

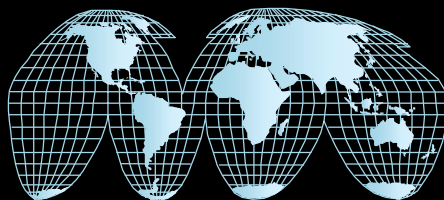
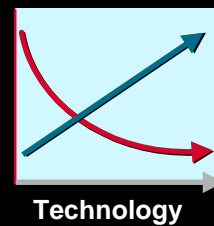
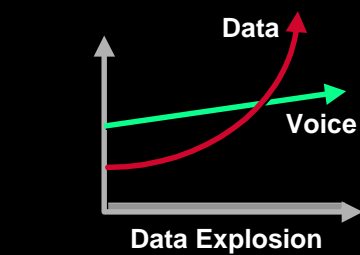


## Agenda

- **Market Developments**
- **Background—Cisco's Open Packet Telephony Architecture**
- **Solution Updates**
- **Closing**

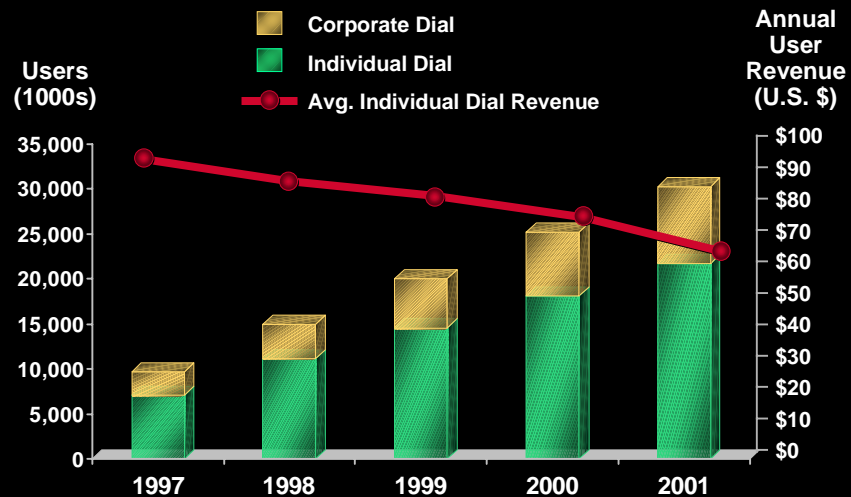
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## Market Developments



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## Market Developments



Source: IDC, 1998

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## Consequences

- **Tomorrow's networks must efficiently transport data, and voice**
- **Advances in packet-switching technology will far outstrip TDM**
- **Deregulation has created a new competitive landscape**
- **Networks based on open standards enable innovation, and services**

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## Service Provider Benefits

- **Leverage existing customer base:**
  - More \$/subscriber
- **Leverage IP network infrastructure:**
  - Level out busy-hour traffic
- **Build new customer base:**
  - New revenue source
- **Expand territory:**
  - Low startup cost for new POPs
- **Service bundling opportunity:**
  - Improved customer retention and loyalty
- **Toll-quality voice offering:**
  - High customer satisfaction
- **Upsell enhanced services:**
  - Increase revenue per subscriber

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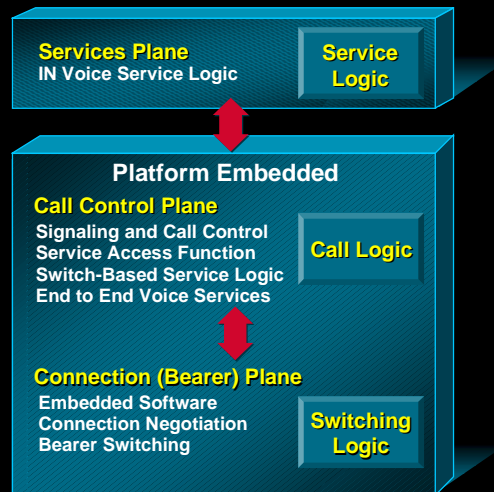
## Agenda

- **Market Developments**
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## Traditional Switch Architecture

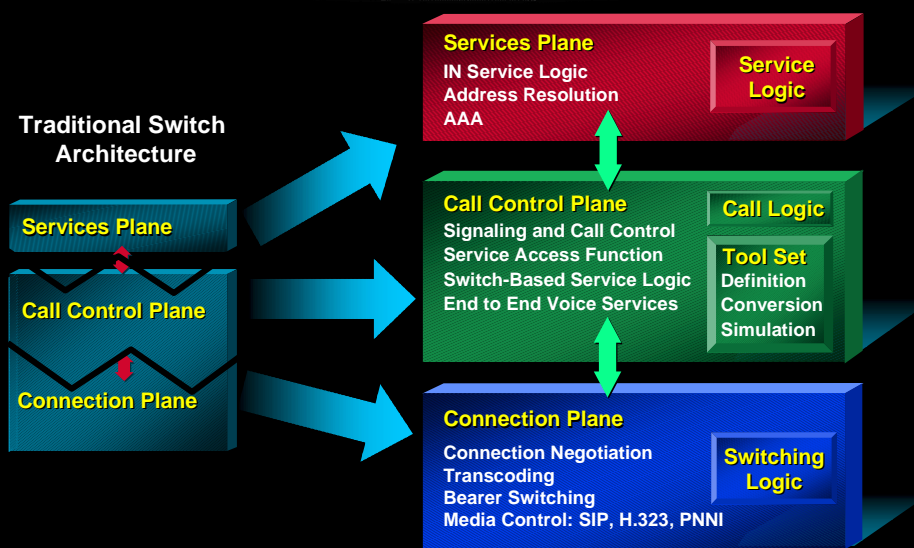
- Legacy TDM closed architecture
- Limited scalability, bottlenecks
- Complex, inflexible
- Tied to physical infrastructure
- Lack of open, standard interfaces



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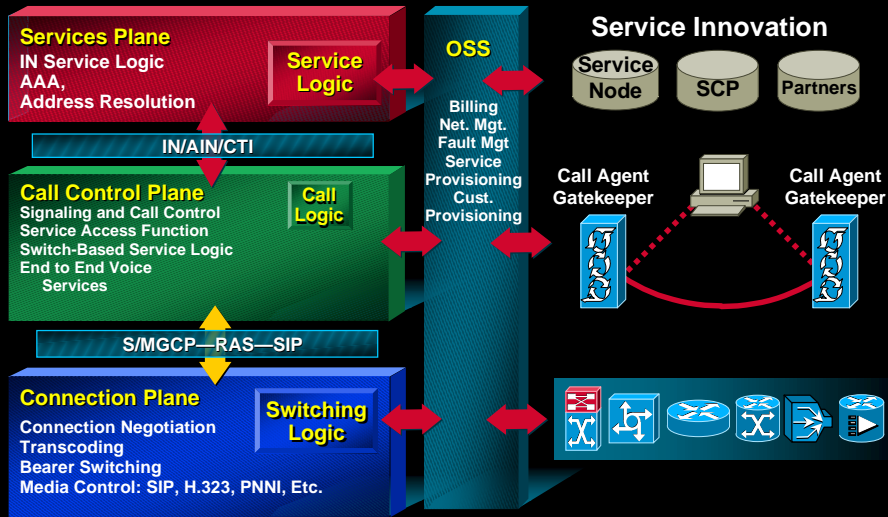
## Cisco's Open Packet Telephony Architecture

