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# Conversations

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# **Internet, Access, Content and Applications: Building on the DSL Foundation**

**John Goodhue**

VP/GM Aggregation,  
Cisco Systems



# Agenda

- **The Broadband Opportunity**

- **The ISP Perspective**

**DSL Network Evolution  
(Simplicity and scale)**

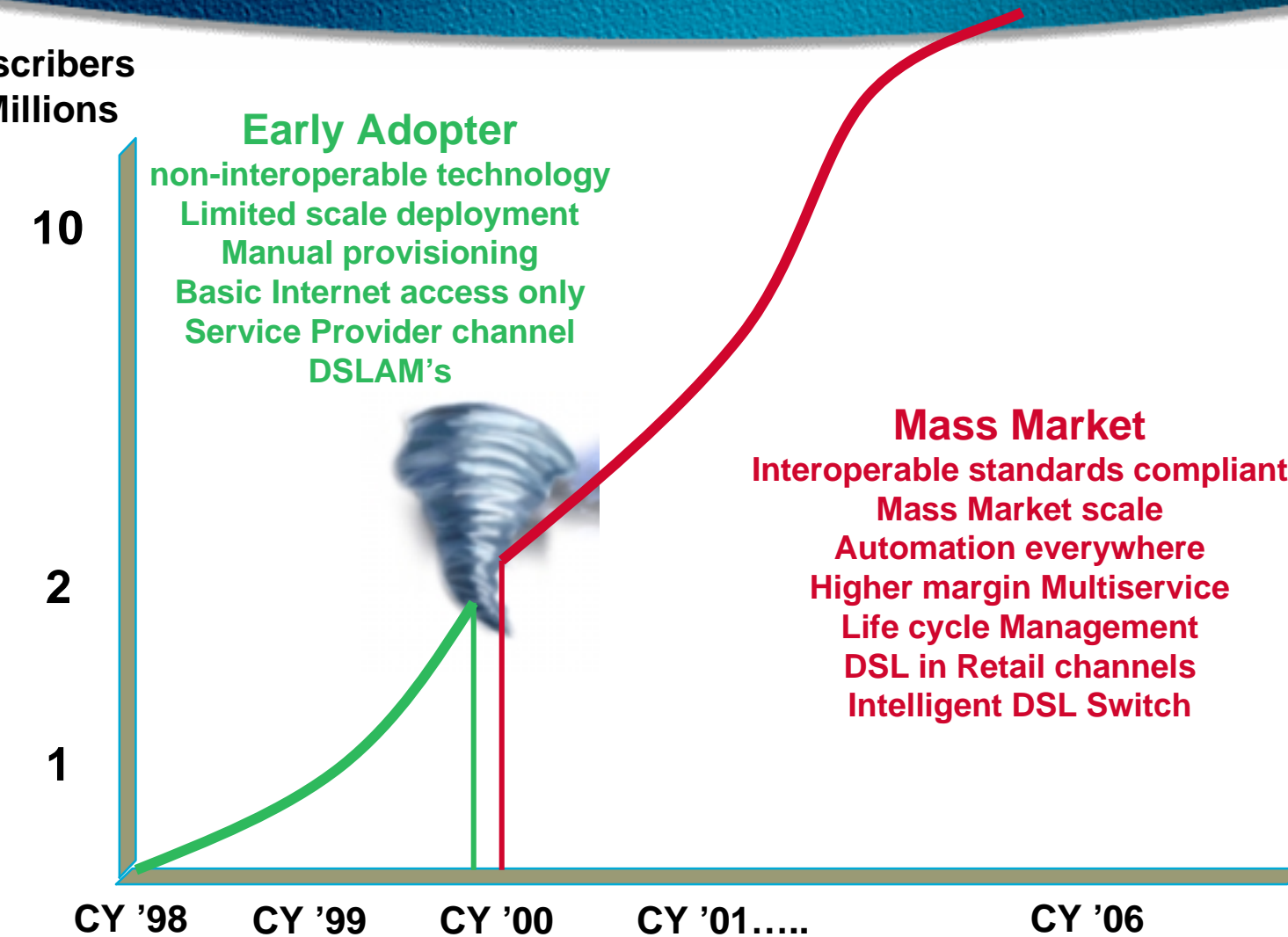
**Multiservice Solutions  
(Any Service / any place)**

**Subscriber Management  
(Any User / Any Media)**



# DSL Industry Evolution

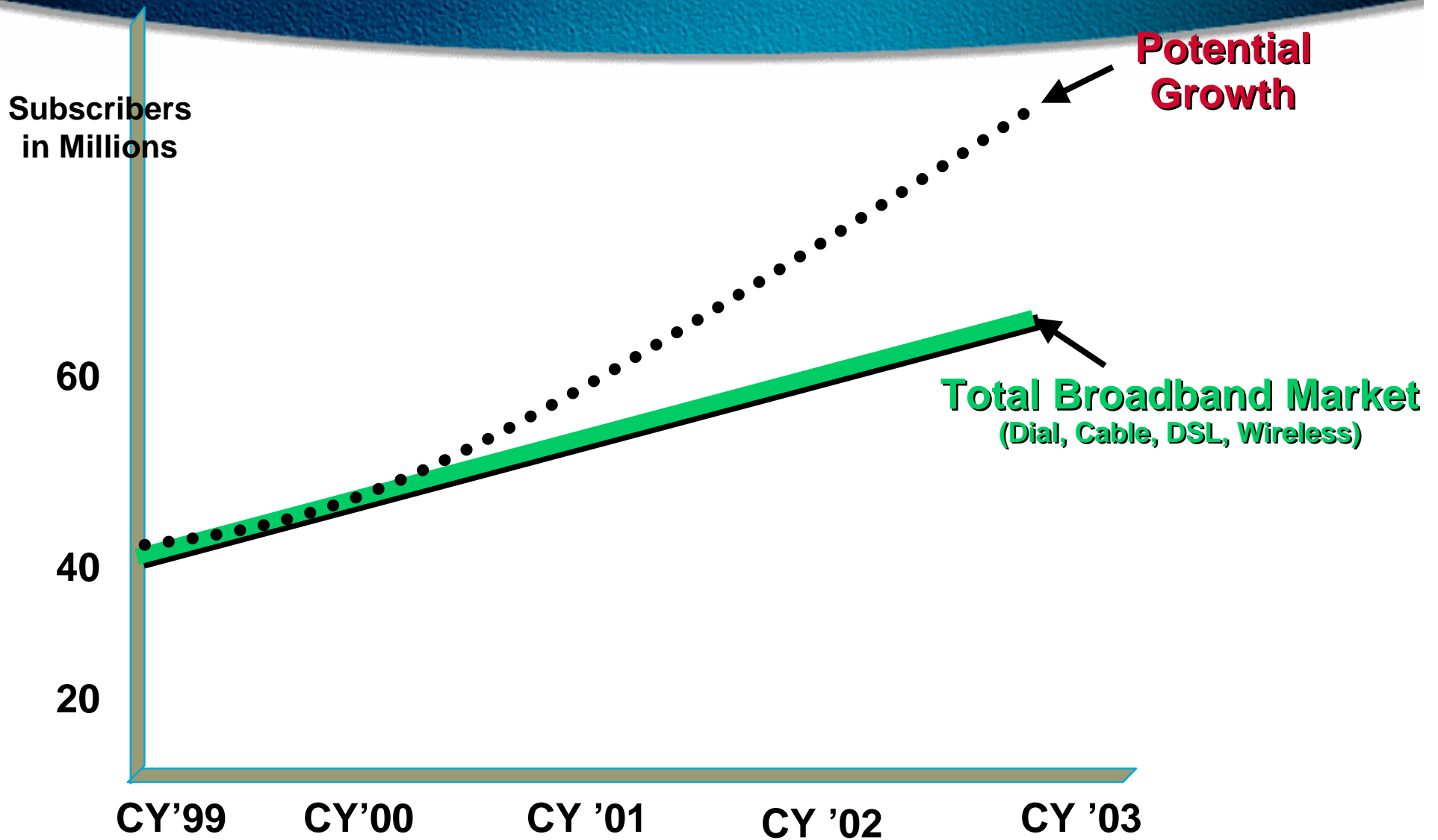
Subscribers  
in Millions



Source: Multiple Analyst's



# The Broadband Opportunity



# Opportunities for Today's DSL Service Providers

- **Service reach—Expand addressable market**
- **Mass market scale—Reduce current long lead times to turn service on**
- **Consumer services—Upsell from basic Internet access**
- **Business services—Migrate leased line services to broadband media**
- **Regulation—Leverage the latest deregulation rulings**
- **Virtual Global Footprint to enable Broadband roaming**



