Building the Next Generation Network

NCF 2001

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John Shaw

johnshaw@cisco.com

Agenda

Observations from the VoIP "Front Line"

**Emergence of the "Service Carrier"**

Traditional Voice Under Seige

Pricing
- From 1996 to 1999, interstate LD prices dropped 15.3%; international calling rates fell 28%
- 1990 to 1999 average residential phone rates rose 3%; business rates remained flat

Substitution
- 44% of online users use instant messaging; 9.5% use VoP
- 38% of mobile phone users use their mobile for LD calls from home
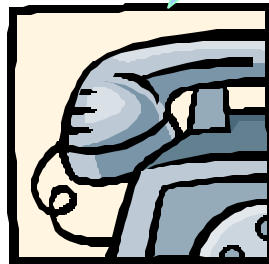
New Competition
- AT&T Broadband adds 692K cable telephony subscribers in 2000, a hundredfold increase
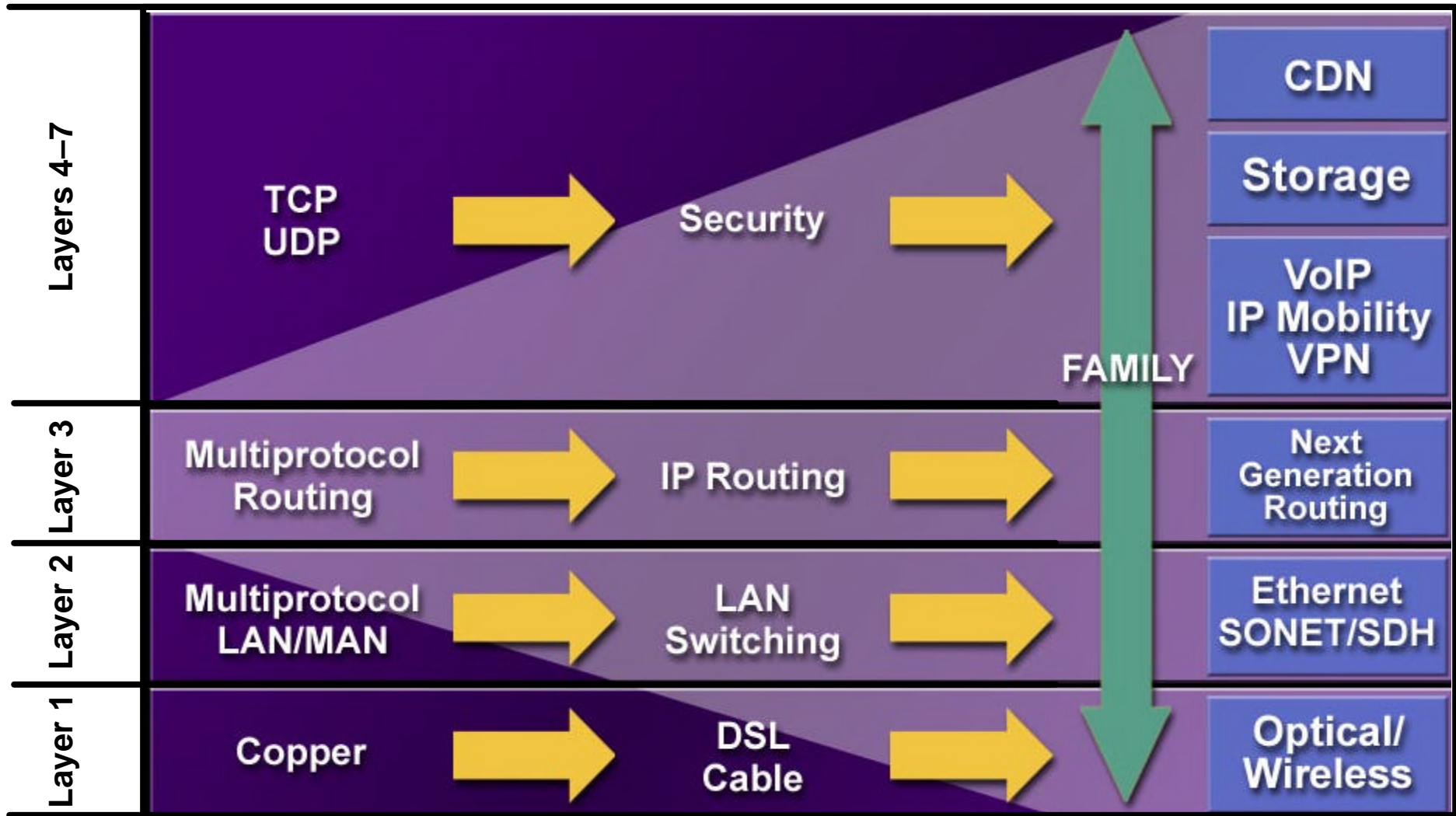- iBasis transports 20+% of the LD traffic to China

- BellSouth attributed a 2.7% drop in local minutes from Q1 '01 to increased use of wireless, email, and dedicated digital services

- AT&T's LD revenue fell 20.5% or $1B, from Q1 '00 to Q1 '01 because of a decline in use of a traditional voice services, competition, and substitution
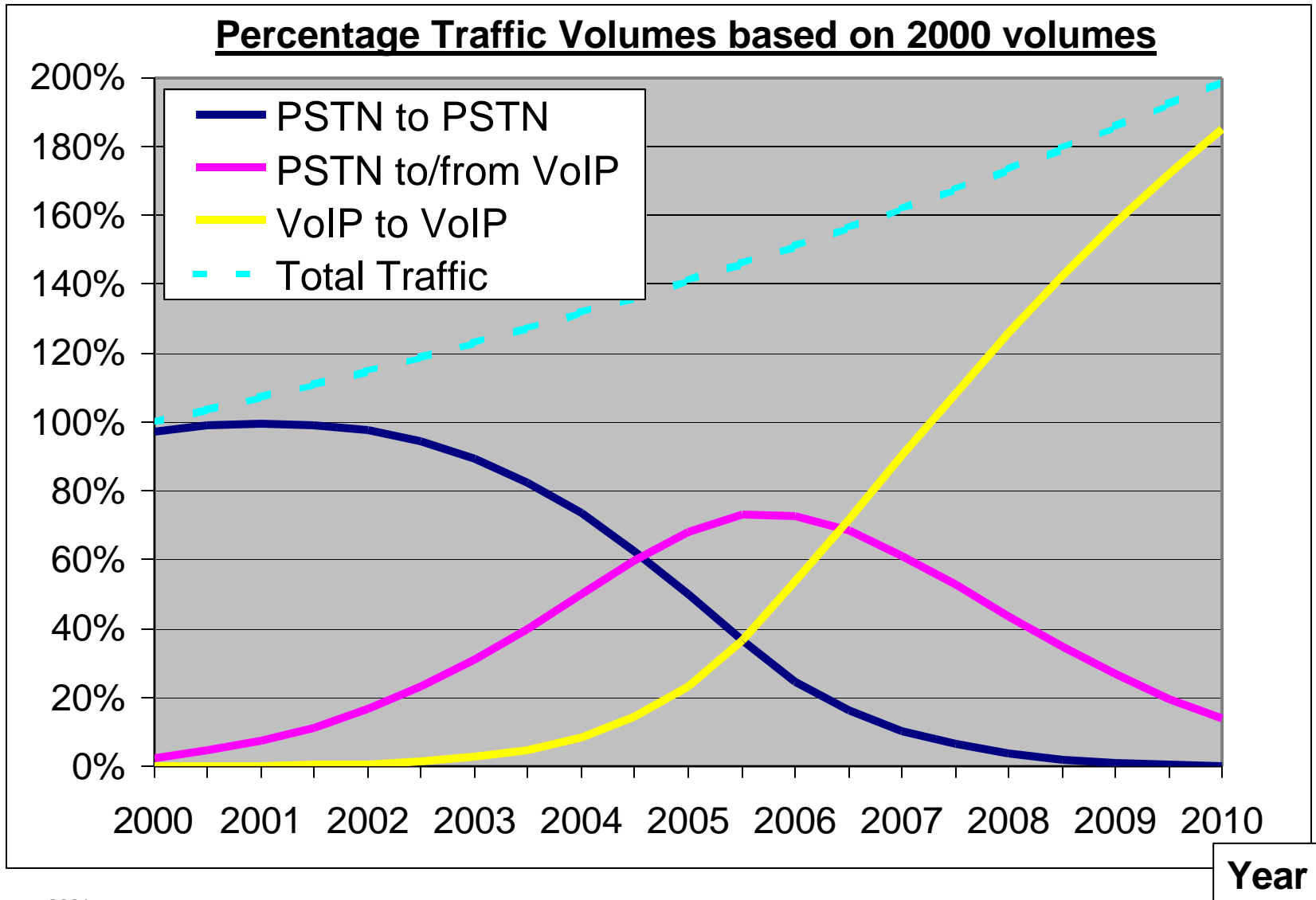
- Worldcom's MCI revenue dropped 13.4% and profit plummeted 88.4% from Q1 '00 to Q1 '01 because of the substitution effects of wireless and email