Traditional Switch Architecture



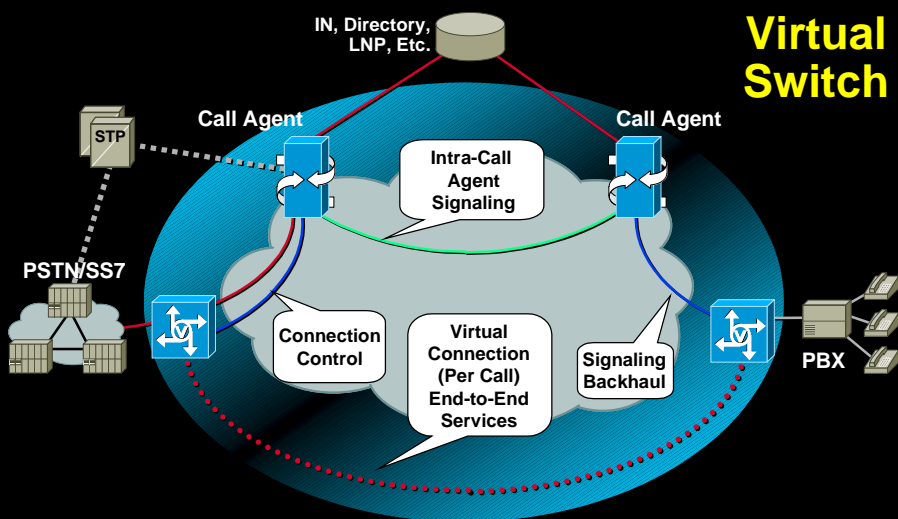
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# Open Packet Telephony Elements



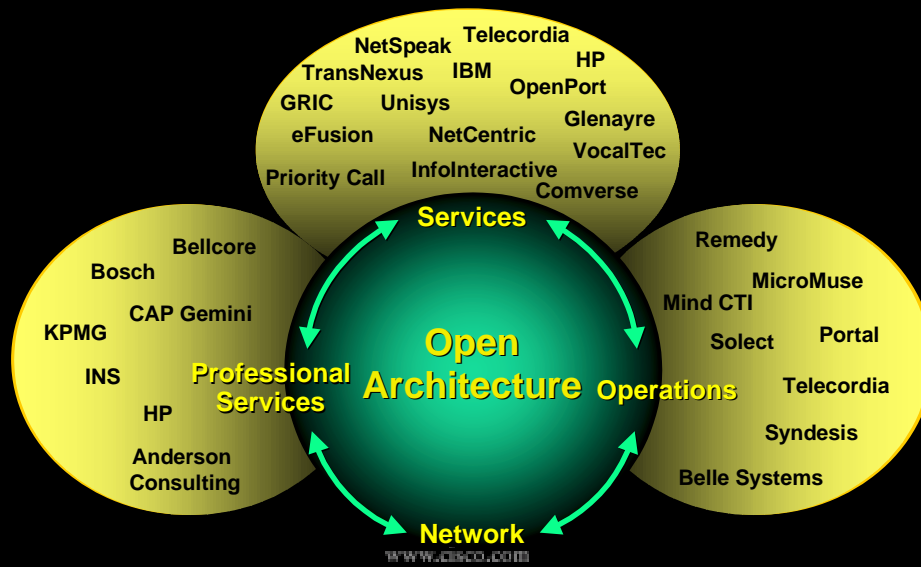
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# The Result—The Virtual Switch



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## New-World Ecosystem



## Agenda

- Market Developments
- Background—Cisco's Open Packet Telephony Architecture
- **Solution Updates**
- Closing

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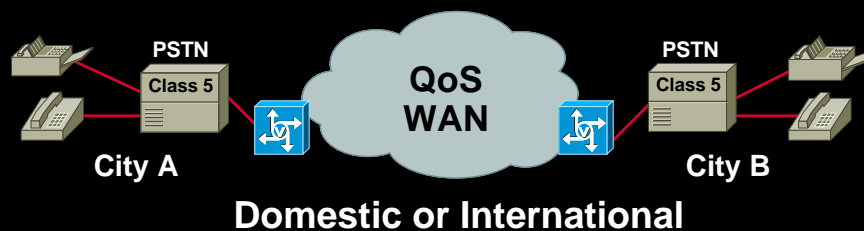
## Agenda—Solutions Update

- **Retail Long Distance for ITSPs**
- Wholesale IP Minutes
- Managed Services
- Unified Communications
- Value Added Services
- Emerging Technologies

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## What Is IP Long Distance Service?

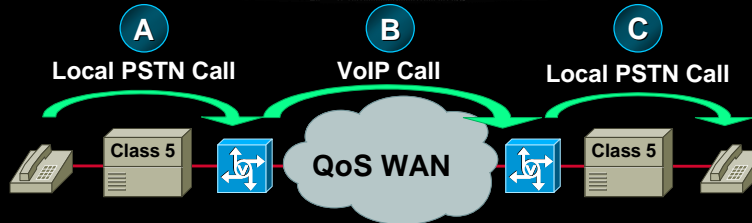
- Long distance phone-to-phone or fax-to-fax calls over a data network rather than the Public Switched Telephone Network (PSTN)
- Carrier-class voice quality
- Gateways enable traffic to be passed between the two networks



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## Two-Stage Dialing Model



### Steps to Make Long Distance Call

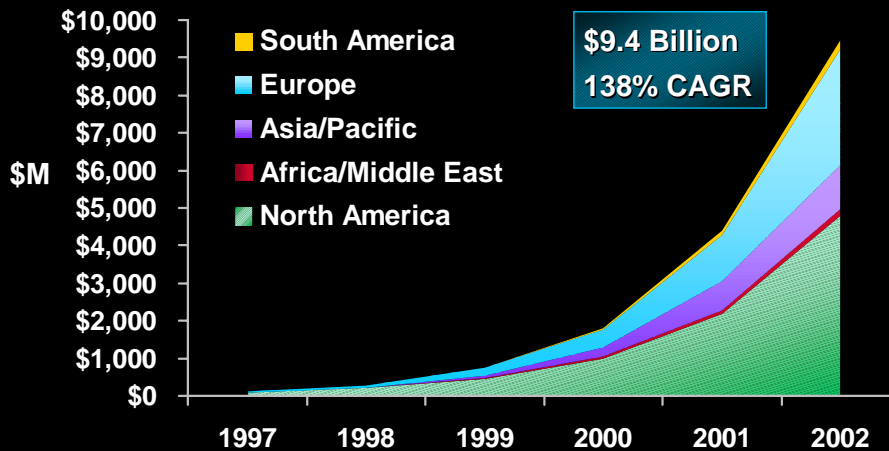
1. Subscriber dials local phone number of Service Provider (call leg A)
2. Subscriber gets second dial tone and is prompted to enter  
Destination phone number  
Account number and password if calling away from home
3. Call is completed to the destination phone (call legs B and C)

**Experience  
Similar to Using  
a Calling Card**

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## Why the Interest—Global Carrier Revenue Forecast

### IP Voice Long Distance Services



Source: Killen & Associates 5/98

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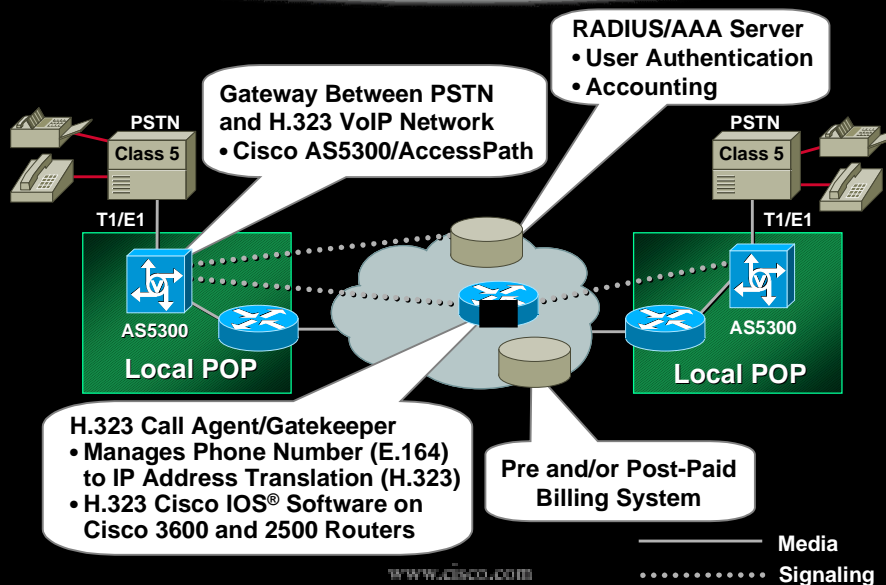
## Market Entry Strategies

- Start regional with hop-off to long distance carrier for bulk minutes
- Expand: Direct with other ISPs; join a consortium; join a clearinghouse
- Target market specific communities for international long distance
- Prepaid calling card services

