

# EXC04: Exchange 2010 Designing for Unified Messaging

Anthony Vitnell

Dimension Data

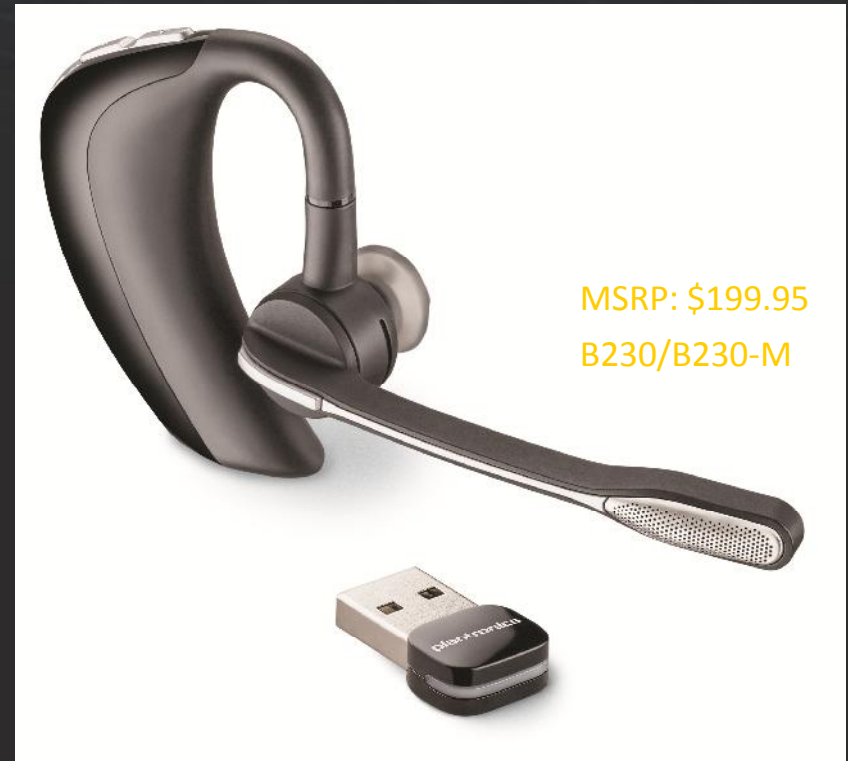
[Anthony.Vitnell@DimensionData.com](mailto:Anthony.Vitnell@DimensionData.com)



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### Revolutionizing the Mobile Office

- New **Smart Sensor™** technology provides intuitive call management including Auto Answer and Smart Call Transfer
- Single headset connects to PC and Bluetooth® mobile phone
- Synchronized softphone presence on mobile calls or multiple softphones via software.
- Portable, Bluetooth mini USB adapter

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# Agenda

- **Telephony Primer**
  - Telephony integration – how to make it work
  - Integration limitations & workarounds
- **Exchange UM Drill Down**
  - UM design components
  - Sizing and architecture planning
  - After connection to the PBX

# TELEPHONY PRIMER

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# Do you need to be a Telephony expert?

- No, but understanding the concepts will help
  - Learn to talk the right language
- Build relationships with the telephony team early
- Partner with an organization that can provide the expertise

# PBX – The Artefacts in the Closet

- PBX operates on traditional telephony protocols and physical media
  - Not traditionally 'IT network' connected
  - Communicates using TDM / Circuit-switched / PSTN
  - Some can be IP-enabled
    - This can require downtime which is hard to get!, and the upgrade is expensive



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# IP-PBX – The new generation



- Communicates natively over TCP/IP
- Software Based
- Most support SIP
  - But not all are equal!



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# How can I Integrate with my PBX/IP-PBX

- Many PBX's support native SIP integration
- Telephony Advisor provides ***“supported” configurations***
  - <http://technet.microsoft.com/en-us/library/ee364753.aspx>
- 3<sup>rd</sup> Party UC Gateways provide connectivity to from “un-supported” PBX's

# So my PBX supports SIP.....

- Unfortunately, not all SIP is created equal!
- SIP [RFC 3261](#) states: When processing 3xx responses the device SHOULD re-use the header field.
- So when Exchange UM sends the INVITE to change the port, the information such as diversion headers SHOULD be re-used; however, in some PBX environments such as Cisco CallManager 4.x this isn't the case and the header information is lost.

