



## NETWORKERS 2004

### DESIGNING AND DEPLOYING BUSINESS (HOSTED OR MANAGED) IP VOICE/DATA SERVICES

VVT-2021

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VOICE SERVICE PROVIDER SOLUTION ENGINEERING (SPSE)

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## Agenda

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- Business Voice Solution (BVS) Overview
- Architecture and Service Layers Overview
- Customer Endpoint Deployments
- Voice Call Routing
- IP Transport
- Multi-Service Applications
- Operations and Management
  - NMS and Billing (FAB = Fulfillment, Assurance, Billing)
  - Security
  - Scaling the Endpoints and the Network
  - Resiliency and Redundancy
- Case Studies
- Summary

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## BUSINESS VOICE SOLUTION (BVS) OVERVIEW



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## Cisco Business Voice Solution (BVS)

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- Enables Service Providers to deliver **revenue generating services** based on Cisco IP Communications to enterprises and SMBs
- Allows Enterprises and SMBs to **mix and match deployment models (own premise vs. SP's Data Center) and management options (self vs. SP-managed)** for IPC services across various locations
- Ensures **application inter-working, feature transparency, and PSTN connectivity** for business voice services across a range of IP and TDM deployment options

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## Voice Enterprise/SMB Careabouts

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### Service Level Agreement (SLA) Characteristics

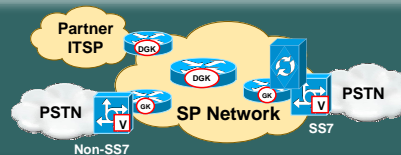
Voice Quality	High Availability	Security	Transparency	Management	Investment
<ul style="list-style-type: none"> <li>Toll quality: echo, delay, gain, noise, drops, clipping</li> <li>QoS: Complex real-time traffic engineering</li> <li>Performance monitoring</li> </ul>	<ul style="list-style-type: none"> <li>Network redundancy</li> <li>Fast recovery in event of failures</li> <li>High call completion</li> <li>Voice / Data Traffic Engineering</li> </ul>	<ul style="list-style-type: none"> <li>NAT/FW</li> <li>Denial of Service</li> <li>Viruses</li> <li>Theft of service / identity</li> <li>Secure access to components</li> <li>Privacy</li> </ul>	<ul style="list-style-type: none"> <li>Telephony features</li> <li>User habits</li> <li>Bearer transport: voice, fax, and modem</li> <li>Logistics: cabling and power needs</li> </ul>	<ul style="list-style-type: none"> <li>Performance management</li> <li>Fault management</li> <li>Troubleshooting</li> <li>Detailed billing and reporting</li> <li>Low-touch deployment</li> </ul>	<ul style="list-style-type: none"> <li>Telephony is a tool, not core business</li> <li>Extensive staff training</li> <li>Complex acceptance testing</li> <li>Unwanted CAPEX burdens (lease vs. buy)</li> <li>Fear of obsolescence</li> </ul>

- Protection—Prepared For Threats, Disaster Recovery, Workforce Displacement, Security Regulations
- Profitability—Lower Total Cost of Ownership (TCO) lowers Bottom Line and Increases Profit
- Productivity—Using Technology to Capture Business Process Improvements, Being Able to do Something New

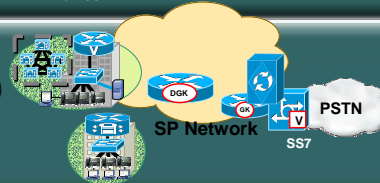
## Voice: SP Service Foundation Areas

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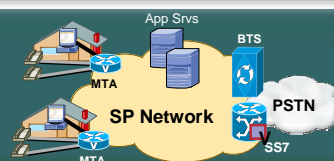
### Transit Voice Services (TVS) (VIA Wholesale)



### Business Voice Services (BVS) (IPT to Enterprise/SMB)



### Residential Voice Services (RVS) (Local IPT over Broadband)



# De-Mystifying Voice Services

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Service Delivered to User  
(End-Customer Relevance)

Service Foundation Areas  
(SP Relevance)

	Transit	Business	Residential
PSTN Toll-bypass (Local, LD, Int'l)	✓	✓	✓
Data VPN/Voice integration		✓	✓
Basic Phone Features (PBX, Key, Centrex)		✓	
Inter-site Toll-bypass (Remote offices, teleworkers)		✓	
IP Contact Center		✓	
Remote Network Operations		✓	
Unified Communications		✓	✓
Custom Application Hosting (vXML, Calling Card)	✓	✓	✓
Residential Line (Class 5)			✓