Money up-front; unused minutes; sold- on a per-minute basis, purchased- in 6 second increments; no consumer collections activity

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## Network Design and Solution Components



## Gateway Feature Summary

- H.323 Endpoint
- PSTN interfaces
- Interactive Voice Response (IVR)
- AAA enhancements
- Voice Activity Detection (VAD)
- OSP Support

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## Solution Components— Cisco AS5300

### Independent Test Rated Cisco No. 1 in VoIP

- Key applications
  - VoIP
  - Toll Bypass
  - Fax relay
  - Modem/ISDN
  - Internet access
- Performance
  - Embedded, high-performance, low-latency architecture

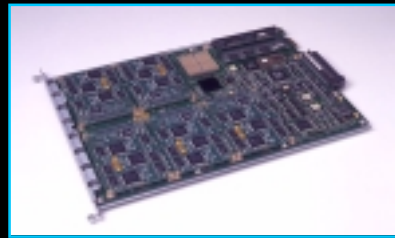


- Carrier Class
  - Highly scalable
  - Supports 96/120 calls (4 T1/E1/PRI) per 2 RU
  - 10MB & 10/100MB Ethernet
- VoIP protocol support
  - H.323, RTP, RTCP, NTP, CRTP

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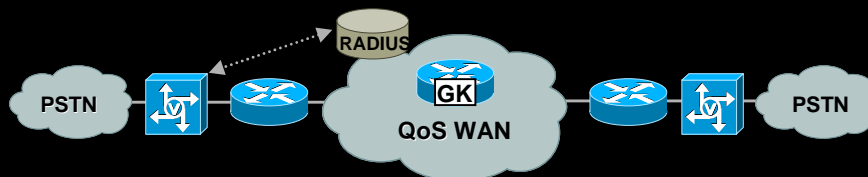
## Cisco AS5300 Voice/Fax Feature Card

- **High performance voice processing**  
Specifically designed for real-time, high quality voice processing  
Industry standard CODECS including:  
G.729, G.723.1, G.711  
Full featured voice processing including:  
echo cancellation, VAD/silence suppression,  
programmable frame size
- **Group III Fax relay**
- **Distributed IP processing**  
QoS packet designation on-card



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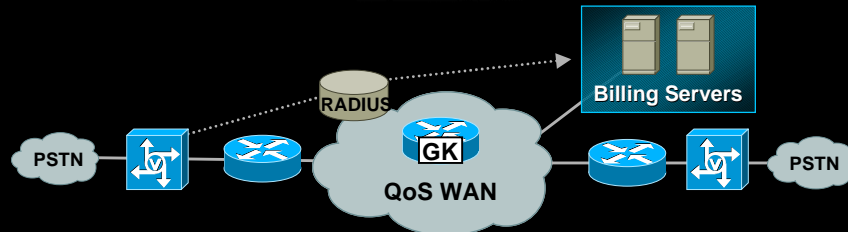
## Solution Components— AAA RADIUS Authentication



- **Controls access to service**
- **Callers authenticated at originating gateway**
- **Scalable user authentication**
- **Centralized authentication offloads user database from gateway**
- **IVR application prompts users and collect digits**

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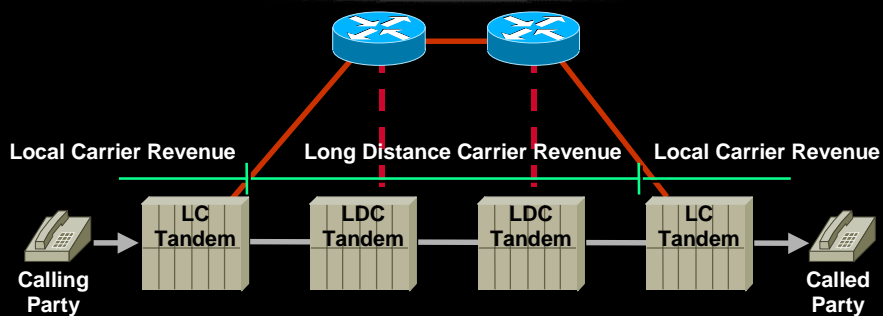
## AAA RADIUS Accounting



- Scalable billing solution
- Gateways send start/stop accounting records to AAA server to support billing applications
- Integrates well with existing RADIUS-based dial access billing systems

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## Solution Components— Voice Settlements



- Ability to divide per call revenue among multiple carriers

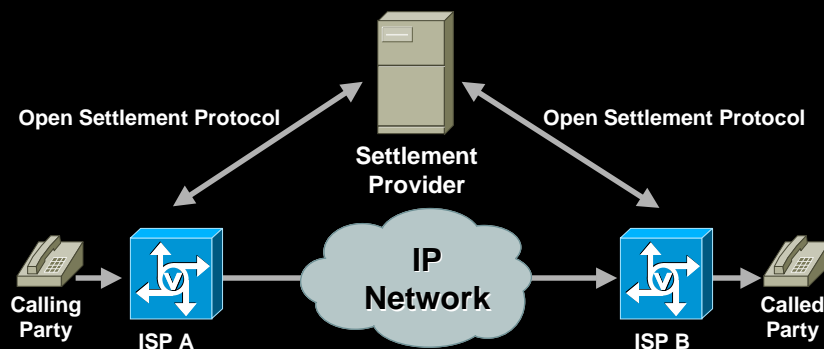
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## Telephony and VoIP Settlement

- **Traditional telephony settlement**
  - Bilateral agreement between carriers
  - Static inter-carrier routing
  - CDR from C7/SS7 information
- **VoIP settlement**
  - ISPs to build connectivity and sign with clearinghouse
  - Settlement provider does inter-ISP routing and authorization

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## VoIP Settlement Scenario



- **Secure settlement protocol**
- **Call signalling protocol is not included**

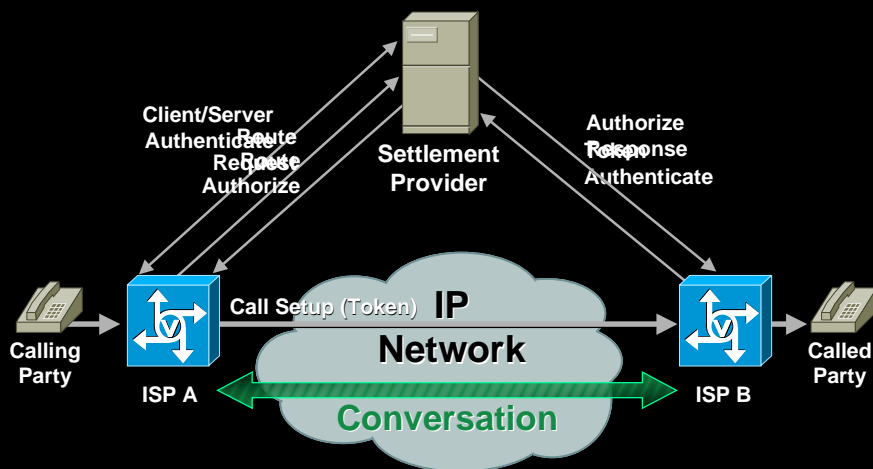
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## Open Settlement Protocol

- Standard track within ETSI, approval in Sept 1998
- Wide support
  - TransNexus, iPass, GRIC, Cisco, 3COM...
- Extendable to additional services
- Settlement independent from IVR, GK...

