



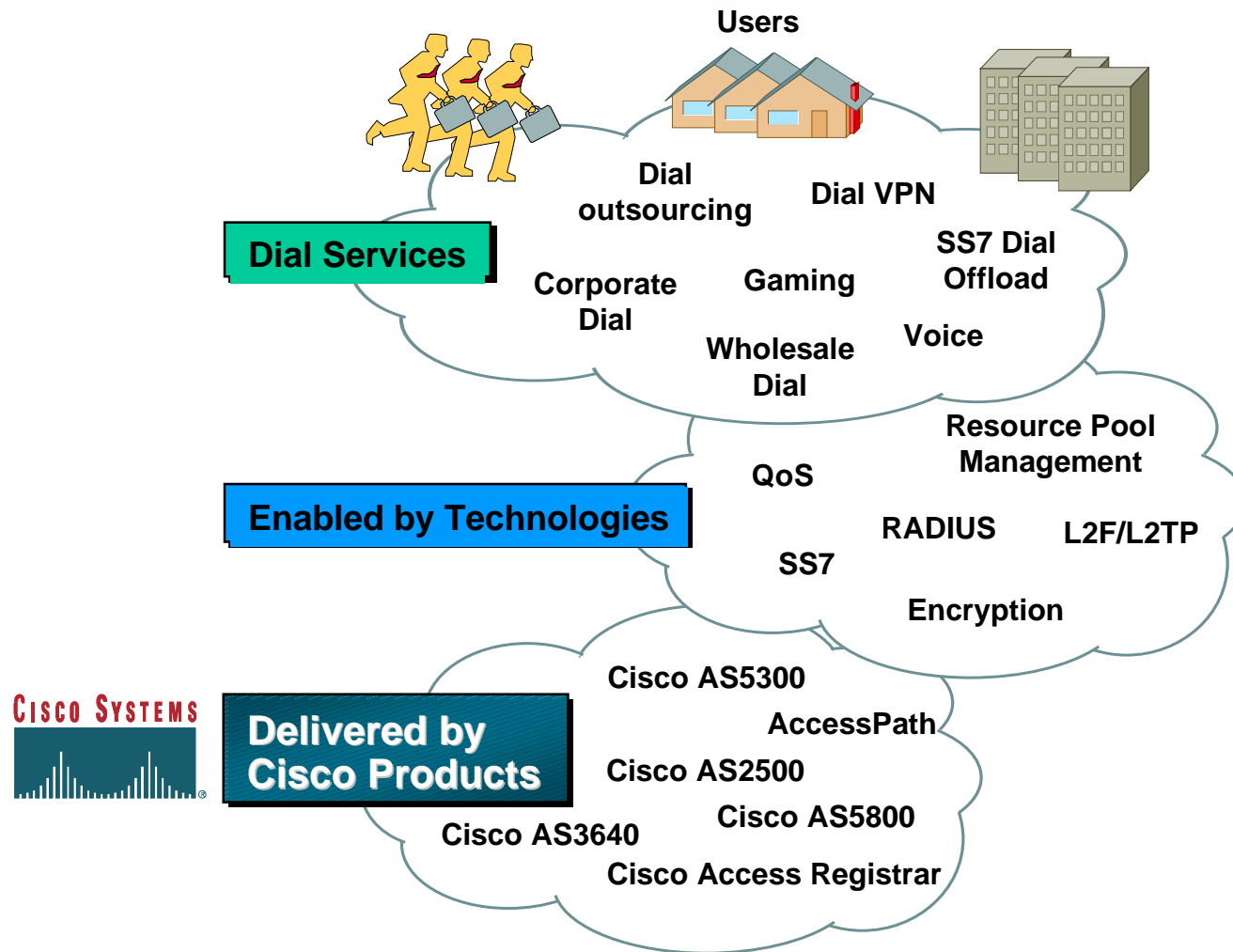
Cisco PSTN/ISDN Access Solutions



Agenda

- **Dial Architecture and Service Basics**
- **Applying the Principles to Dial POPs**
- **Big Time Dial Aggregation**
- **The Extra Value Add**

Dial Solutions

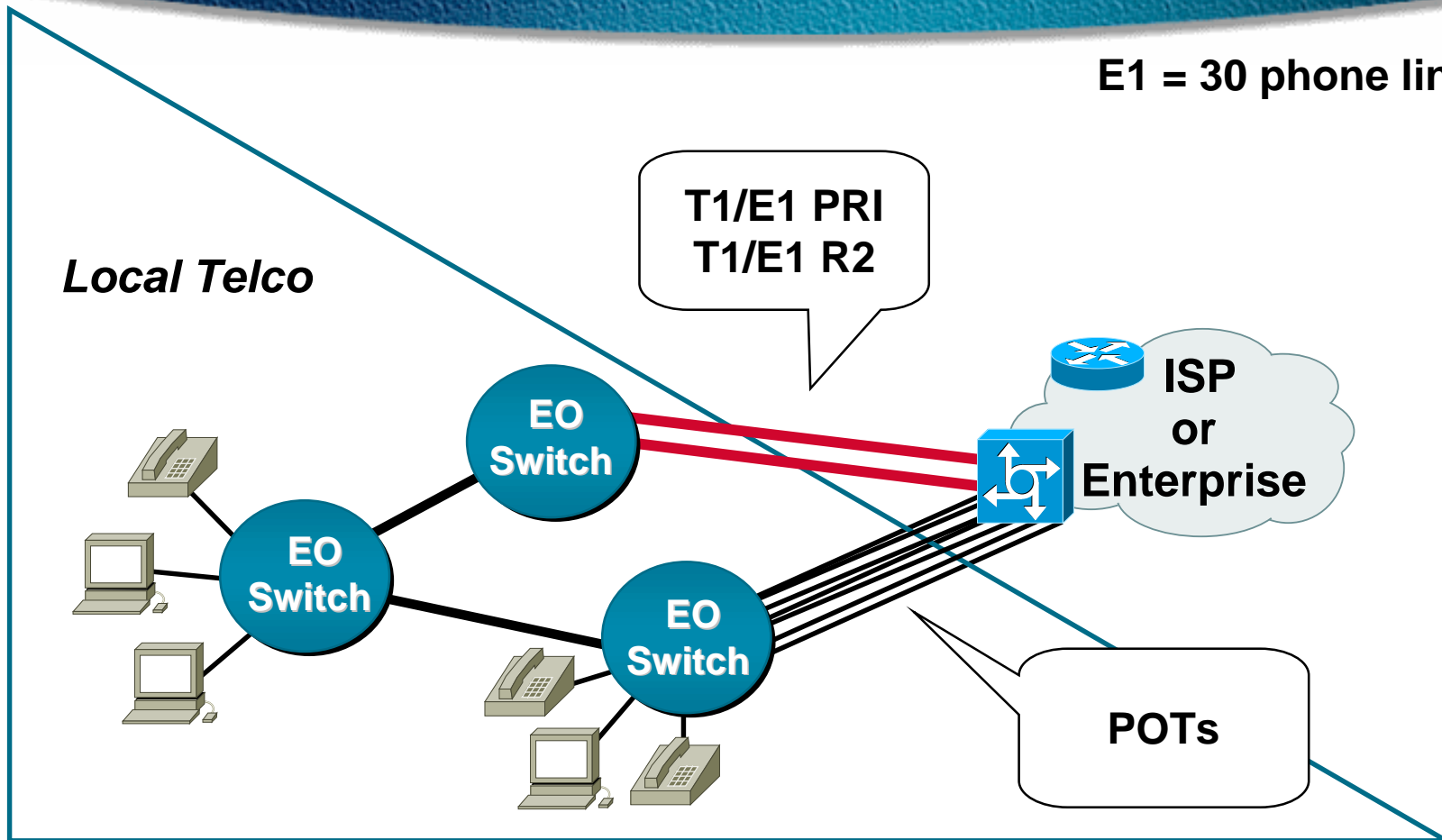


Network Scenarios

- **Corporate Networks**
 - Dial access for employees
- **ISP Networks**
 - Internet Service to end user
 - Corporate outsourcing
 - Wholesale Dial