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# Enabling a Portfolio of Business Voice Services Cisco SP Business Voice Solution

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SERVICE  
PROVIDER  
SERVICES

Business  
Phone  
Services

Voice Call  
Routing  
Intra and Inter

PSTN  
Access

Unified  
Communi-  
cations

Enhanced  
IP  
Services

Remote Network Management and Operations

Site-to-  
Site Call  
Routing

Scalability

Security,  
QoS

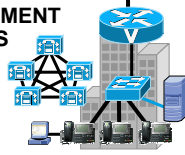
Regulatory  
LNP, LI

PSTN  
Connectivity

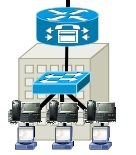
Call  
Accounting

SP Business Voice Infrastructure

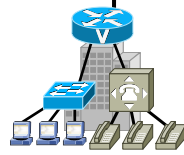
CUSTOMER  
DEPLOYMENT  
OPTIONS



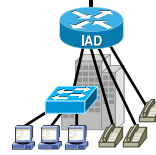
CCM  
Customer Premise/  
SP Premise



Cisco CallManager  
Express (CCME)  
<120 seats



VoIP GW  
Fronting  
Legacy PBX



IAD with  
Analog Phones



SIP IP Phone

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# Cisco SP Business Voice Solution (BVS) Service Portfolio Summary

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End User Service	SP Business Voice Services Descriptions
Business Phone	Provides IP Subscriber and Group Calling Features, Such as Paging, Intercom, 3-way Conferencing, Hunt Groups, Call Forwarding, Call Transfer, etc. on a Range of CPE Options (CallManager, CallManager Express, Remote IP Phones, Legacy PBX with GW)
Site-to-Site Voice	Enables a Company to Use the Service Provider's VoIP Infrastructure for Toll Bypass among CME Distributed Sites and Branches; with This Service, an Enterprise can Preserve CME Custom Dial Plans and Gain New Features Such as Abbreviated Extension Dialing
PSTN Access	Connects All Enterprise Branches and Sites to the PSTN, either Using the Service Provider's VoIP Infrastructure or a VoIP Gateway on the Customer Premises
Unified Communications	Managed and 1:1 Hosted Unified Communications (Voicemail, Email, Fax, Find/Follow Me)
Enhanced IP Services	Hosted Applications for IP Phones (E.G. vXML), IP Conferencing Services, Managed/Hosted IP CC (Future), etc.
Remote Network Operations	Manage Customers' IPT CPE and Networks, Including Remote Fault Monitoring, Performance Management, Configuration, MACs, etc.

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## Business Phone Service

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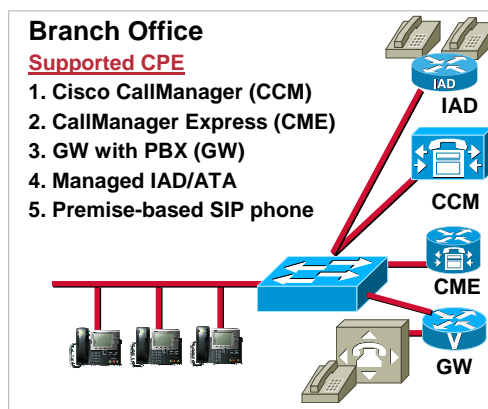
### Service Provider Offering:

- **Features**
  - Dial-Tone
  - DID Assignment
  - Basic Business Features
    - CCM—Full IP PBX
    - CME—Keyswitch
- **Optional Features**
  - vXML Enhanced Features
  - Centralized Voicemail
  - Local PSTN Connectivity (backup or primary if no centralized offering)

### Branch Office

#### Supported CPE

1. Cisco CallManager (CCM)
2. CallManager Express (CME)
3. GW with PBX (GW)
4. Managed IAD/ATA
5. Premise-based SIP phone



Target Customer Types: All

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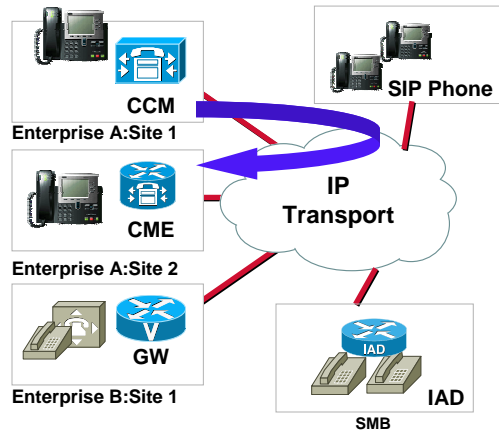
## Site-to-Site Voice/Data Connectivity