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## OSP and Gateways



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## Benefits of OSP Clearinghouse

- Immediate access to markets
- Terminating services from other ISPs
- Lower financial risk
  - Termination payment guarantee, No currency risk
- Flexible pricing per ISP
  - Type of service, weekly schedule, “Ask” price, “Bid” price and quality

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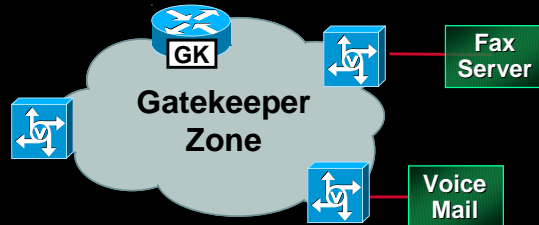
## Solution Components—Gatekeeper (Multimedia Conference Manager)

- Cisco’s H.323 gatekeeper
- Scalable E.164/H.323 ID address resolution
- RAS technology prefixes
- HSRP support
- Bandwidth management
- Available on NEBS-compliant platforms

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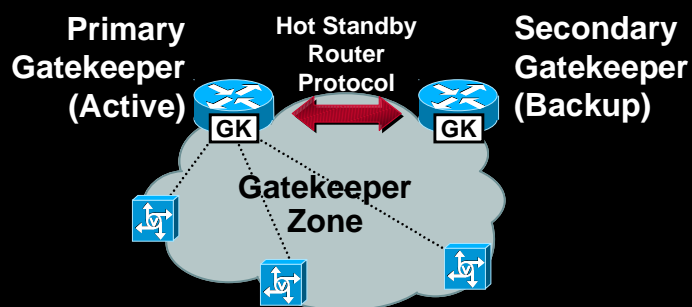
## RAS: Technology Prefixes



- Technology prefix defines a type of gateway capability
- Benefit: allows the use of centralized servers  
E.g. technical prefix 1# = fax server; 2# = voicemail server
- Can be used to route calls within a zone

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## Hot Standby Router Protocol (HSRP)



- Redundant gatekeepers serving the same zone
- Secondary gatekeeper can take over from primary gatekeeper in case of failure
- Increases VoIP network availability

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## Agenda—Solutions Update

- Retail Long Distance for ITSPs
- **Wholesale IP Minutes**
- Managed Services
- Unified Communications
- Value Added Services
- Emerging Technologies

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## What Are Wholesale IP Minutes

- Service Provider resells international minutes to other carriers as a carriers' carrier
- On a call-by-call basis, Service Provider selects the Internet, their "private" internet or other wholesaler
- Selection based on voice quality available at the time of call setup

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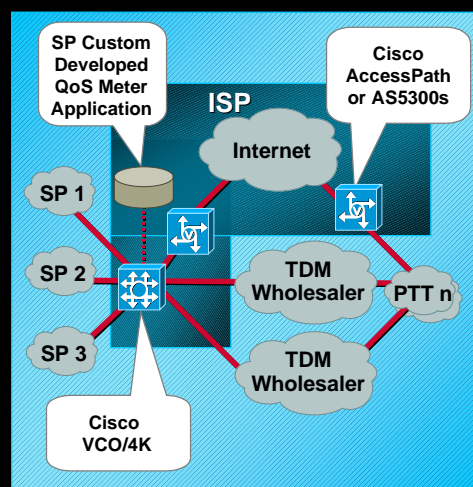
## Why the Interest?

- 94.1 billion international voice minutes in 1998
- International voice tariff umbrella remains high and relatively non-economic-based
- Technology now enables it
- **Cost of Internet minutes is extremely low**

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## Network Design and Solution Components

- ISP offers wholesale int'l minutes to other SPs
- Uses Internet; switches to TDM trunks when Internet quality degrades
- Use VCO/4k for switching
- Custom application interrogates SNMP MIB variable determines which trunk to use



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## Solution Components— AccessPath-VS4

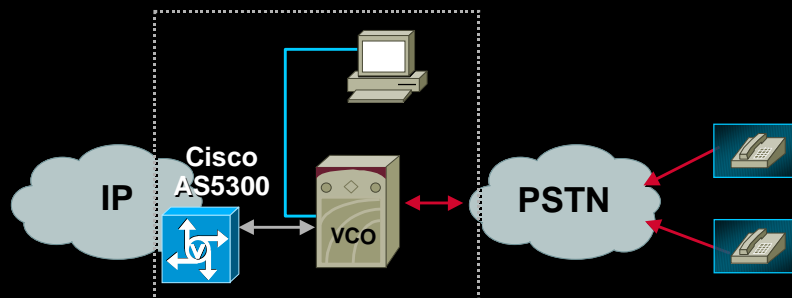
- **Highly scalable**  
CT1/PRI VoIP port capacity: 192 to 2018  
CE1/PRI VoIP port capacity: 240 to 2520  
Integrated gatekeeper and programmable VCO/4K switch (optional)
- **High Availability**  
VoIP feature shelves: hot swap and RPS  
Gatekeepers: failover with HSRP  
DASA: No single point of failure  
NEBS Level 3 compliant
- **Completely integrated solution**  
Dial, switching, backhaul routing, system controller  
Configurator—quick deployment, user-friendly configuration



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## Solution Components—VCO/4K Programmable Switch

- **Front end of an AS5300 VoIP network**
- **Support for:**  
Custom development with open API  
Cisco voice partners for debit card, calling card, IVR, fraud control, and billing



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## Solution Components— Network Selection

- On call setup, VCO/4K interrogates the Service Provider developed application
- Using the VCO/4K's open API the application commands the VCO/4K to switch the call based on latest QoS metrics
- Avoiding Internet congestion points (NAPs, MAEs) dramatically increases Internet usage

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## Cisco VCO/4K

- World's highest density programmable switch
- Scale from 24 to 4,088 ports capacity
- Redundancy
- NEBS certified
- Live upgrade
- Rack mountable (17.5"W x 25.25"H)



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## **Solution Components—Sample Application Partners**

- Voice Messaging—**Unisys, Priority Call**
- Calling Card—**Comverse, Vicorp, Simplified**
- Debit Card—**Comverse, Glenayre, Synapsys**
- International Callback—**Compro, ITL**
- Operator Services—**MD Telecom**
- Predictive Dialing—**Castel**
- Directory Assistance—**Voicetek/Aspect**
- Voice Dialing—**Intellivoice**
- Lawful Intercept—**ADC**
- Single Number—**Priority Call, Compaq/DEC**
- Web-Enabled Services—**Timeshift**

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## **Agenda—Solutions Update**

- Retail Long Distance for ITSPs
- Wholesale IP Minutes
- **Managed Services**
- Unified Communications
- Value Added Services
- Emerging Technologies

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## What Is a Managed Service

- **Data Service Provider shifts the demarc to include the CPE**
- **Service Provider uses CPE that supports voice over data to provide a combined voice and data managed service**

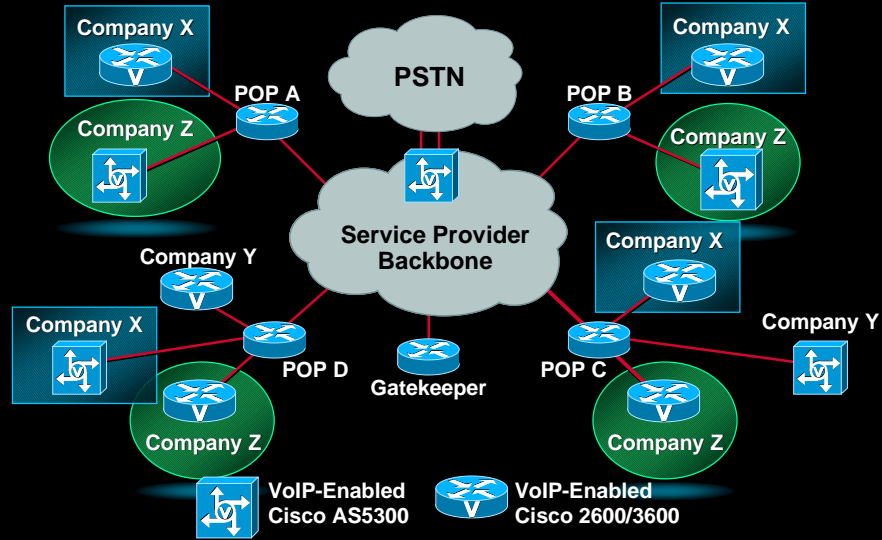
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## Why the Interest

- **Reduce or eliminate charges paid to other carriers**
  - Reduce the number of access lines required
  - Bypass local access charges
  - Keep more interexchange traffic "on-net"
- **Offer bundled services**
  - Capture most or all of a customer's networking business
- **Better manage overall traffic**
  - Keep more traffic "on-net"
  - Monitor traffic end-to-end
  - Better utilize total network bandwidth
  - Balance variations in data, voice traffic patterns

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## Network Design and Solution Components