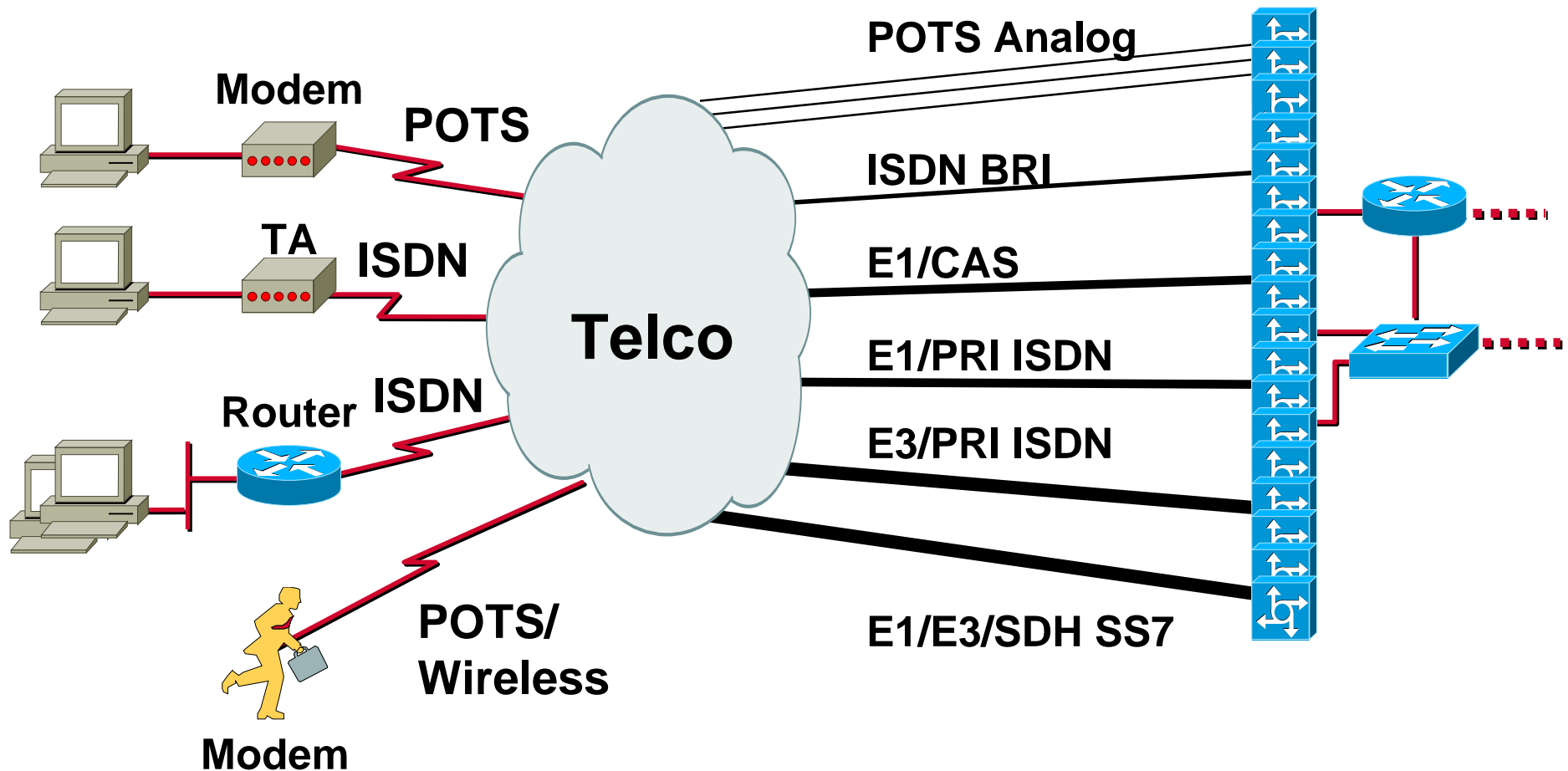
Internet Dial Access Today

E1 = 30 phone lines



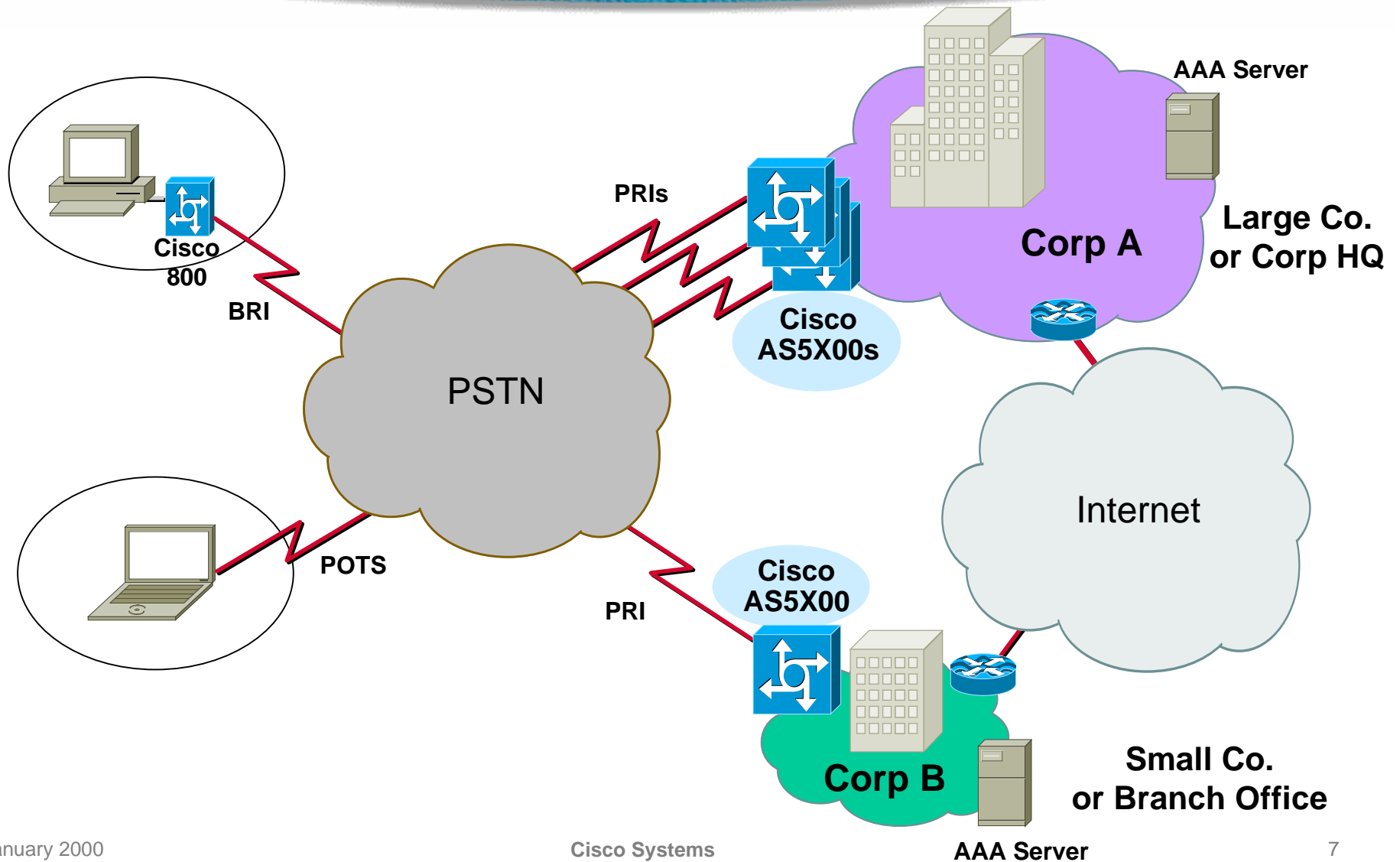
Internet Dial Access Today

Telco Connections



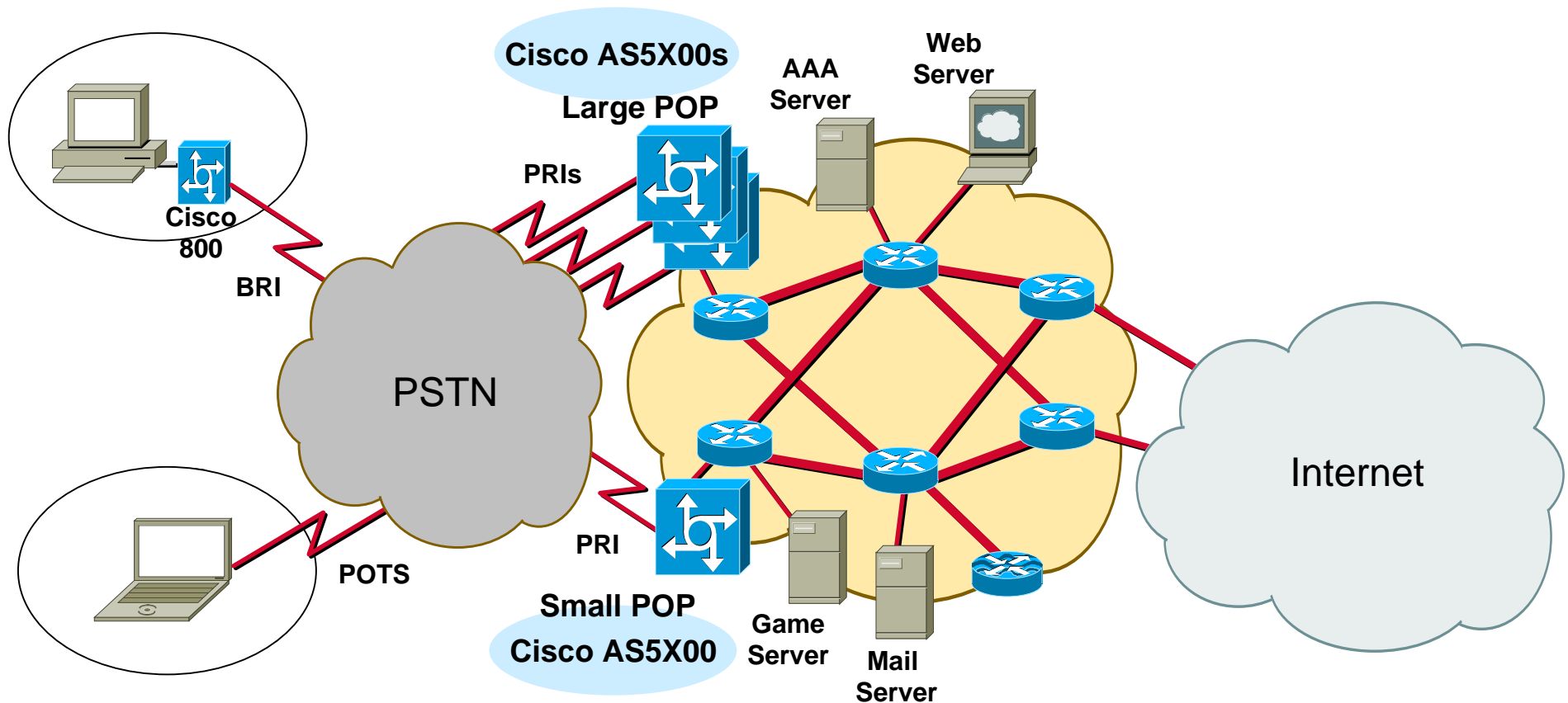
Corporate Networks Scenario

Dial Access



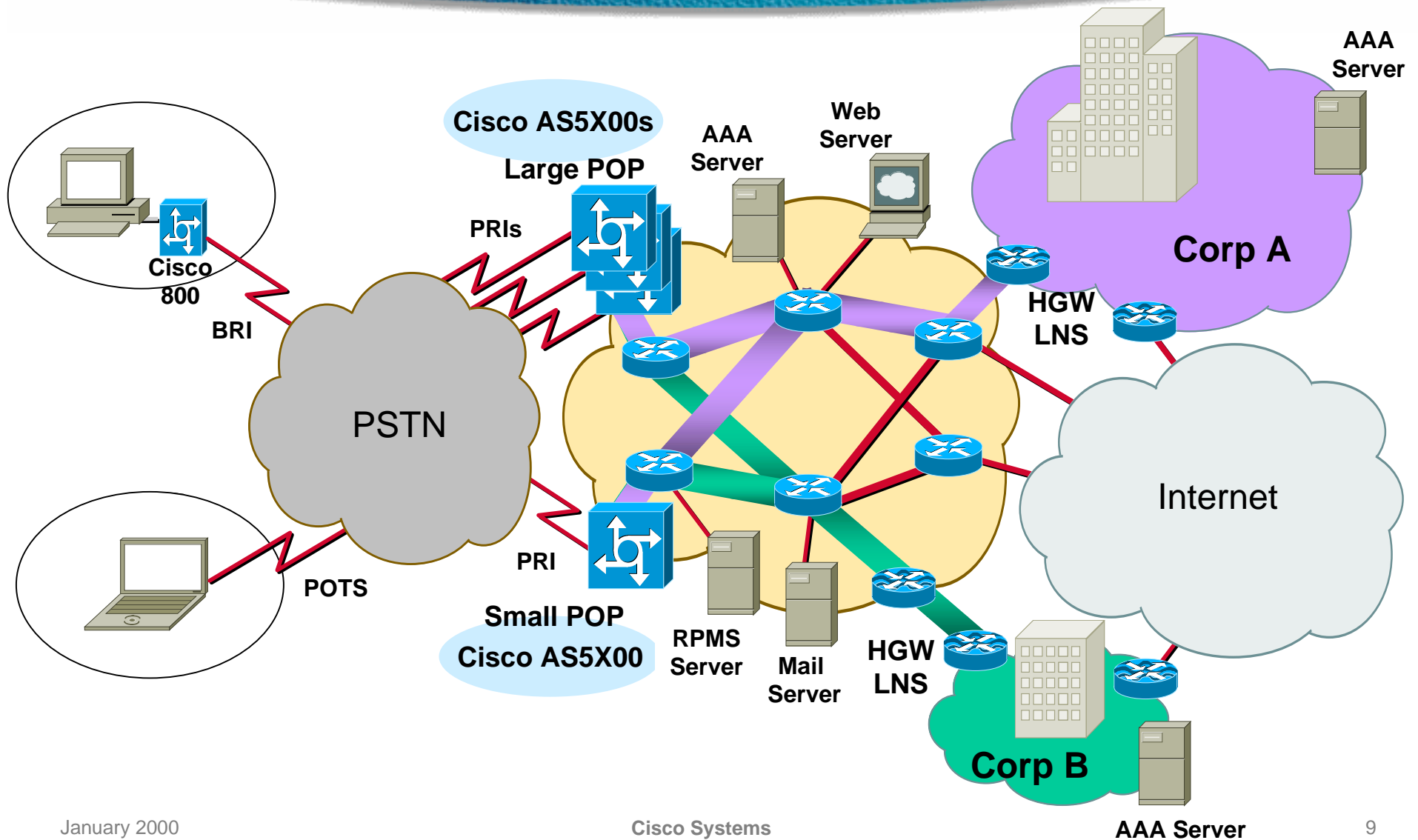
ISP Networks Scenario

Internet Access



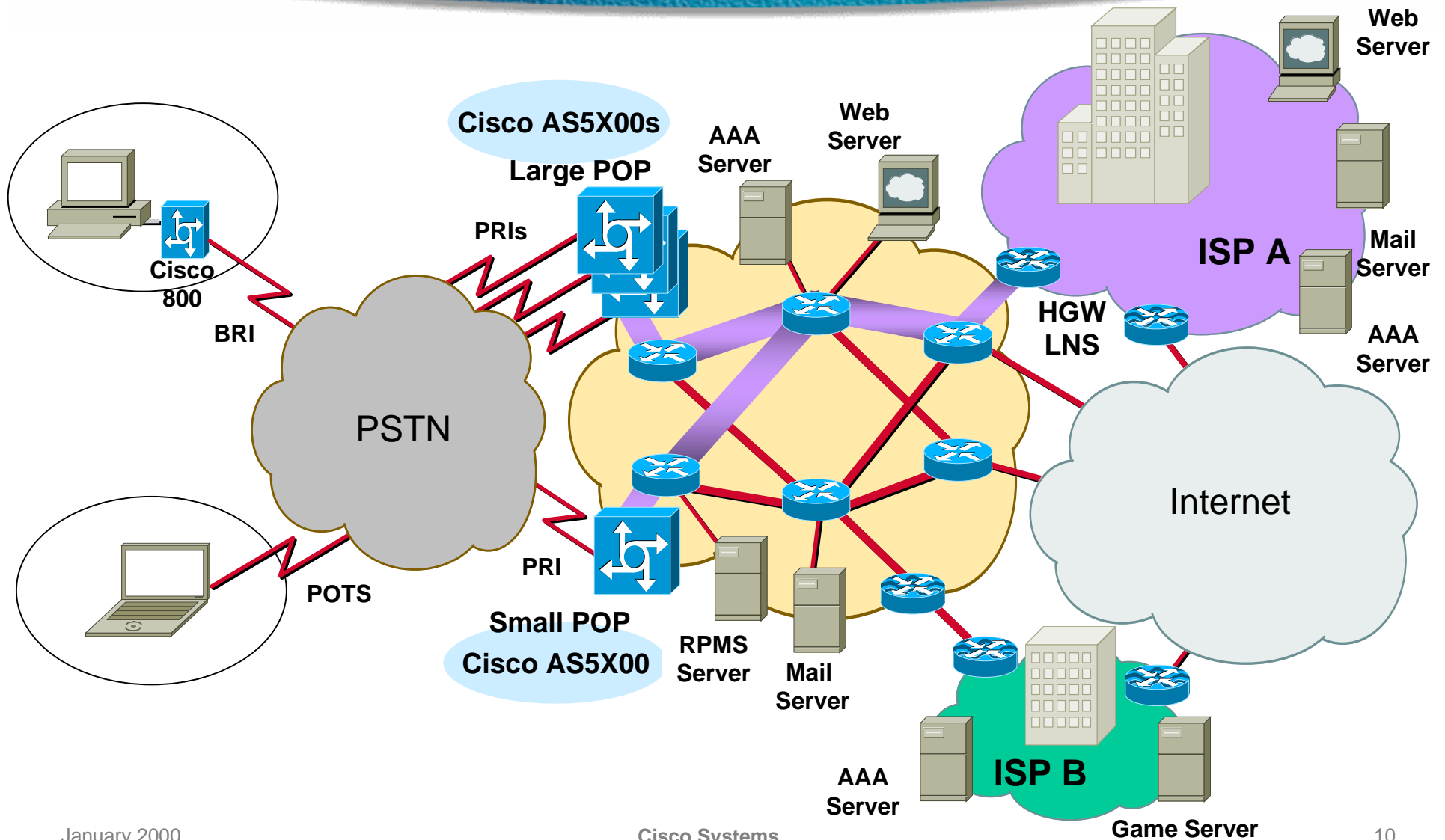
ISP Networks Scenario

Corporate Outsourcing

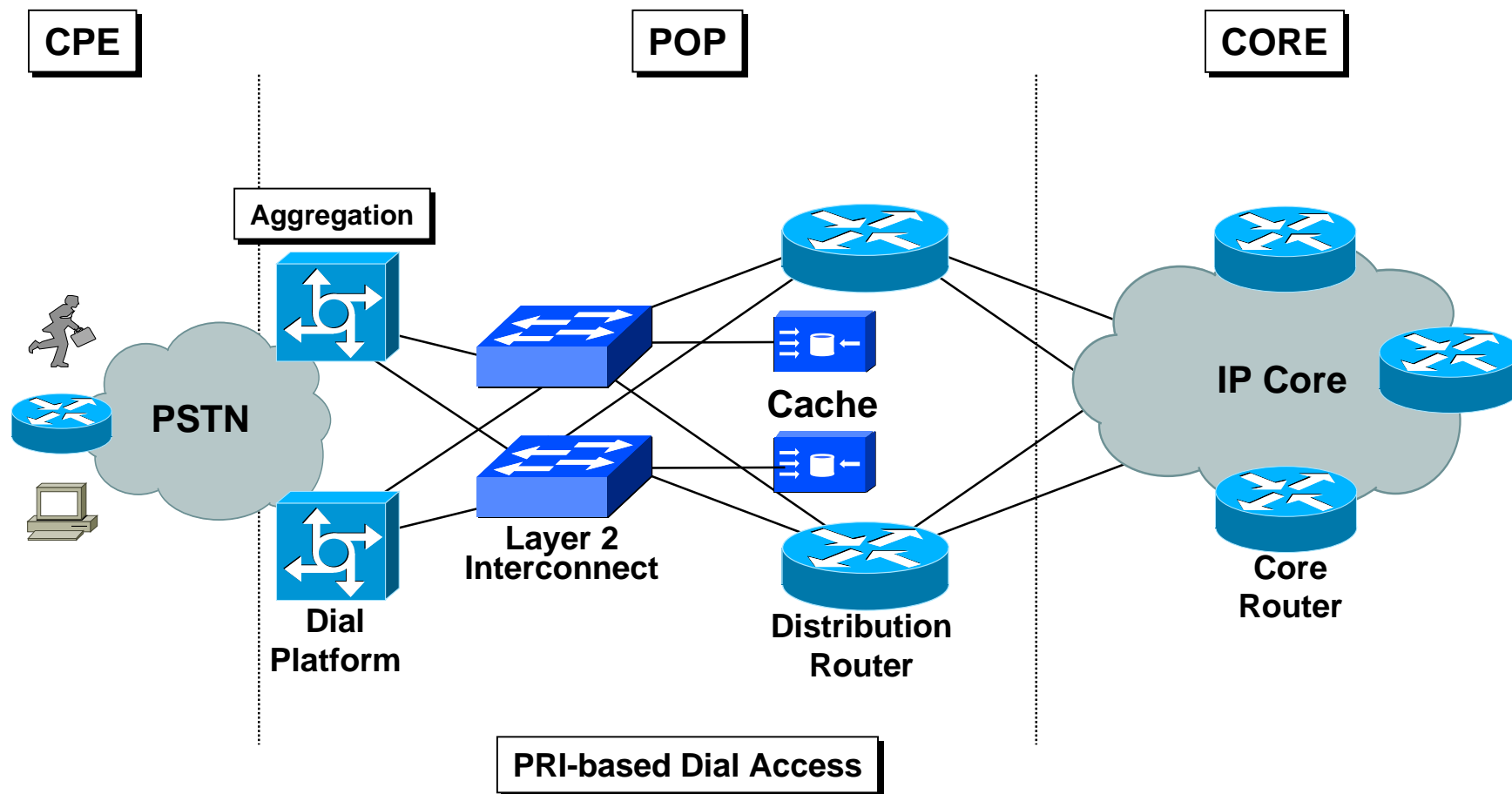


ISP Customer Scenario

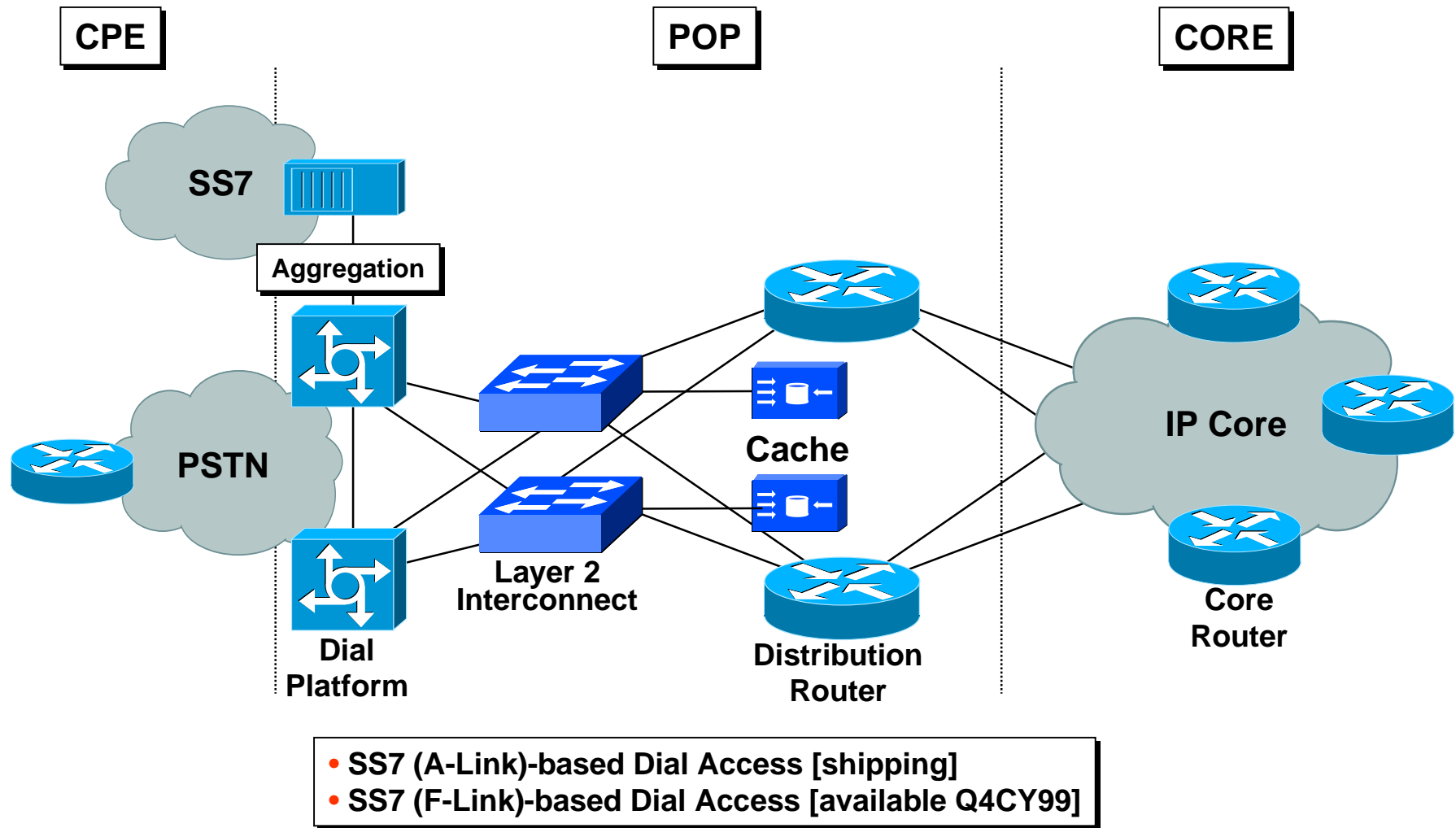
Wholesale Dial



Dial Internet Access *Service Architecture*

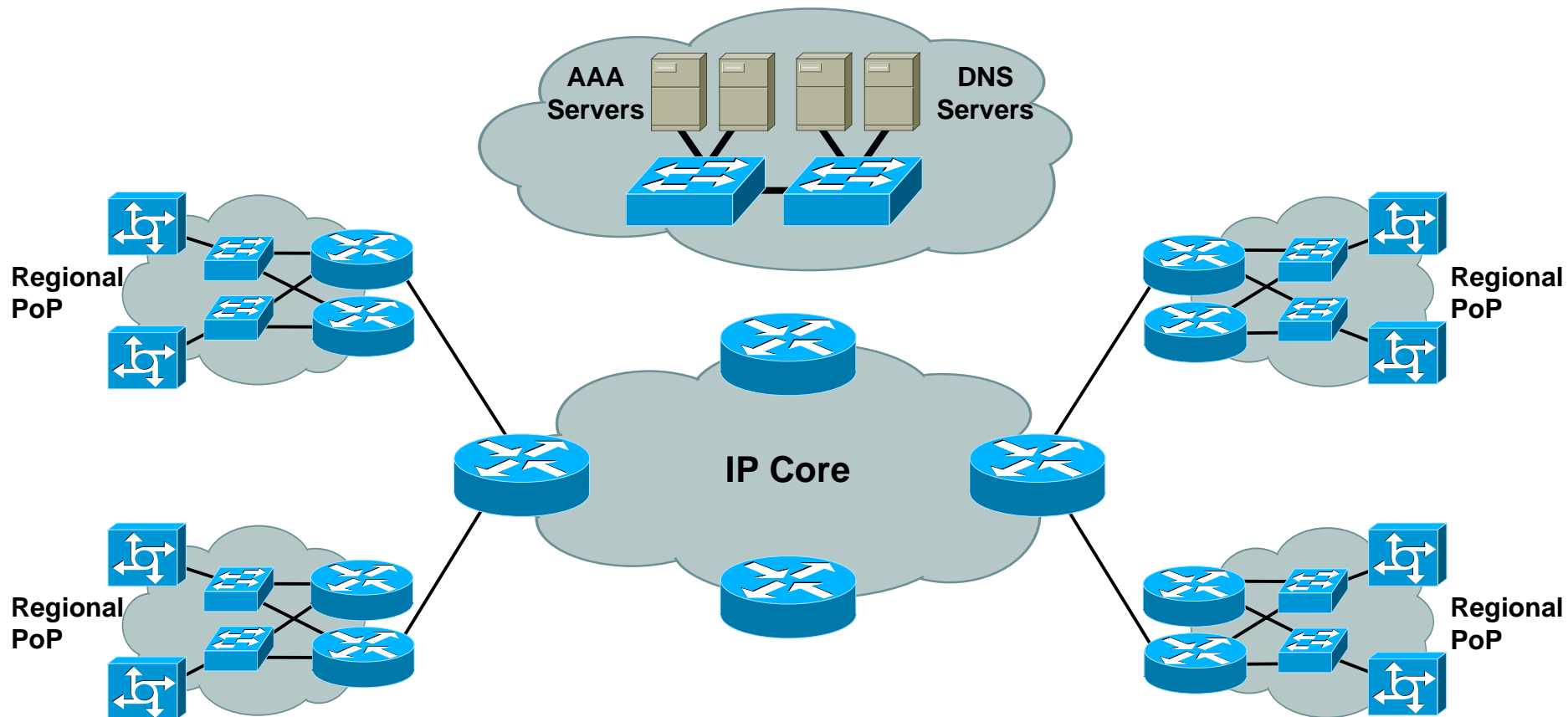


Dial Internet Access Service Architecture



Dial Internet Access

DNS/DHCP Architecture



Dial Internet Access

Software Features

CPE Software Features

- PPP Multilink
- PPP extensions

DIAL ACCESS Software Features

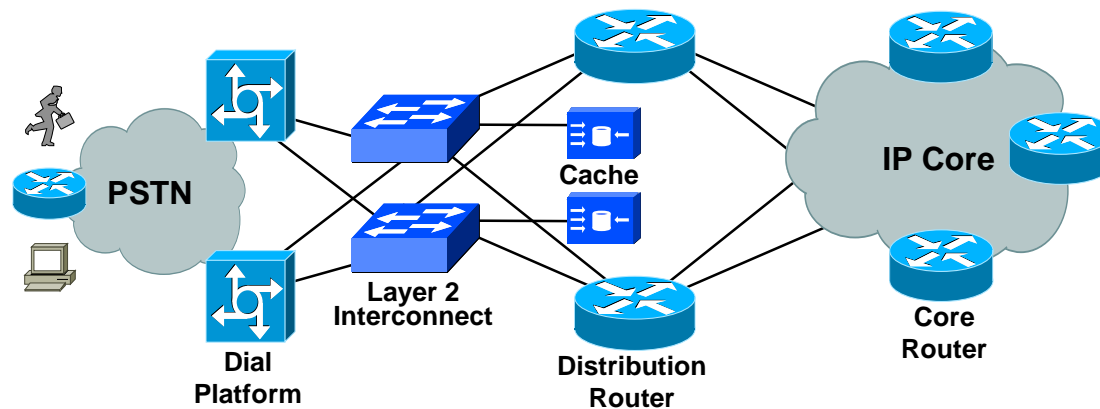
- Integrated V.90 Modem & ISDN Support
- Dial Access Stacking Architecture (DASA)
- SS7 Integration
- AAA Support
- Web Caching Via WCCP