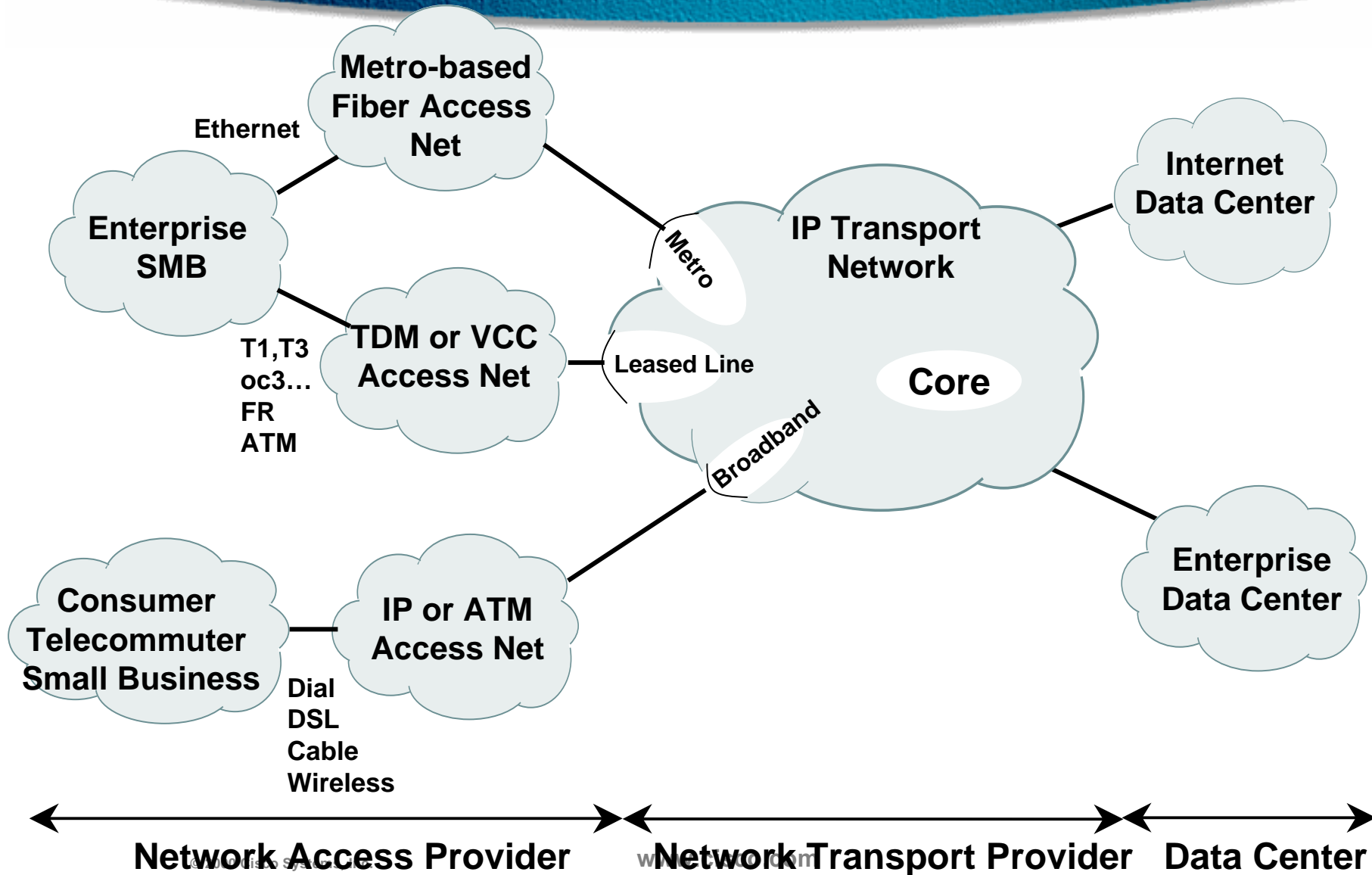




# DSL Network Evolution

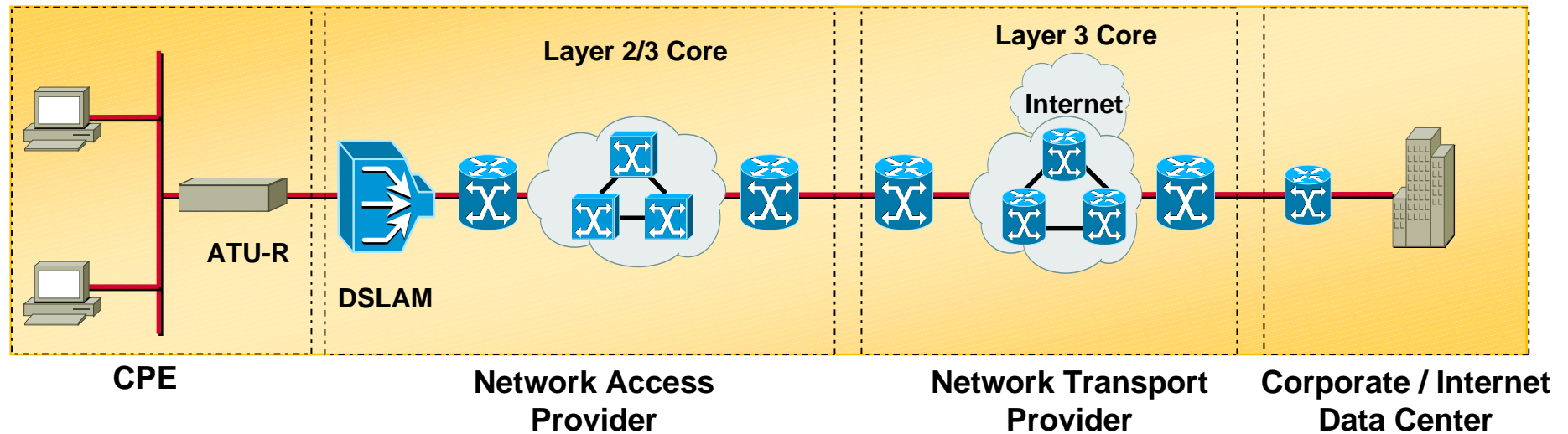


# Service Provider Internet Architecture

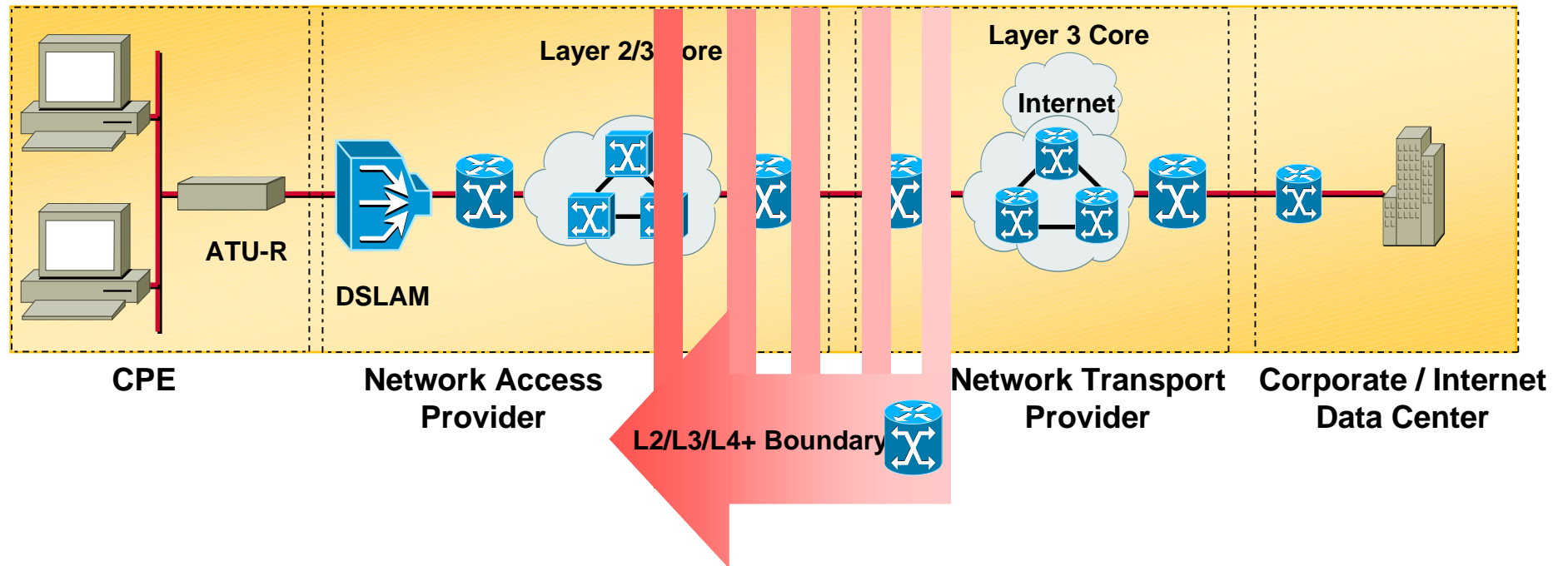




# DSL Network Architecture



# DSL Network Migration

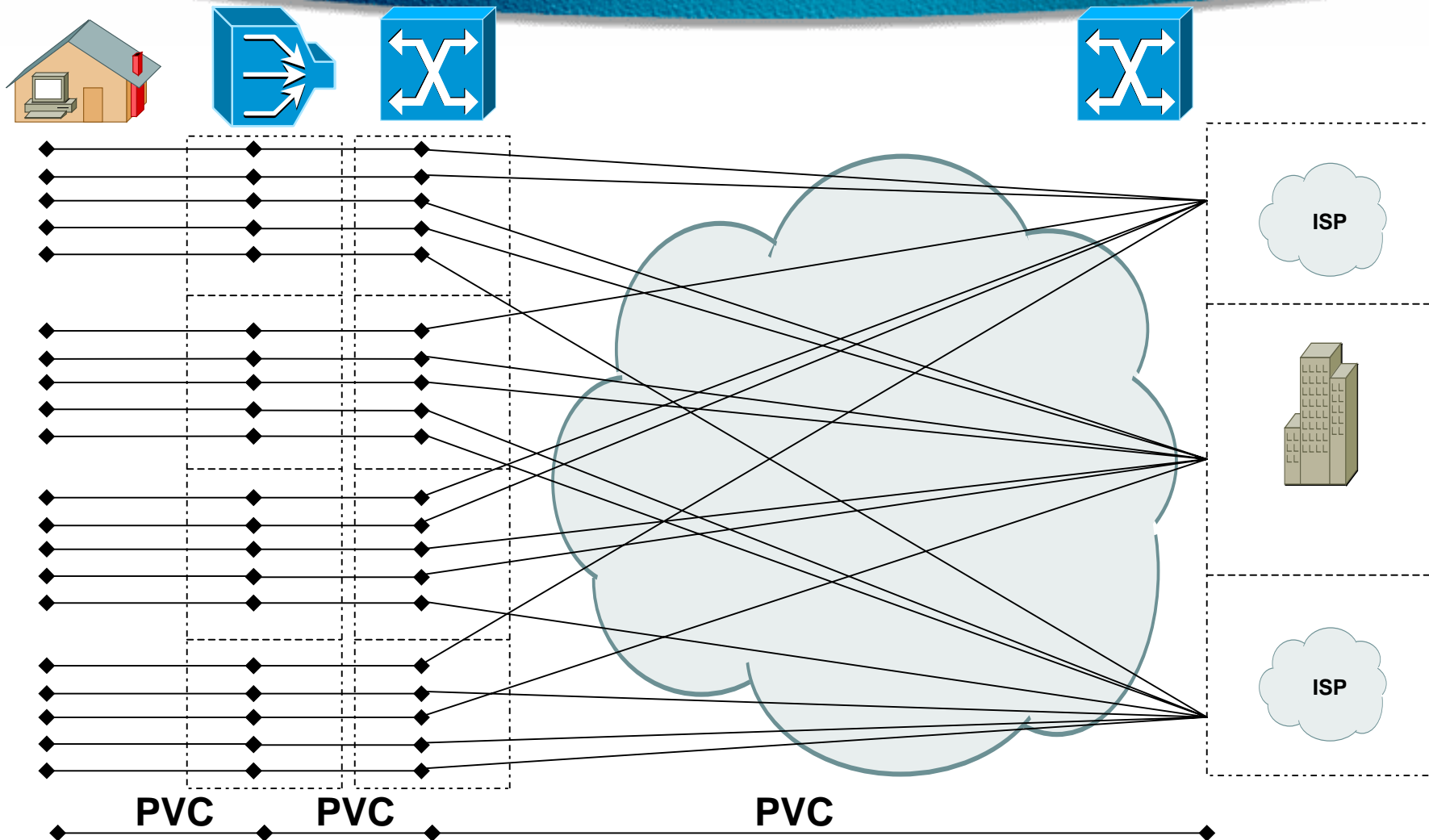


# DSL Network Migration

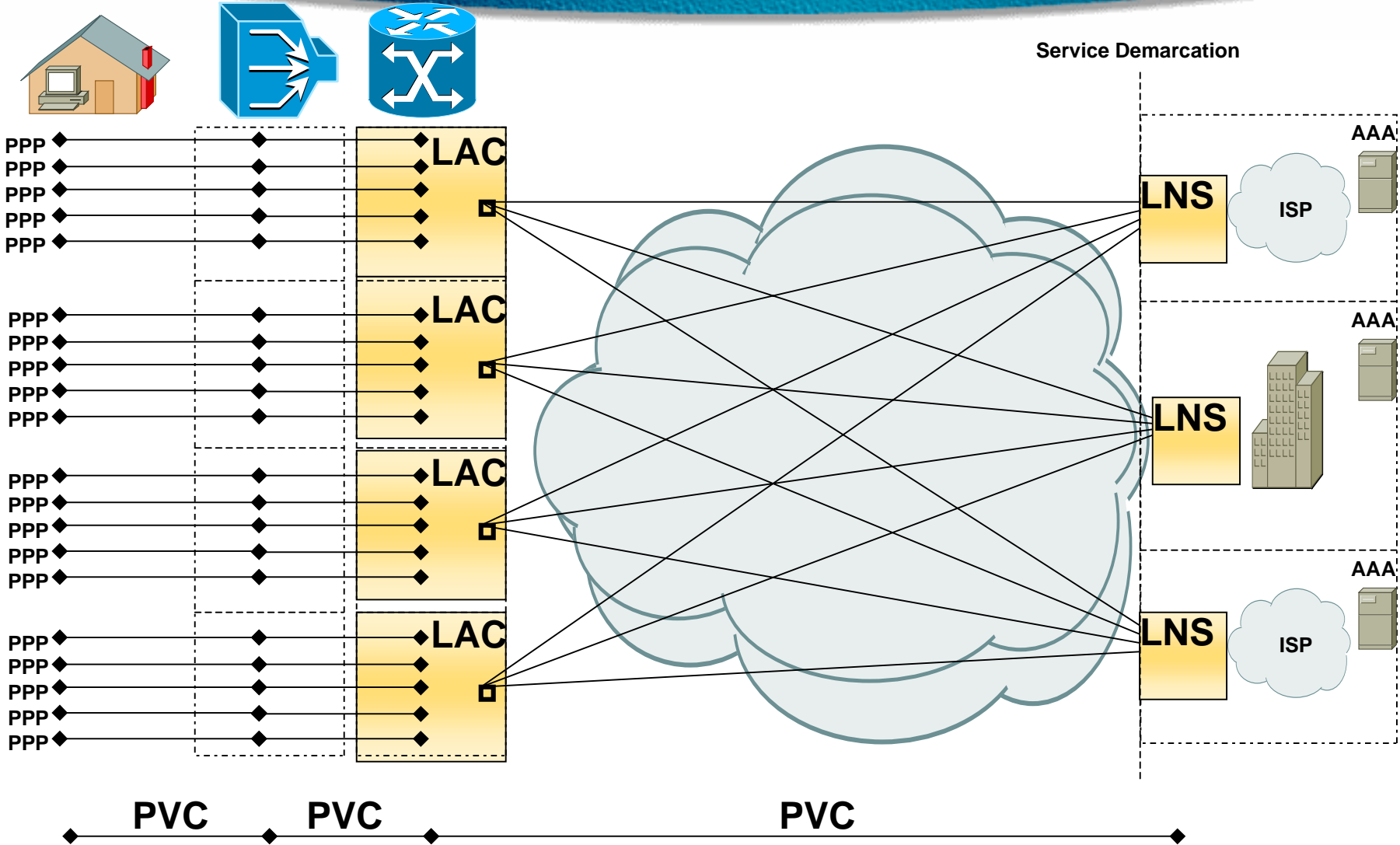
- **Phase I - today**  
**ATM Point to Point**
- **Phase II - Design / Deployment**  
**L2TP Aggregation**
- **Phase III - Design**  
**MPLS VPN**  
**IP/DSL Switch**



