄┄┄┄┄┄┄┄┄┄► C1-VR — C1-CPE

Def **Def**

Service Provider Plane (BGP)

SP-VR — SP-Router — SP-Router — SP-VR

Def **Def**

CX-CPE — CX-VR ◄┄┄┄┄┄┄┄┄┄► CX-VR — CX-CPE

Tunnel Interface

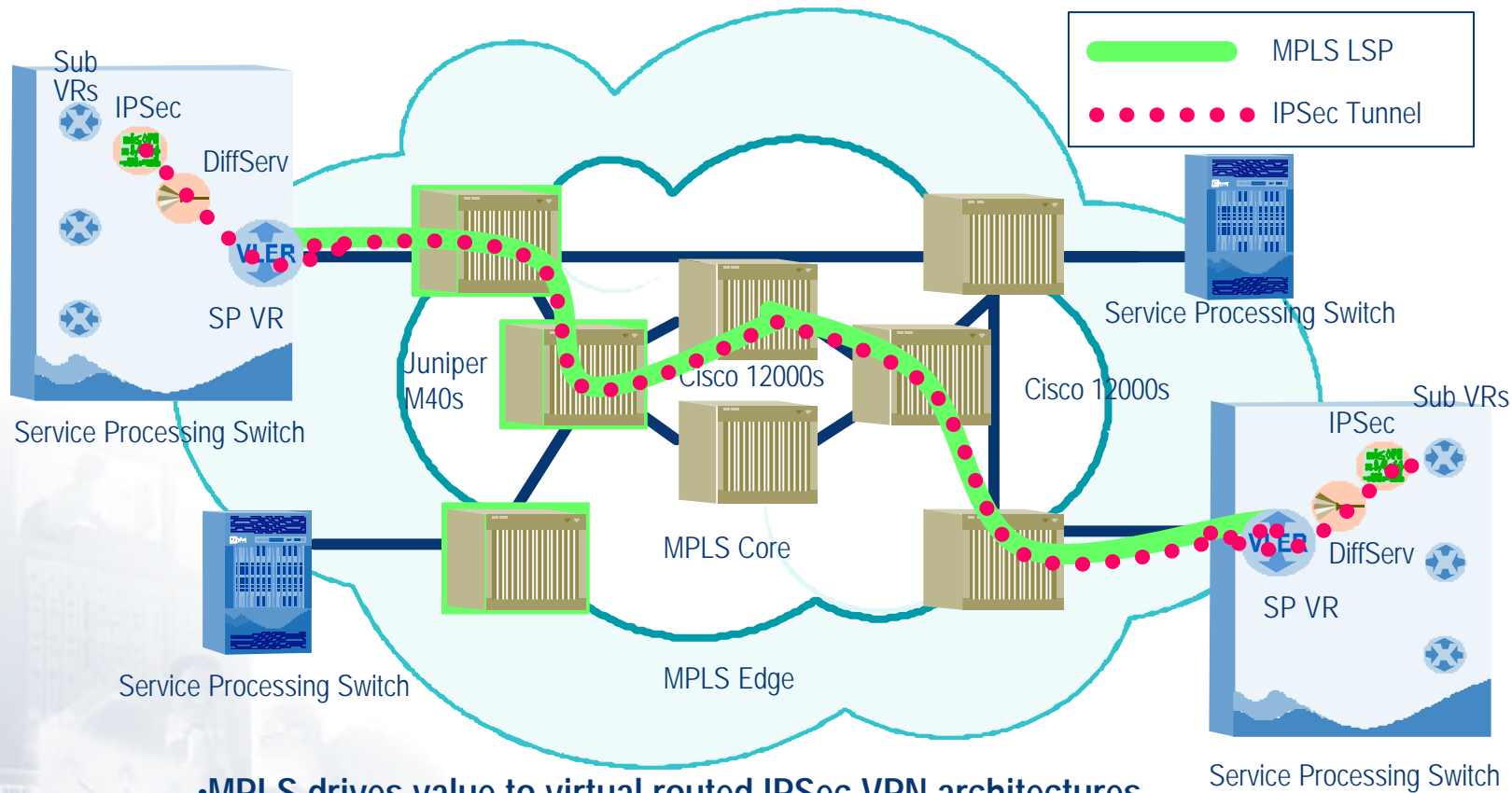**Customer X VPN Plane (RIP2)**

- Recursive layering of Routing schema's
- Complete isolation of Subscriber and Service Provider Route functions
- Increases scalability of VPN Routing solutions

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Agnostic Access and Transport