- Unicast RPF

POP Software Features

- AAA
- Web Caching Via WCCP
- IGP Support/BGP Peering
- MPLS/Traffic Engineering
- IP QoS Support

CORE Software Features

- IGP Support/BGP Peering
- MPLS/Traffic Engineering
- QoS Support





Applying the Principles to Dial POPs

*From the 2511 to the GSR - how ISP POP
Designs Scale to the requirements of all ISPs*

Small Start-up ISPs

- **Cisco's 2500 Access Server Series: A low-cost entry-level access server product family**
- **Connects async devices (such as terminals, modems, ISDN terminal adapters) into routed network**
- **Backhauls routed traffic through T1/E1 lines**
- **Cisco 2500 Series is the workhorse of the start-up ISP**

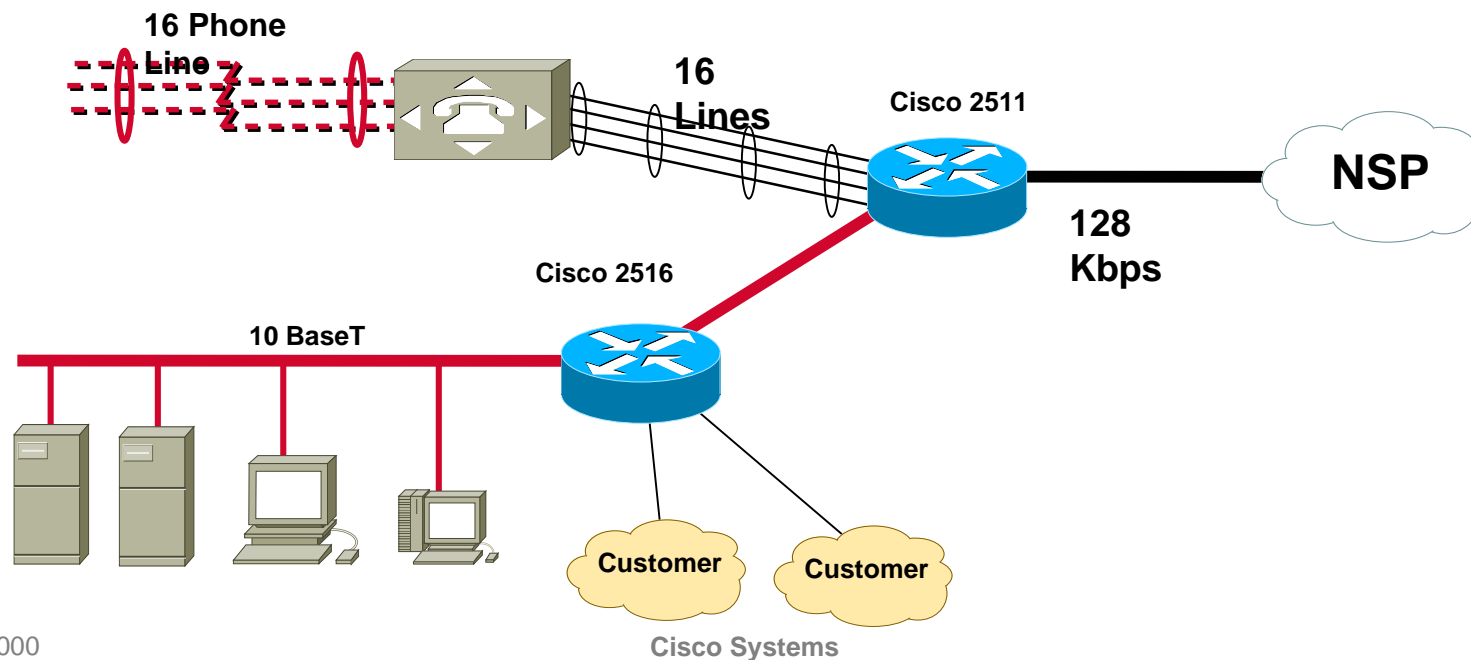


Cisco 2509 and Cisco 2511 Access Servers

Central Site Access Server Solutions		
	<u>Cisco 2509</u>	<u>Cisco 2511</u>
Ethernet	1	1
Synchronous Serial Ports	2	2
High-speed Async. Serial Ports	8	16

Small Start-up ISPs

- One Cisco 2511, One Cisco 2516, a Modem Bank, and a few PC Based UNIX workstation gets you started.