Source: Forrester Research, 2001

Voice Is One of Cisco's Six Key Strategic Technologies

Layer			
Layers 4–7	TCP UDP →	Security →	CDN / Storage / VoIP IP Mobility VPN
Layer 3	Multiprotocol Routing →	IP Routing →	Next Generation Routing
Layer 2	Multiprotocol LAN/MAN →	LAN Switching →	Ethernet SONET/SDH
Layer 1	Copper →	DSL Cable →	Optical/ Wireless

FAMILY

Projected Transition from TDM to VoIP

Percentage Traffic Volumes based on 2000 volumes

Legend:
- PSTN to PSTN
- PSTN to/from VoIP
- VoIP to VoIP
- Total Traffic

Y-axis: 0% to 200%

X-axis (Year): 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010

Year

Five Phase Evolution

1. **Build basic transit networks**

2. **Extend to access network**

3. **Emergence of network-of-networks**

4. **Arrival of rich and dense media**

5. **New public network**

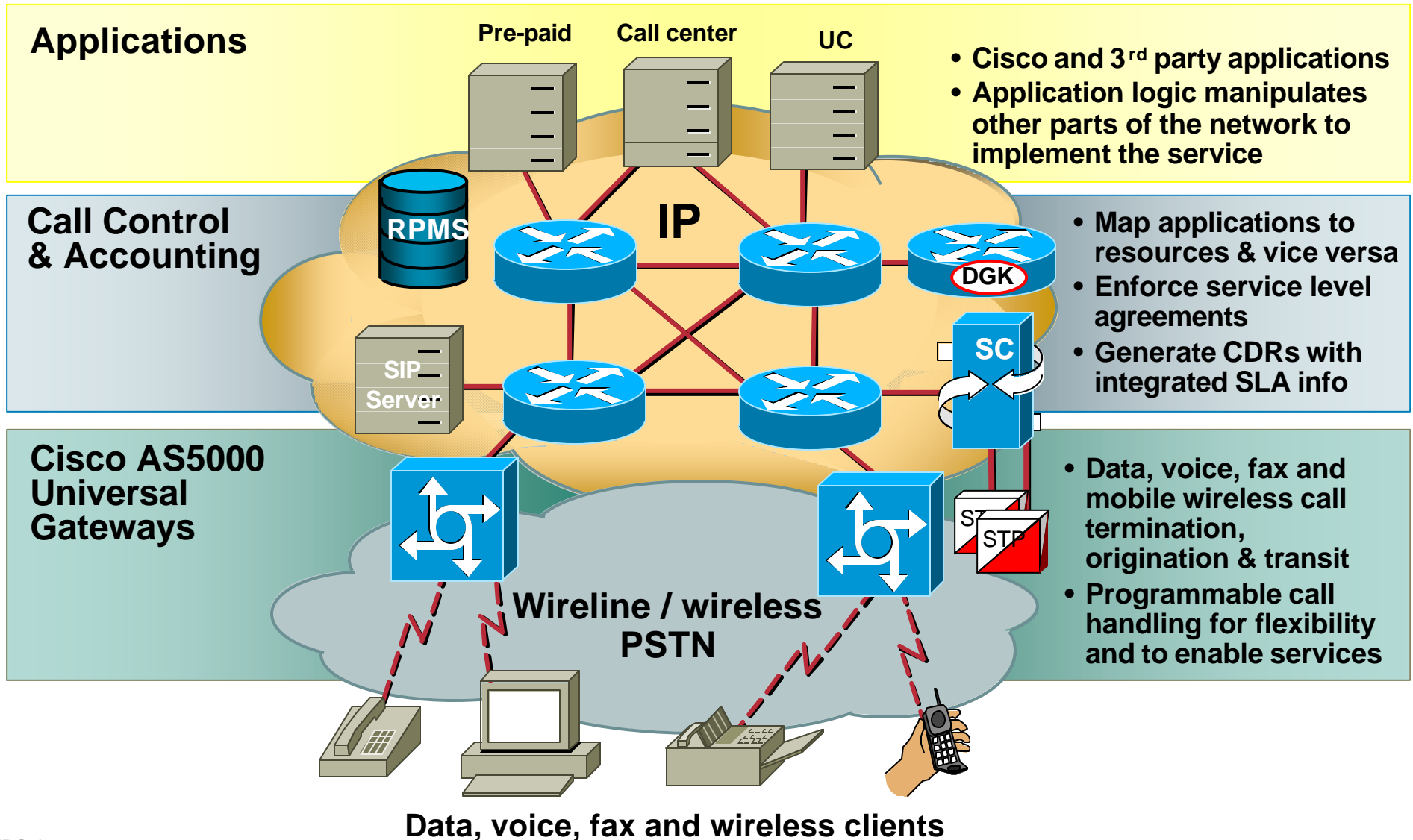# Transit & Access Services

Services

- Toll arbitrage/bypass
- PC to phone
- Dial offload
- Card services
- Integrated access

Cisco Leadership

- 40-50% WW market share is service provider VoIP
- 4 carriers generated > 1 billion VoIP MOUs

Transit & Access Services
Cisco ASAP High Level Architecture

Applications

Pre-paid   Call center   UC

- **Cisco and 3rd party applications**
- **Application logic manipulates other parts of the network to implement the service**

Call Control & Accounting

RPMS

IP

DGK

SIP Server

SC

- **Map applications to resources & vice versa**
- **Enforce service level agreements**
- **Generate CDRs with integrated SLA info**

Cisco AS5000 Universal Gateways

ST
STP

Wireline / wireless PSTN

- **Data, voice, fax and mobile wireless call termination, origination & transit**
- **Programmable call handling for flexibility and to enable services**

Data, voice, fax and wireless clients

Transit & Access Services
BTS 10200 Call Agent

CNAM   800   LNP

SS7

STP

AIN 0.1

Call Center Servers

TCAP

800   LNP

Tandem FS

Centrex FS

Centrex FS

AIN FS

FCP Interface

3rd party Virtual call Center FS

Parlay/JTAPI

Centrex FS

BTS 10200—Call Agent

MGCP Interface

Residential Gateway

Media Gateway

Media Gateway

Trunking Gateway

Enabling a Network of Networks

AVVID

PSTN

Enhanced Services (UC)

PSTN

IP Transit

PSTN

PSTN

Multiprotocol Global Long Distance Network

GK

SIP

Cable MSO IP Net

PSTN

PSTN

SS7

Business Services

Integrated Access

TDM Grooming ASAP

PSTN

PSTN

Wireless

PSTN

Enabling a Network of Networks
Cisco IOS® Software Voice Support

Enabled Features (Left)	Service	Enabled Features (Right)
Line Rate Throughput on All Channels Simultaneously	Enhanced Voice Services	Out-of-Band DTMF Digit Relay for Value-Added Applications
Low Latency Packet Switching		Hierarchical, Scaleable Dial Plans
Mobile Wireless Call Termination	Pre-Paid Calling	Foreign-Language IVR Support
Built-in Firewall and Intrusion Detection		Non-Repudiated Accounting via Open Settlement Protocol
V.44 Data Compression	Mobile Wireless Data	T.37 Store-and-Forward Fax
Remote Access VPN Service Level Agreements		SIP and MGCP Call Control with 3rd Party Application Integration
Reverse Path Forwarding to Block of Denial-of-Service Attacks	Unified Communications	RealAudio Audio Streaming for Dynamic, On-Demand Content
V.92 Modem on Hold per Subscriber	Wholesale Dial	TCL and VXML Scripting
		SS7 Signaling
Per-Call Modem Pre-Configuration		T.38 Real-Time Fax Relay
Dial PPP, V.92/V.90/V.42 RADIUS Authentication	Wholesale VoIP	Voice Packetization G.711/729/723.1 CODECs H.323