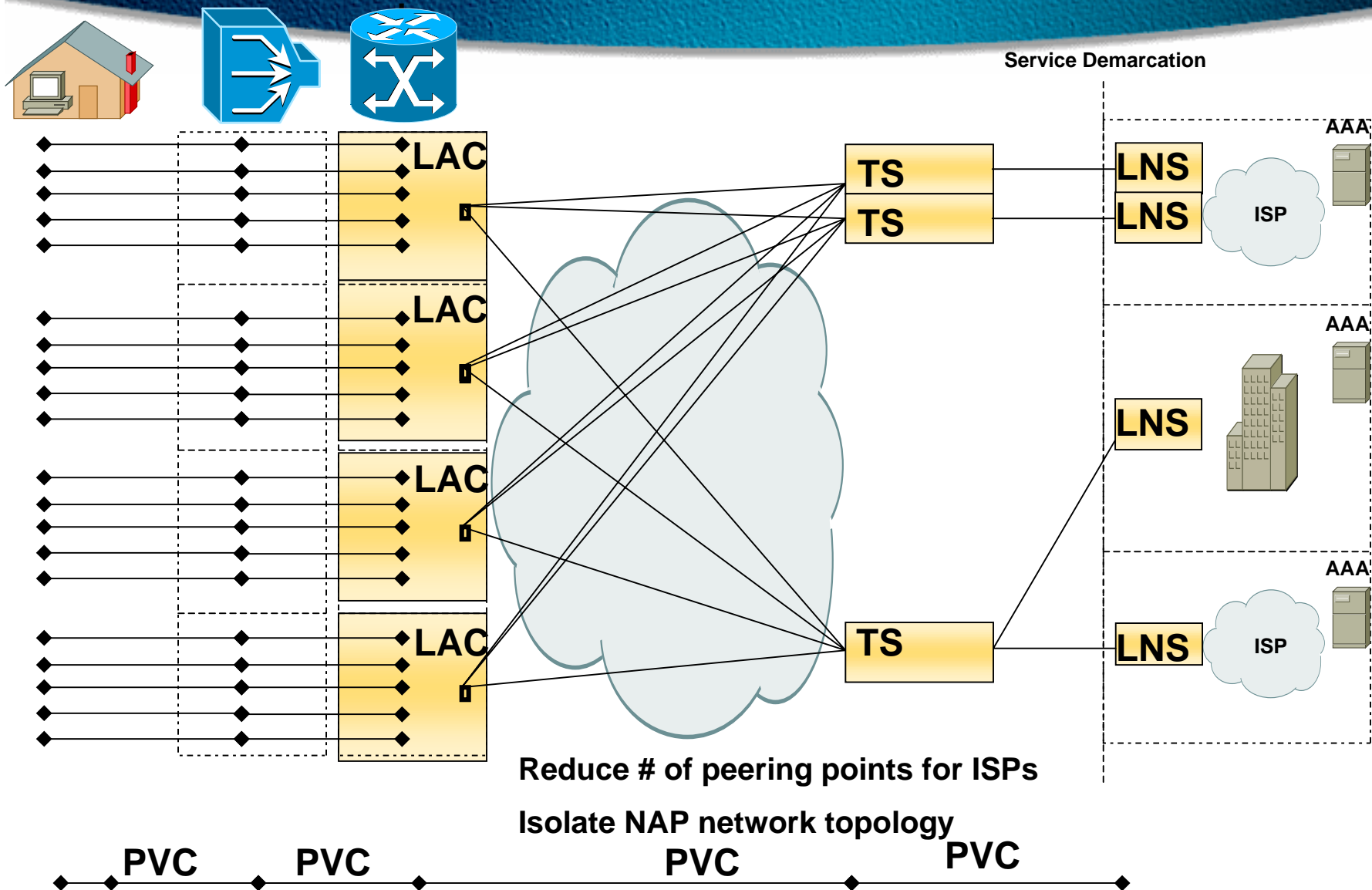
# ATM Point to Point



# PPP to L2TP LAC/LNS

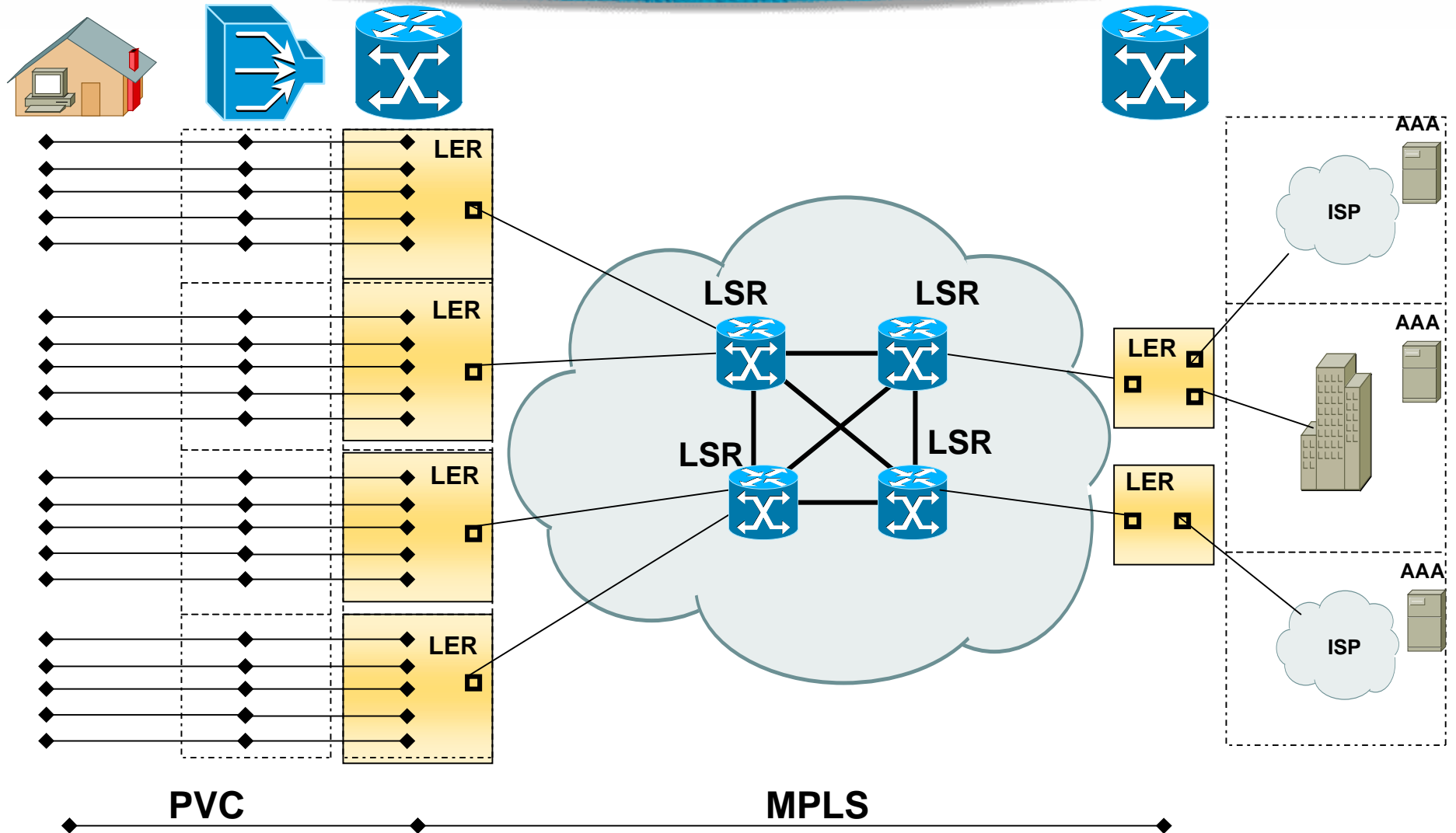


# Tunnel Switching

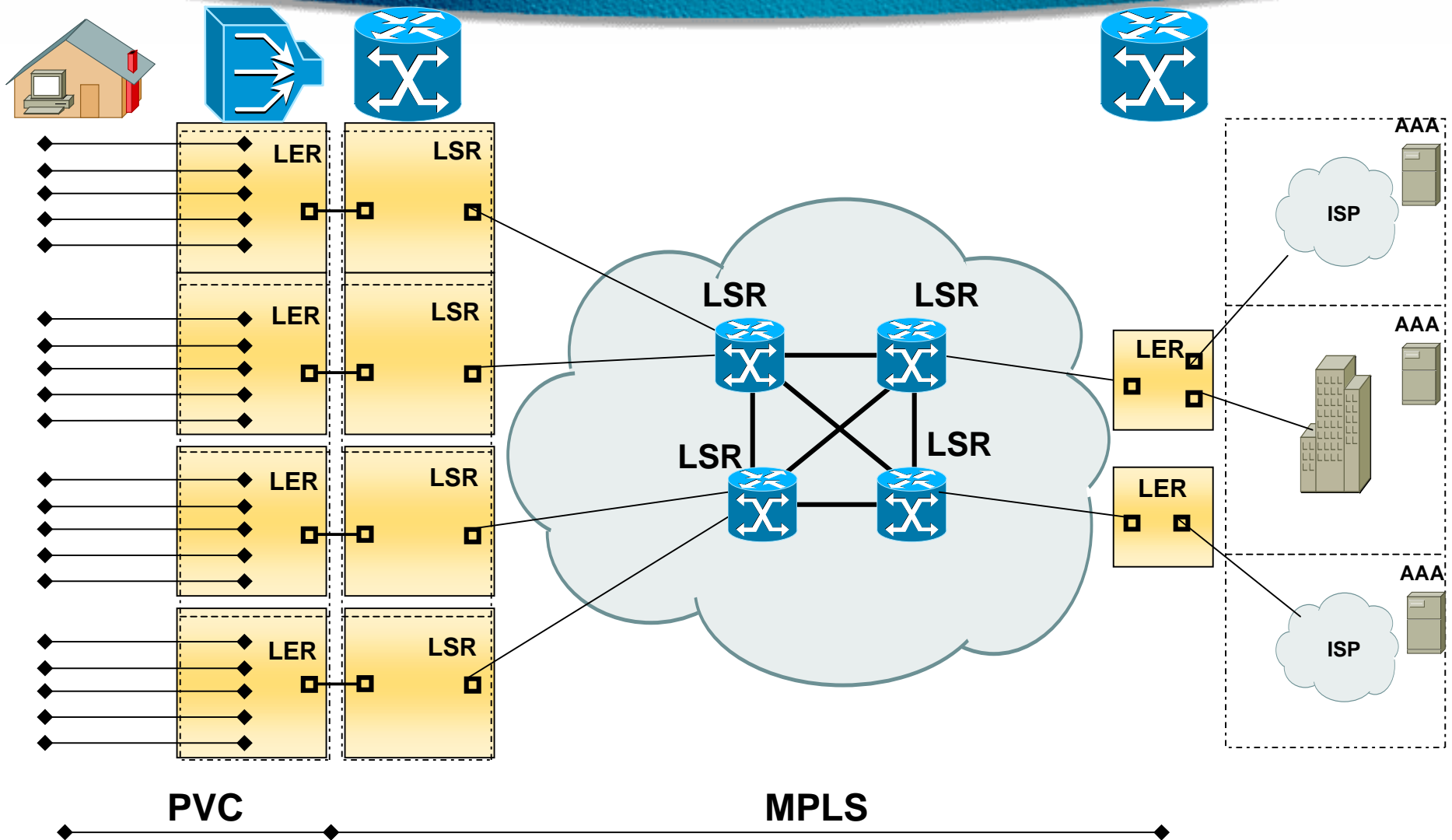




# MPLS VPN



# IP DSL Switch

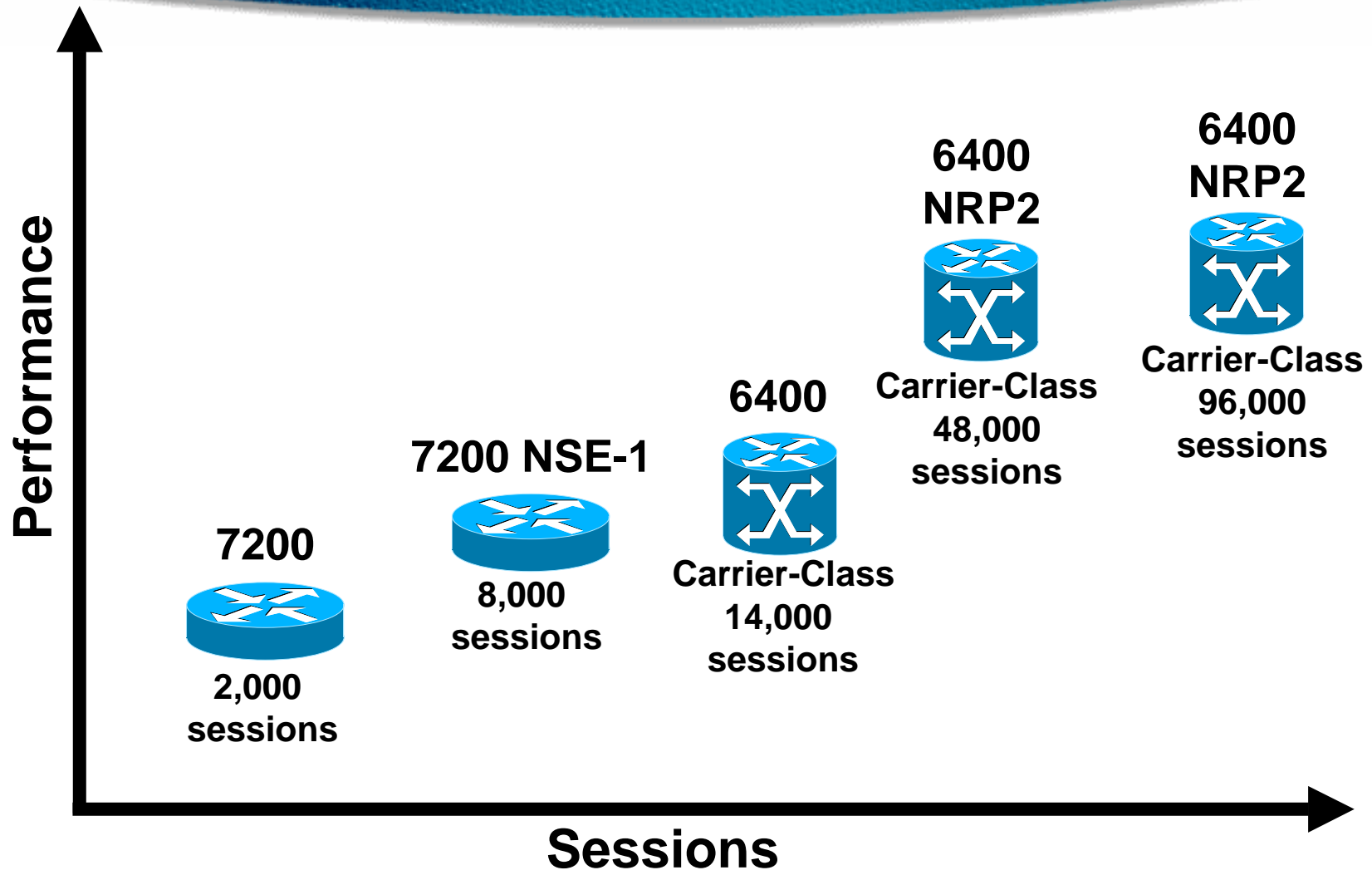


# DSL Aggregation Performance and Scaling

<b>Location</b>	<b>Subscribers per Chassis</b>	<b>Subscribers per Rack</b>	<b>Chassis Uplink</b>
<b>Small Access Provider POP</b>	<b>8,000</b>	<b>N/A</b>	<b>DS3 OC3</b>
<b>Enterprise / Data Center</b>	<b>8,000</b>	<b>N/A</b>	<b>DS3 OC3</b>
<b>Large Access Provider POP</b>	<b>10,000 to 20,000</b>	<b>50,000</b>	<b>OC3 OC12</b>
<b>Tier 1 ISP Handoff Point</b>	<b>30,000 active 100,000 total</b>	<b>100,000 active 300,000 total</b>	<b>OC12</b>