Frame Relay
- PVC
- PVC

ATM
- VC
- VC

MPLS

MPLS / BGP
- LSP
- LSP

SDH
- T1
- DS3

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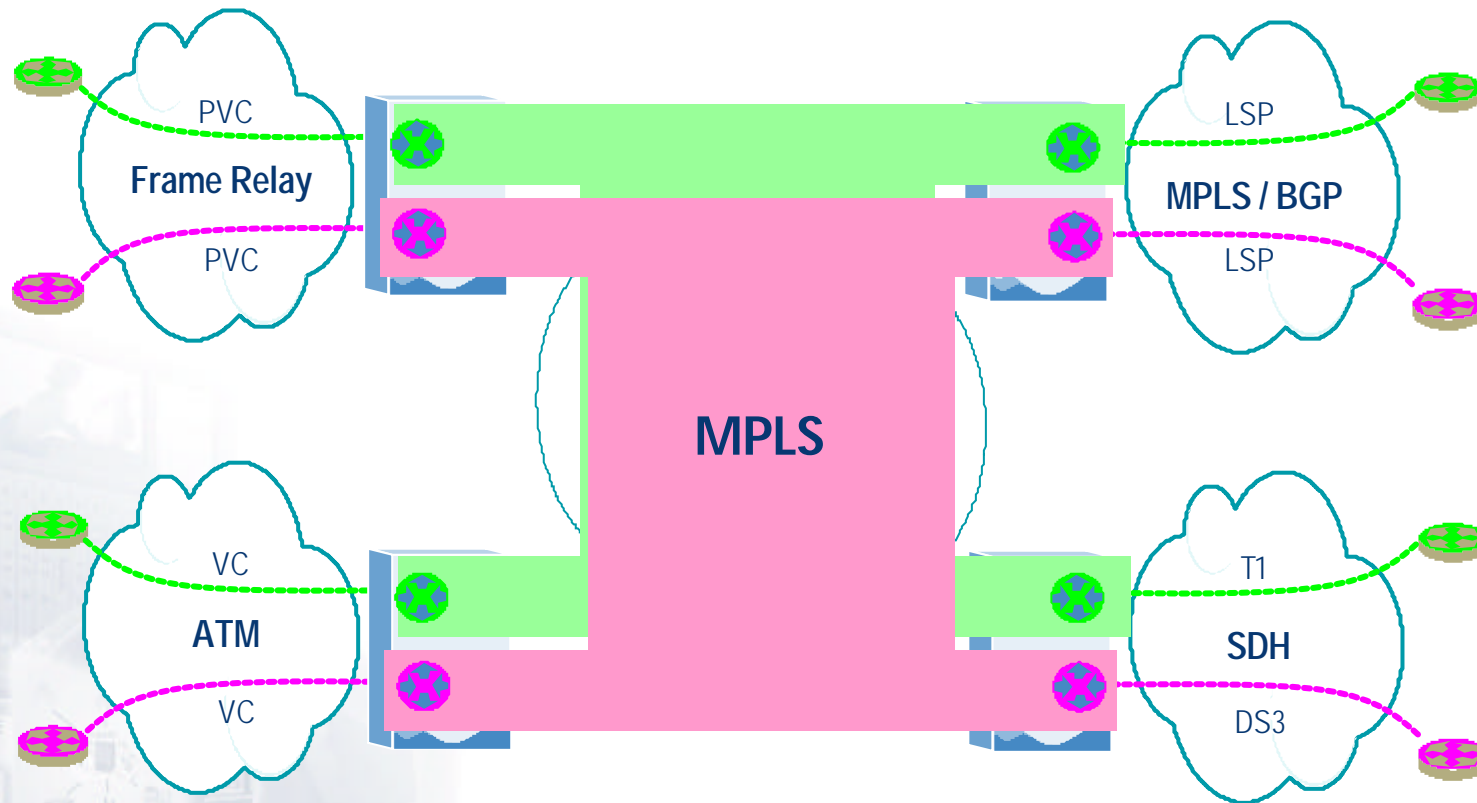
MPLS TE Coupled with DiffServ