Delivery of Rich & Dense Media

Multimodal

Voice

Graphic

Network value proportional to number of endpoints

Connectivity increases value of device

Building the New Public Network

Fusing the best properties of today's networks onto a common lowest cost infrastructure

Agenda

**Observations from the VoIP "Front Line"**

Emergence of the "Service Carrier"

Key Business Communications Service Gaps Have Existed

- **Business broadband deployments largely limited to large enterprise users (90% of SMB market not equipped)**

- **Two divergent information appliances exist at the desktop**

  - **Business voice applications limited by "black telephone" technology**

  - **Desktop PCs used largely as data information devices**

- **Multiple competing technology approaches have slowed end-to-end IP service deployment**

Catalysts for Change
Broadband Access Becoming Rationalized

US SMB DSL Access Lines

Chart: US SMB DSL Access Lines. Y-axis: Access Lines (OOO), 0 to 5000. X-axis years: 98, 99, 00, 01, 02, 03, 04. CAGR = 90%
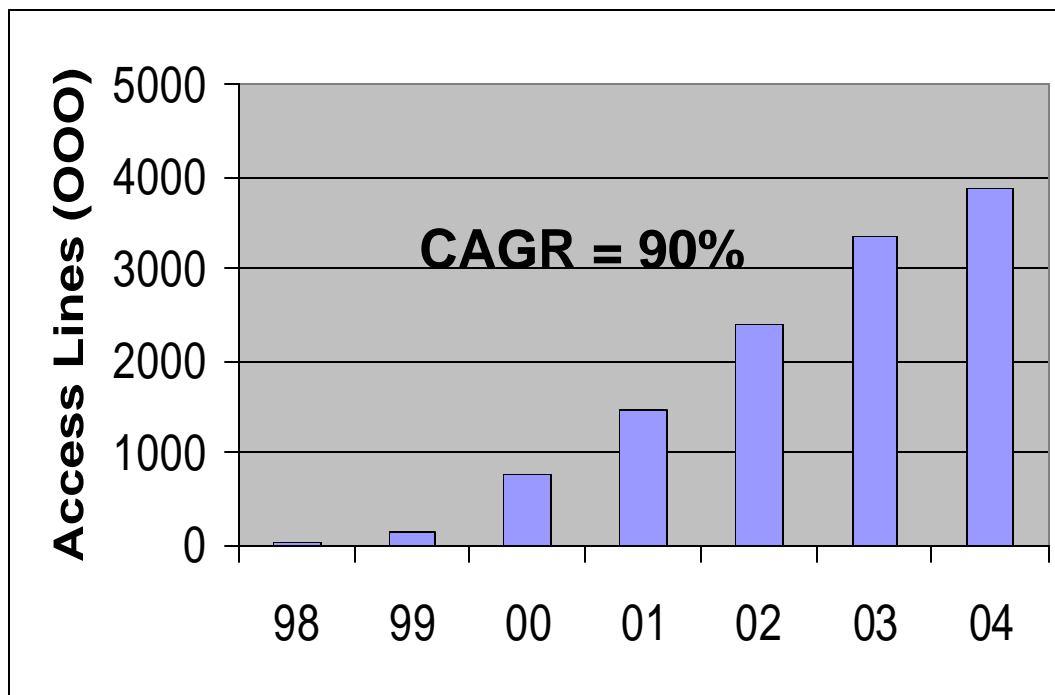
Source: IDC, Dec. 2000

US small & medium business deployments projected to increase 5 fold over next 4 years

Catalysts for Change
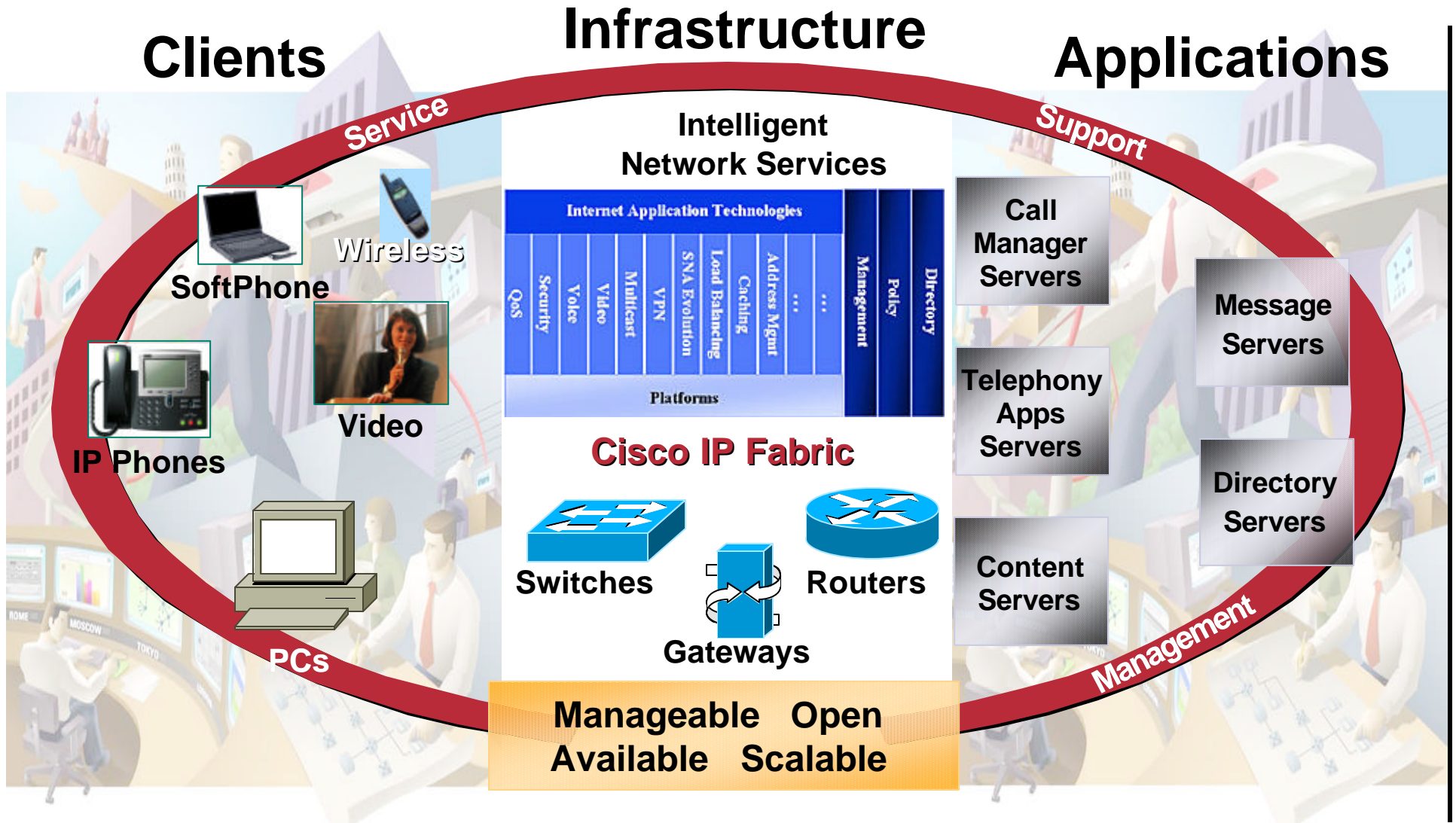## *Corporate Adoption of IP Voice Solutions*

- **AVVID IP telephony sales have exceeded 2M ports shipped; 400% Y/Y growth**

- **Shipping ~ 100K Cisco IP phones/quarter**

- **AVVID IP telephony being trialed/adopted by 50+% of Cisco's Fortune 500 customers**

- **Cisco has 45% market share in IP LAN Telephony (Synergy Research)**

WW IP LAN Telephony $

($M)