Cisco 2500 Integrated Hub Models

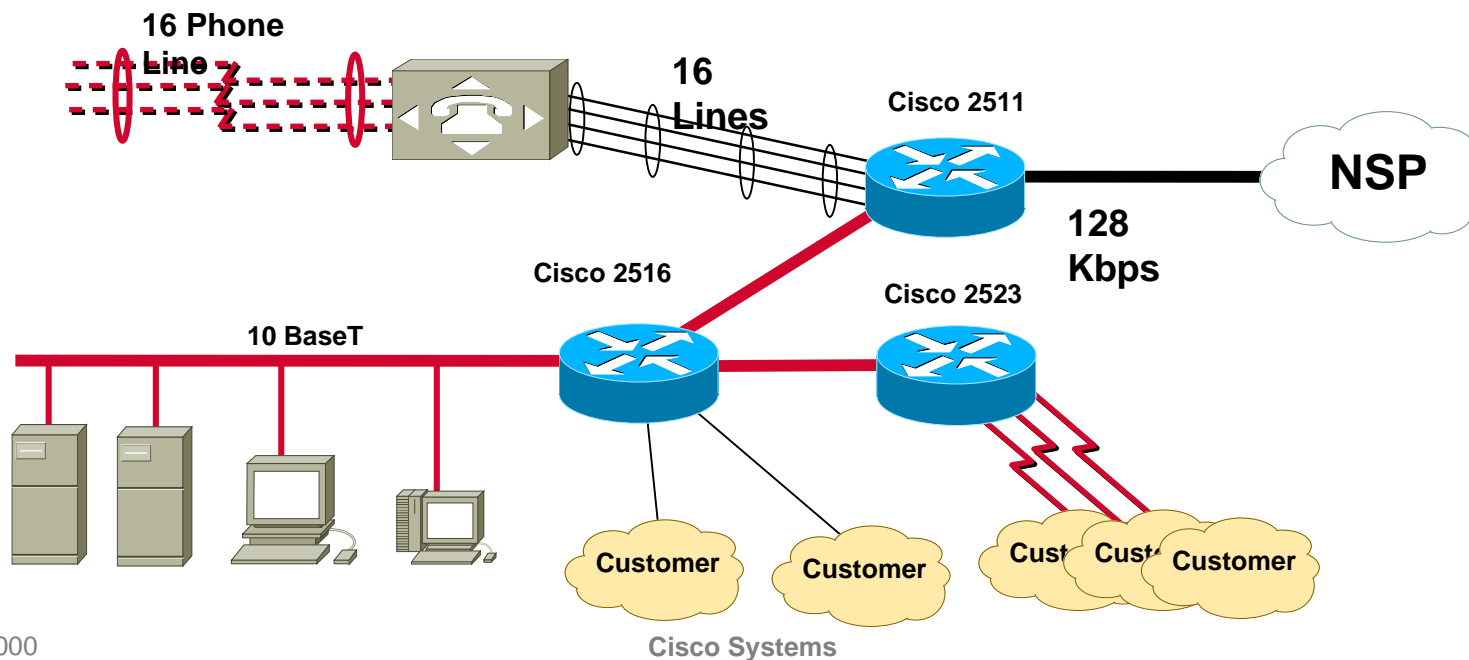
Hardware Configuration

	LAN Interface						WAN Interface		
	Topology	Hub Port	MDI MDI-X Switch	AUI Port	Lobe Exp Port	Ring-In Ring-Out Port	T1/E1 Sync Serial	Low Speed Async	ISDN BRI
2505	Ethernet	8	–	–	N/A	N/A	2	1	–
2507	Ethernet	16	–	–	N/A	N/A	2	1	–
2516	Ethernet	14	Yes	–	N/A	N/A	2	1	1
2517	Token Ring	11	N/A	N/A	Yes	Yes	2	1	1
2518	Ethernet	23	–	Yes	N/A	N/A	2	1	1
2519	Token Ring	23	N/A	N/A	No	Yes	2	1	1



Small Start-up ISPs

- Add a Cisco 2522 for low speed lease line ports.



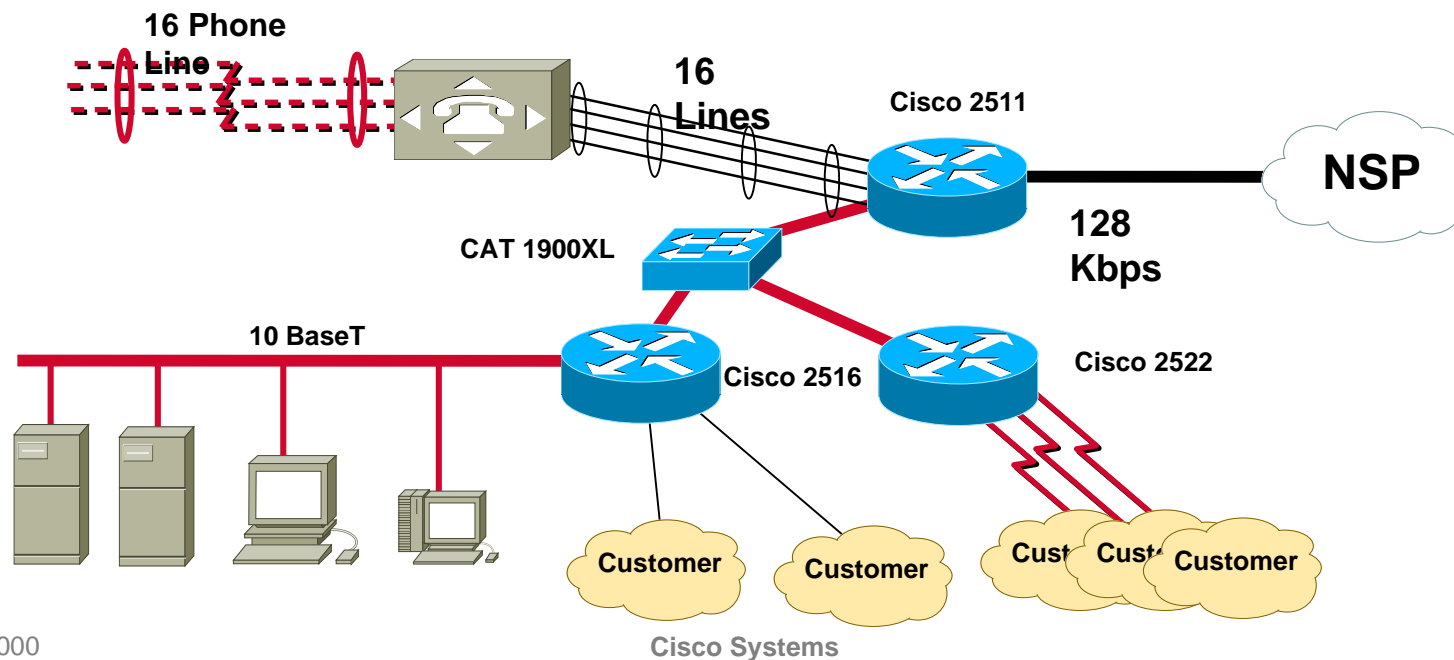
Cisco 2522 - Low Cost Lease Line Aggregation

- 1 Ethernet (AUI/10BT)
- 2 High-speed synchronous serial
- 1 ISDN BRI S/T interface
- 8 Low-speed (115.2 kpps) asynchronous/synchronous serial (5-in-1)



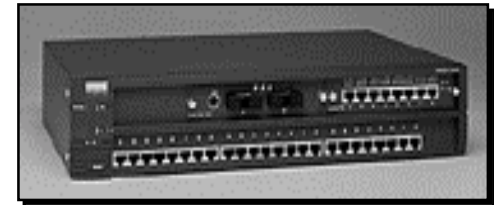
Small Start-up ISPs

- Add a CAT 1900XL for switched ethernet with VLAN



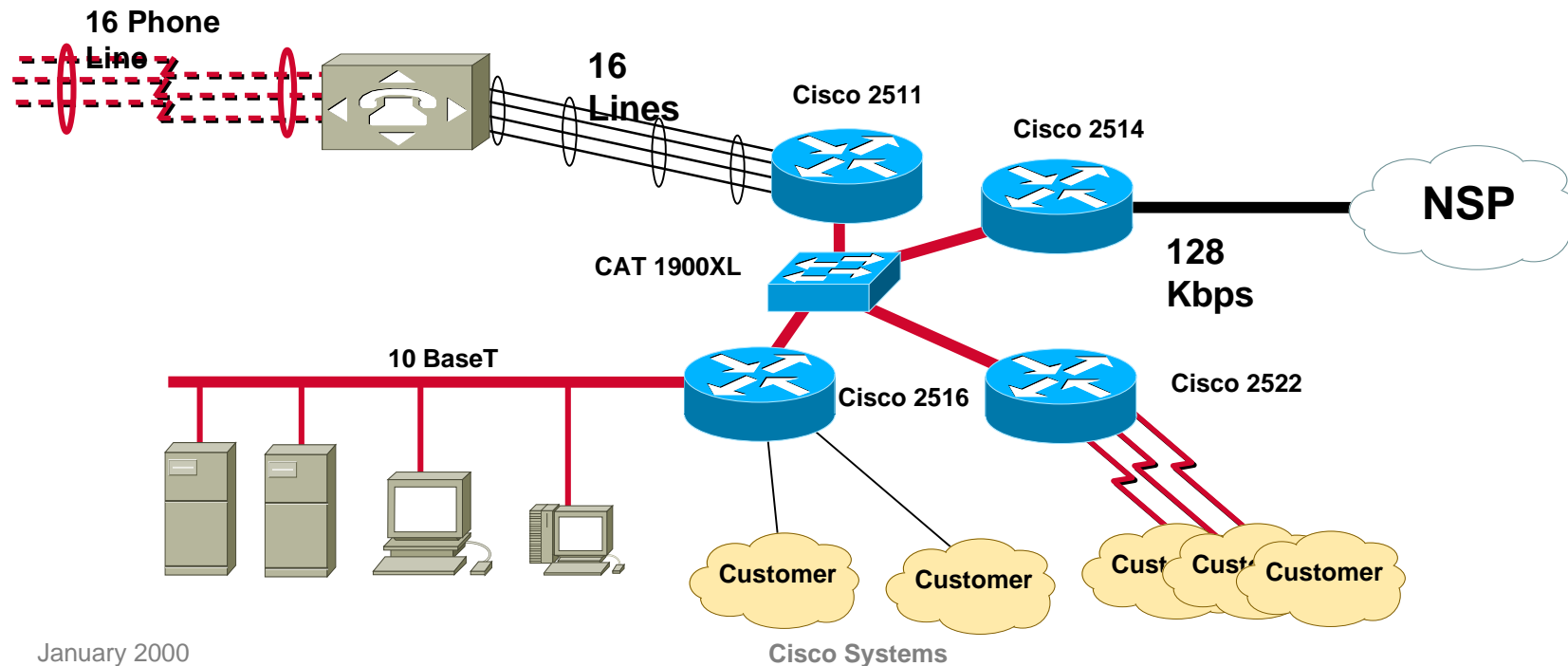
Catalyst 1900

- **Extremely low price per port**
- **Affordable high-performance alternative or complement to shared media 10BaseT hubs**
- **12 or 24 switched 10BaseT ports**
- **Choice of 100BaseTX or 100BaseFX uplinks**
- **Slimline one-rack unit high enclosure**
- **VLAN**