# Supported IP-PBX's

PBX Manufacture	PBX Model/Type	Required Software Version
Aastra	MX-ONE	4.0
Avaya	Aura	5.2.1 with Service Pack 5 (SP5)
Cisco	Call Manager, Unified Communications Manager	5.1, 6.x, 7.0 and 8

# So your PBX/IP-PBX is not listed as supported.....

- Look at PBX upgrade &/or consolidation
- PBX vendors are slow to certify Exchange UM
  - Your PBX may already function today
    - Requires testing and validation
  - UC Gateway Vendors can integrate almost every PBX
    - May require PBX software/hardware upgrade
- Look for creative solutions 😊
- Many PBX Vendors such as Avaya publish their own configuration/integration guides

# The role of UC Gateways

- Provides protocol translation between VoIP and traditional PBX telephony protocols
  - From: ISDN, QSIG, SMDI, CAS etc
  - To: SIP, RTP, SRTP, and T.38
- Available from AudioCodes, Dialogic, and Network Equipment Technologies (NET)
  - Varying port sizes & configurations

# EXCHANGE UM DRILL DOWN

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# What happens when the phone rings

- Session initiated between CM Gateway/IP-PBX & UM Server via SIP
- Data stream received by UM server over
  - RTP for Voice
- Checks destination mailbox size prior to accepting the call
  - Call denied if mailbox limit exceeded
- Messages composed as
  - Email with attachment for Voice calls
    - MP3 (default)
    - Windows Media Audio (WMA)
    - Group System Mobile (GSM) 06.10
    - G.711 Pulse Code Modulation (PCM) Linear
- Stored in `.. \unifiedmessaging\temp`
  - Then copied to Pickup directory on HT role for delivery
- Missed Call notification optional
  - CLI matches to GAL & Contacts

# The little red light....

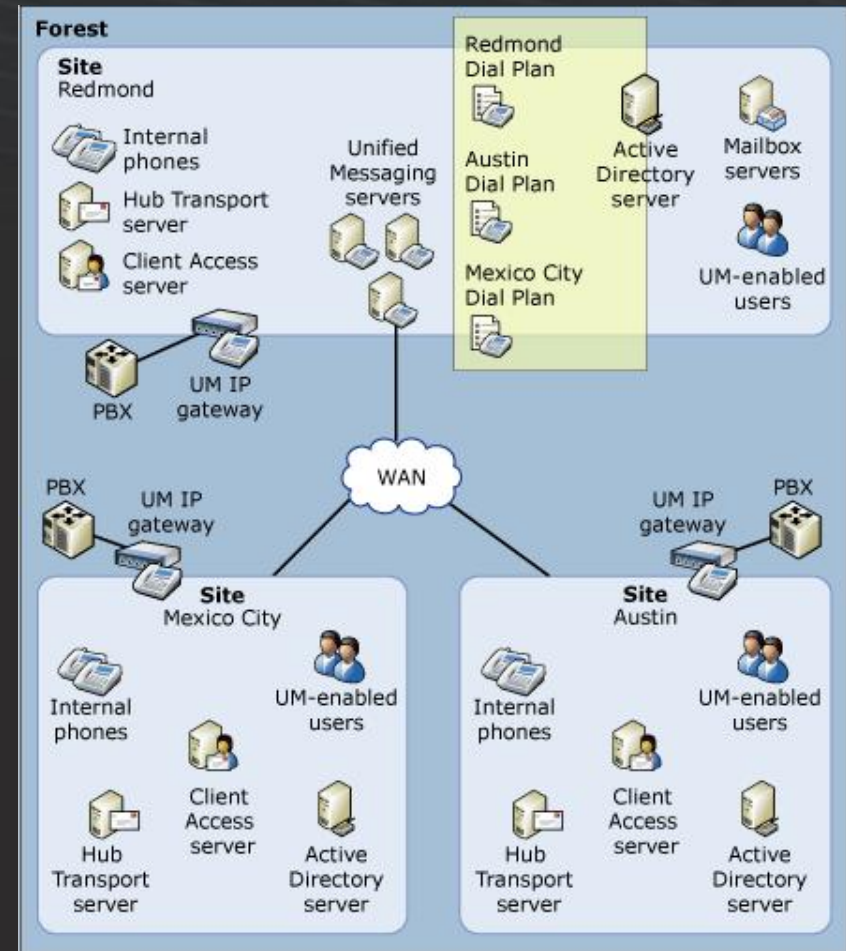
- Exchange 2010 provides native Message Wait Indicator (MWI) for supported PBX's
- Geomant MWI2007 can provide this capability for Exchange 2007
  - Also provides external paging
  - Additional cost
  - Consider additional sizing impacts
  - Not all PBX/IP-PBX's supported