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### Service Provider Offering:

- **Features**
  - Private Dial Plan (small scale can be done without centralized routing)
  - QoS over WAN
  - Converged Data/Voice
  - Site-to-Site Toll Bypass
- **Optional Features**
  - Secure IP Transport (MPLS VPN or FW)
  - Overlapping Dial Plans through route server (scaling—transparent to end user)
- For multi-site customers beyond the basic Business Phone service
- Allows for adaptation and growth

### Multiple Site Offices



**Target Customer Types: Multi-Site/Multi-Branch**

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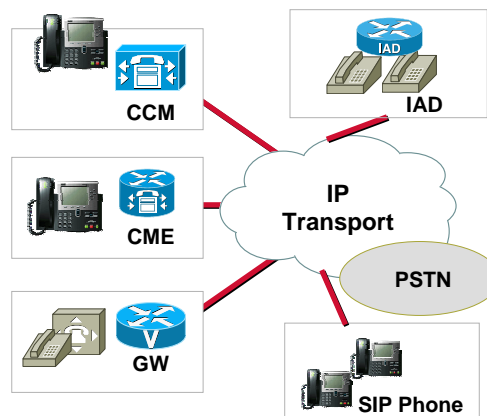
## Centralized PSTN Access

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### Service Provider Offering:

- **Features**
  - Centralized PSTN
  - Off-net connection through: PSTN Hopoff GwithGK (VIA)
  - Interconnect to VoIP Wholesaler (VIA)
  - SS7 or Non-SS7
- **Optional Features**
  - Centralized PSTN On-Net e.g. LNP, DID
  - 2 Stage Dial On-Net
- **Revenue opportunity for SPs**
  - Can own all the minutes
  - Provides customer stickiness

### Multiple or Single Site Offices



**Target Customer Types: All**

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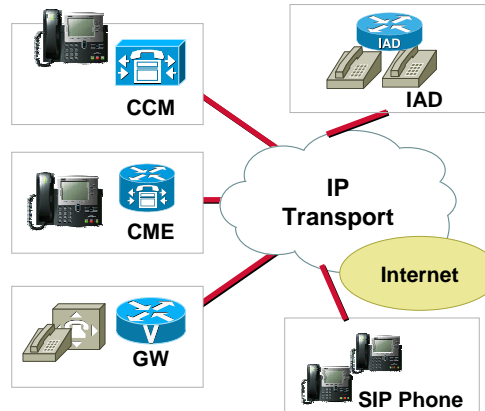
# Internet Access

Cisco.com

## Service Provider Offering:

- **Features**
  - Centralized Internet Connection
- **Optional Features**
  - Security (FW with NAT)
- Collapses Enterprise/SMB network for greater efficiencies and economy
- Adds voice to data offerings, essentially offering a pipeline of services

## Multiple or Single Site Offices



**Target Customer Types: All**

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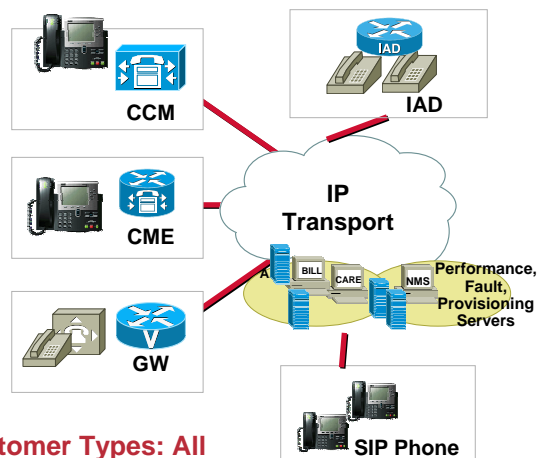
# Remote Network Management

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## Service Provider Offering:

- **Features**
  - Fault**
  - Configuration**
  - Accounting**
  - Performance**
- Allows enterprise/SMB customers to stick with their core competencies
- Revenue opportunity for SPs

## Multiple Site Offices



**Target Customer Types: All**

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## BUSINESS VOICE SOLUTION ARCHITECTURE



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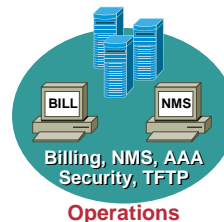
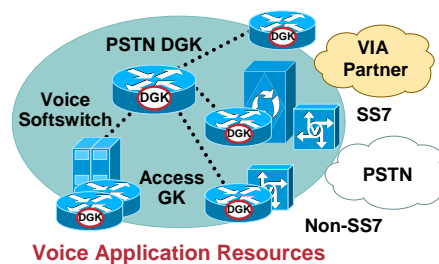
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## Primary Functions Required to Enable Business Voice Services