CAGR = 88%

Year	Value
2000	138
2001	351
2002	1,018
2003	1,781
2004	2,455
2005	3,235

$4,000
$3,000
$2,000
$1,000
$0
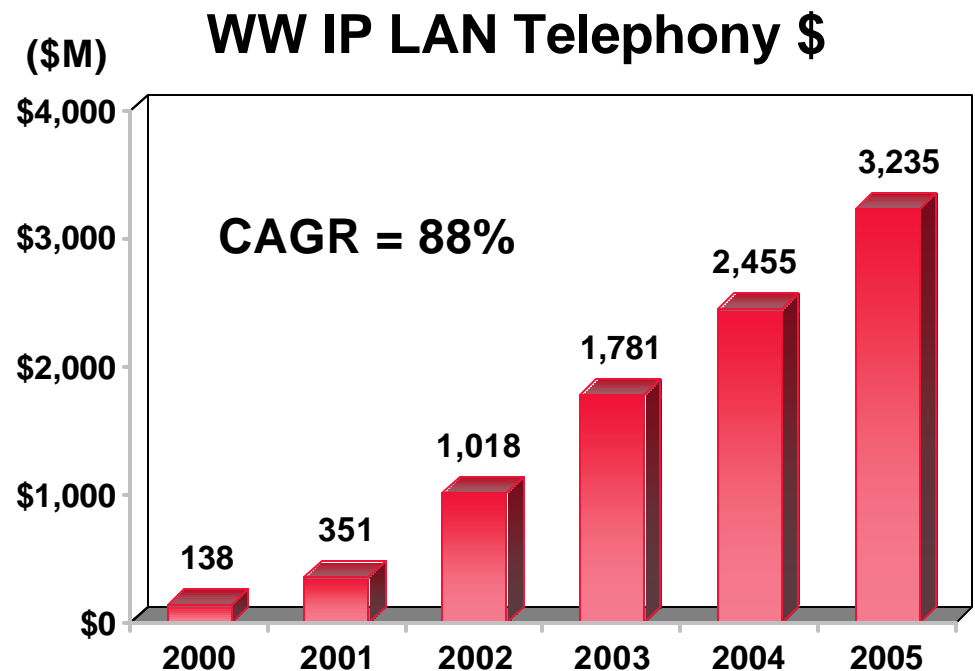
Source: Phillips InfoTech, Dec. 2000

Catalysts for Change
Corporate Adoption of IP Voice Solutions

Clients

Infrastructure

Applications

Service

Support

SoftPhone

Wireless

IP Phones

Video

PCs

Intelligent Network Services

Internet Application Technologies

QoS | Security | Voice | Video | Multicast | VPN | SNA Evolution | Load Balancing | Caching | Address Mgmt | ...

Management | Policy | Directory

Platforms

Cisco IP Fabric

Switches

Gateways

Routers

Call Manager Servers

Telephony Apps Servers

Content Servers

Message Servers

Directory Servers

Management

**Manageable   Open
Available   Scalable**

Catalysts for Change

- **PCs & other IP appliances transforming to universal multi-media communications instruments**

  – **Microsoft "Windows XP" to multi-media-enable their customer base**

  – **Intel aggressively introducing specialized multi-media processors on PC motherboards**

- **Industry reaching consensus on important data/signaling plane technologies, reducing risk of stranding capital investment**
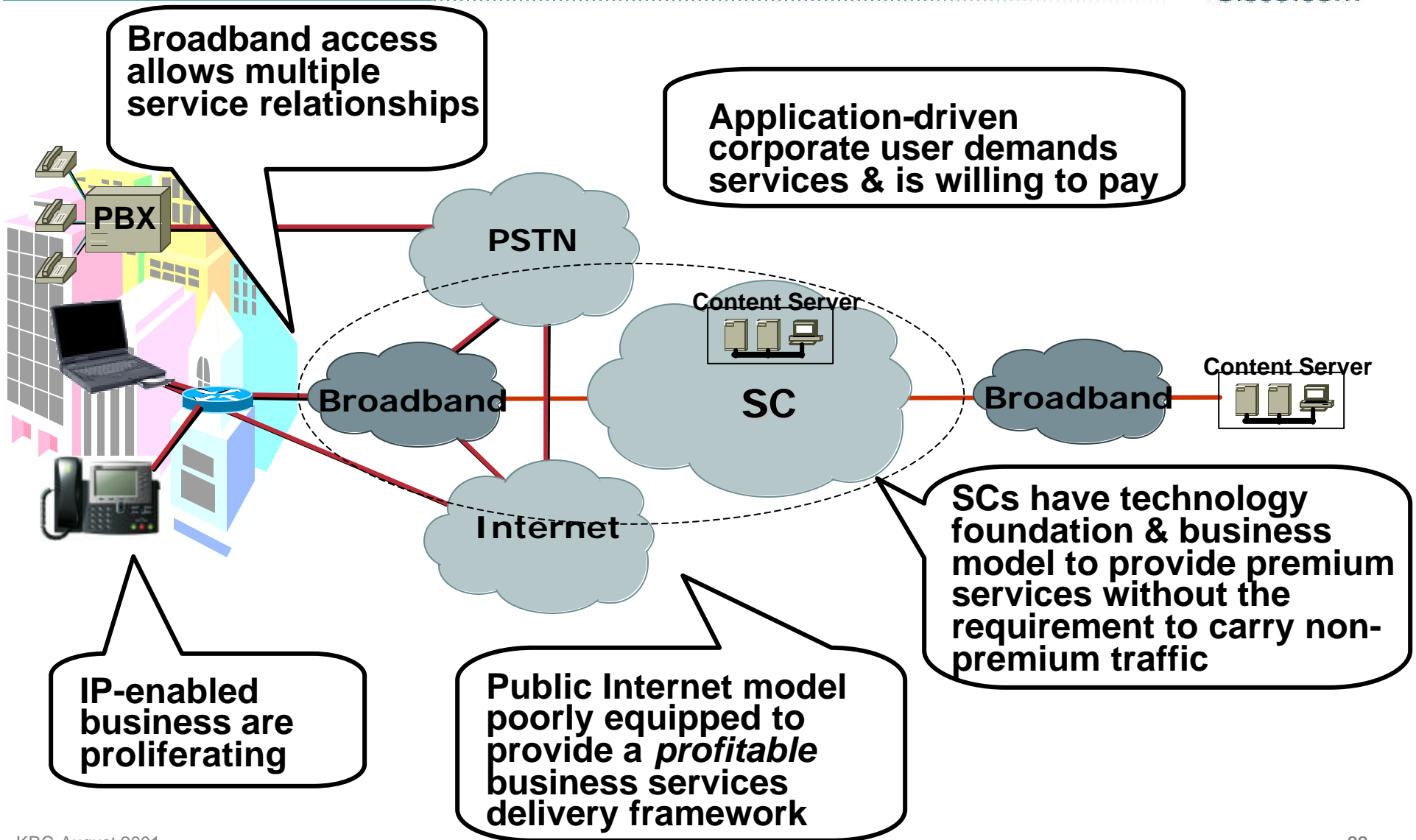
Catalysts for Change
Gateway Protocols Transition