# Cisco DSL Aggregation Products



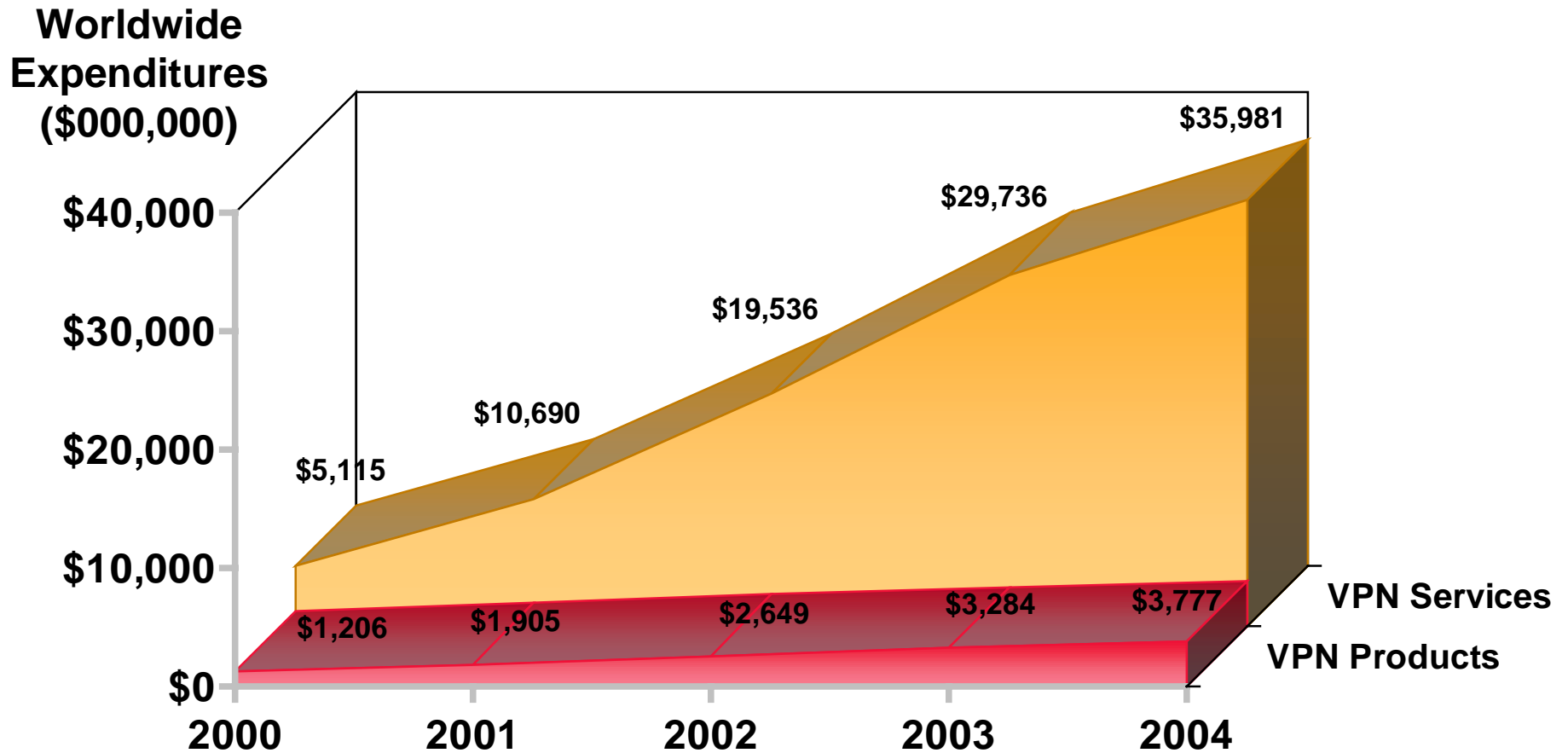


# Broadband Services





# Worldwide Growth Rate of IP-VPN Services

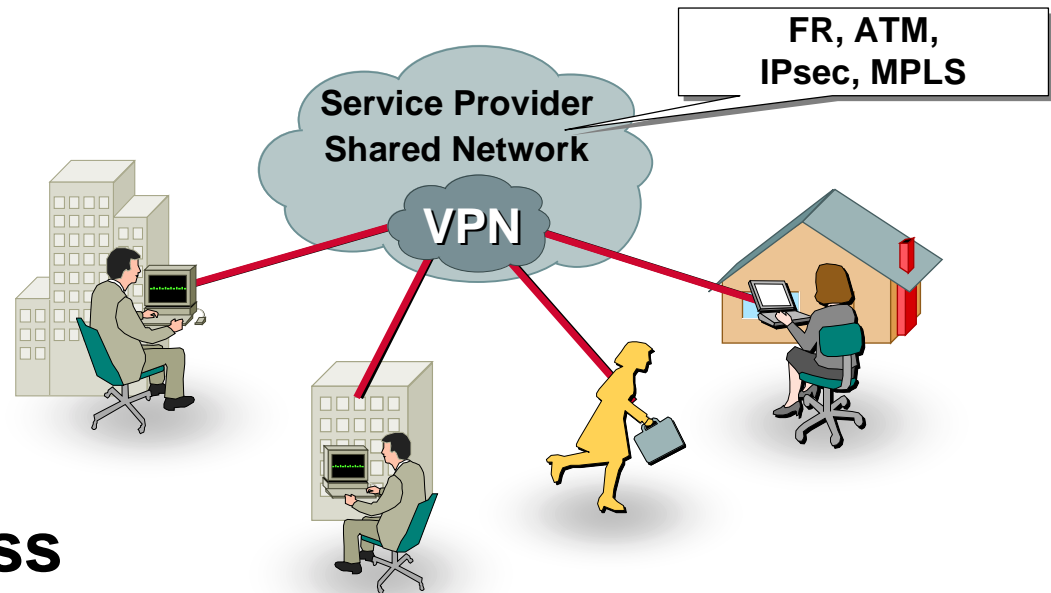


Source: Infonetics (April, 2000)



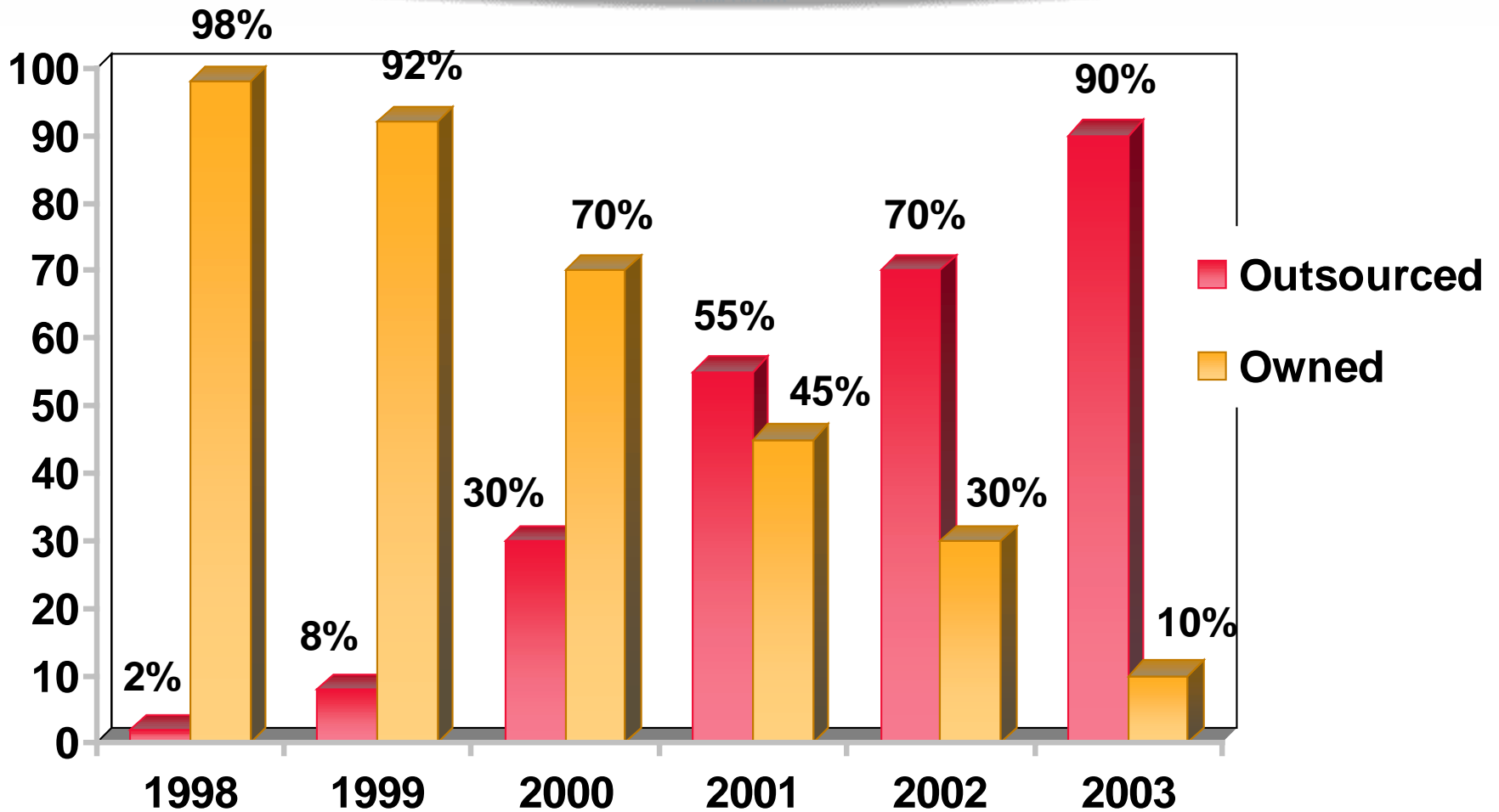
# Virtual Private Network Services Definition

- **Intranet VPN**  
Branch offices
- **Access VPN**  
Enterprise access  
Wholesale
- **Extranet VPN**  
Business-to-business  
Industry groups



**Customer communities  
deployed on a shared infrastructure  
with the same policies as a private network**

# Outsourced vs. Owned VPNs



Source: Cahners In-stat Group, 1999

# Why Would an Enterprise Outsource?

- **Reduced total cost of ownership**
- **Access to VPN expertise through outsourcing**
- **Adds, removes, and changes as needs evolve**
- **Universal access (dial-up, DSL, CableModem, Ethernet "guest", etc.) to IP-based VPN on global basis**
- **Customer can focus on core competencies**