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- **Call routing**
  - Support all calling patterns
  - Support all numbering plans
  - Accommodate scaling
  - Provide fault tolerance
  - Enable high availability
  - Enforce call admission (BW) policies
- **Call security**
  - Endpoint integrity
  - Call integrity
- **Billing**
  - Flat rate
  - Duration/destination sensitive
- **Network management**
  - Provisioning
  - Fault
  - Performance



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# Overview of BVS Service Layers

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- **Customer Endpoint Deployment**  
Different customer-premise-equipment (CPE) deployment options and how each customer endpoint interfaces into the Service Provider network
- **IP Transport**  
IP connectivity between the Service Provider and the end customer with either or both MPLS or "IP in the clear"
- **Multi-service Applications**  
Service Provider can deliver any combination of voice, video, and data applications. For voice services, a Cisco softswitch is used to perform call routing between Enterprise locations and off-net resources
- **Operations and Management**  
Enables Service Provider to provision, monitor, maintain, and troubleshoot voice applications for its Enterprise and SMB customers

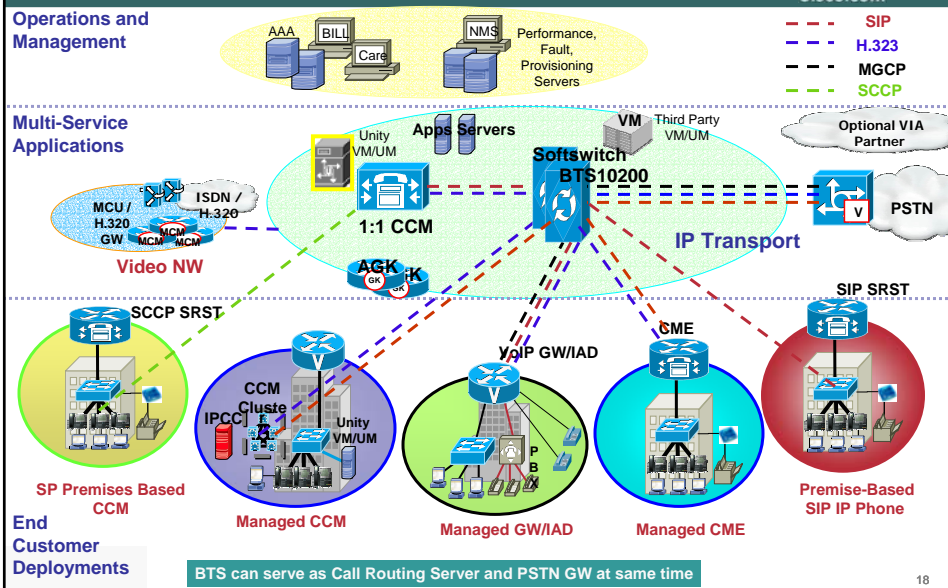
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## BVS Service Provider Architecture