Projected Port (DS0) Protocol Transition Rates

% Port Unit Sales

- ☐ MGCP - DS0s
- ☐ SIP - DS0s
- ☐ H.323 - DS0s

Dual Mode H.323 or SIP

100%
80%
60%
40%
20%

Q1CY98   Q1CY99   Q1CY00   Q1CY01   Q1CY02   Q1CY03

Calendar Quarters

KRC-August 2001   20
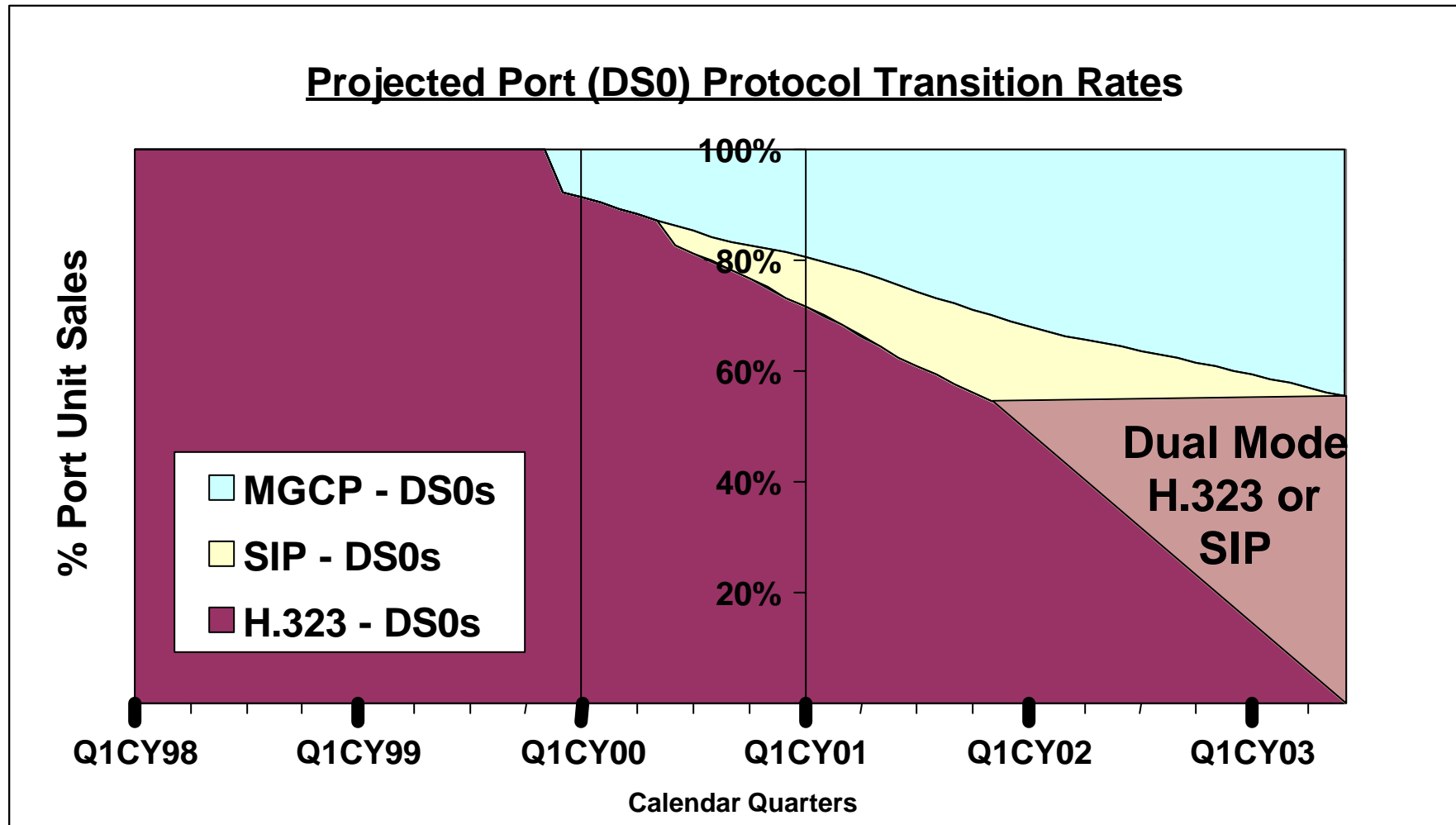
The Opportunity

There is a new class of provider, the "Service Carrier", that is well positioned to profit from the demand for high margin business-to-business communications services

Market Dynamics Create Opportunities for Service Carriers

Broadband access allows multiple service relationships

Application-driven corporate user demands services & is willing to pay

PBX

PSTN

Content Server

Broadband

SC

Broadband

Content Server

Internet

SCs have technology foundation & business model to provide premium services without the requirement to carry non-premium traffic

IP-enabled business are proliferating

Public Internet model poorly equipped to provide a *profitable* business services delivery framework

Service Carrier Networks

- **Converge w/ other networks and the internet at the point of business broadband access**

- **SC controls the traffic ingress and egress to the customer and content source**
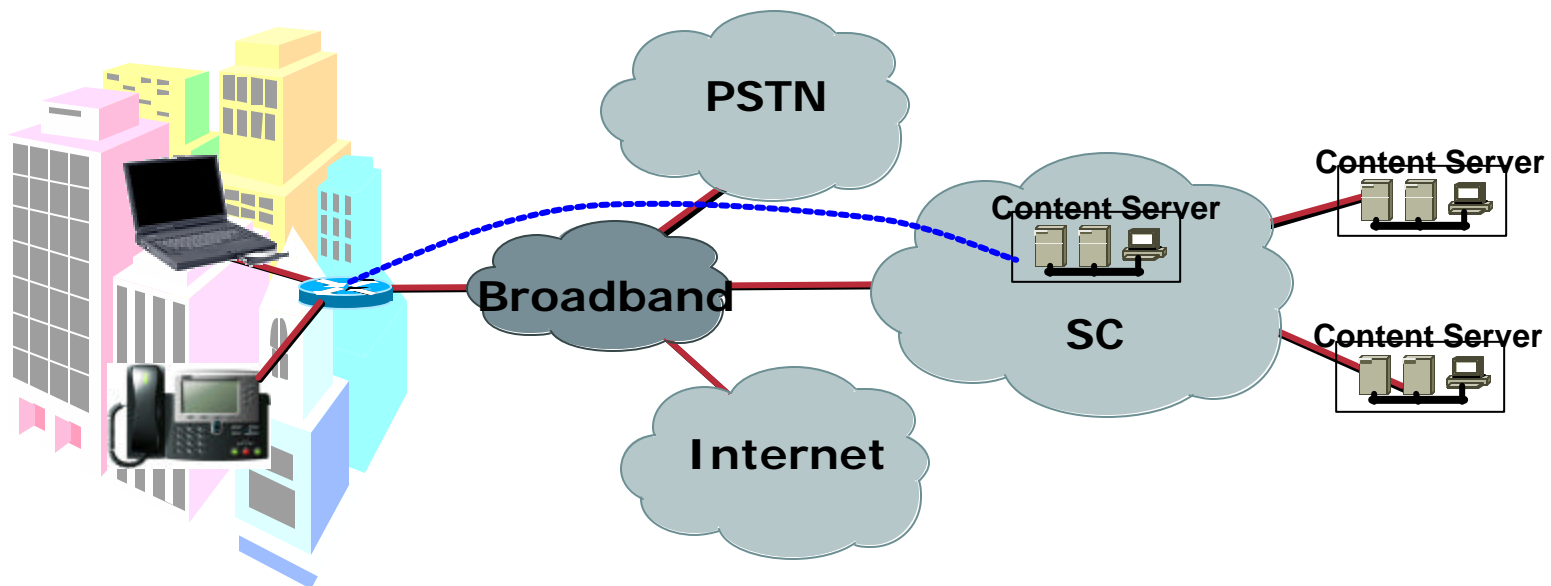
Establishes a multi-service, multi-media portal to the business customer

Service Carrier Networks

- **Uses IP architecture because a connectionless transport model is far more versatile, and multi-media content relationships have the most diverse topologies**

- **Augments IP transport with facilitation technologies (e.g., SIP, VXML, SALT, HTML, ASR) that help to target services efficiently to their customers**
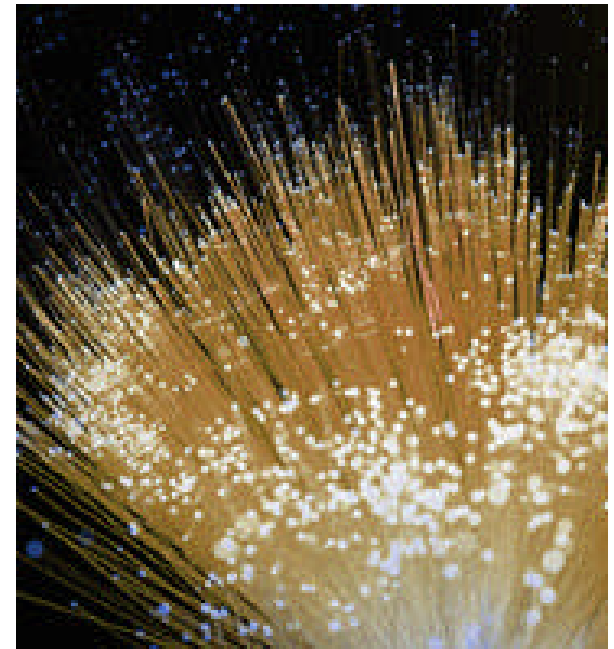
Service Carrier's Business Model

- **High revenue per user through bundled content options; Creates entry barriers for follow-on competitors**

- **Rapid turn rates for new services enable SCs to seek out profitable business opportunities**

- **As incumbents re-capitalize in order to build data-agile networks, SC's have clear TTM & capital cost advantages**

Service Carrier Summary Attributes

	Service Carrier	Traditional Voice CLEC	Traditional ISP
Focuses on high margin business content services	X		
Delivers services over an IP backbone	X		X
Can communicate w/ intelligent endpoints	X		
Tailors services to specific market segments	X		
Provides service-sensitive billing	X	X	
Provides service-selectable QOS	X	X	
Delivers content securely	X		
Not required to bear cost of access facilities	X		
Service delivery non-geographically constrained	X		X
Can scale capX to match market demand	X		X