# Service Provider IP VPN Service Types

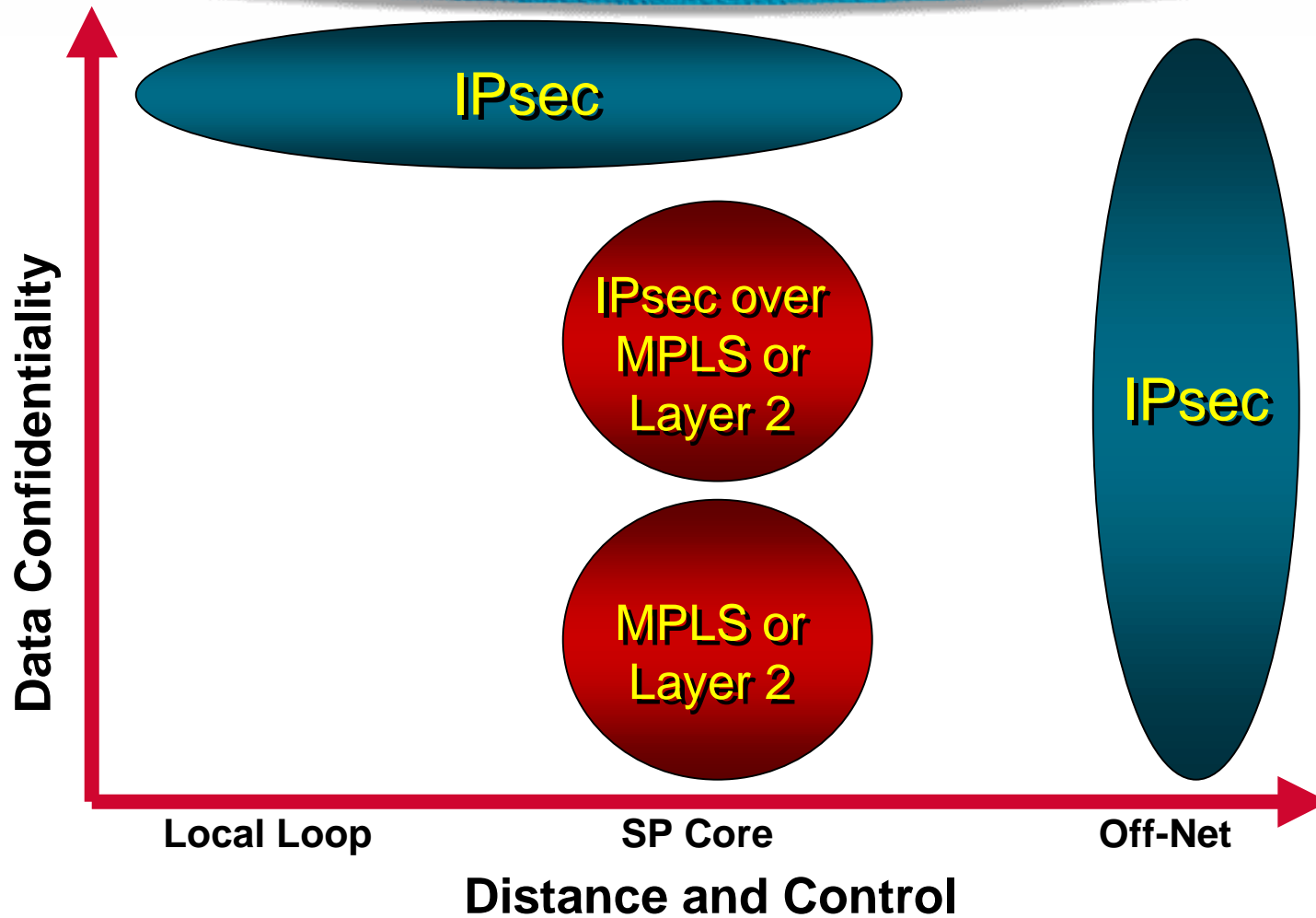
- **Managed CPE VPNs**

- **Functionality deployed on Customer premises**
- **Typically built using IPsec appliances or specialized routers**
- **Most common service type today**
- **More difficult to operate profitably**
  - \* **Truck rolls to install and service Customer Premise Equipment**
  - \* **Expensive to scale, manage and maintain**

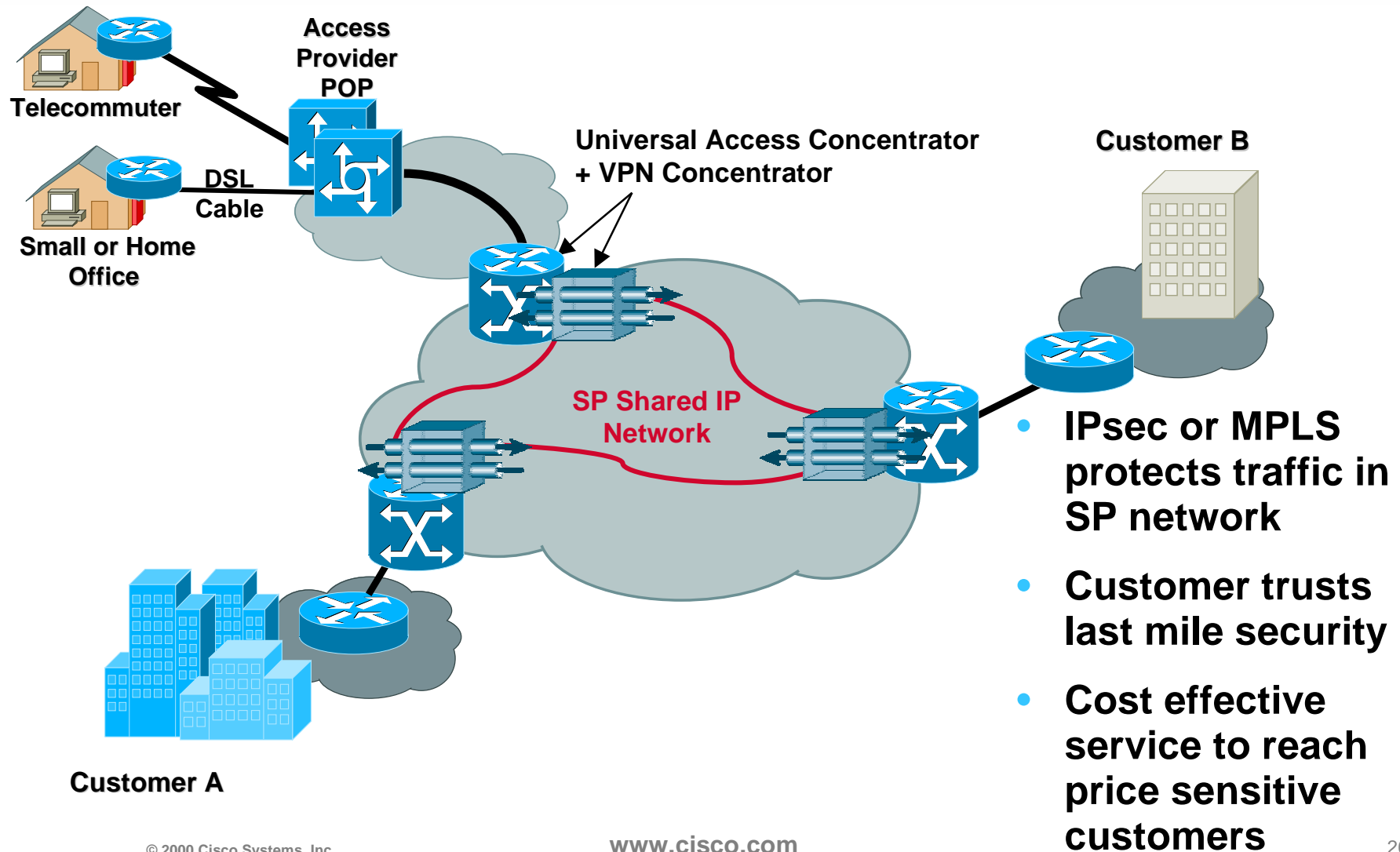
- **Network-Based VPNs**

- **Functionality deployed in SP POPs, or elsewhere in SP net**
- **Lower cost to deploy and operate**
- **The majority of new VPN services will use this model**