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## CUSTOMER ENDPOINT DEPLOYMENTS SERVICE LAYER

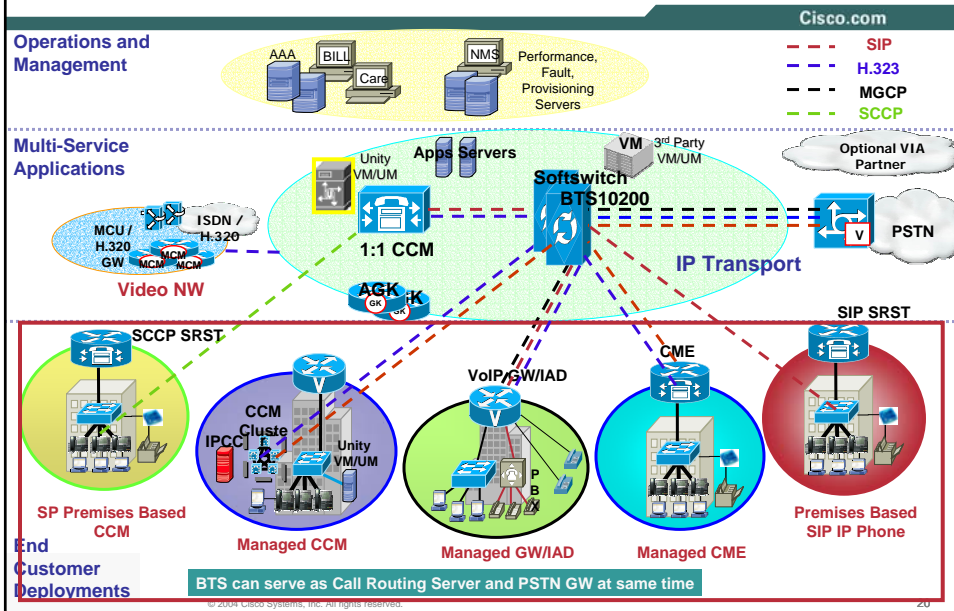


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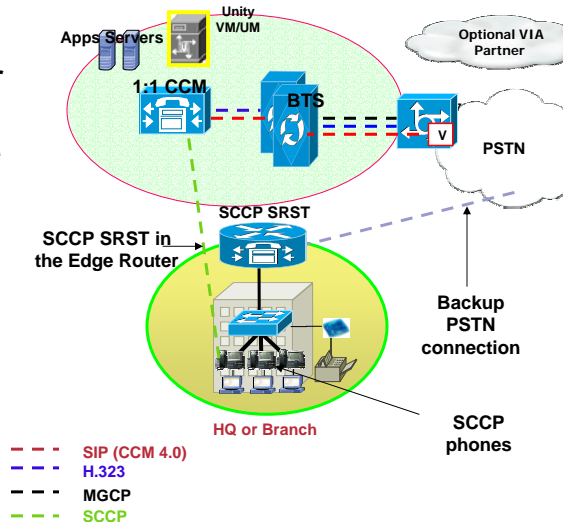
## BVS Service Provider Architecture



## SP Premises Based CallManager

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- A single CallManager cluster is allocated for each customer
- Hosting in the Service Provider NOC eliminates CCM NMS access issues
- Requires backup mechanism in the event that WAN Transport link goes down: Skinny SRST
- VM through Cisco Unity



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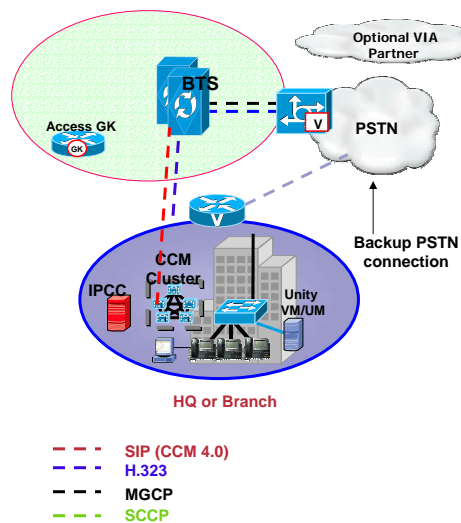
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## Managing/Interconnecting Cisco CallManager (CCM)

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- Cisco CallManager offers medium to large enterprise customers an **IP PBX solution for up to 30,000 users**
- Provides feature rich IP enhanced productivity applications
- CallManager resides on customer premise
- CallManager may also provide centralized call control for smaller remote offices
- SP provider can provide day 2 managements for customer CCM
- SP provides VoIP PSTN interconnection
- BTS10200 interconnect to CCM with either SIP or H.323



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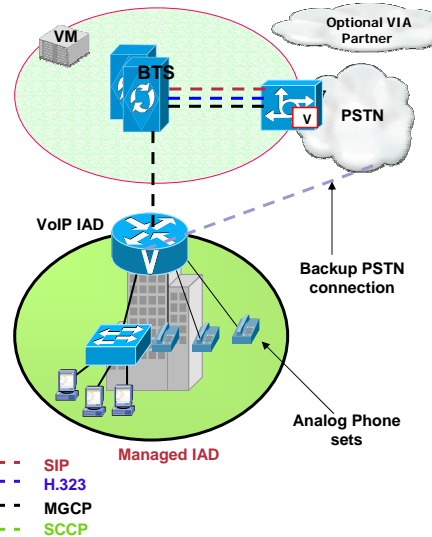
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## Managed IAD: Business Analog Lines

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- Cisco IAD24xx with analog business phones and BTS10200 as MGCP Call Control
- Enables Customer benefit from IP Data/Voice Convergence with Minimal Investment in CPE and Phones. SP sells VoIP PSTN minutes
- Interconnect customer sites with VoIP
- Interconnect to PSTN using VoIP and benefit of low rates
- Up to 24 Analog Devices per IAD
- Class 5 feature set through BTS10200 feature server
- Supports of extension, private, overlapped dialing
- Minimal cost through use of Analog Phone sets
- Centralized VM through third-party