Service Carrier Strategy

Are pursuing a FedEx strategy,
not trying to duplicate the post office
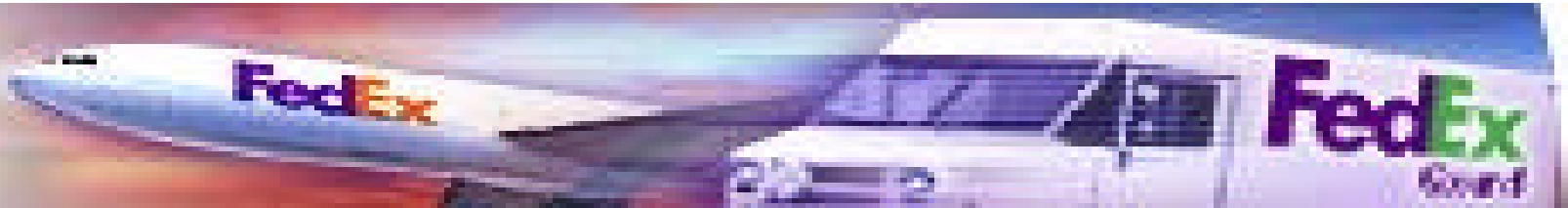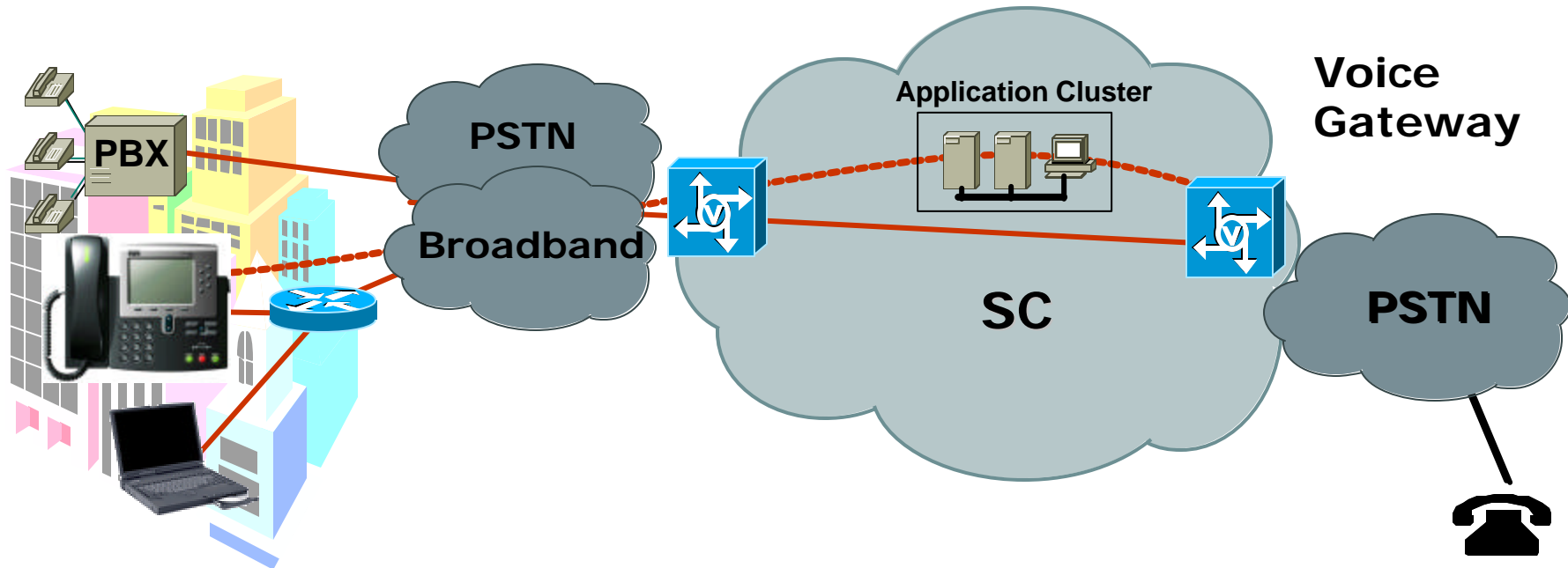
How did FedEx Win?

- **Created a new industry by radically changing distribution dynamics**

- **Attacked incumbent's revenue/margin strongholds**

- **Focused on B-to-B services & expanded to other markets after establishing a secure business foundation**

- **Created a service that didn't exist before**

Service Carrier Sector Evolution

Service Carrier $

Current Position

Content Svcs

High ROI Bus Svcs

Cost Curve

Foundation Services

Time
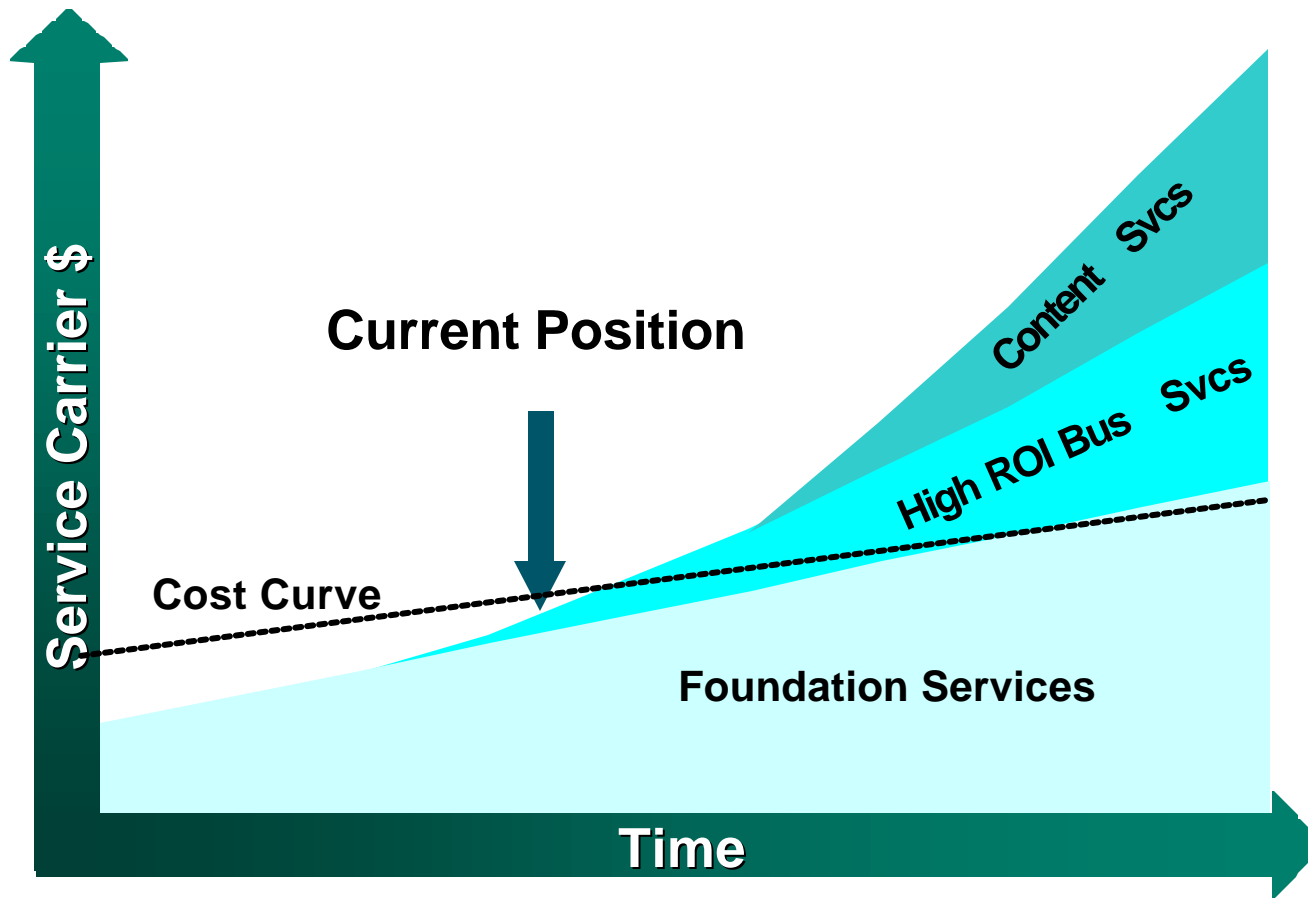
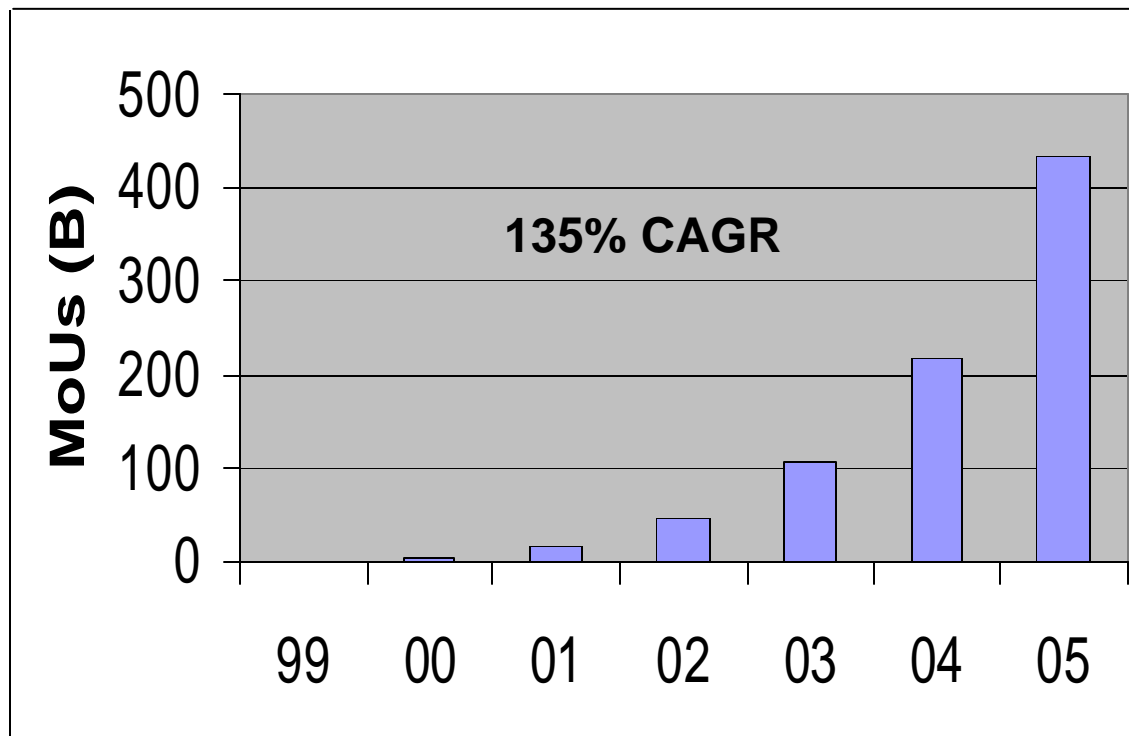# I. Foundation Voice Service