## Network Design and Solution Components

### Hardware

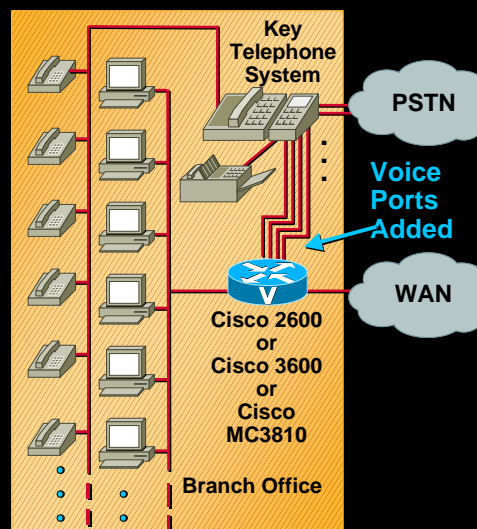
- Voice-enabled Cisco 2600/3600 using VoIP or VoFR
- MC3810 using VoFR or VoATM
- Key system or PBX connected via multiple analog lines to router

### Software

- VoIP configured using Weighted Fair Queuing (WFQ) to ensure QoS
- KTS or PBX programmed to do least cost routing when dialing interoffice

### Result

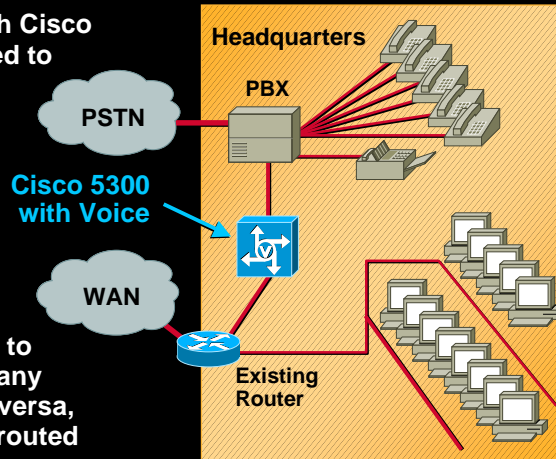
- Branch-to-branch voice traffic now carried by the packet network
- PSTN carries local calls and backs up the packet network
- Fax traffic can also be routed across packet network when it is interoffice





## Network Design and Solution Components

- Voice ports added with Cisco AS 5300 and connected to PBX through E1/T1
- On-net long distance voice traffic carried by the IP network
- PSTN carries local calls and backs up the IP network
- Any phone connected to the PBX can now call any branch phone or vice versa, and the traffic can be routed over the data network



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## Solution Components—Modular Access Router Family

- 50–70 kpps fast switching
- 3–4 kpps process switching
- Four network module slots
- 25–40 kpps fast switching
- 1.5–2 kpps process switching
- Two network module slots
- 12–25 kpps fast switching
- LAN interfaces integrated
- One network module slot

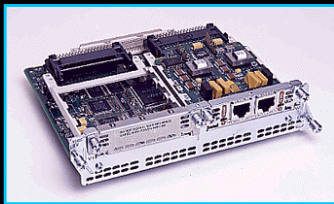


Versatility  
Integration  
Performance

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## Solution Components— Network Modules—Voice/Fax

- **Flexible Voice Interfaces (VICs)**
    - FXS
    - 2-, 4-wire E&M types I, II, III, V
    - FXO
    - BRI VIC—Up to 4 voice channels
  - **Diverse signaling**
    - Delay, immediate, and wink start
    - Loop and ground start
  - **DSP architecture—TI542**
    - G.729 CS-ACELP—8K
    - G.711 PCM
    - Group III fax relay
  - **Voice transport support**
    - Voice over IP—H.323
    - Voice over frame—VoFR, FRF.11, and FRF.12
    - Future support for: VoATM**
  - **Two versions**
    - NM-1V (1 VIC slot)
    - NM-2V (2 VIC slots)
- Editors' Choice:**  
Computer Telephony  
March 1998



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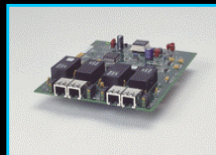
## Solution Components—MC3810 Multiservice Access Concentrator

### Voice over Frame Relay or ATM

G.729, G.729a, G.726, G.711

Group III Fax Relay

- **Analog Voice Module (pictured here)**
  - FXS, FXO or E&M up to six interfaces in any combination
- **Digital Voice Module—T1 or E1**
  - Up to 30 channels—24 compressed
  - Q.SIG PRI CAS and CCS transparent signaling
- **BRI Voice Module**
  - 4B+2D Q.SIG
- **Video**
  - AAL1 ATM stream



**MultiFlex Trunk**

- T1/E1 Uplink
- BRI Back-up Option
- Built-in CSU/DSU
- Drop and Insert

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## Agenda—Solutions Update

- Retail Long Distance for ITSPs
- Wholesale IP Minutes
- Managed Services
- **Unified Communications**
- Value Added Services
- Emerging Technologies

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## What Is Unified Communications?

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**Unified Communications  
consolidates voicemail,  
e-mail and fax on a single  
IP network independent of  
location, time or device**

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## Unified Communications Service Examples

### Voice mail

- Message on Busy
- Retrieve via Phone
- Retrieve via E-mail
- Retrieve via Web
- Retrieve via Fax

### Fax Messaging

- Fax → E-mail
- E-mail → Fax
- 'Never Busy' Fax Line
- Fax Broadcast, Etc.

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## Why the Interest?

- **Tap into the 125 million Service Provider-hosted voice mailboxes worldwide**
  - Continued growth driven by wireless and bundled service offerings
- **Deliver the 25 million unified messaging mailboxes projected to be in service by 2003**
- **Carry the 250 billion pages projected to be faxed over IP in 2004**

Source: Ovum Ltd., Kaufman Group

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## Service Provider Benefits

- **Generates additional revenue**
- **Increases customer loyalty**
- **Increases network utilization**
- **Bundling and branding opportunities**

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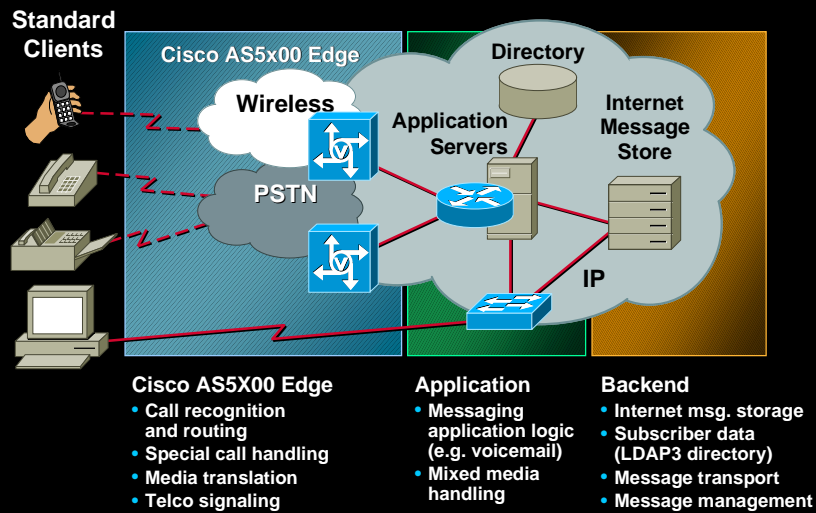
## End-User Benefits

- **Shifts Control of Communication from Sender to Recipient**
- **Managing Multiple Messages from a Single Interface Increases Daily Productivity Time**