# Data Confidentiality & SP VPN Architecture

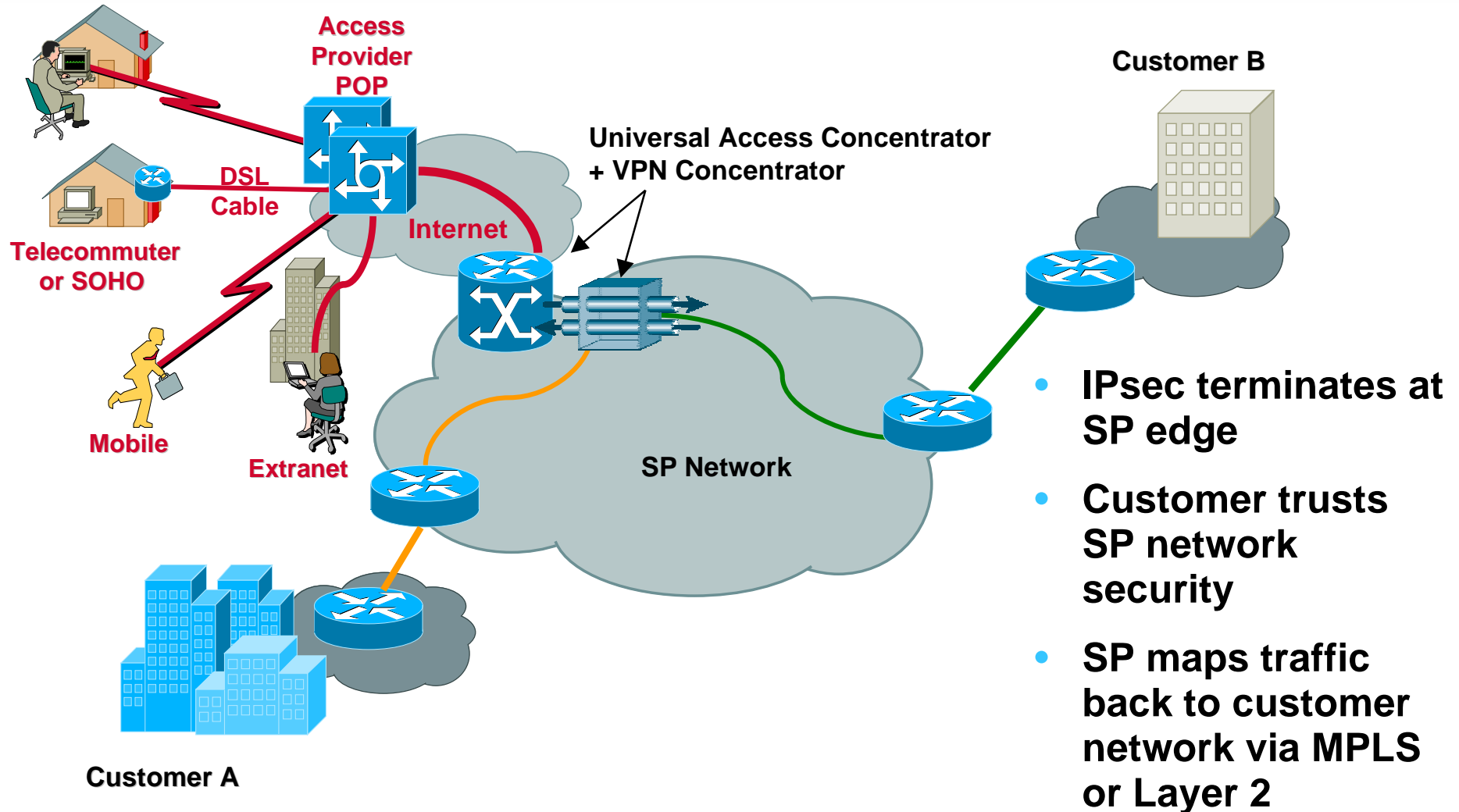


# Intranet and Extranet VPN – Network Based

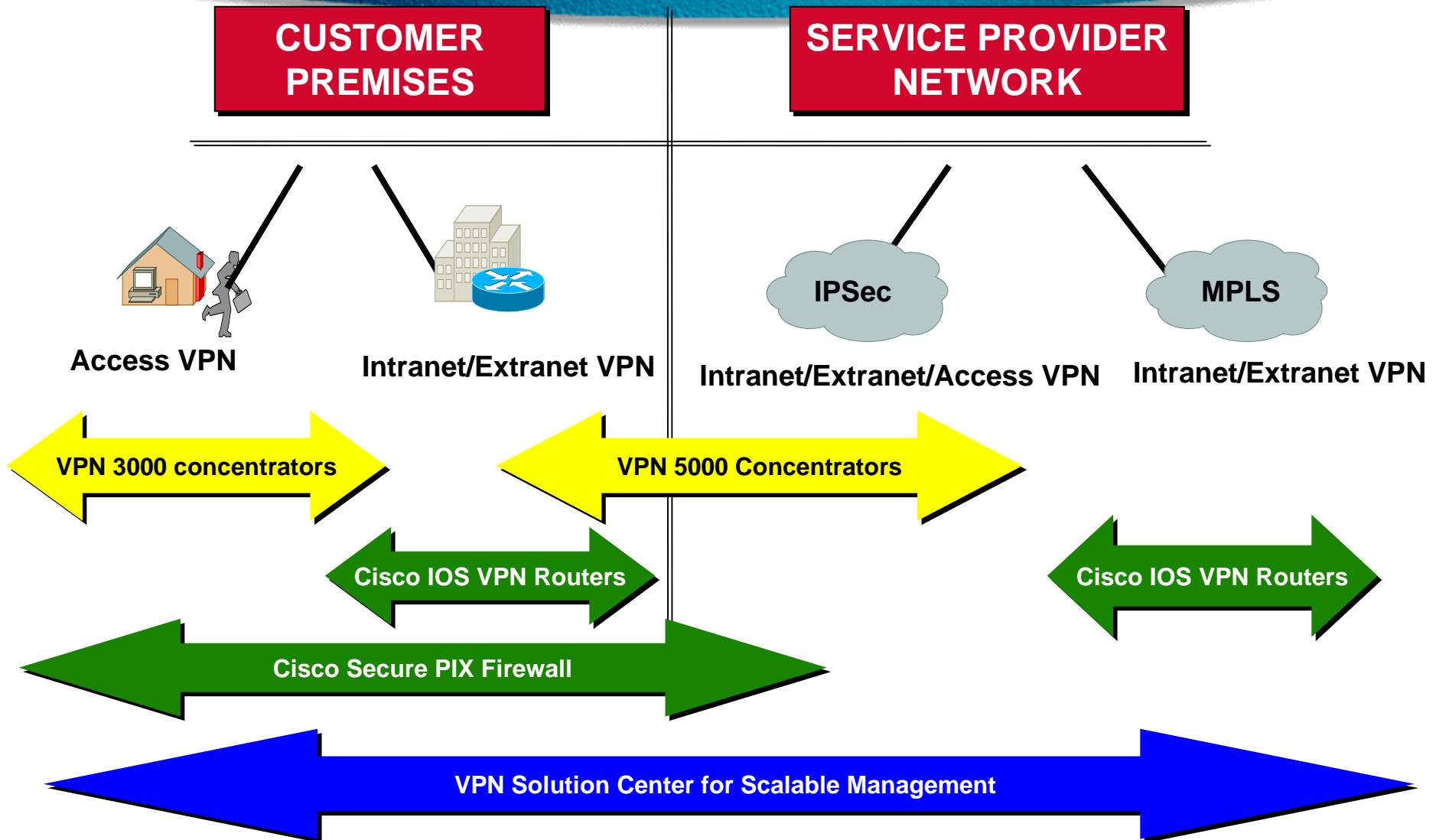




# Access VPN – Network Based

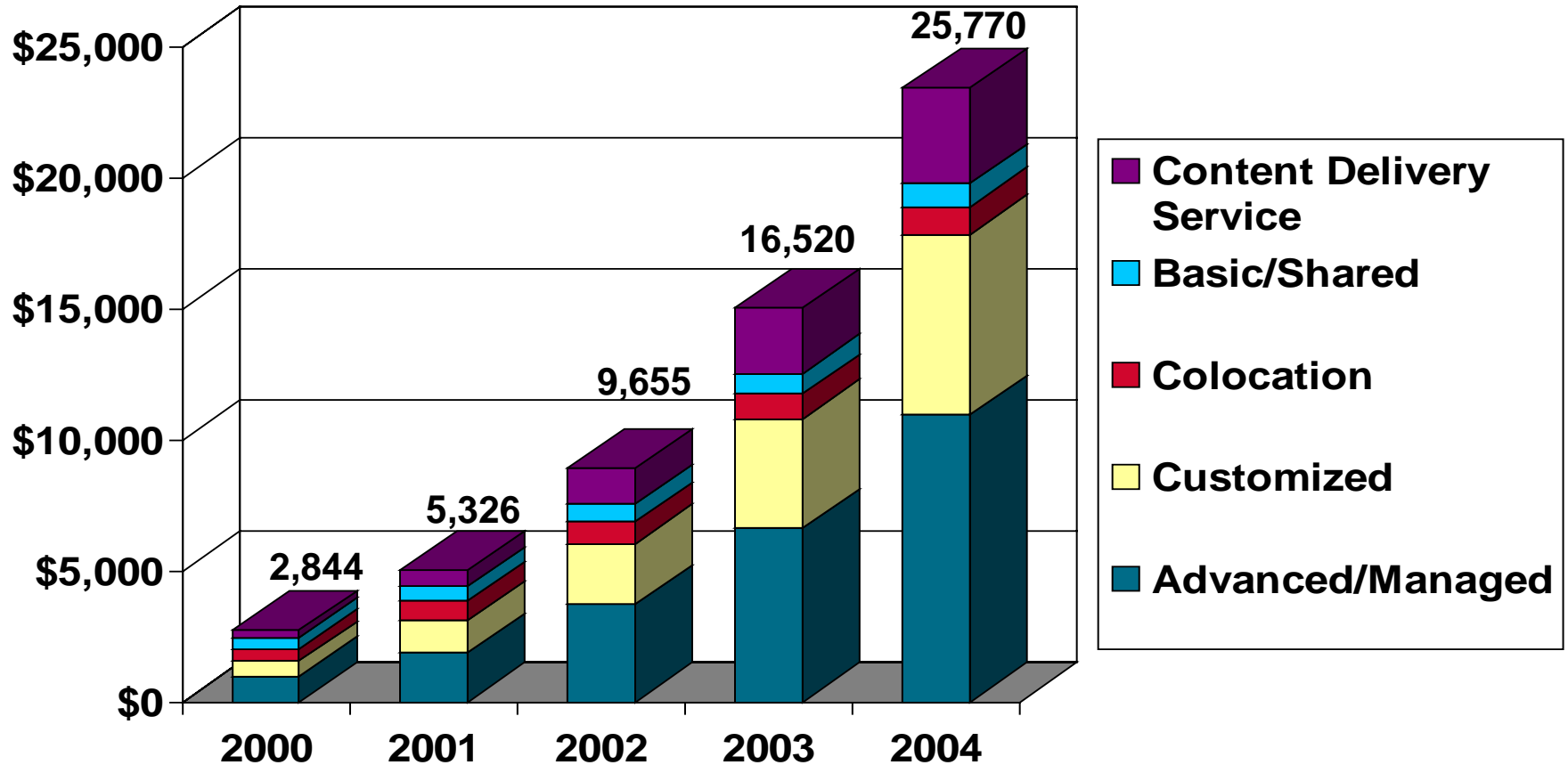


# Cisco IP VPN Products



# U.S. Web Hosting and Content Delivery Service Revenue

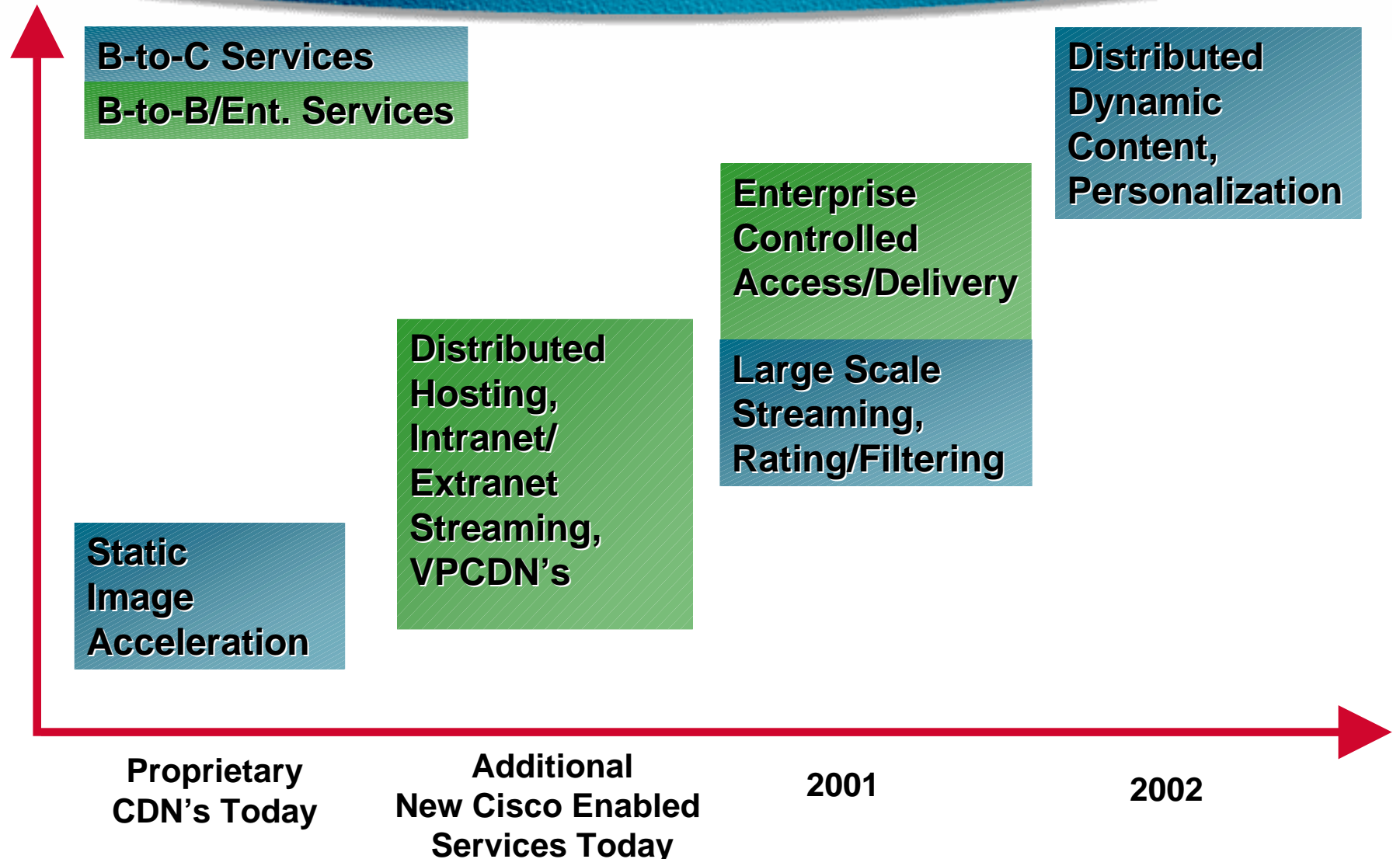
Millions



Source: Forrester Research, 2000  
Internet Research Group, 2000



# CDN Service Evolution



# Content Delivery Networks

## Required System Building Blocks

Content Delivery Services

Web Hosting    E-Commerce    Streaming    Applications

Content Delivery Networks

Content Distribution & Management    Content Routing    Content Switching    Content Edge-Delivery

Intelligent Network Services

L2/L3 Networks

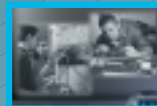
Highly available, scalable, performance network at Layer 2/3



Mobile



Fixed Wireless



Cable



DSL



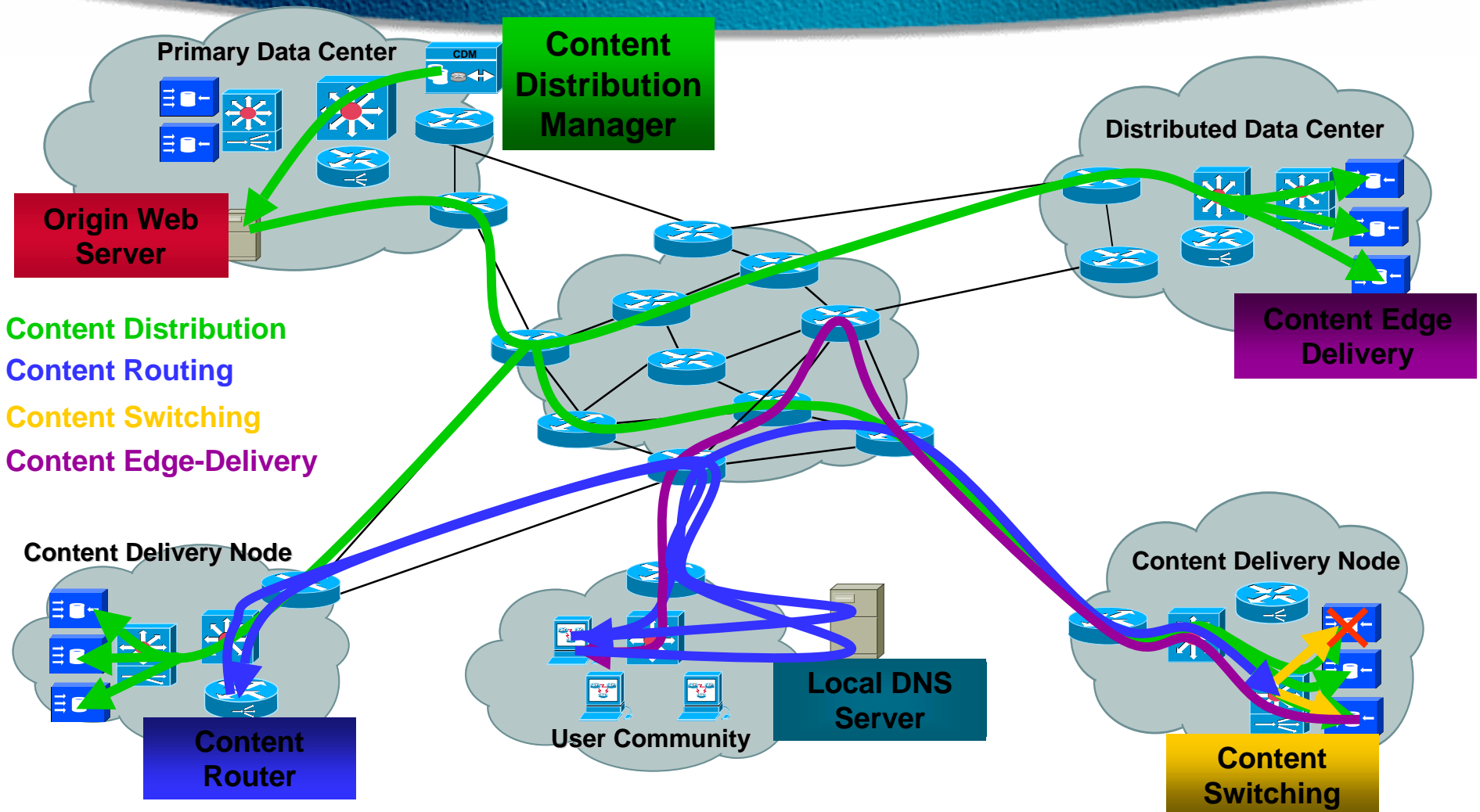
Dedicated/ATM/FR



ISDN/Dial

# Content Delivery Networks

## Five Technology Components





# Content Delivery Network Products

	Content Distribution & Management	Content Routing	Content Switching	Content Edge-Delivery	Intelligent Network Services
Key Features / Benefits	<ul style="list-style-type: none"> <li>•Global / centralized provisioning</li> <li>•Real time monitoring</li> <li>•Ensuring fresh content</li> <li>•Self healing distribution network</li> </ul>	<ul style="list-style-type: none"> <li>•Scalability</li> <li>•Routing to best most proximate content</li> <li>•Adaptive routing around failures / congestion</li> </ul>	<ul style="list-style-type: none"> <li>•Flash crowd protection</li> <li>•Optimal handling for non-cacheable content (e-commerce, etc)</li> <li>•E-commerce transaction assurance</li> <li>•Core distribution capabilities</li> </ul>	<ul style="list-style-type: none"> <li>•High-perf static streaming</li> <li>•Integrated caching for transparent insertion into the network</li> <li>•Full scalable range product portfolio w/ common architecture</li> </ul>	<ul style="list-style-type: none"> <li>• Leverage your existing infrastructure</li> <li>• QoS</li> <li>• Security</li> <li>• Multicast</li> <li>• VPNs</li> </ul>
Products	<ul style="list-style-type: none"> <li>•Content Distribution Manager 7000</li> <li>•Content Distribution Manager 4600</li> </ul>	<ul style="list-style-type: none"> <li>•WebNS4.0/ CSS11000</li> <li>•Content Router 4400 / 4450</li> <li>•Distributed Director</li> </ul>	<ul style="list-style-type: none"> <li>•CSS11000 + Catalyst 6500</li> <li>•Local Director 400 + Catalyst 6500</li> </ul>	<ul style="list-style-type: none"> <li>•Cache Engine 590</li> <li>•Content Engine 7300</li> </ul>	<ul style="list-style-type: none"> <li>• Cisco IOS</li> </ul>

A man in a white shirt and red tie is holding a large orange pipe over a colorful landscape. The landscape is divided into blue, green, and yellow sections, suggesting a stylized or abstract environment. The man is standing on a blue surface, and the pipe is arched over the landscape.