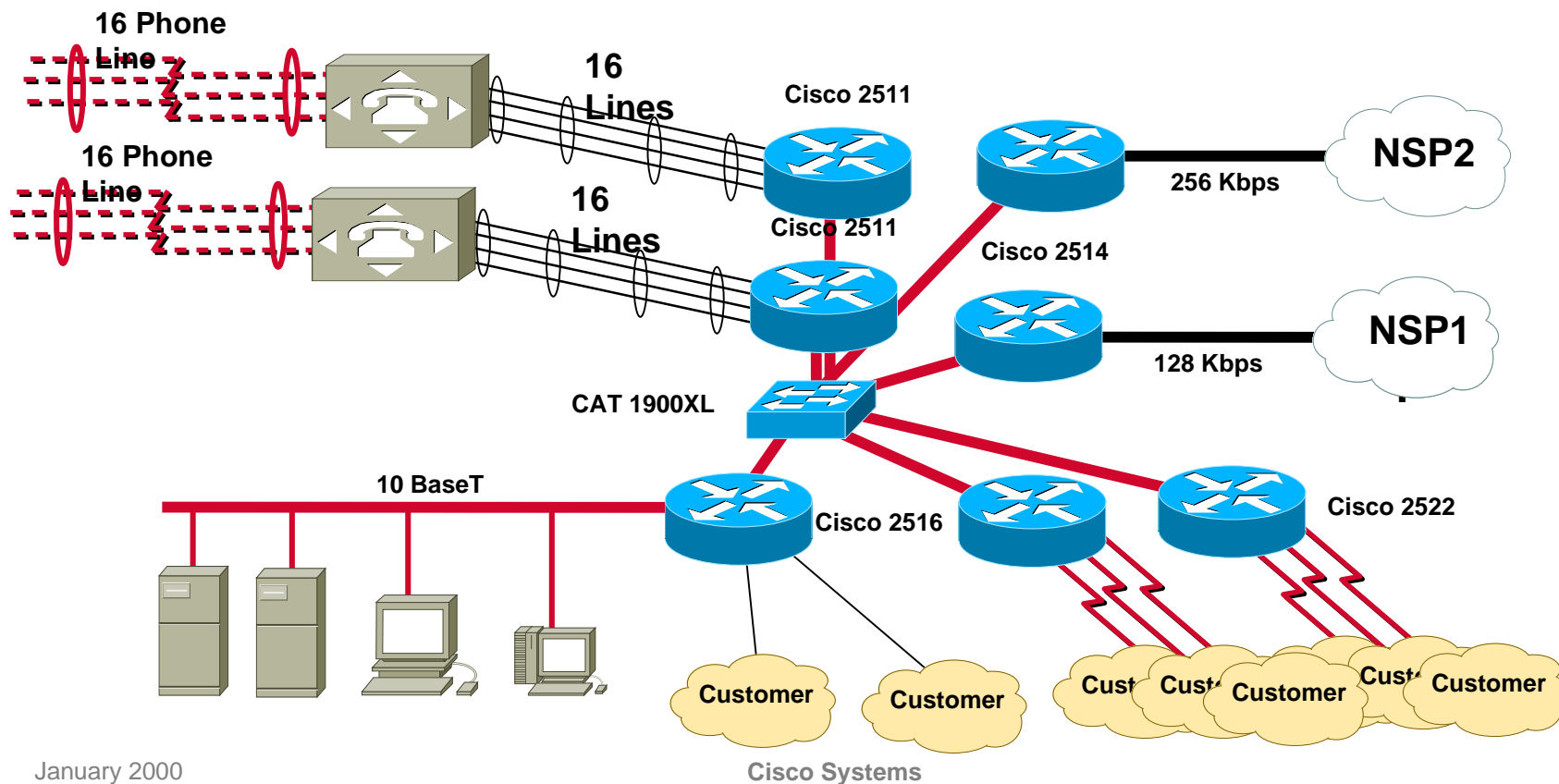
Small Start-up ISPs

- **Start Adding Redundancy - Break the Dial and the Backbone**



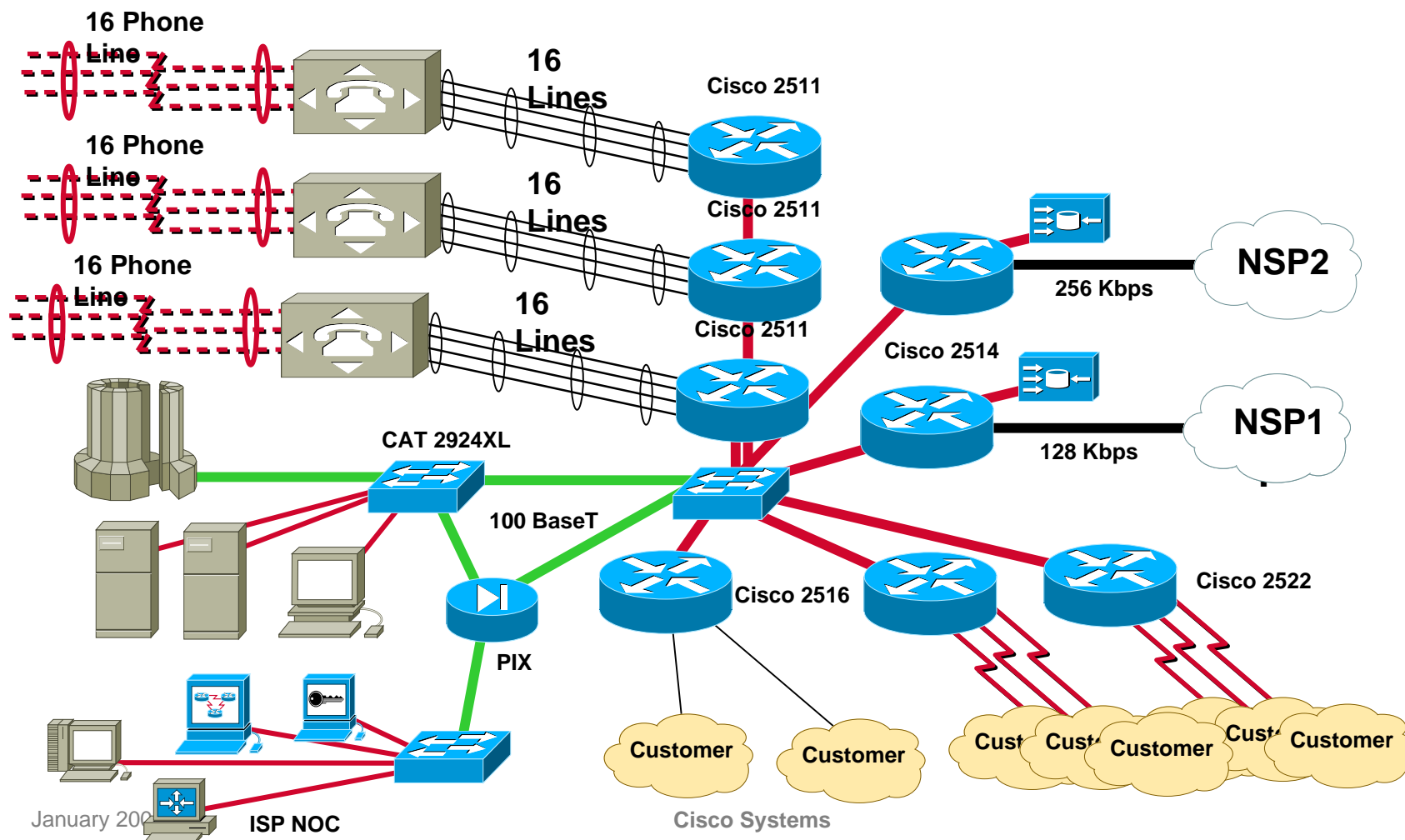
Small Start-up ISPs

- Multiple directions of growth...



Small Start-up ISPs

- **Multiple directions of growth...**



Cisco 3600 Family Platforms

- 50-70 kpps fast switching
- 3-4 kpps process switching
- Four network module slots

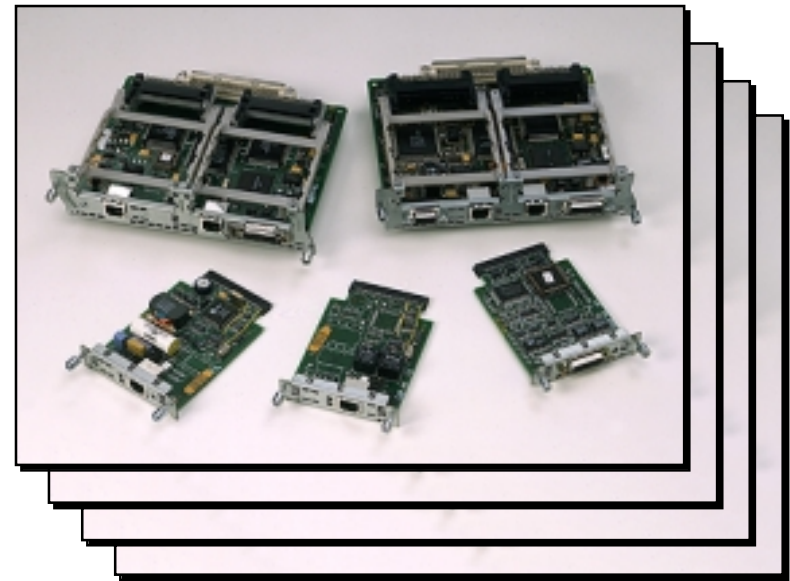
↑ **Versatility**
↓ **Integration**
↓ **Performance**

- 20-40 kpps fast switching
- 1.5-2 kpps process switching
- Two network module slots



Cisco 3600/2600 Family Interfaces

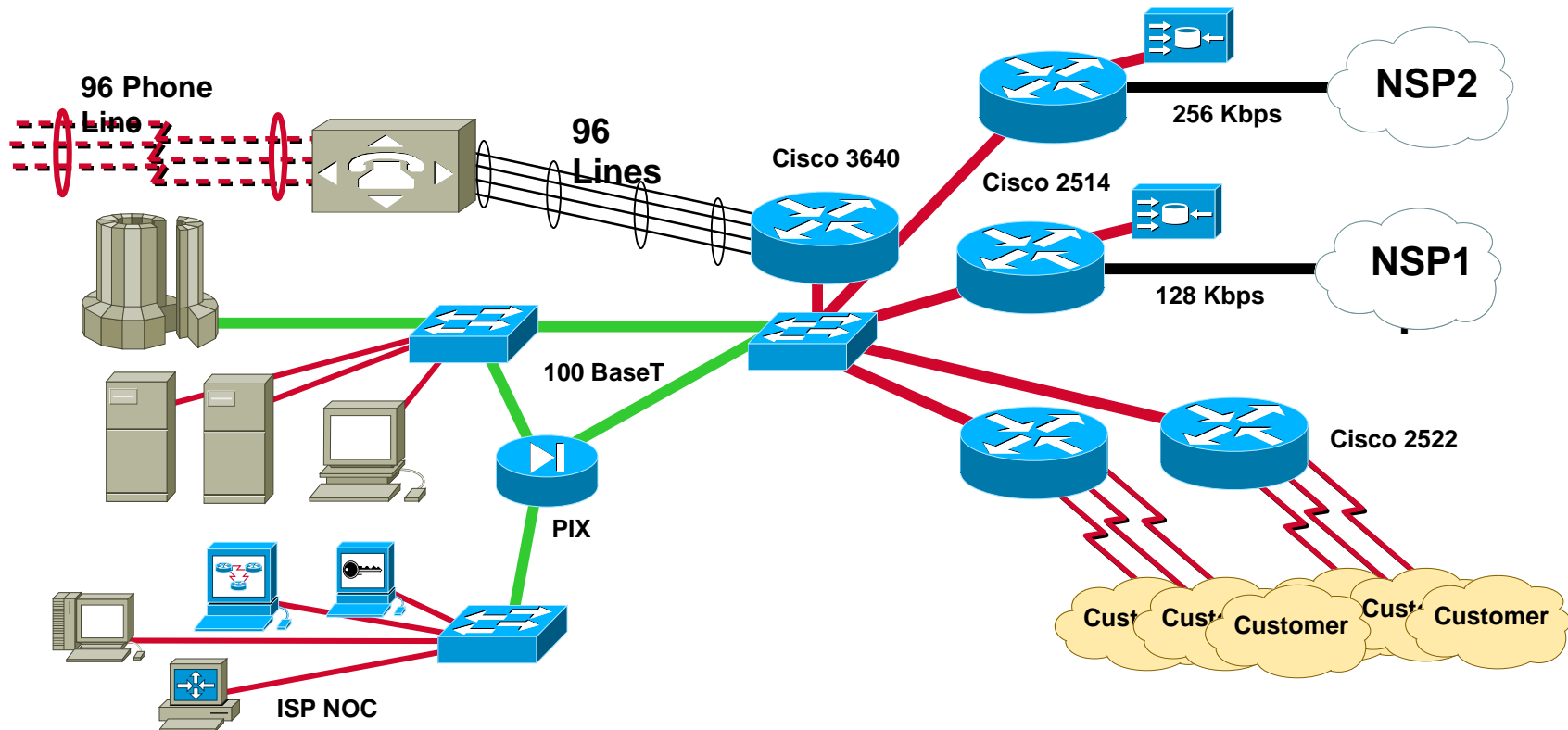
- **Multiple LAN/WAN combinations**
 - Ethernet, Token Ring, Fast Ethernet, Serial, ISDN, CSU/DSU
- **Broad range of network services**
 - Dial—ISDN, async, modems
 - Multiservice—Voice and fax over IP packet gateways (BRI/PRI digital interfaces, VoFR, and VoATM in '98)
 - Emerging technologies—ATM, xDSL in '98
- **Simplified solutions**
 - Integrated 56K CSU/DSU (T1 in '98)
 - Integrated compression and encryption
 - WICs shared with Cisco 1600 series