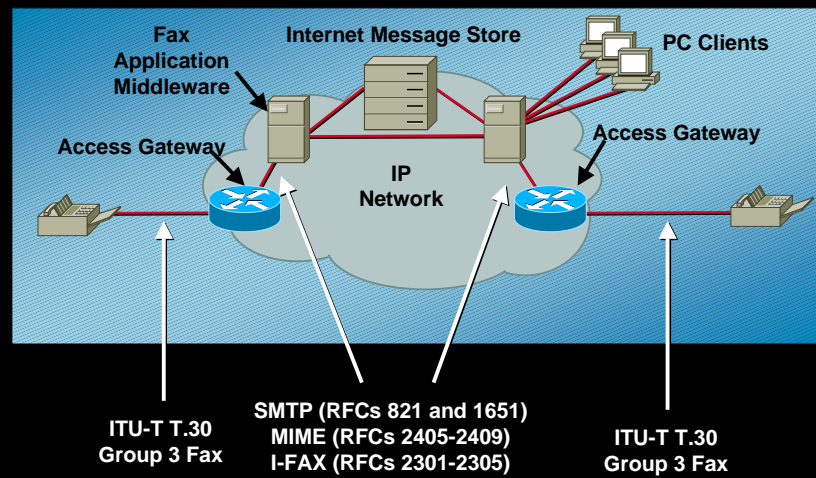
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## Solution Components



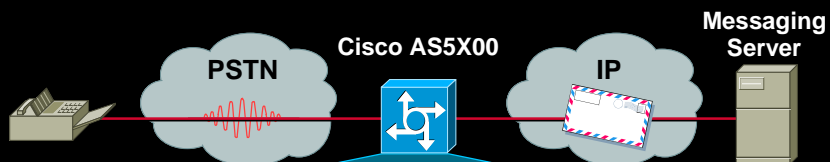
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## Solution Components



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## Onramp Function



- Demodulate fax call
- ITU-T T.30 fax protocol handling
- Authenticate sender against AAA
- Turn Fax image into TIFF file
- Create MIME message with TIFF attachment
- Optionally re-write to: address
- Create call history record
- Forward to ESMTMP mail server

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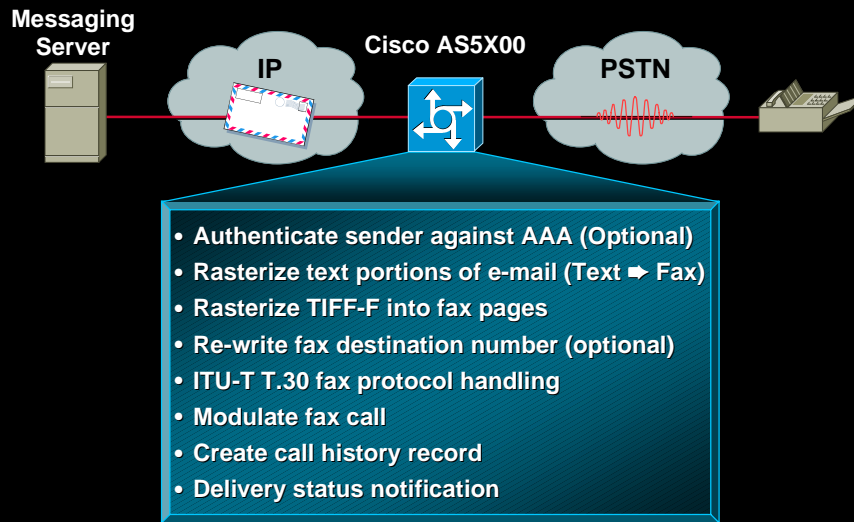
## Messaging Server Functions



- Least-cost routing (LCR)
- Mailbox mapping  
Map fax number user account
- Message transport  
(mail transport agent)
- Message storage and retrieval  
Mail user agent interactions

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## Offramp Function



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## IP Voice Mail

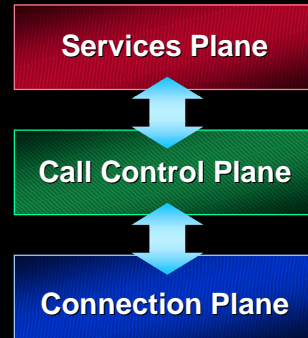
- IP voicemail with e-mail and Web access
- Cisco AS5300 voice gateway running Cisco IOS version 12.0(5)T
- Amteva UM 4.0 messaging middleware
- Backend message store and directory from software.com or Netscape

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## Service Provider Benefits from Open Packet Telephony

- **Generates Service Provider revenue through**
  - Incremental services without need for new infrastructure
  - Expanding addressable market
  - Increased customer loyalty
- **Built on the open packet telephony architecture**
  - Modular versus monolithic
  - Open interfaces
  - Industry standards
  - Best-of-breed applications

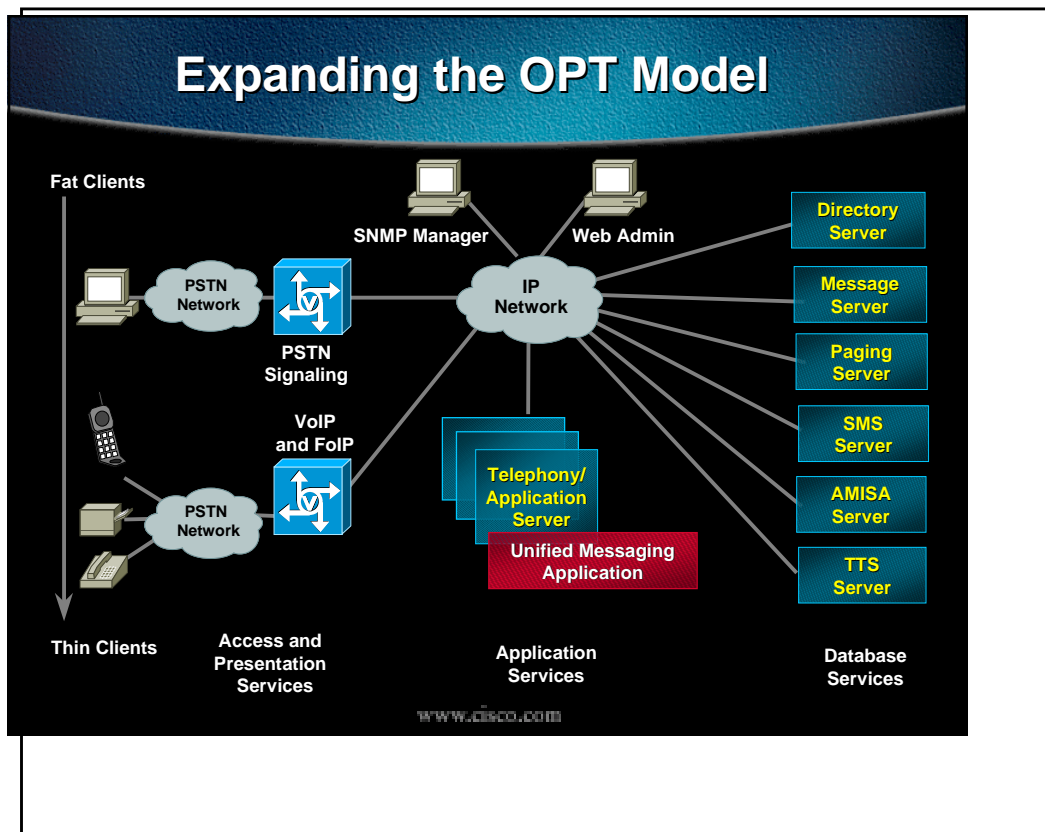


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## Third-Party Alliances

Solution	Third Party
Fax Store and Forward	NetCentric Corporation
IP Voice Mail	Amteva (UM4.0) and Netscape/Software.com
Solution Consulting and Systems Integration	Telcordia (Formerly Bellcore)

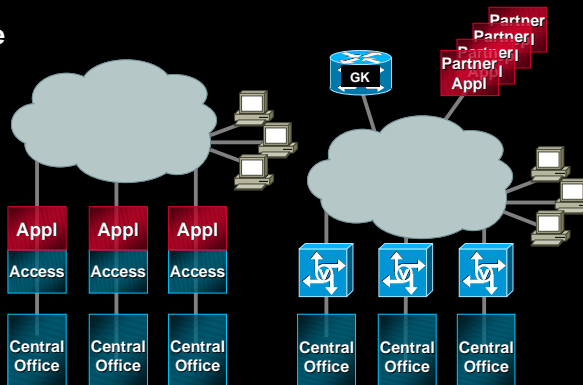
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- ## Agenda—Solutions Update
- Retail Long Distance for ITSPs
  - Wholesale IP Minutes
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  - Unified Communications
  - **Value Added Services**
  - Emerging Technologies
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## Cisco OPT Architecture Benefits

- Distributed multiservice access
- Centralized services
- Increased scalability, upgradability and robustness
- H.323 standards based
- Open architecture enables future applications on common infrastructure
- Fast feature development/introduction



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## Cisco Enhanced Services Strategy



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## What Is Internet Call Waiting?