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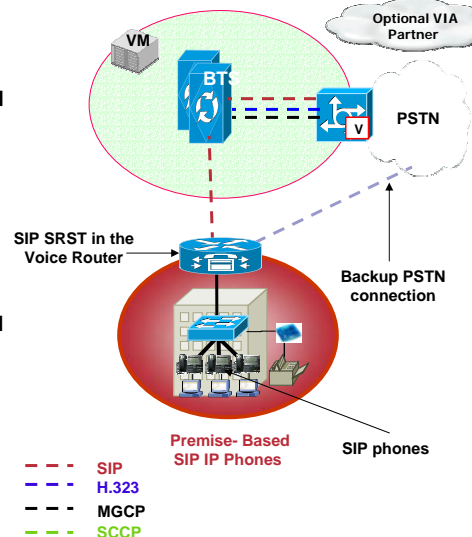
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## SP Managed Premise-Based SIP IP Phones

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- Small Office and Home Office (SOHO) can benefit from VoIP by deploying SIP IP Phones with limited business feature set
- BTS10200 is a SIP B2BUA
- Centrex groups with private and overlapped extension dialing
- Multi-level of administration and end user control of features using SPA GUI
- Analog lines for Fax can be provided by edge voice router or by ATA18x
- Backup PSTN lines can be provided through edge voice router
- SIP Survivable Remote Site Telephony (SRST) for redundancy
- MWI Support
- VM thru third VM systems



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## VOICE CALL ROUTING BETWEEN SP AND CUSTOMER ENDPOINTS



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## Basic Call Routing Design Factors

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- **Flexibly Accommodate Multiple Endpoint Options and different call routing cases**
  - Cisco IOS GWs
  - Cisco IADs
  - SIP IP Phones
  - Cisco CallManager
  - Cisco CallManager Express
- **Flexibly Support End User Dialing Habits**
  - Each Business Has Its Own Customs
  - Each Local Region Has Its Own Customs
- **Economically Enable with Shared Resources**
  - Support Overlapping Dial-Plans Between Customers
  - Uniquely Identify Customers
- **Use Standards-Based Interconnection Mechanisms**
  - Increases Solution Interoperability
  - Uses H.323 and SIP today

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## Endpoint Call Routing Responsibilities

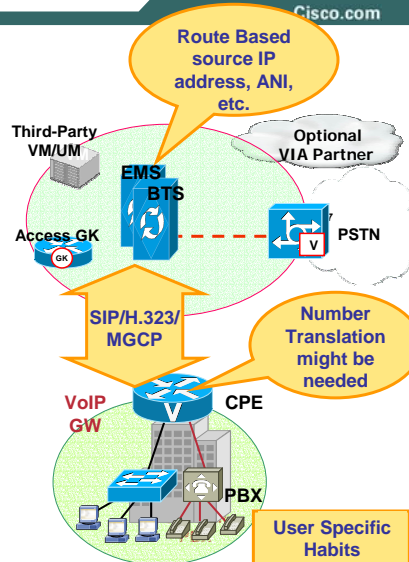
- Minimize endpoint responsibilities in the core routing
- Endpoints perform “number normalization”

Flexibly support varying end user habits

Present consistent call routing information to the routing engine independent of endpoint type (e.g., CM, GW, CME)

Provide unique customer identification to support overlapping dialing plans

Insure meaningful CLID display (removal of inserted customer IDS)



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## Sample User Dialing Habits

- On-net user habit
  - Straight extension dialing (e.g., 2xxxx)
  - Supplies indication digit (e.g., 8+extension)
- Off-net user habit
  - Supplies Indication Digit (e.g., 9+e.164)
- Forced on-net user habit (intra-enterprise)
  - Dials as if off-net (e.g., 9+e.164) but call stays on IP
  - Assumes IP data connectivity possible between sites
- PSTN-to-enterprise access
  - VoIP SP owns DIDs (off-net to on-net)
  - LEC owns DIDs (straight Into enterprise—not much to do)
- CLID presentation
  - User sees CLID as the number to dial if call were to be returned (e.g., abbreviated extension for on-net or full E.164 for off-net)

These Are Assumptions to Guide Our Examples; We Can Flexibly Accommodate Derivatives as Customers Define Them

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## BTS10200 as a Call Route Server (CRS) 1/2

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- Need to apply specific dial plan for each customer that requiring site-to-site routing through CRS
- Dial plans are applied on trunks (H.323/SIP)
- BTS10200 identifies each customer site with a trunk
- Source IP address, ANI, H.323-ID, carrier ID, DNIS prefix all can be used to identify the customer/site
- After identifying the source the dial plan is applied and the call is routed based on destination number
- CRS strips any customer/site ID prior to routing the call to its destination

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## BTS10200 as a Call Route Server (CRS) 2/2