**Over 5000
Unique Combinations!**

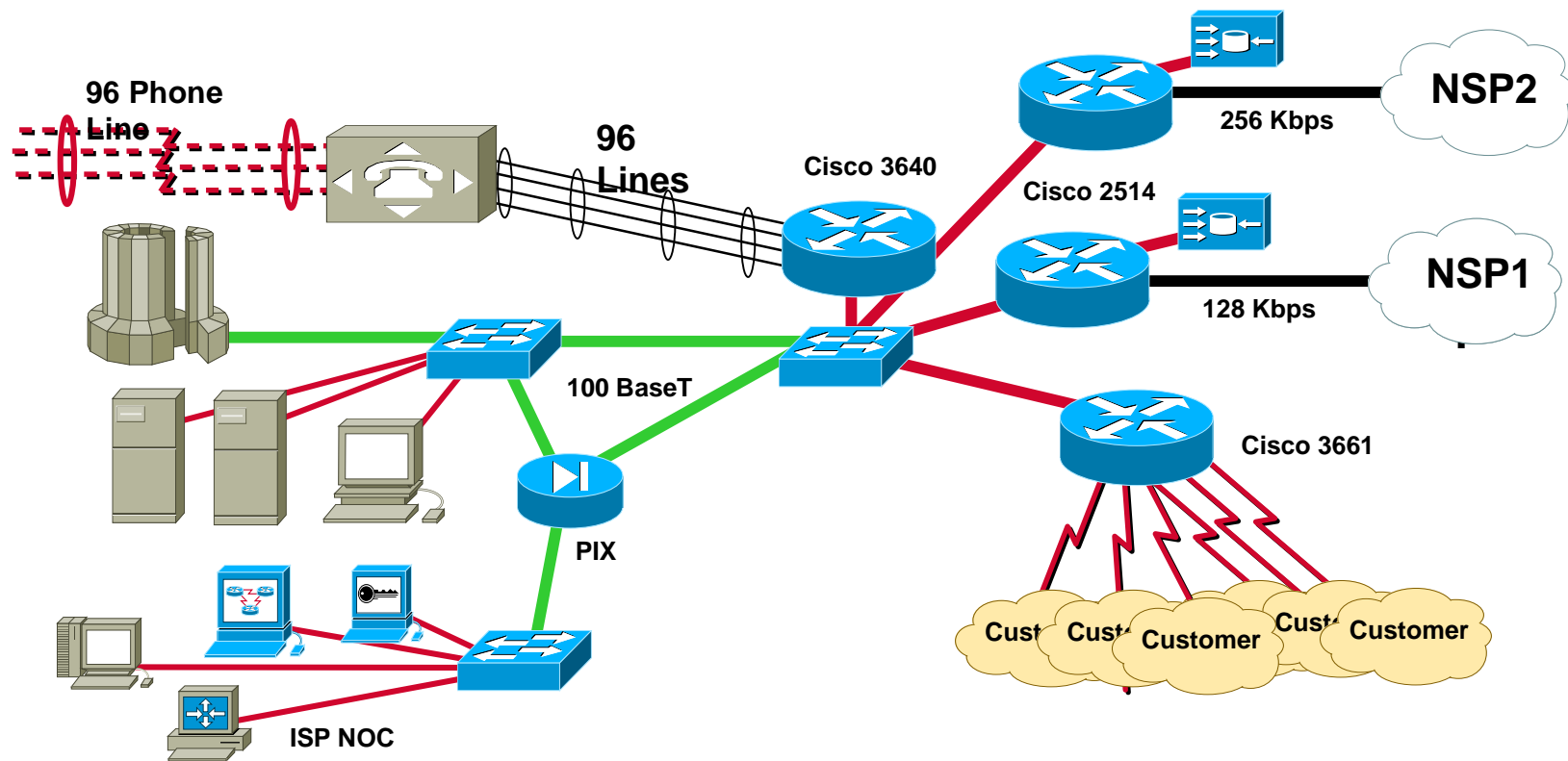
Scaling the Start-up ISPs

- Replace six 2511s with one 3640 with 96 ports



Scaling the Start-up ISPs

- Replace three 2522s with one 3661 with 48 low speed ports (up to 128Kbps)



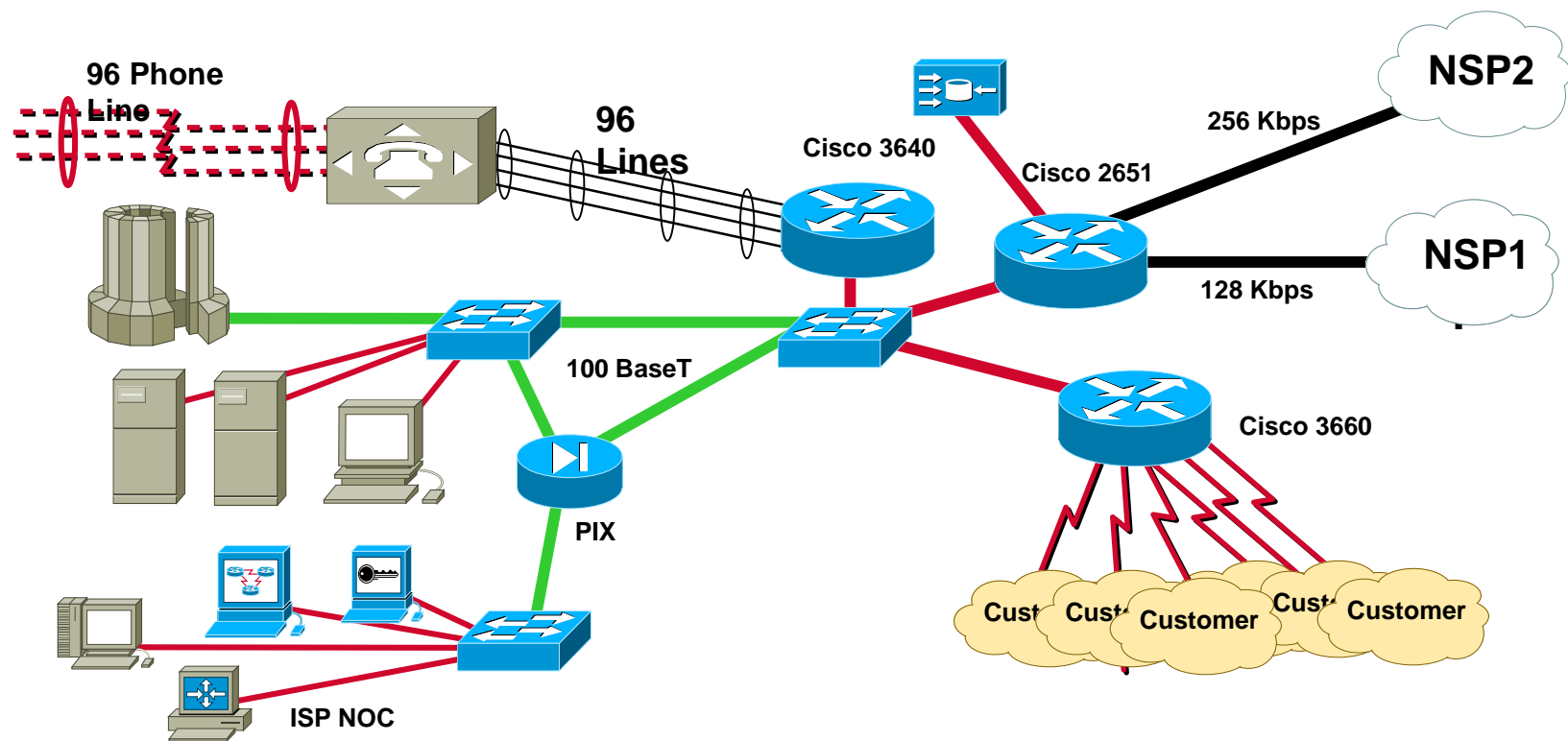
Introducing the Cisco 3660

- **Higher performance**
100 to 120 kpps
(Cisco 3640: 50 to 70 kpps)
- **Higher density: six slots**
- **Higher level of integration**
One or two Fast Ethernet ports
Two Advanced Integration Module (AIM) slots
Console port, aux port, dual PCMCIA card slots, dry contact closure
- **Higher availability**
Dual power (dual AC, dual DC, or AC and DC)
Hot-swap like-like network modules
Hot-swap power supplies



Scaling the Start-up ISPs

- Replace two 2514s with one 2651 with 2 high speed ports and the capability to carry the full Internet Routing Table (with 128Mbytes of memory).



Cisco 2600 Series Modular Multiservice Routers

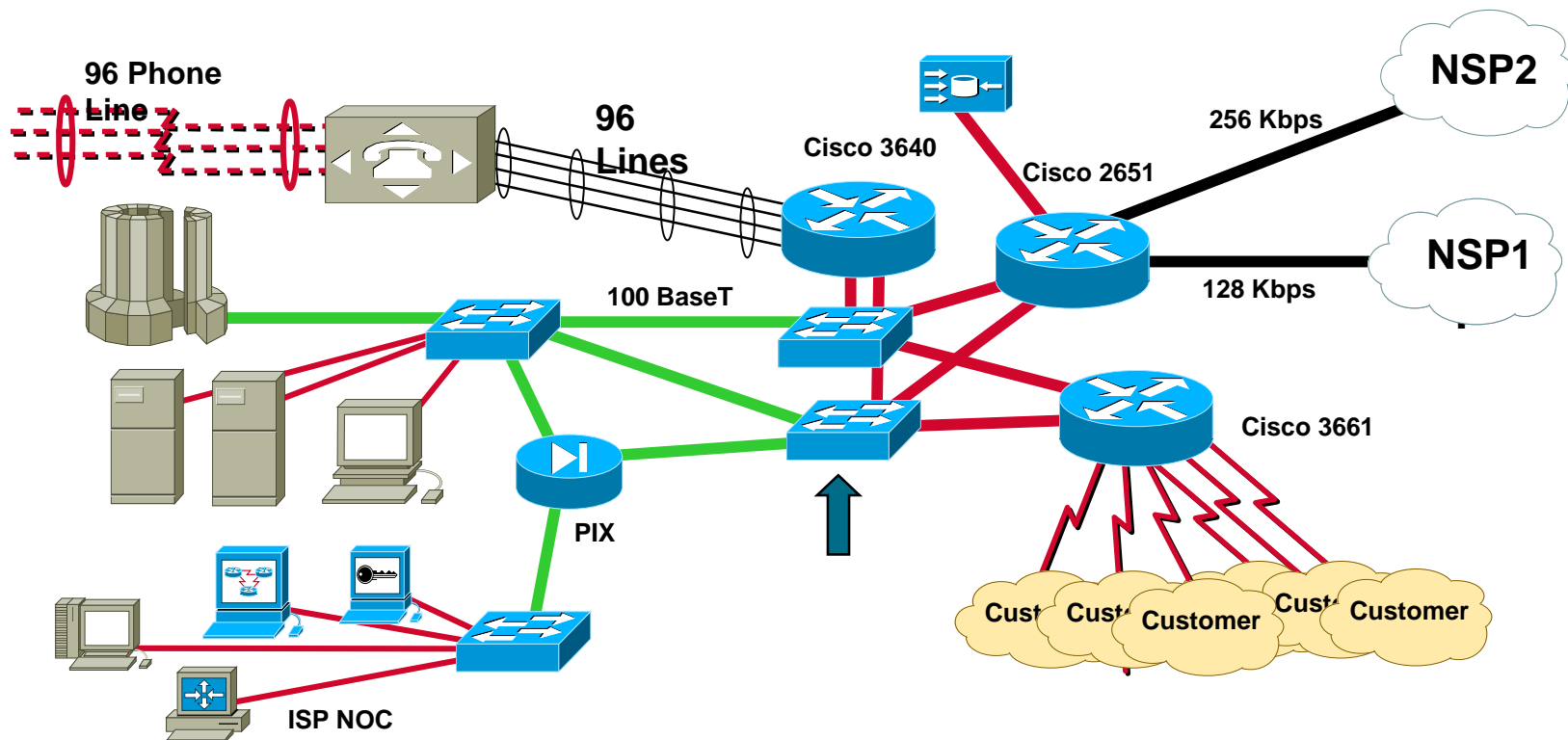
- Data, voice, dial and VPN access applications
- One network module slot, two WAN Interface Card (WIC) slots, one AIM slot
- Ethernet, Token Ring, mixed LAN, and 10/100 Fast Ethernet models
- 3 Performance Levels
 - 35-37Kpps on Cisco 265x
 - 23-25Kpps on Cisco 262x
 - 12-15Kpps on Cisco 261x



**Computer
TELEPHONY**
The Magazine for Computer and Telephone Integration

Scaling the Start-up ISPs

- **Start Adding Redundancy.** Add a second CAT1900XL with all routers and the PIX dual homed into both. If one CAT 1900 goes down, the other takes over.



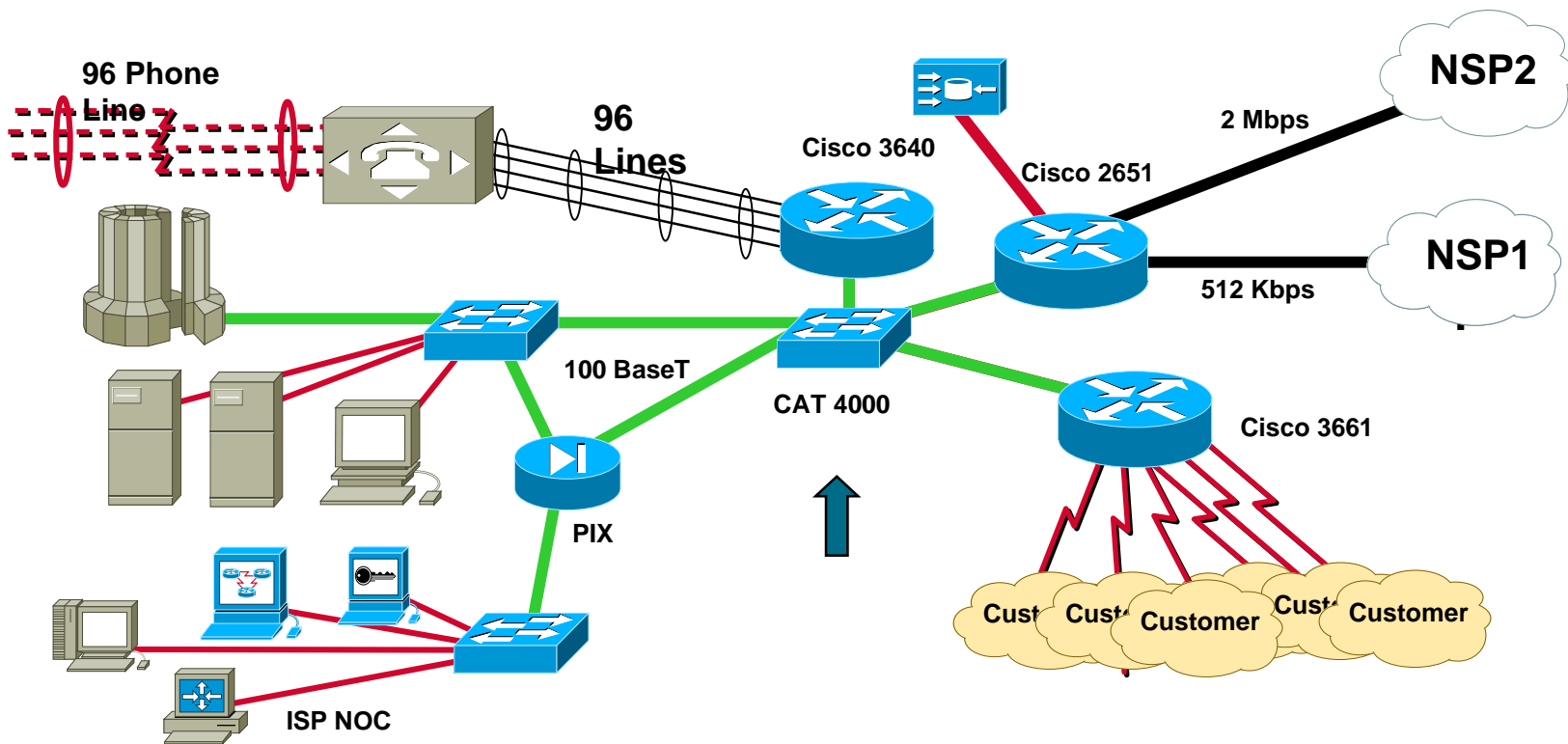
Scaling the Start-up ISPs

- **Summary**

- Six 2511 w/ 96 async ports ➡ One 3640
- Three 2522 w/24 low speed sync ports ➡ One 3640
- Two 2514s ➡ One 3620 w/ full Internet routing table