- **Alternative to a second line for ISP subscribers**
- **On busy-call-forward, the application suspends the call and presents the subscriber with alternatives**
  - Ignore the call**
  - Redirect the call to voice mail**
  - Terminate ISP connection and take the call**
  - Take the call over the Internet**

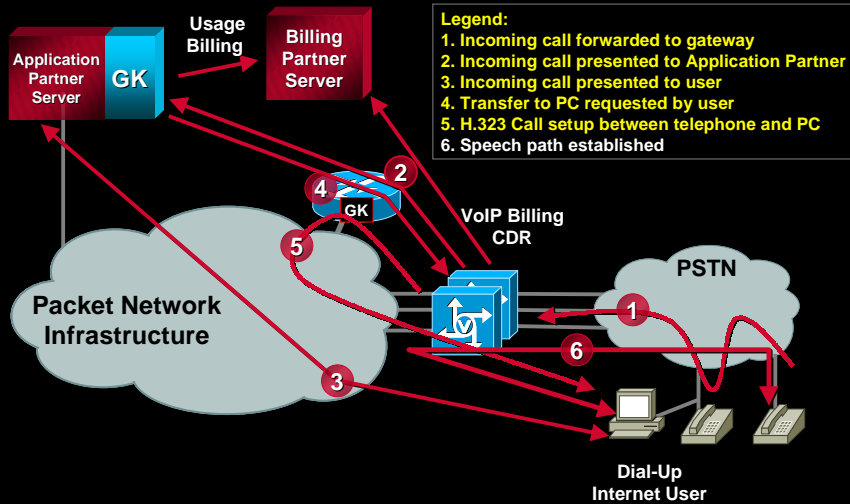
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## Why the Interest?

- **Higher margin than second line services**
- **Increased call completion revenues**
- **Increased voice mail usage**
- **Easy to bundle**
- **A very “sticky” service**

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## Internet Call Waiting Solution



## What Is a Web Call Center?

- Integrate “talk to operator” button onto web site
- User has option to immediately call operator from PC
- Operator can answer questions, push web sites to user session, and close the sale
- Service provider collects “800-service” type revenue
- Result is higher customer satisfaction

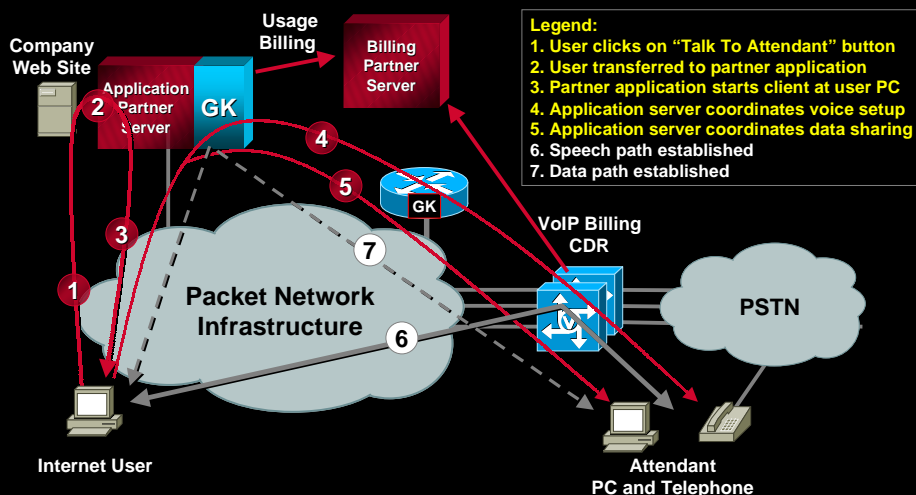
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## Why the Interest?

- New revenue-generating service for corporate customers
- Marketed similar to 800 service so that PC to operator calls are reverse billed to the company
- Integrated with voice and data services to the company
- Increased billable VoIP traffic

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## Web Call Center Solution



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## Third-Party Alliances

Service Solution	Partners
Clearinghouse Services	GRIC, TransNexus
Post and Prepaid Calling	Belle Systems, GRIC, Mind CTI, Portal, Solect
Internet Call Waiting	eFusion, InfolInterActive, NetSpeak
Click to Dial	eFusion
H.323 Gatekeepers	NetSpeak, RADVision, VocalTec
Unified Communications*	NetCentric, OpenPort, Software.com, Telcordia

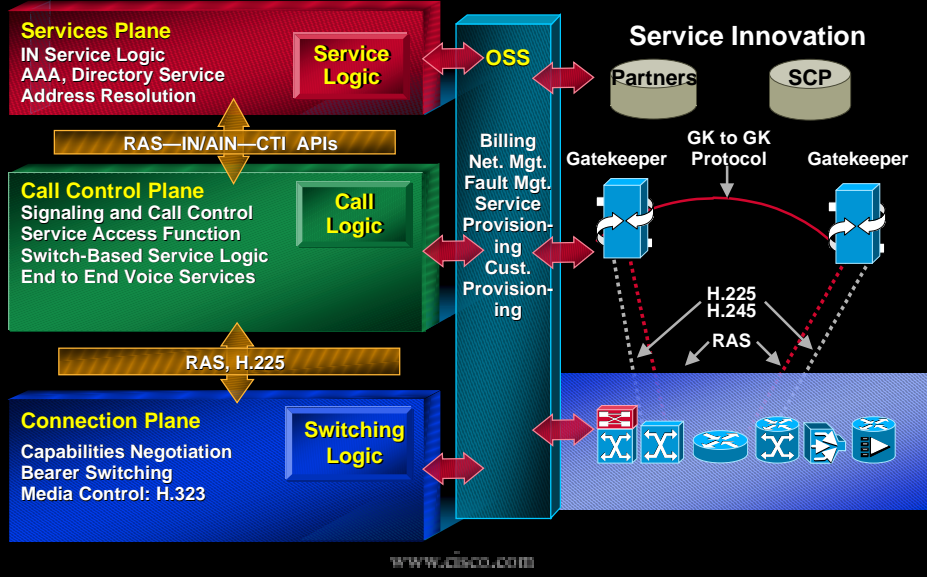
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## Agenda—Solutions Update

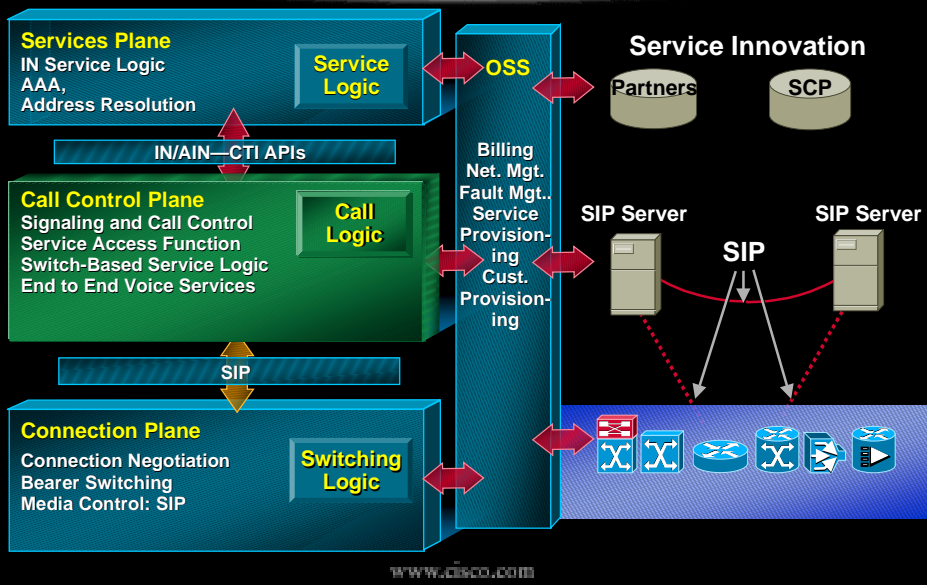
- Retail Long Distance for ITSPs
- Wholesale IP Minutes
- Managed Services
- Unified Communications
- Value Added Services
- **Emerging Technologies**