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- For IADs, IOS GWs using MGCP and for SIP IP phones, Centrex groups are used to provide private and overlap digit dialing
- BTS10200 can perform different routing policies:
  - Least Cost Routing
  - Prefix-Based Routing
  - Calling Area Based Routing
  - Time of the Day (TOD) routing
  - Percentage Based Routing
  - SP Based Routing
  - Carrier ID Based Routing
  - Source IP address Based Routing

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## BVS Basic Call Flows

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IP Phone SCCP ↔ CCM H.323 ↔ BTS H.323 ↔ IOS GW  
 IP Phone SCCP ↔ CCM H.323 ↔ BTS H.323 ↔ IOS VIA Trunking GW  
 IP Phone SCCP ↔ CCM H.323 ↔ BTS SIP ↔ IP Phone  
 IP Phone SCCP ↔ CCM H.323 ↔ BTS MGCP ↔ IOS/IAD GW  
 IP Phone SCCP ↔ CCM H.323 ↔ BTS MGCP ↔ IOS/MGX Trunking GW  
 IOS/Cat MGCP ↔ CCM H.323 ↔ BTS MGCP ↔ IOS/IAD GW  
 IOS/Cat MGCP ↔ CCM H.323 ↔ BTS MGCP ↔ IOS/MGX Trunking GW  
 IOS/Cat MGCP ↔ CCM H.323 ↔ BTS SIP ↔ IP Phone  
 IP Phone SCCP ↔ CME H.323 ↔ BTS MGCP ↔ IOS/IAD GW  
 IP Phone SCCP ↔ CME H.323 ↔ BTS MGCP ↔ IOS/MGX Trunking GW  
 IP Phone SCCP ↔ CME H.323 ↔ BTS SIP ↔ IP Phone  
 IP Phone SCCP ↔ CME H.323 ↔ BTS H.323 ↔ IOS GW  
 IP Phone SCCP ↔ CME H.323 ↔ BTS H.323 ↔ IOS VIA Trunking GW  
 IP Phone SCCP ↔ CME H.323 ↔ BTS H.323 ↔ CME SCCP ↔ IP Phone  
 IP Phone SCCP ↔ CCM H.323 ↔ BTS H.323 ↔ CCM SCCP ↔ IP Phone  
 IP Phone SCCP ↔ CME H.323 ↔ BTS H.323 ↔ CME MGCP ↔ IOS/Cat GW  
 IOS/IAD MGCP ↔ BTS MGCP ↔ IOS/IAD GW  
 IOS/IAD MGCP ↔ BTS MGCP ↔ IOS/MGX Trunking GW  
 IP Phone SIP ↔ BTS SIP ↔ IP Phone  
 IOS GW H.323 ↔ BTS H.323 ↔ IOS GW  
 IOS GW H.323 ↔ BTS H.323 ↔ IOS VIA Trunking GW  
 IP phone SIP ↔ BTS MGCP ↔ IOS/IAD GW  
 IP phone SIP ↔ BTS MGCP ↔ IOS/MGX trunking GW  
 IP phone SIP ↔ BTS H.323 ↔ IOS VIA trunking GW

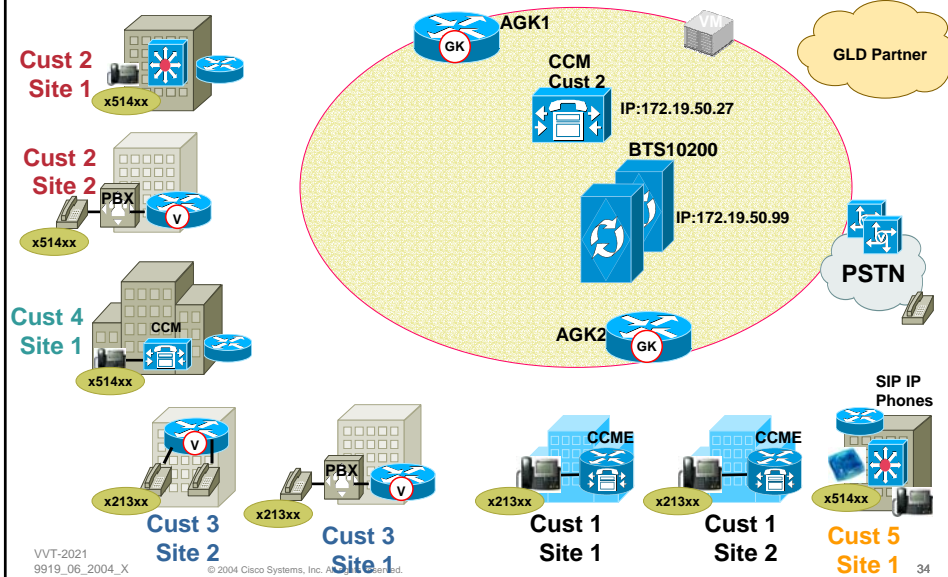
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## Call Routing Topology