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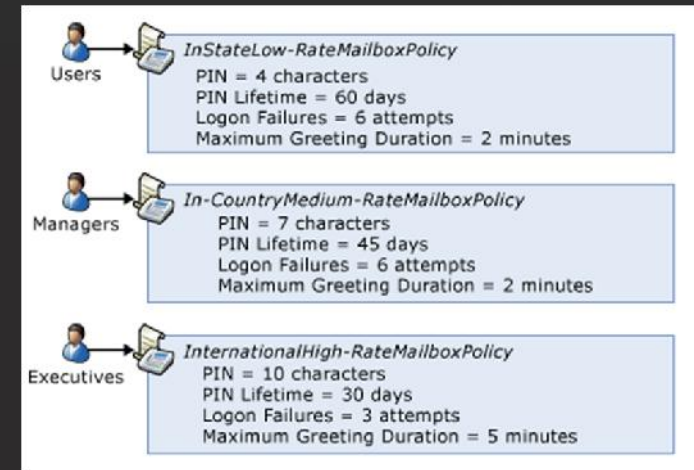
# UM Dial Plan

- Basic unit of administration in Exchange UM
- Represents the telephony extension numbering plan of your PBX
  - Extensions are unique & of fixed length
  - May consist of networks of PBXs
- Dial Plan + Extension # uniquely identifies each UM user
  - *proxyAddresses: EUM:1001;phone-context=Test DialPlan.DimensionData.com;*



# UM Mailbox Policy

- Defines UM settings
  - Voicemail PIN Policy & lockout
  - VM Greeting Length
  - Missed Call notification
  - Welcome Messages
  - Receiving Fax ID
  - Dialing Restrictions
- Belongs to a single Dial Plan
- Mandatory for UM-Enabled mailboxes
  - Links mailbox to Dial Plan



# UM IP Gateway

- Represents a physical UM gateway device or IP-PBX from which an Exchange UM server can receive and initiate calls
  - Identified via IP or DNS name
- Can be associated to multiple Dial Plans and Hunt Groups

# UM Hunt Groups

- Represents a Hunt Group configured at the PBX which direct calls to a VoIP Gateway
  - Includes a pilot number as the identifier
- One or more Hunt Groups can be associated with any given UM Gateway
- Defines the extension # call to access UM
- Think of this as a network IP load balancer but for phone calls 😊

# UM Server

- Administrable object for controlling UM properties on server running the UM role
- Can communicate with multiple UM Gateways
- Can be in multiple dial plans
  - Pilot number dictates dial plan of the inbound call
- Can support multiple languages simultaneously
- Provides Speech to Text translation (Exchange 2010)
- Responsible for call answering & retrieving voicemail from mailbox
- Responsible for submission of VM messages to Hub Transport
- Can be virtualized in Exchange 2010 SP1

# UM Auto Attendant

- Associated with a single UM Dial Plan
- Speech-access or DTMF single-digit menus
  - Max. of 10 options
  - Keypad 1-9 + Timeout action
    - 0 reserved for transfer to operator
- Integrates with global and/or custom address lists
- Record custom prompts and create custom menus
- Assigned a single language only
  - Are not caller sensitive

# UM Mailbox

- UM users must have an E2007/2010 mailbox.
- Administrator must UM-enable the mailbox
- To be UM-enabled, the mailbox must be associated with:
  - A UM Mailbox Policy
    - Linking them to a DialPlan
  - An extension number
    - Business Phone
- PBX must be separately configured to route the calls to UM-enabled mailboxes

# UM Web Service

- Integrated with EWS in Exchange 2010
- Must be in same site as the users HT and MB server(s)
- Used by voice mail options that are available with  
OWA and Outlook
  - Play on Phone
  - PIN Reset