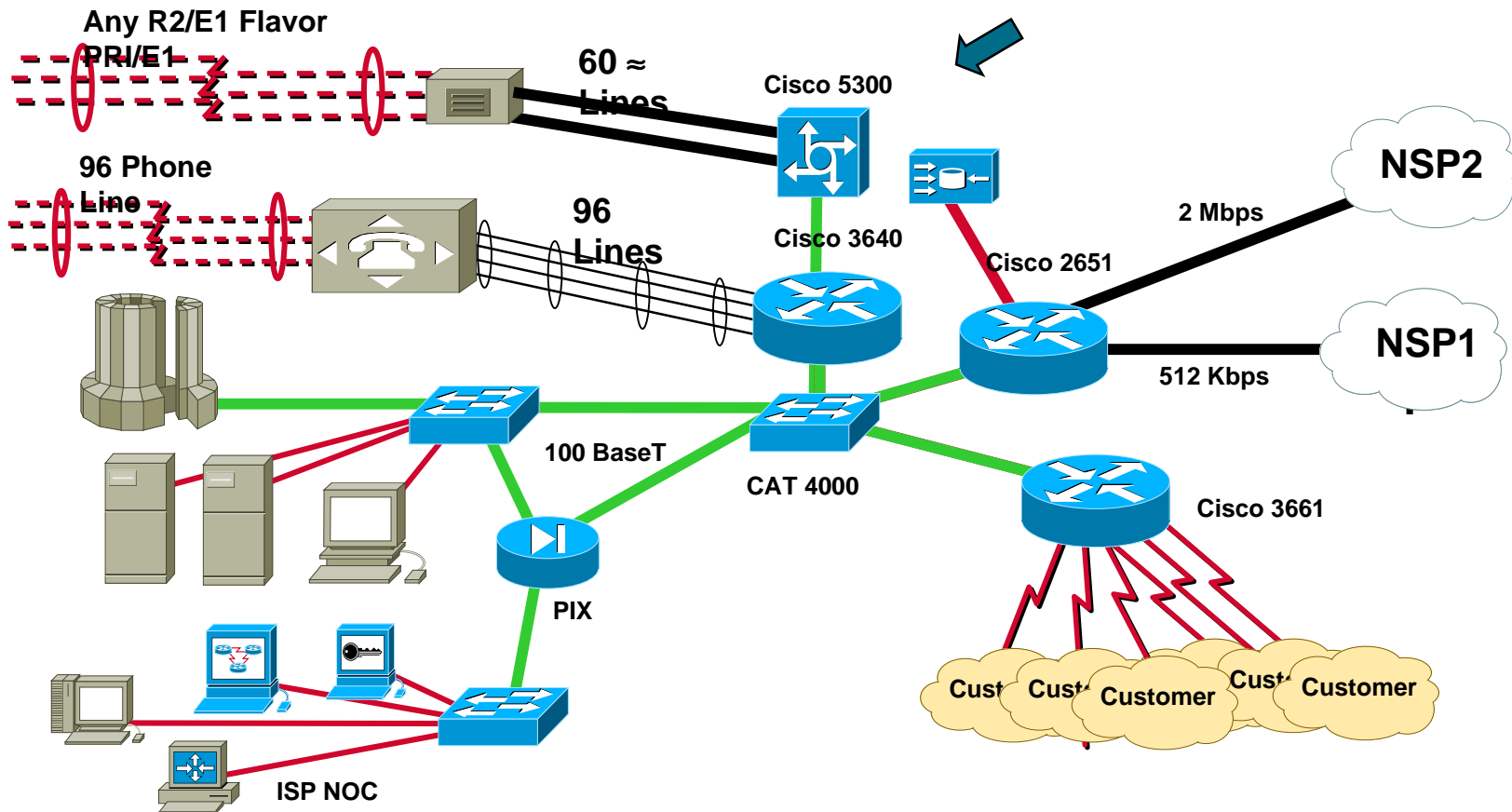
Scaling the Start-up ISPs

- Move to Fast Ethernet - Needed because of service growth and upstream upgrades



Small Start-up ISPs

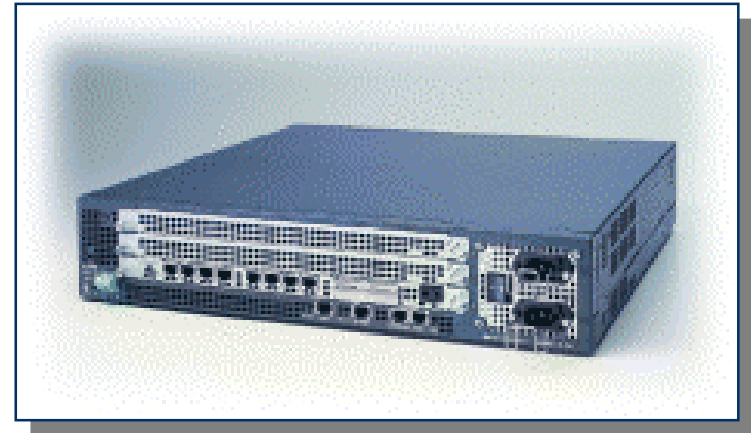
- Add Digital R2/E1 or PRI/E1 Dial-up lines with the Cisco AS 5300.



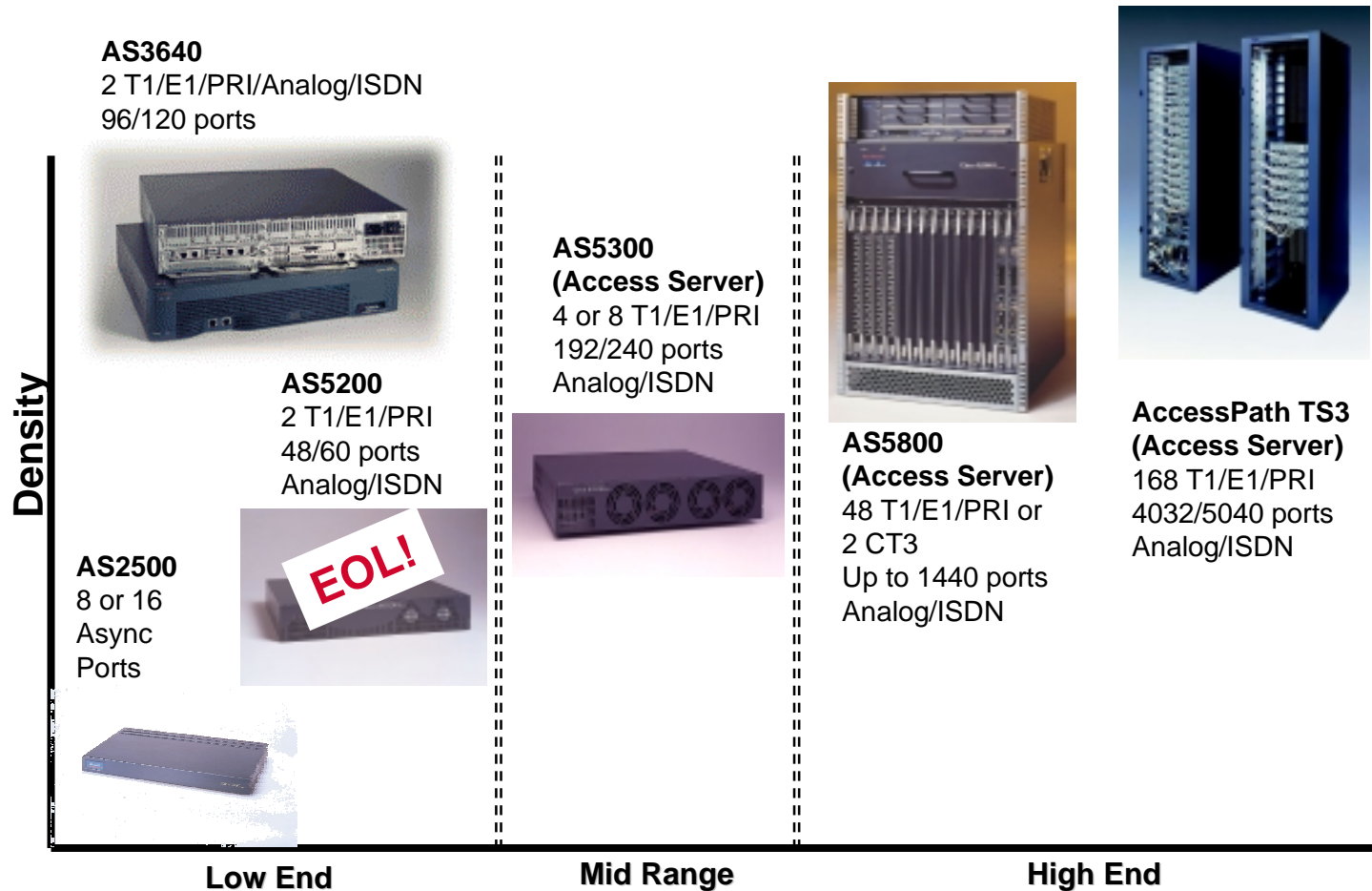
Cisco Access Servers

AS5300 Specifications

- **T1/E1:** Up to 8
- **Data ports:** Up to 192/240
- **Voice ports:** Up to 96/120
- **Serial:** 4
- **LAN:** 10/100Mbps + 10Mbps
- **Power:** Redundant AC or DC
- **Compliance:** NEBS/ETSI compliant



Cisco Access Servers





Big Time Dial Aggregation

What do the Tier 1 & Tier 2 ISPs use for their Dial Solutions

Cisco Access Servers

AS5800 Specifications

- **T1/E1:** Up to 48
- **T3:** Up to 2 (Up to 56 T1s)
- **Data ports:** Up to 1344
- **Voice ports:** Up to 1344*
- **WAN:** OC3, POS, FR, ATM & more!
- **LAN:** 100Mbps, 10Mbps
- **Power:** Redundant AC or DC
- **Compliance:** NEBS/ETSI compliant



* Requires dual router shelf configuration

Cisco Access Servers

AS5800 Features

Earned Tester's Choice award
in independent test by DataComm

- **Carrier class access server**
- **Multiservice platform**
 - Modem, ISDN, VoIP, Fax Relay
- **Security**
 - AAA, RADIUS, TACACS+, IPSec
- **Scalability**
 - MMP, L2F, L2TP, SS7
- **Availability**
 - Hot swap on all cards, hot sparing of modems, highly redundant architecture
- **Vast range of dial features**
 - Dialout, policy based routing, QoS, per user attributes



Cisco Access Servers

When to sell AS5800

- **Large deployment**
 - 288 to 1344 voice/dial ports (12xT1 to 2xCT3)
 - Supporting ~2880 to ~13440 users
- **Carrier class system**
 - Hot swap cards, power supply, fans
 - High availability with redundant elements
- **Range of WAN backhaul options**
 - Wide selection of WAN interfaces, including PoS, OC3, ATM, HSSI & more!
- **High density chassis**
 - Up to 1344 dial ports in single chassis
 - CT3 ingress interface
- **Basic VoIP/Fax support with high density**
 - Up to 672 voice calls per Router Shelf