Legend:
- MPLS LSP
- IPSec Tunnel

Labels in diagram: Sub VRs, IPSec, DiffServ, VLER, SP VR, Service Processing Switch, Juniper M40s, Cisco 12000s, Cisco 12000s, MPLS Core, MPLS Edge, Sub VRs, IPSec, DiffServ, SP VR, Service Processing Switch
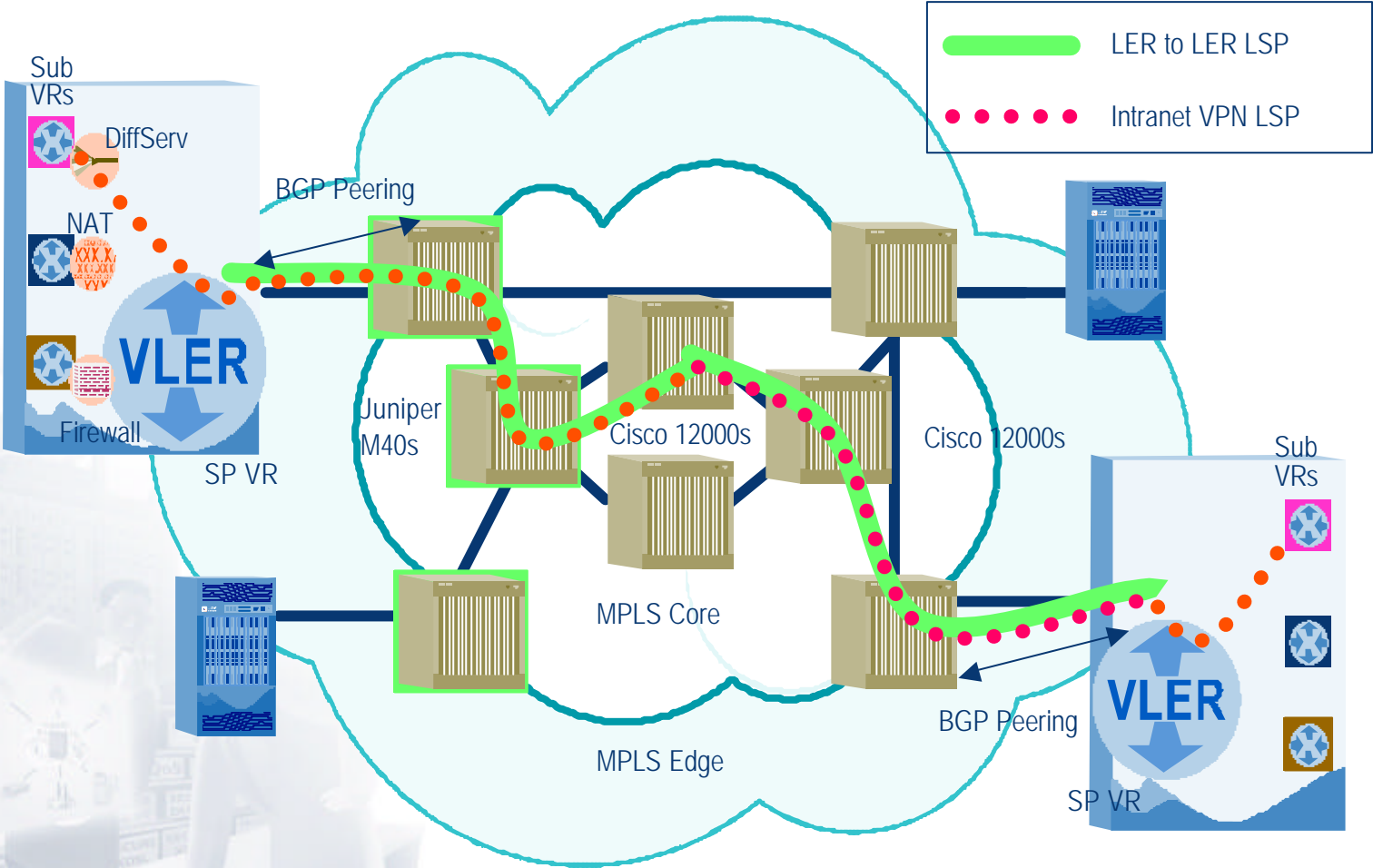
- MPLS drives value to virtual routed IPSec VPN architectures
- Secure intranet with ATM-like end-to-end performance level guarantees
- DiffServ mapped into MPLS LSPs enables application level performance parameters to be handled accordingly
- IPSec tunnel generated at the Sub VR and mapped into LSPs at the SP VR

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MPLS/BGP RFC 2547bis VPN's and Services

Legend:
- LER to LER LSP
- Intranet VPN LSP

Sub VRs
DiffServ
NAT
Firewall
VLER
SP VR

BGP Peering

Juniper M40s
Cisco 12000s
Cisco 12000s

MPLS Core
MPLS Edge

Sub VRs
VLER
SP VR
BGP Peering

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Firewall and Virus Application

Remote Office

Remote Office

Service Processing Switch

Subscriber Virtual Router

IPSec

Service Provider Virtual Router

Virus Scan   Firewall

Internet

IP or ATM Core

Service Management System

Service Processing Switch

Service Provider Virtual Router

IPSec

Subscriber Virtual Router

Virus Scan   Firewall

Corporate Headquarters

Customer Network Management System

Summary

- Commoditization of Internet access drives down Service Provider margins

- Managed services such as VPNs are a high growth, high revenue opportunity

- Agnostic approach must be taken to any network design and implementation

- Network-based service delivery enables scalable deployment of profitable services

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