# UM Server and Gateway Sizing Considerations Part 1

- **Supply of Resources**
  - Each UM Server has limited system resources 100 Calls per server (200 is upper limit)
  - Voice ports in UM gateways and voice ports / legacy gateway PRI/QSIG ports
  - Administrators can configure a max limit of calls
- **Voicemail Preview (TTS) decreases this number\*\***
- **Recommendations are 1 msg / core / minute.**
- **In virtual environments a 16GB, 4vCPU server can handle around 40 (TTS enabled) / 65 (TTS disabled) active calls**

# UM Server and Gateway Sizing Considerations Part 2

- Erlang traffic analysis is a common sizing metric
- Consider impact on users if busy tone received by customer
- Monitor and report on the following counters;
  - MExchangeUMGeneral
    - Average Call Duration
      - Average call duration since the service was started
    - Average Recent Call Duration
      - Average call duration for last 50 calls
    - Total Calls per Second
      - Total calls initiated in the last second
    - Current Calls
      - Number of calls currently connected to the server
    - Calls Rejected per Second
      - Number of call invitations that have been rejected by the system in the last second

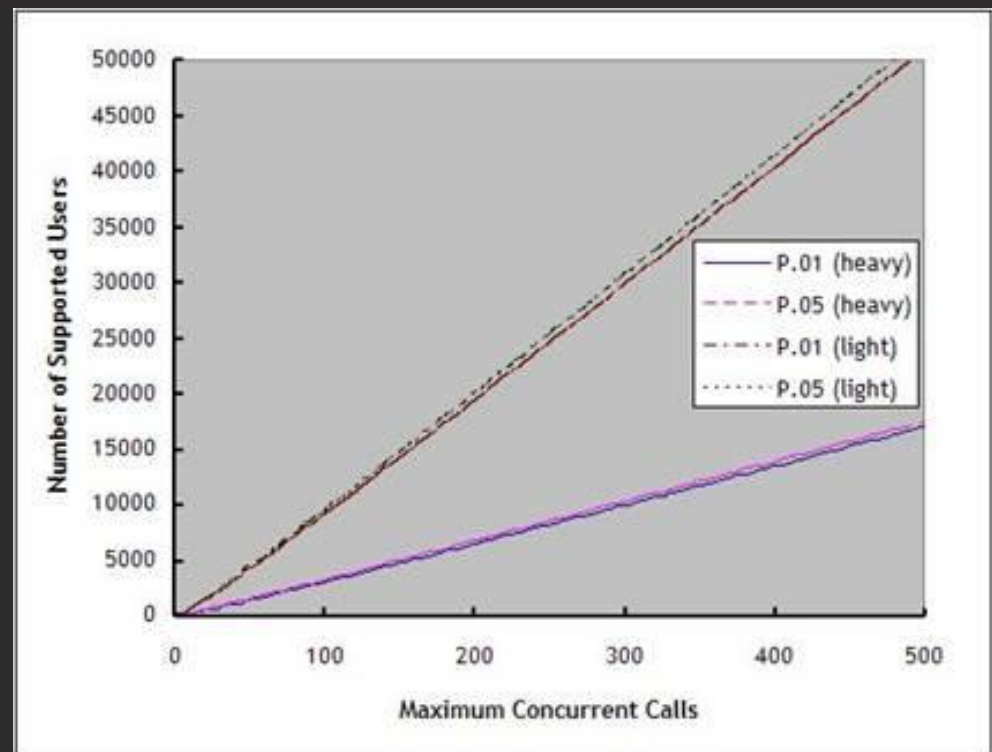
# UM Server and Gateway Sizing Considerations Part 3

- Demand of UM-Enabled users
  - Directly
    - OVA, Play on Phone
  - Indirectly
    - Send Voicemail, Receive Fax or Voicemail
- Demand of Unauthenticated users
  - Auto attendant, external non authenticated callers
- Demand at Busy Hour
  - 14% of total calls is a 'typical' telco measurement

# Sample Voice port/server sizing

- No Play on Phone, Auto Attendant or text to speech usage included in example
- Sizing shows 3,000 (heavy usage) or 10,000 (light usage) per UM Server