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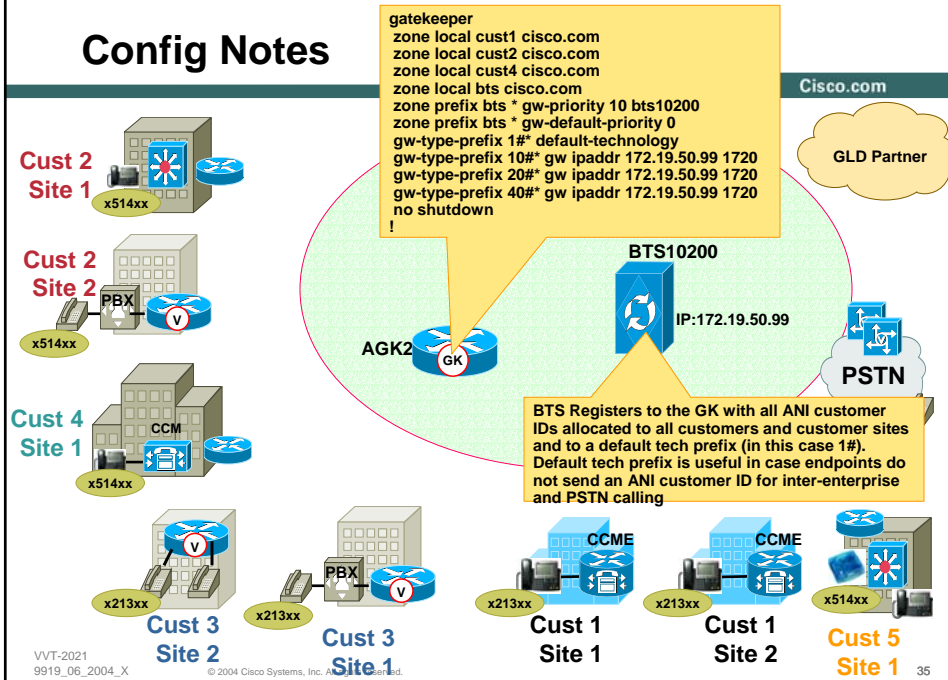


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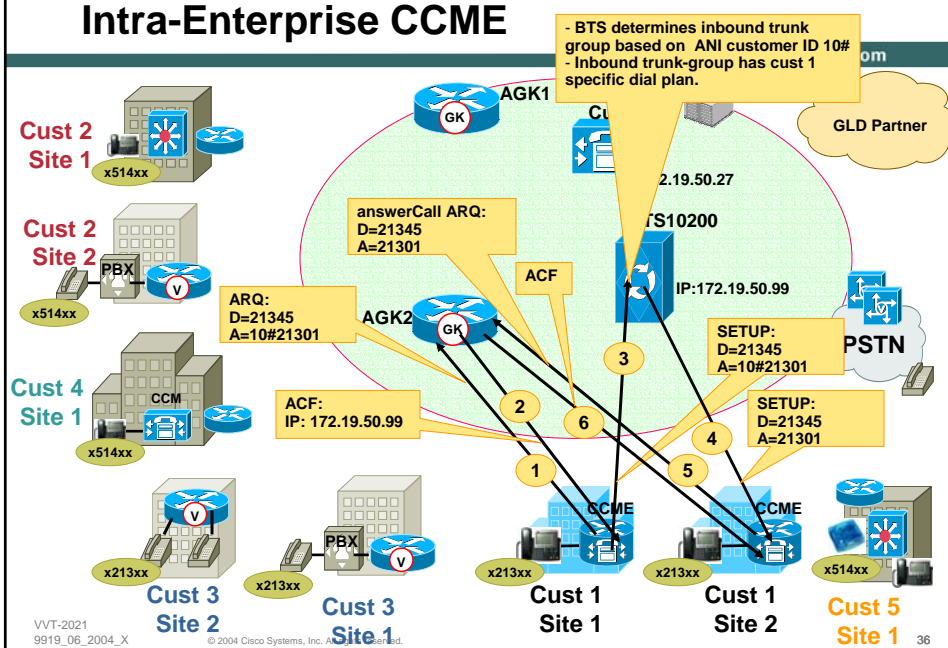
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## Config Notes



## Intra-Enterprise CCME



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