International LD; In-Country Voice

Equipped to deliver the lowest unit cost/minute

I. Foundation Voice Service

LD VoIP Minutes of Use

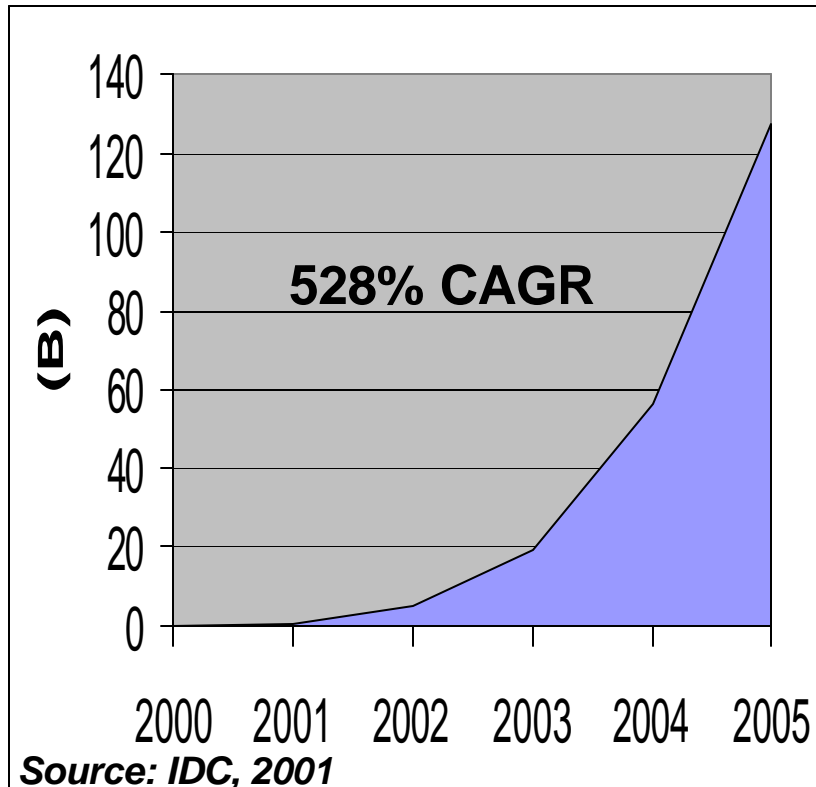Source: IDC, Dec 2000

II. Delivering High ROI Business Services

- **High runner legacy services offered more effectively & efficiently over IP (e.g., messaging, calling card)**

- **Local business services (e.g., IP Centrex, IP VPN)**

- **New services made possible by data/voice convergence (e.g., unified communications, workgroup collaboration)**
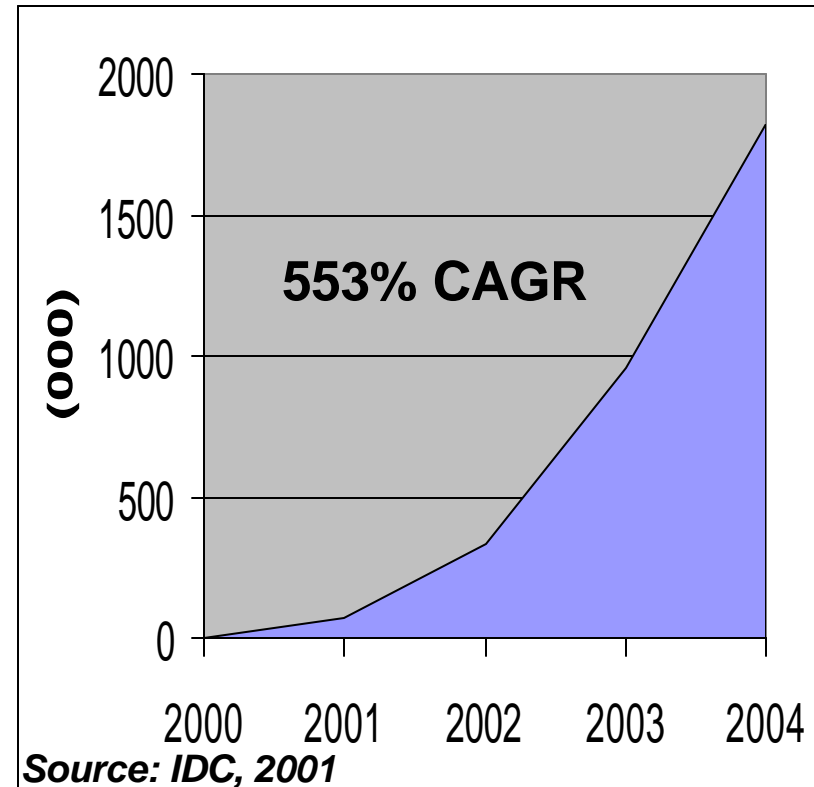
Example: Voice VPN & IP Centrex

WW Voice VPN Minutes

528% CAGR

(B) — vertical axis: 0, 20, 40, 60, 80, 100, 120, 140
Horizontal axis: 2000, 2001, 2002, 2003, 2004, 2005

Source: IDC, 2001

IP Centrex Lines Installed Base

553% CAGR

(000) — vertical axis: 0, 500, 1000, 1500, 2000
Horizontal axis: 2000, 2001, 2002, 2003, 2004

Source: IDC, 2001

Representative SCs offering Cisco-based Voice VPN svcs:
Equant, Worldcom
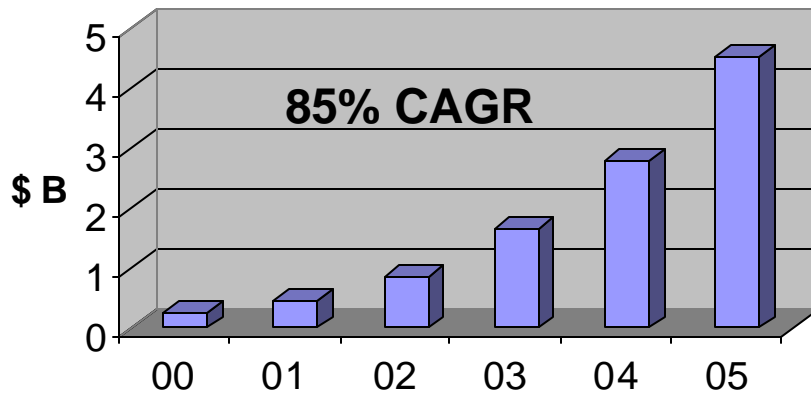
Representative SCs offering Cisco-based IP Centrex/Local Business svcs:
GoBeam, PingTone, TalkingNets, Telverse