Task/Description	Light	Heavy
Average number of call-answered voice messages per use per day	4	8
Average duration of call-answered voice message, seconds	25	25
Average duration of greeting, seconds	5	5
Average number of fax messages per user per day	1	2
Average duration of fax call, seconds	60	60
Average number of UM logins per user per day	0.5	3
Average duration of UM user session, seconds	120	120
Average usage per user in busy hour (14%), seconds	33.6	100.8



# Codecs

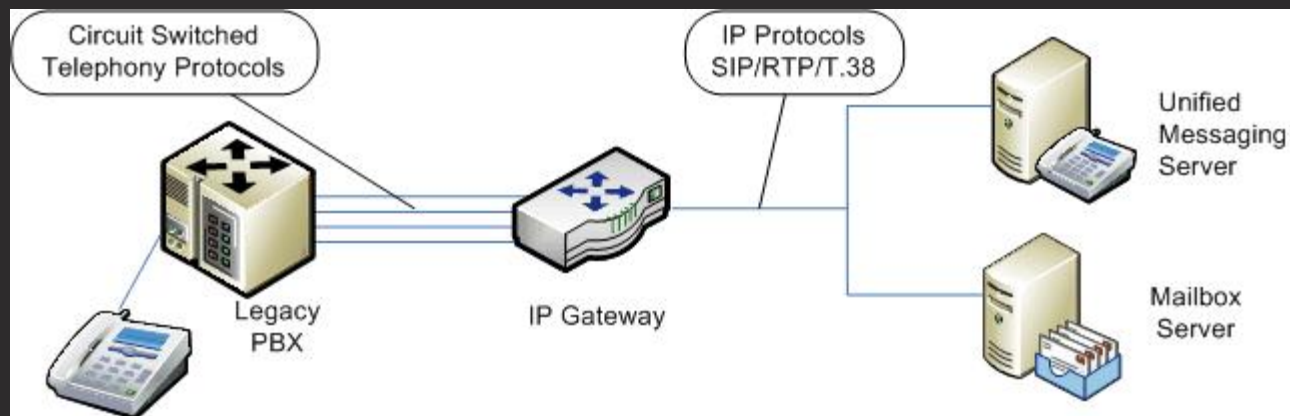
- Exchange UM supports three codec's for communications between the IP-PBX or UM Gateway and the Exchange UM server;
  - G.711  $\mu$ -law
  - G.711 A-law
  - G.723.1
- For voicemail encoding, Exchange UM also supports three codec's
  - MP3 (default)
  - Windows Media Audio (WMA)
  - Group System Mobile (GSM) 06.10
  - G.711 Pulse Code Modulation (PCM) Linear

# UM Server placement considerations

- QoS is mandatory for consolidated UM infrastructure
  - Choppy or garbled voice messages are not desirable
- Codec choice between IP-PBX/UM Gateway and UM is an important factor
  - G.711 requires 87.2kbps (RTP only). Add 5% (4.36kbps) for signalling for a total of 91.56kbps per call at <20ms latency
    - 3,000 heavy UM users (100 active calls) would require 8.94Mbps
  - G.723 requires 21.9 Kbps (RTP only). Add 5% (1.093kbps) for signaling for a total of 22.96kbps. per call at <30ms latency
    - 3,000 heavy UM users (100 active calls) would require 2.24Mbps
- Placement of UM servers should be close to PBX.
  - Roundtrip latency not to exceed 150ms

# UC Gateway placement considerations

- Gateway talks native (legacy) to PBX
  - Some via Serial cable or standard phone cables
- Gateway talks SIP/RTP/T.38 over IP to Exchange UM
- Place gateways close to PBXs
- Network Load balancing is not supported