# Subscriber Management



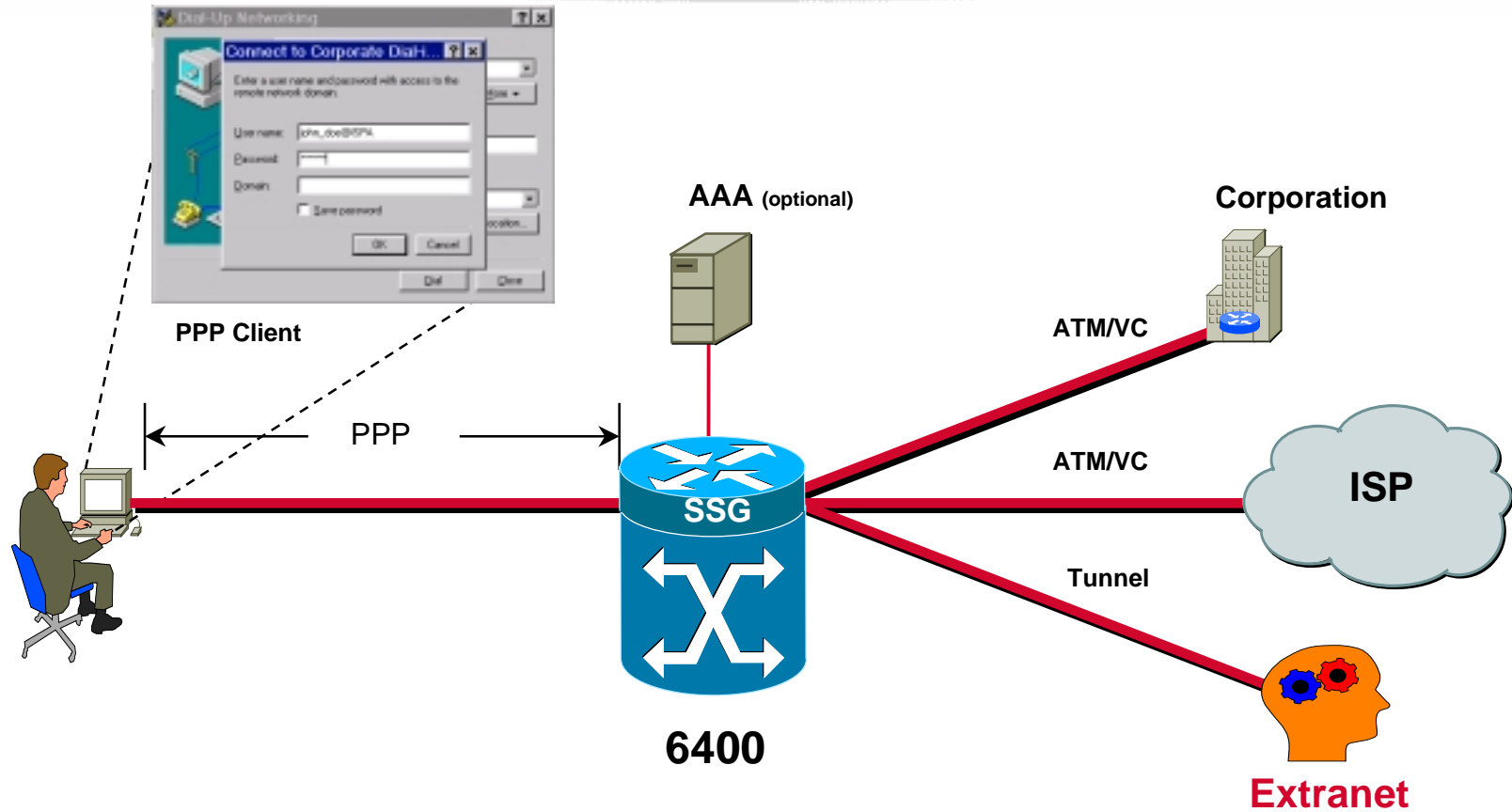


# Subscriber Management Options

- **Dedicated Connection**  
“hard-wired” to a single destination
- **PPP Service Selection**  
“the dial experience”
- **Web-based Service Selection**  
Select service via web-based dashboard
- **Service Subscription**  
Automated service subscription and update



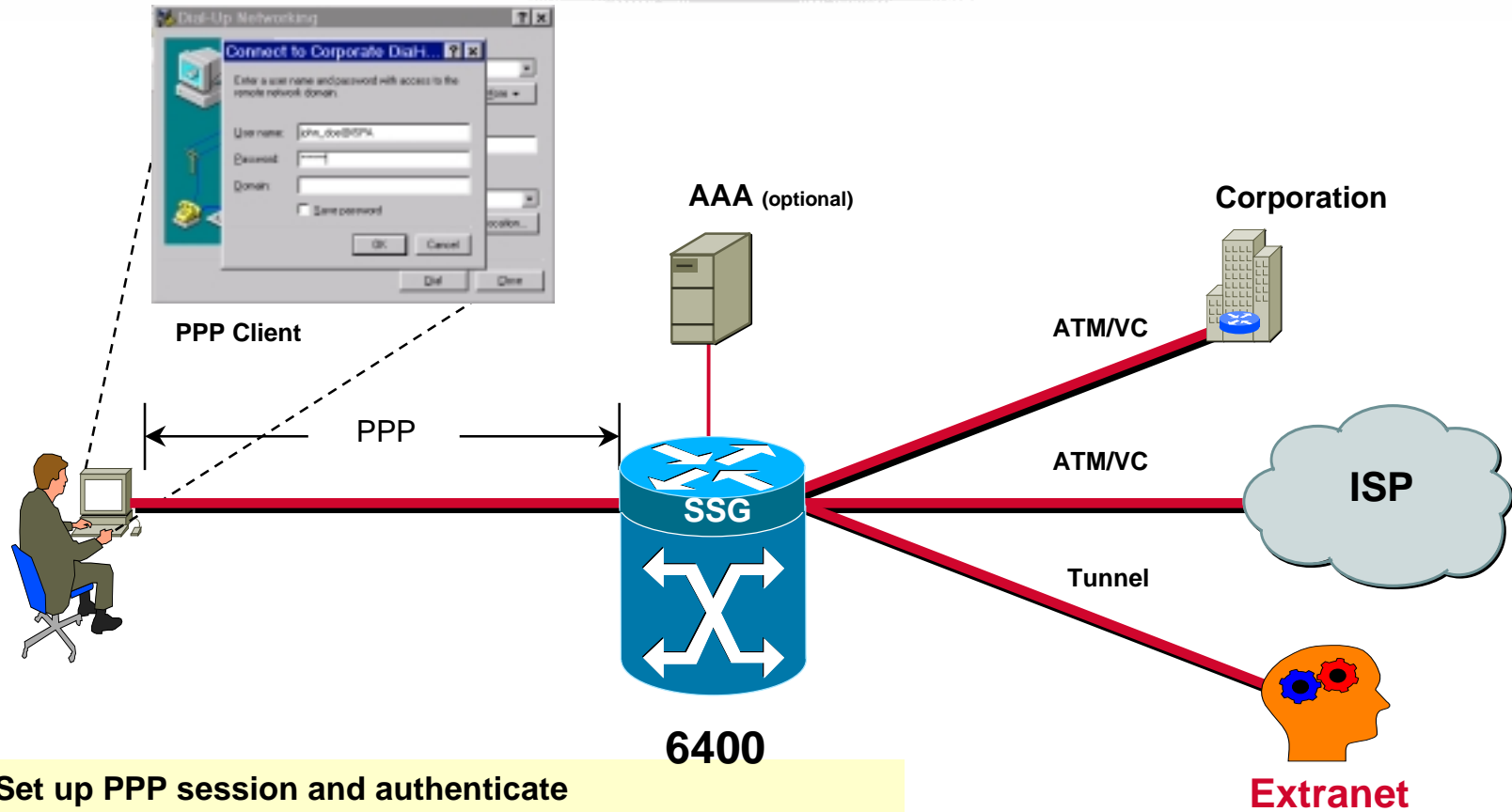
# Dedicated Connection



- Set up PPP session and authenticate
- Single choice of destination

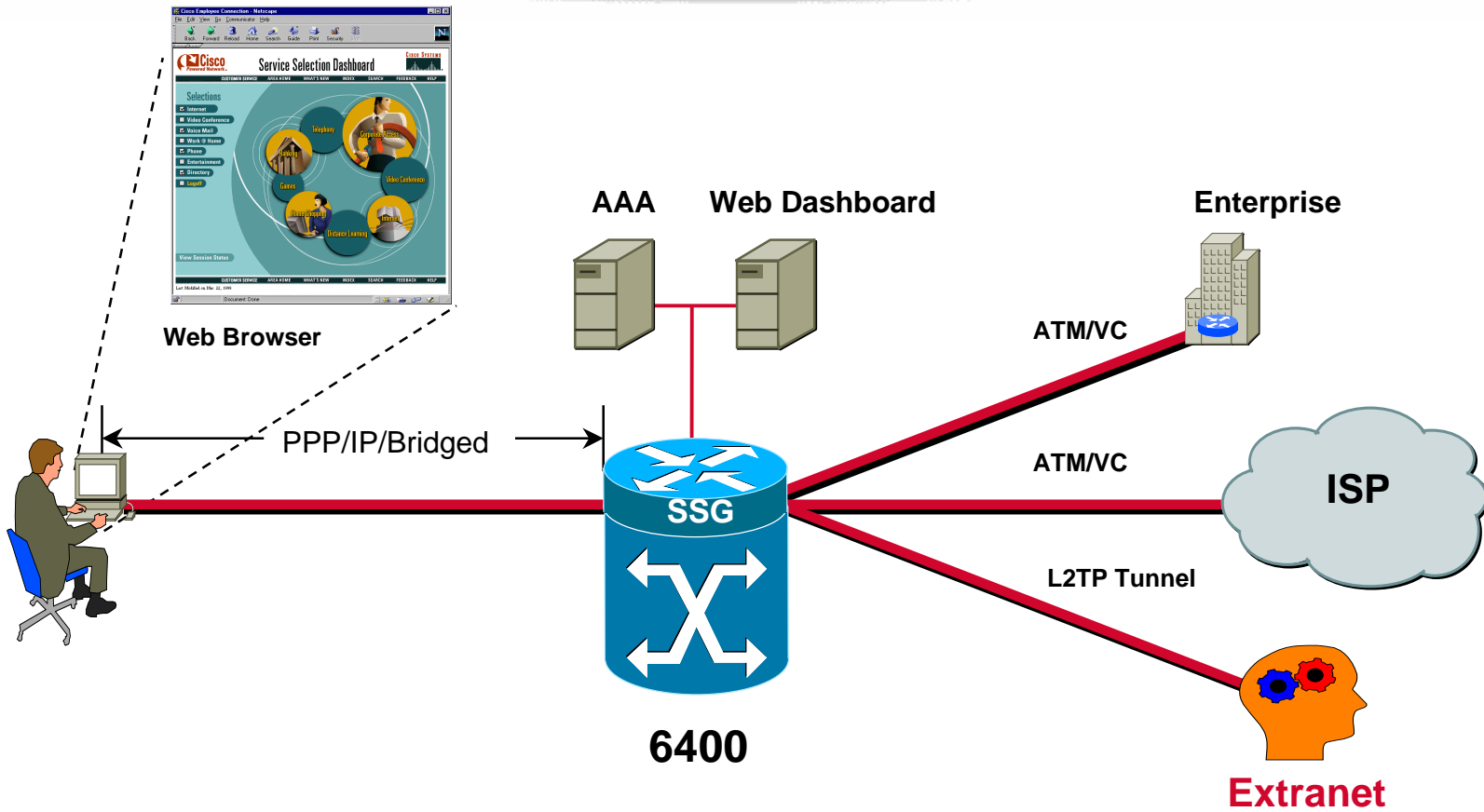
# PPP Service Selection

## “The Dial Experience”



- Set up PPP session and authenticate
- Domain Name identifies destination
- Select another Destination?
  - Tear down PPP session
  - Set up another PPP session