Example: Unified Communications
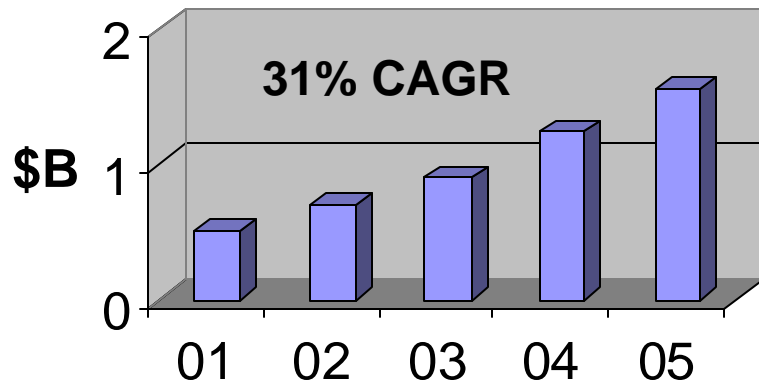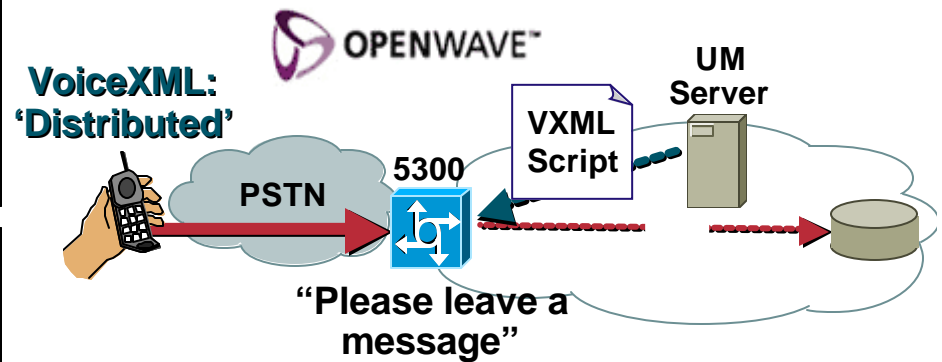
Unified Messaging

85% CAGR

$ B

5
4
3
2
1
0

00 01 02 03 04 05

Source: IDC, Dec 2000

Multimedia Collaboration

31% CAGR

$B

2

1

0

01 02 03 04 05

Source: IDC, Dec 2000

iBasis & OpenWave team on Unified Communications svc

OPENWAVE™

UM Server

VoiceXML: 'Distributed'

VXML Script
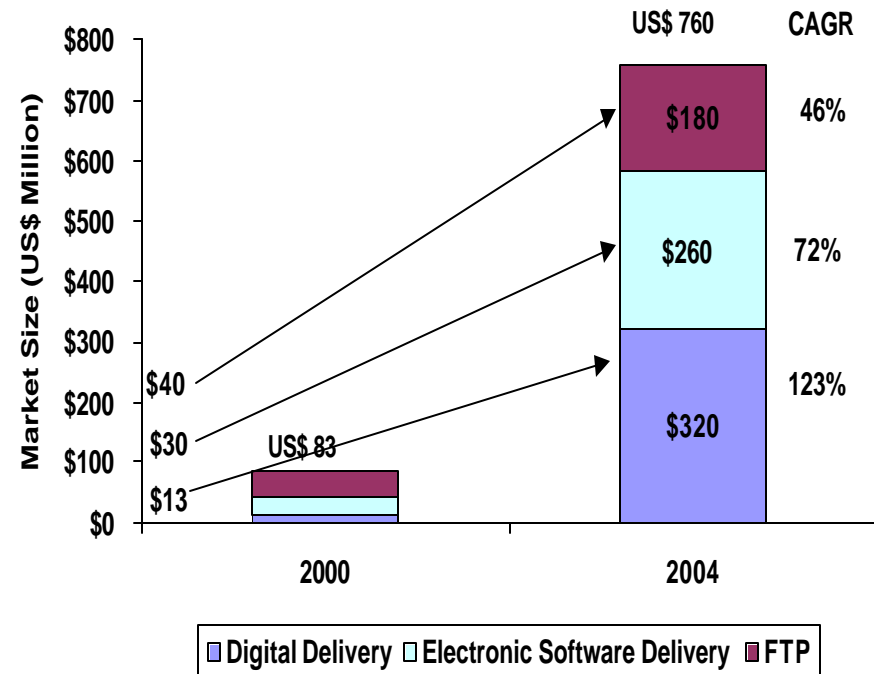
PSTN   5300

"Please leave a message"

Voice Services (VXML, TTS)

Web Server

Mobile Data Services

Message Store Application Services

Directory Application Services

Message Store

LDAP Directory

Calendar Data

III. Business & Consumer Content Services

Total CAGR 2000-2004 - 125%

Left chart — Market Size (US$ Million), years 2000 and 2004:
- 2000: US$ 116
- 2004: US$ 2,959
  - I-Conferencing $190 — CAGR 121%
  - V-World Streaming $260 — CAGR 72%
  - Streaming Audio $566 — CAGR 96%
  - Streaming Video $1,943 — CAGR 164%
- 2000 component values: $8, $30, $38, $40

Legend: ■ Streaming Video ■ Streaming Audio □ V-World Streaming □ I-Conferencing
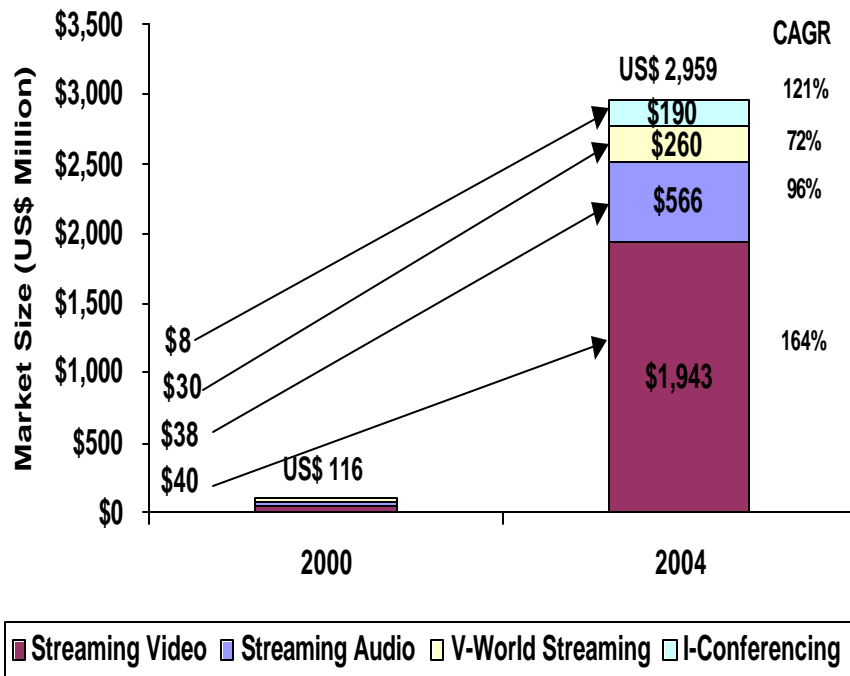
Total CAGR 2000-2004 CAGR 74%

Right chart — Market Size (US$ Million), years 2000 and 2004:
- 2000: US$ 83
- 2004: US$ 760
  - FTP $180 — CAGR 46%
  - Electronic Software Delivery $260 — CAGR 72%
  - Digital Delivery $320 — CAGR 123%
- 2000 component values: $40, $30, $13

Legend: □ Digital Delivery □ Electronic Software Delivery ■ FTP

Source: Merrill Lynch, Internet Research Group 2000

Summary

Service Carriers have the business model and technology underpinning to profitably meet the high demand for business communications services

– **Gain economic advantage through use of disruptive IP technology**

– **Provide the communications advantages of the internet with the requisite QoS, billing, security, etc.**

– **Scale operational costs to closely track demand for value - not volume - services**