Building the Next Generation Network

NCF 2001
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Agenda

Observations from the VoIP “Front Line”

Emergence of the “Service Carrier”
Traditional Voice Under Siege

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
Projected Transition from TDM to VoIP

Percentage Traffic Volumes based on 2000 volumes

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

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

Call Control & Accounting
- Cisco and 3rd party applications
- Application logic manipulates other parts of the network to implement the service
- Map applications to resources & vice versa
- Enforce service level agreements
- Generate CDRs with integrated SLA info

Cisco AS5000 Universal Gateways
- Data, voice, fax and mobile wireless call termination, origination & transit
- Programmable call handling for flexibility and to enable services

Cisco AS5000
Universal Gateways

Wireline / wireless
PSTN

Data, voice, fax and wireless clients

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Transit & Access Services

BTS 10200 Call Agent

- CNAM
- 800
- LNP
- SS7
- STP
- AIN 0.1
- TCAP
- AIN FS
- 3rd party Virtual call Center FS
- Media Gateway
- MGCP Interface
- Residential Gateway
- Media Gateway
- Trunking Gateway
- Call Center Servers
- Parlay/JTAPI
- Centrex FS
- Tandem FS
Enabling a Network of Networks
## Enabling a Network of Networks

**Cisco IOS® Software Voice Support**

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

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Delivery of Rich & Dense Media

Network value proportional to number of endpoints

Connectivity increases value of device

Multimodal

Voice

Graphic

Voice

Graphic
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

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)

Catalysts for Change

Corporate Adoption of IP Voice Solutions

Clients
- SoftPhone
- IP Phones
- Video
- PCs

Infrastructure
- Intelligent Network Services
- Cisco IP Fabric
- Switches
- Routers
- Gateways

Applications
- Management
- Support
- Service

Internet Application Technologies
- QoS
- Security
- Voice
- Video
- Multicast
- VNI
- Load Balancing
- Addressing
- Policy
- Management

Clients Infrastructure Applications
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

Q1CY98  Q1CY99  Q1CY00  Q1CY01  Q1CY02  Q1CY03

Calendar Quarters

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

Dual Mode
H.323 or SIP
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
- 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 with 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

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

- Current Position
- Foundation Services
- Cost Curve
- High ROI Bus Svcs
- Content Svcs
- Time
- Service Carrier $
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

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<th>Min. (B)</th>
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<td>2004</td>
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<tr>
<td>2005</td>
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528% CAGR

Source: IDC, 2001

IP Centrex Lines Installed Base

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<th>Year</th>
<th>(000)</th>
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<tbody>
<tr>
<td>2000</td>
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<td>2004</td>
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</table>

553% CAGR

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
- Source: IDC, Dec 2000

Multimedia Collaboration

- 31% CAGR
- Source: IDC, Dec 2000

iBasis & OpenWave team on Unified Communications svc

VoiceXML: ‘Distributed’

PSTN

“Please leave a message”

5300 VXML Script

Voice Services (VXML, TTS)

Web Server

Mobile Data Services

Message Store Application Services

Directory Application Services

Message Store LDAP Directory Calendar Data

Source: IDC, Dec 2000
III. Business & Consumer Content Services

Total CAGR 2000-2004 - 125%

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