# WebSelection "Always On"





# Service Profiles

## Web Dashboard



## User Profiles

## Service Profiles

jdoe Password = letmein  
 Service = Internet  
 Service = cisco.com  
 Service = Games

cisco.com Password = cisco  
 vpdn:tunnel-id=cisco-gw  
 vpdn:ip-addresses=1.1.1.2  
 vpdn:nas-password=12000  
 vpdn:gw-password=GSR

dsmith Password = wombat  
 Service = Internet  
 Service = coke.com  
 Service = Games

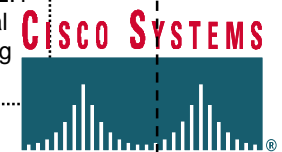
Games Password = cisco  
 vpdn:tunnel-id=games-gw  
 vpdn:ip-addresses=3.1.3.1  
 vpdn:nas-password=Space  
 vpdn:gw-password=Invader

Guest  
 Service = Internet  
 Service = VoIP  
 Service = Games

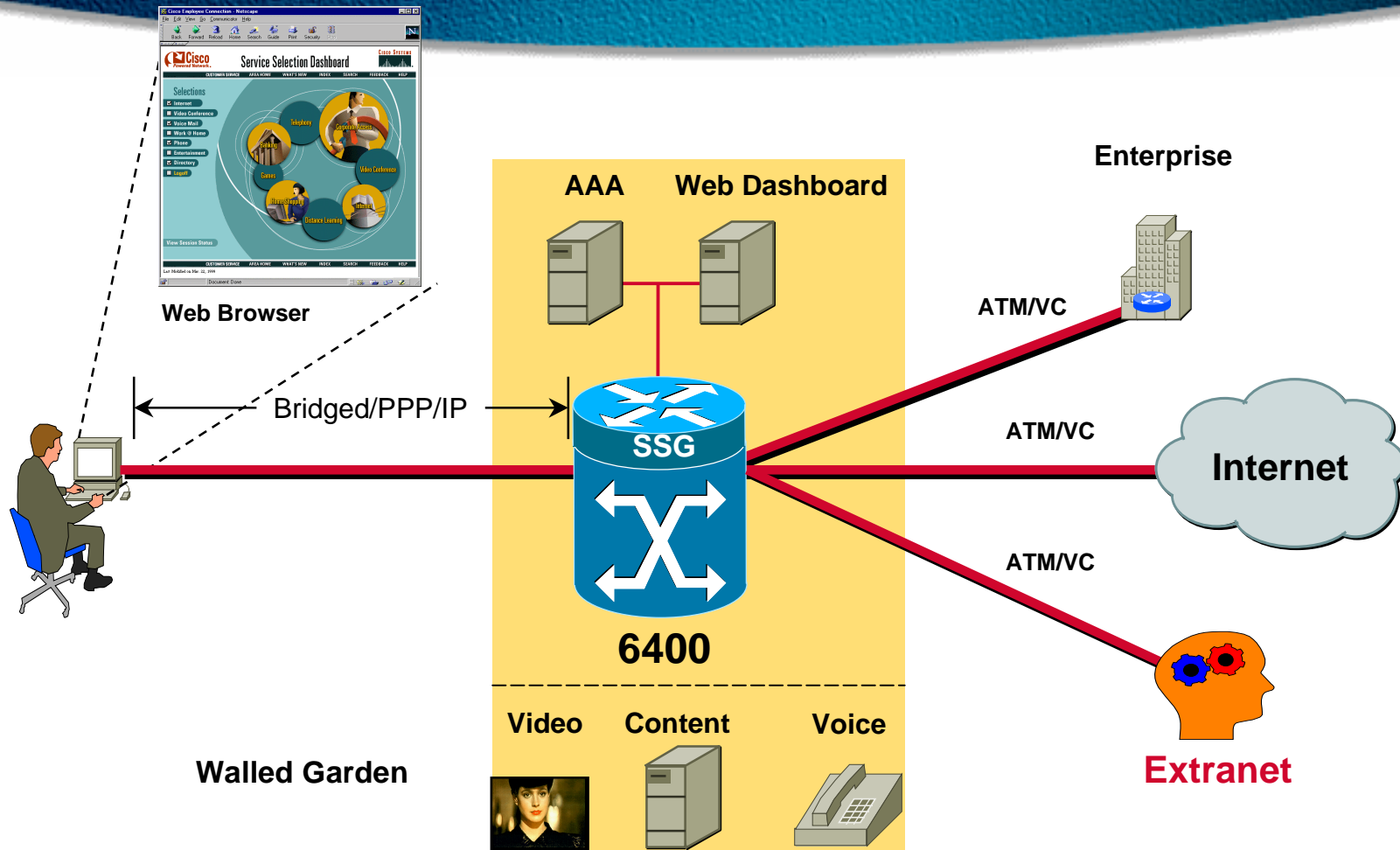
VoIP Password = cisco  
 vpdn:tunnel-id=voip-gw  
 vpdn:ip-addresses=3.3.2.1  
 vpdn:nas-password=pin  
 vpdn:gw-password=drop

coke.com Password = cisco  
 vpdn:tunnel-id=coke-gw  
 vpdn:ip-addresses=2.2.2.1  
 vpdn:nas-password=real  
 vpdn:gw-password=thing

## Radius Server

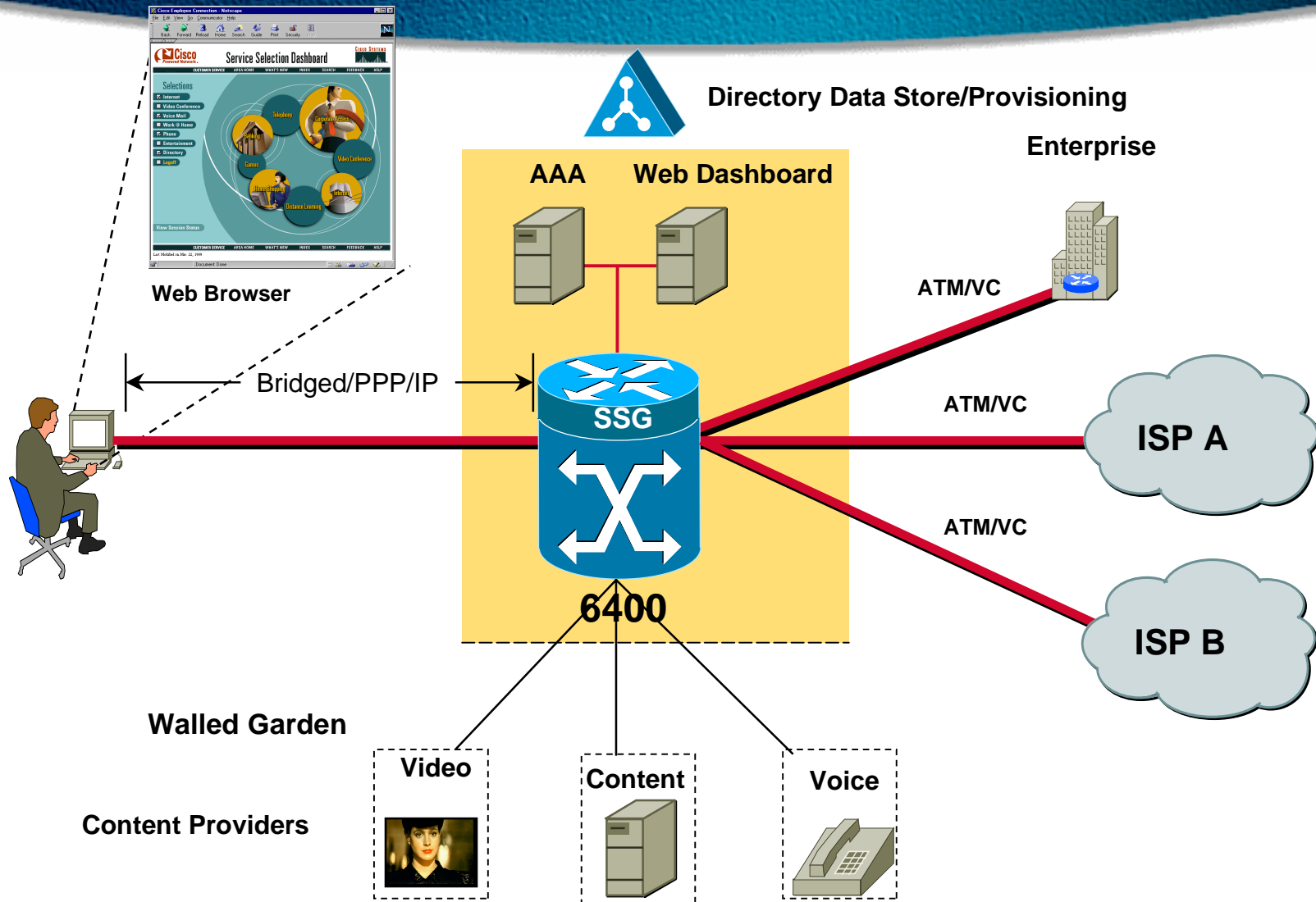


# Retail Service Provider



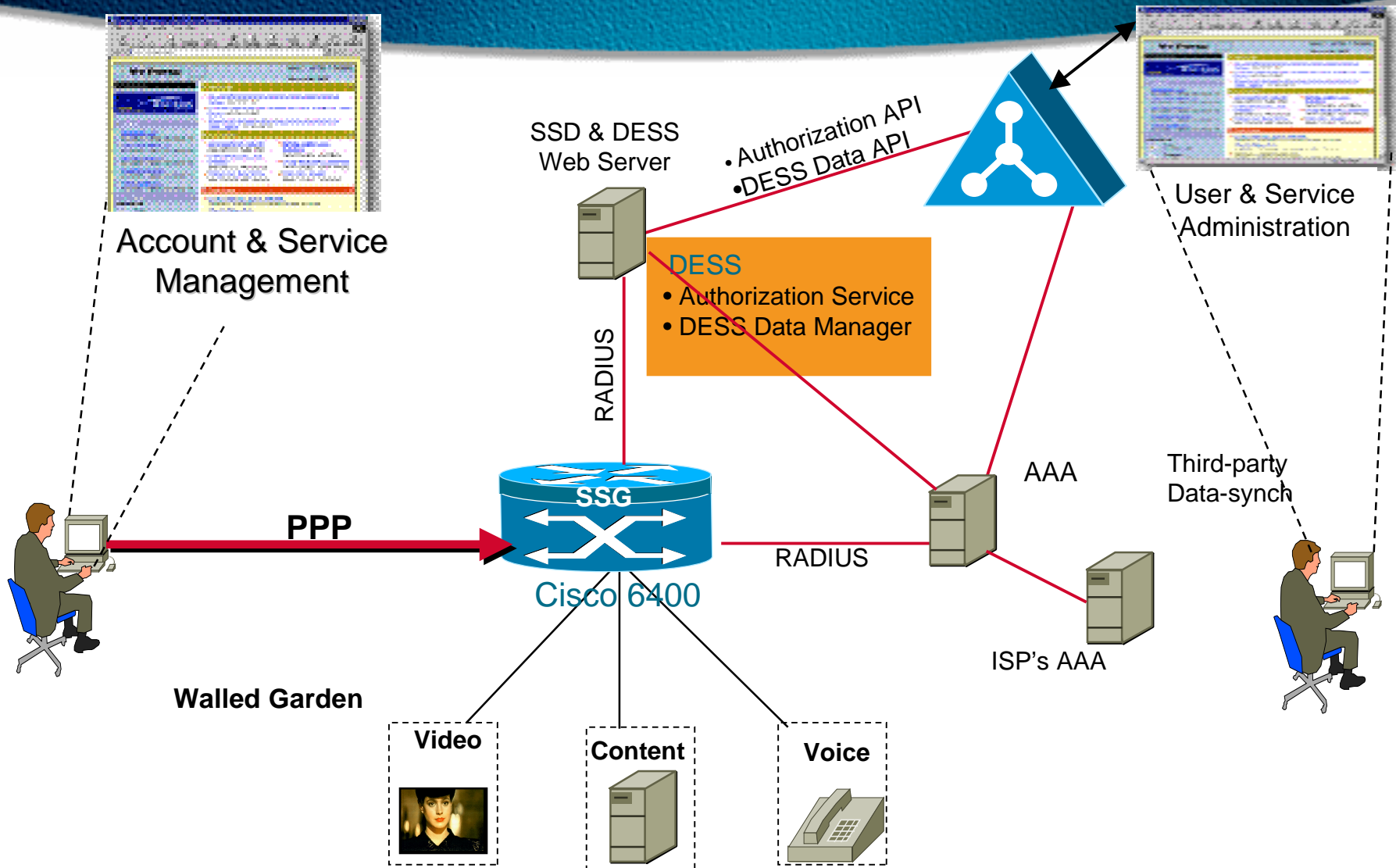
1. Lowers ISP's Bandwidth Requirements
2. Walled Garden can be Offered as Wholesale or Retail

# Branded Portal





# Service Subscription



# Summary

- **The Broadband Opportunity**

- **The ISP Perspective**

**DSL Network Evolution  
(Simplicity and scale)**

**Multiservice Solutions  
(Any Service / any place)**

**Subscriber Management  
(Any User / Any Media)**



# CISCO SYSTEMS



EMPOWERING THE  
INTERNET GENERATION<sup>SM</sup>