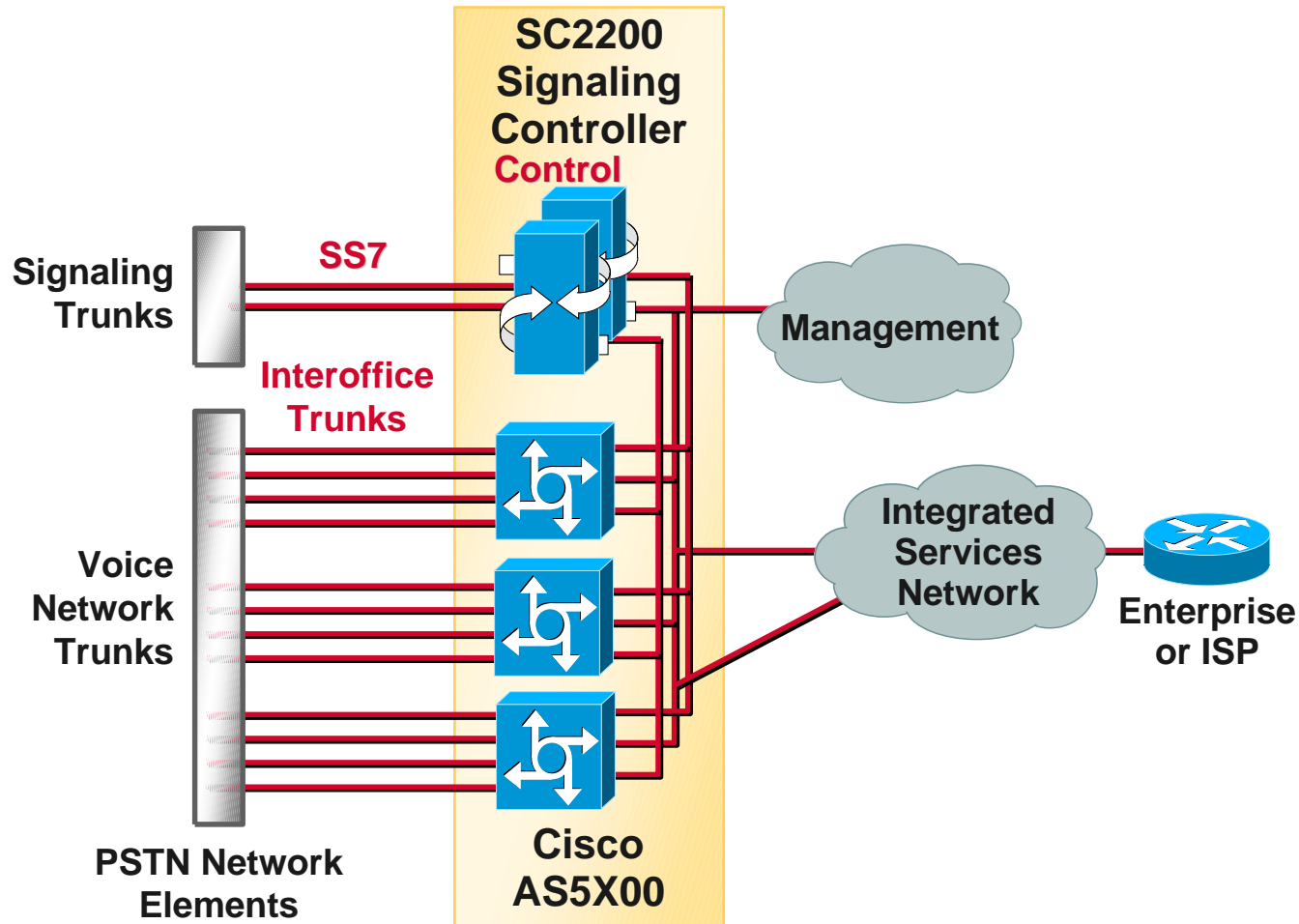


The Extra Value Add

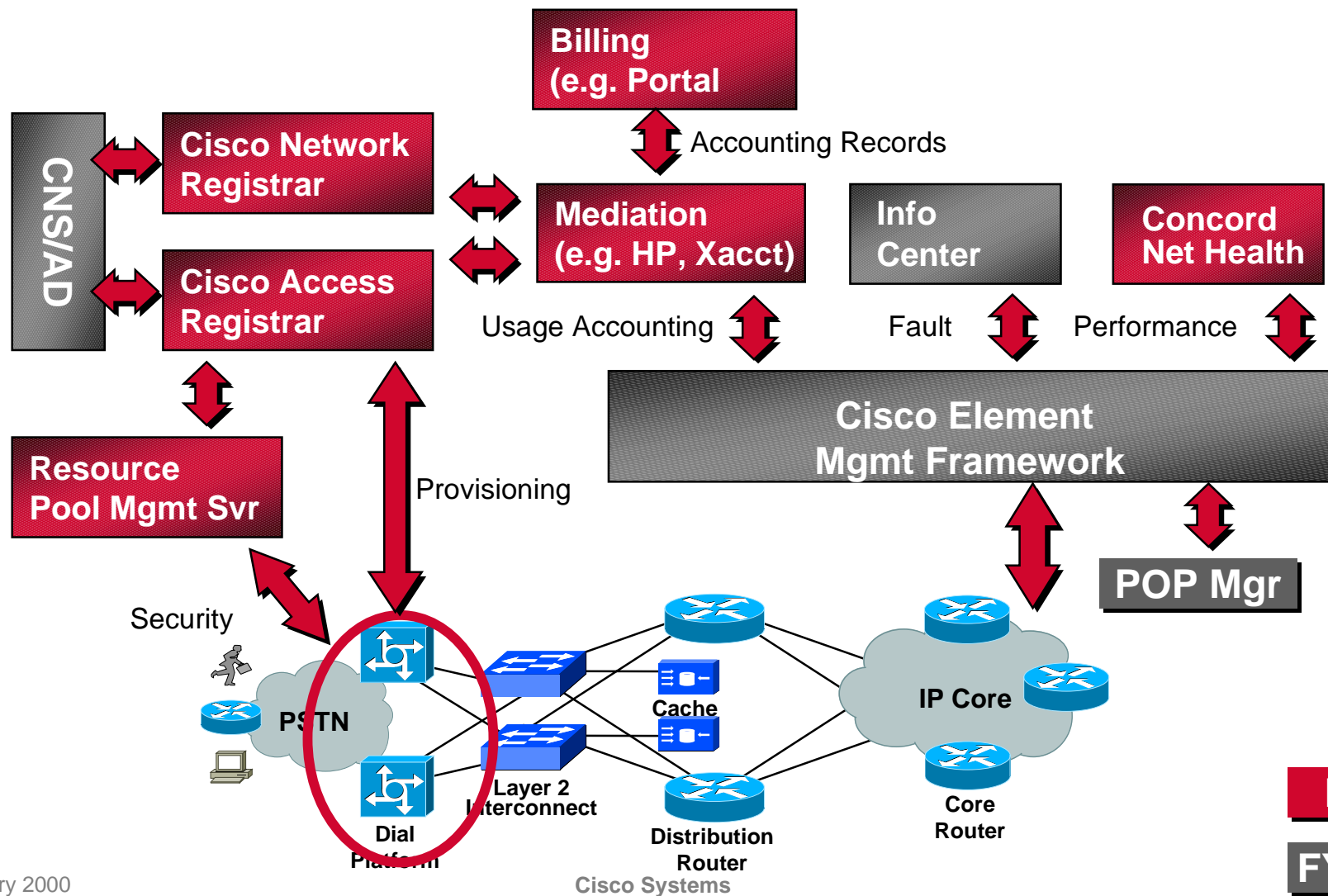
The other factors that add value to Cisco's Dial Solution

Cisco Solutions

SS7 Dial Offload



Dial Internet Access Service Management



Now

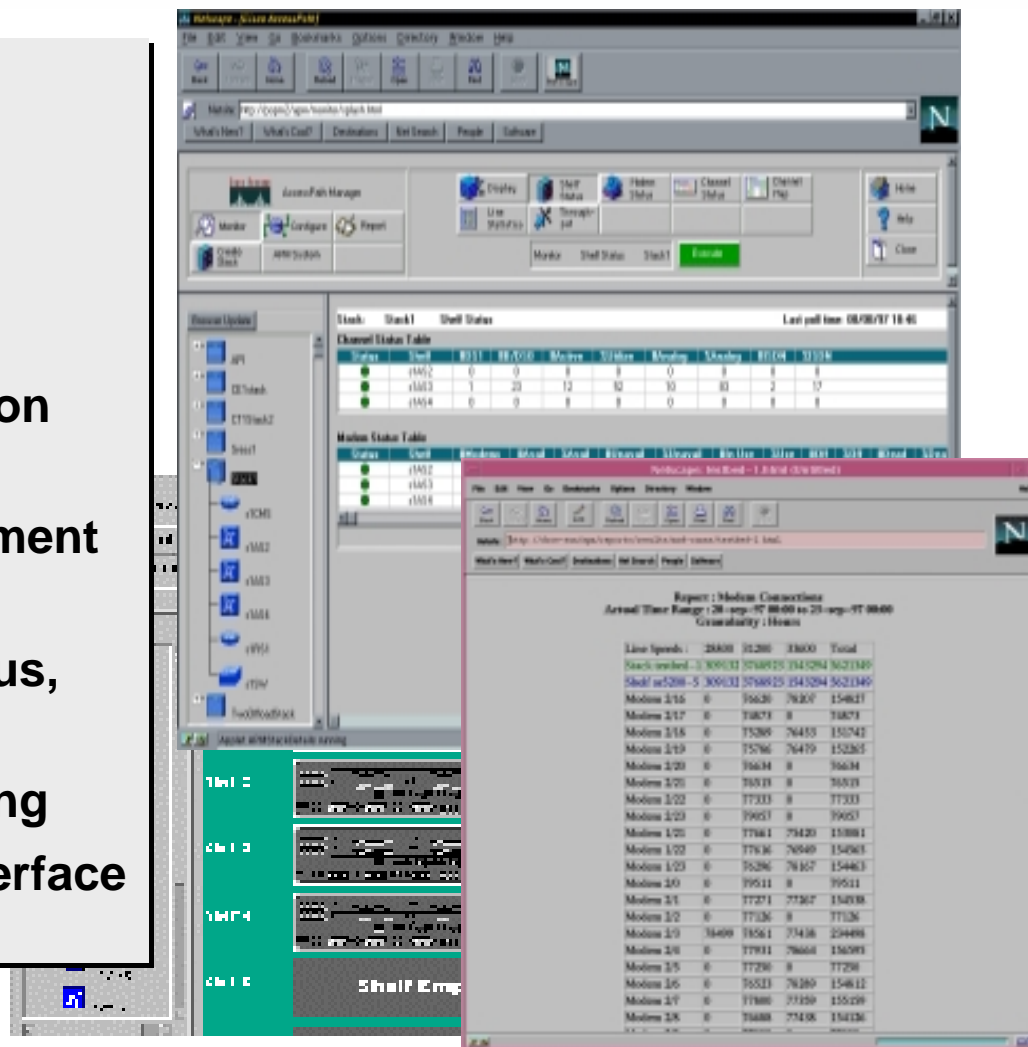
FY2000

Network Management

Cisco Access Manager

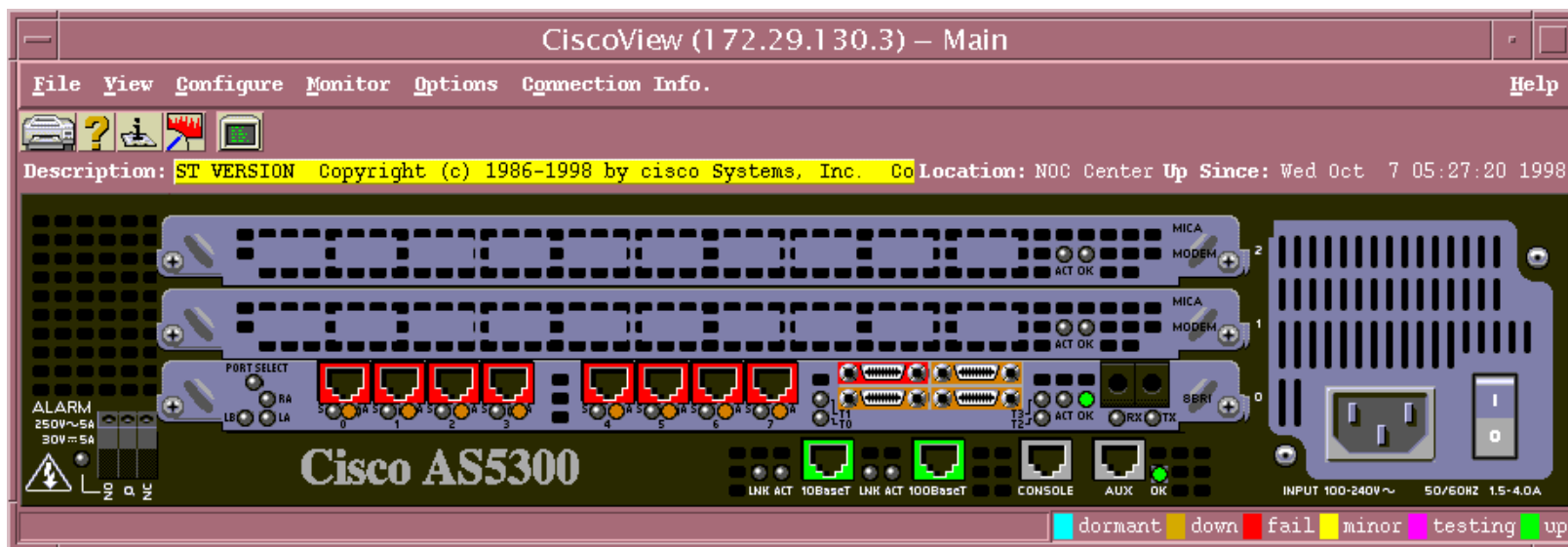
Dial Pool Management

- Functional areas:
 - Device Provisioning
 - Configuration
 - Stack, Shelf creation
 - Activation
 - Template management
 - Dial Pool Operation
 - Performance, Status, Alarm monitoring
 - Utilization Reporting
 - Web Based User Interface



Network Management

Cisco View 2000



- Real Time Call Monitor and Statistics
- Configuration Capability
- Extensive reporting and scheduling

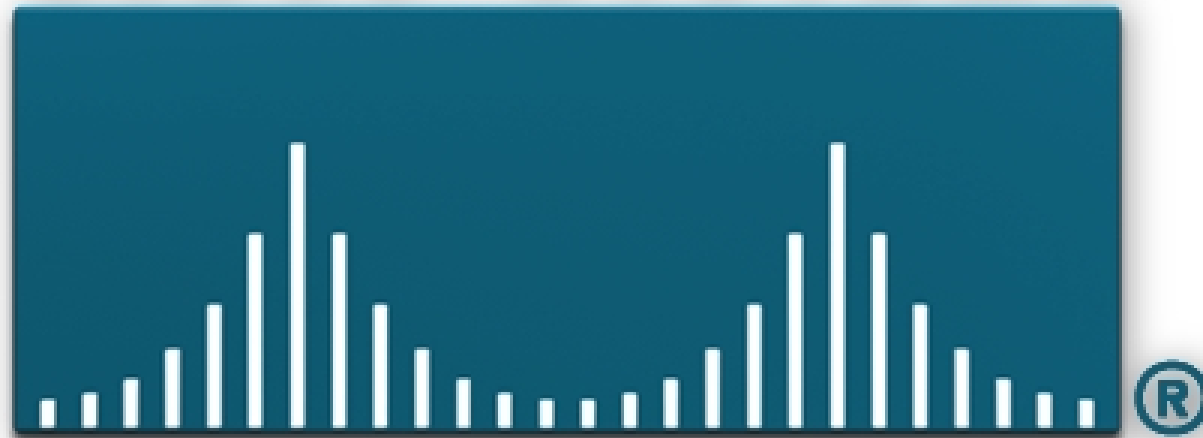
Network Management

Cisco Voice Manager

- **Functional Areas**
 - Voice Configuration
 - Monitoring and Diagnostic Utilities
 - Reporting

T1 0

CISCO SYSTEMS



EMPOWERING THE INTERNET GENERATIONSM