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# Open Packet Telephony H.323 Implementation

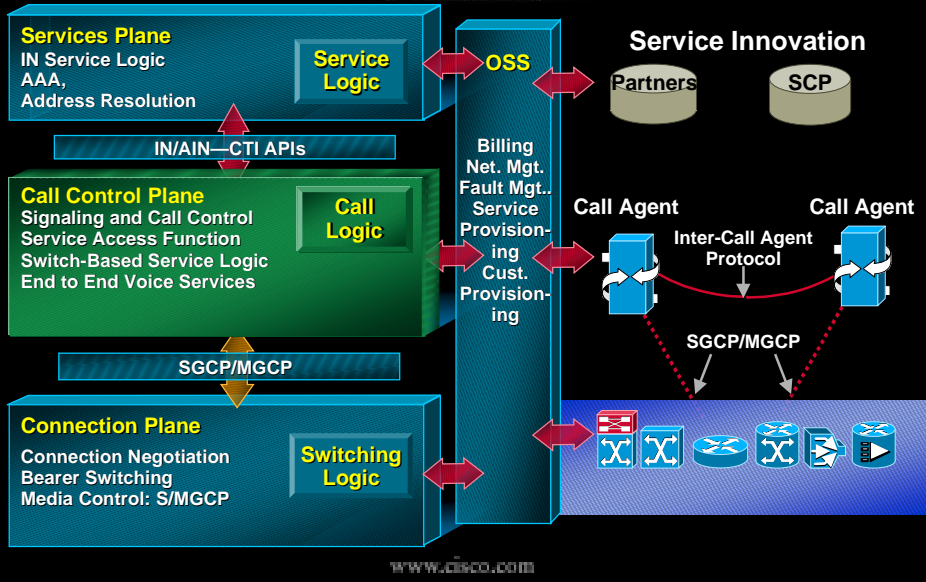


# Open Packet Telephony SIP Implementation





# Open Packet Telephony S/MGCP Implementation

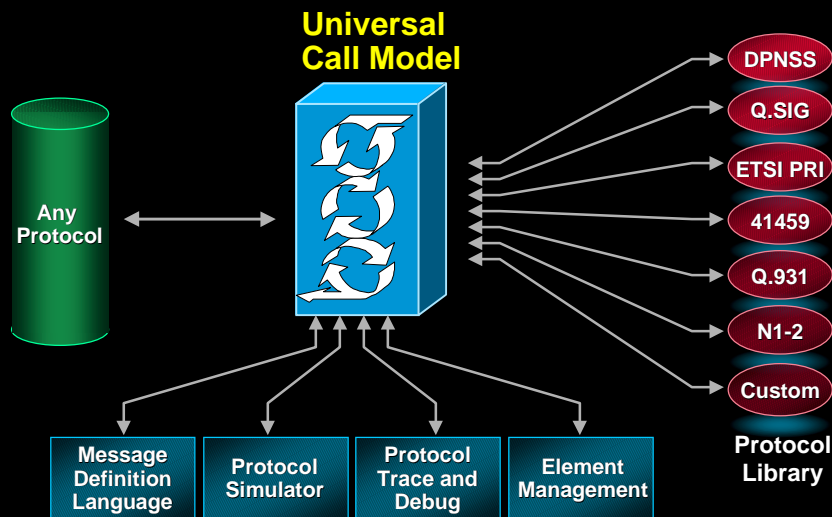


# SGCP Call Control Plane—Virtual Switch Controller 2700

- Call control engine for enterprise and local Service Providers
- Cost-effective alternative to traditional TDM solutions
- Telco class, NEBS compliant solution
- Comprehensive call accounting detail



## VSC Architecture



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## VSC Hardware

- VSC2700 application runs on SUN Netra ts
- Netra t
  - PCI architecture
  - 300 MHz RISC processor
  - NEBS compliant
  - CD-ROM, DAT
  - DC or AC
- Simplex—Single Netra
- High availability—Two NETRAs running in active and standby modes



**Supports Up to  
90 E1s, 72 T1s**

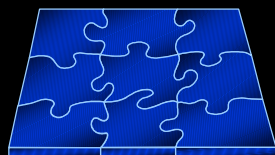
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## Agenda

- Market Developments
- Background—Cisco's Open Packet Telephony Architecture
- Solution Updates
- **Closing**

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## Open Standards Change the Model



### Traditional Telephony

- Proprietary
- Closed
- Inflexible
- Monolithic
- Extremely expensive
- Old world speed

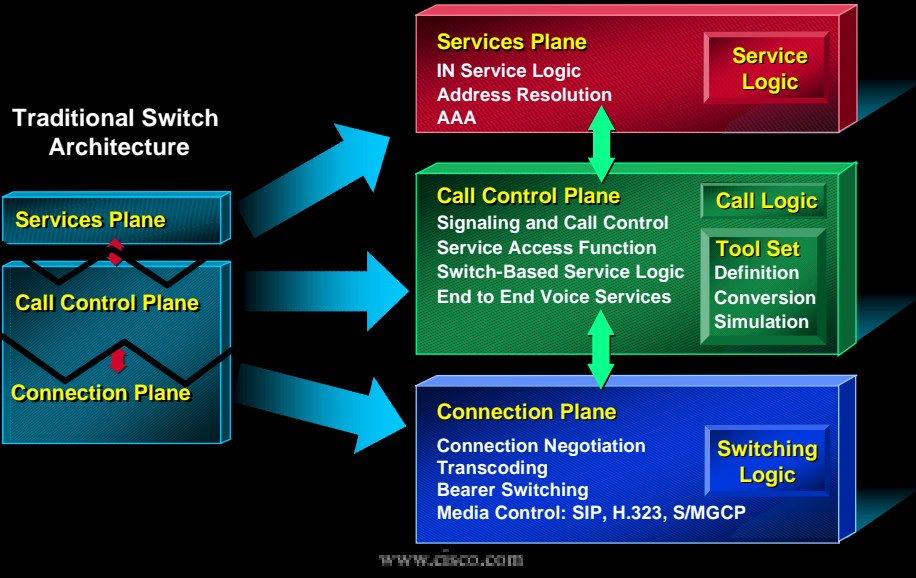
### Open Packet Telephony / IP

- Public standards
- Open systems
- Flexible
- Teams and partners
- Inexpensive
- Internet time

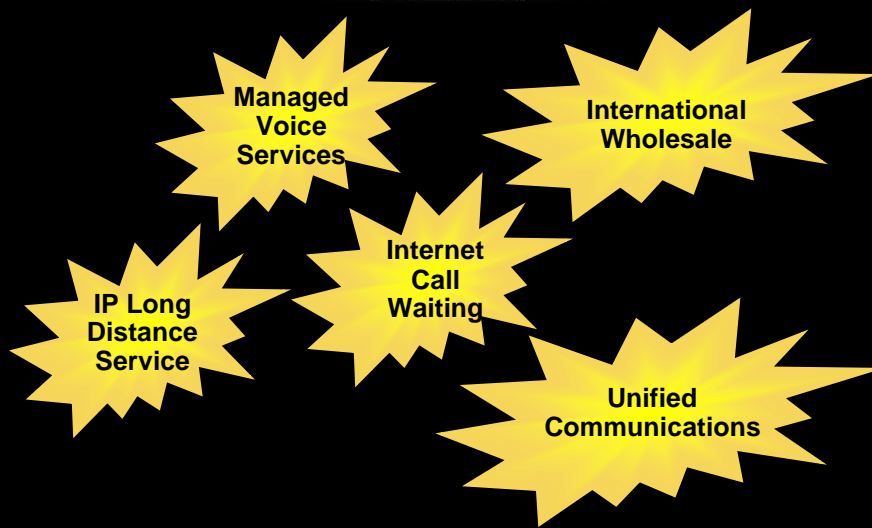
**AND...**

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## ...With the Right Architecture, and Components...



## New Revenue Opportunities Abound





**Please Complete Your  
Evaluation Form**

**Session 1203**

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INTERNET GENERATION<sup>SM</sup>**

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