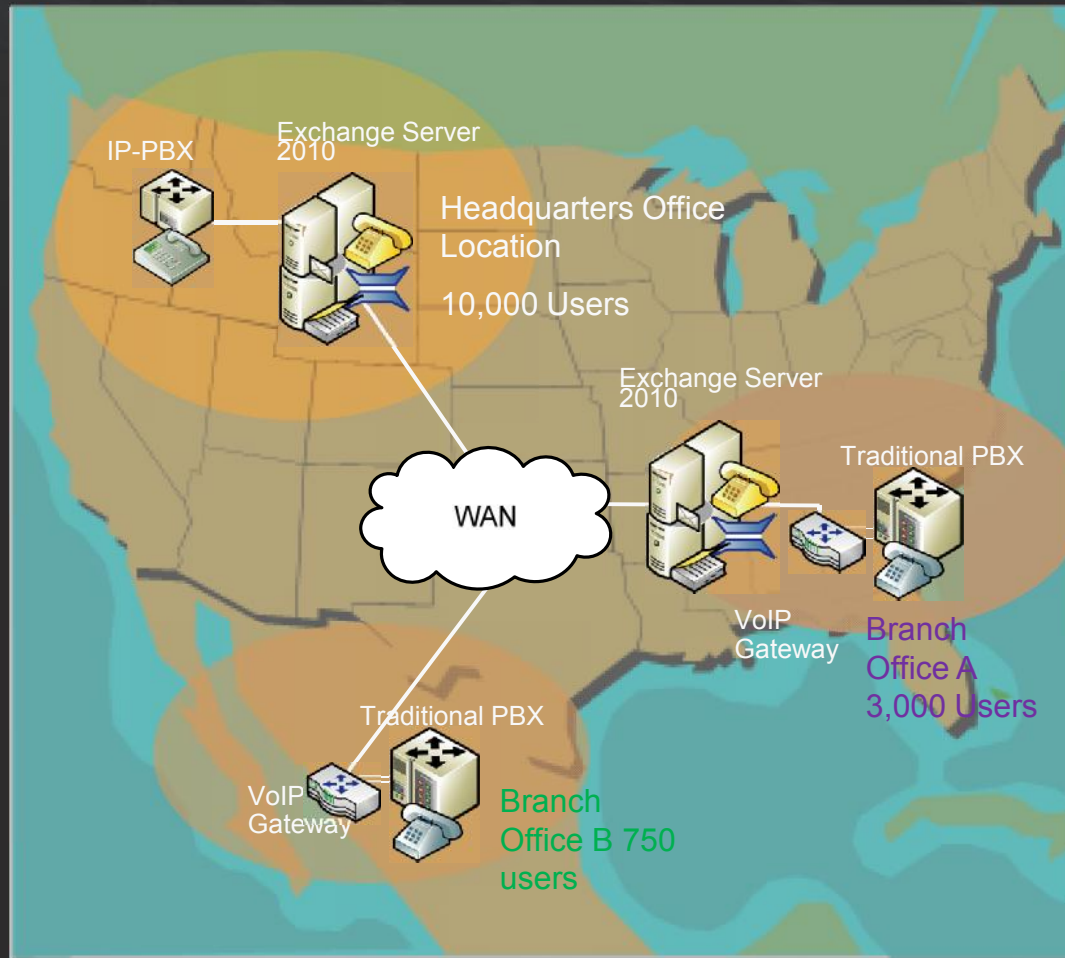
# Fault Tolerance and Load Balancing

- **Distribute calls from the PBX across multiple UM gateways**
  - Can be done via PBX Hunt Group
  - Each UM Gateway can host multiple hunt groups
- **UM gateways provide load balancing between Unified Messaging servers**
  - A list of Unified Messaging servers is maintained on the UM gateways
  - The IP gateways utilize a round robin call routing algorithm
- **IP-PBX connections support multiple Hunt Groups, or employ the usage of IP load balancers**

# More than just UM role & Gateway placement

- Exchange UM relies on the complete Exchange Infrastructure
- This includes the following;
  - Domain Controllers
  - Client Access Role
  - Hub Transport role
  - Mailbox Role

# Example Branch Architecture



## Branch Office A

- Local Mailboxes
- 3,000 UM users
- Codec = G.711

## Branch Office B

- Mailboxes in HQ
- 750 UM users
- Codec = G.723
- Bandwidth required for UM = 0.56Mbps (25 voice channels)

# Linguistic Issues Part 1

- Exchange Server 2010 supports 48 languages for Outlook clients
- Exchange UM supports 28 languages
  - Text-to-Speech (TTS)
  - Automatic Speech Recognition (ASR) – English only
- Exchange 2010 supports 7 Languages for Voicemail Preview
- User setting controlled via OWA
  - Set-Mailbox <mailbox identity> -languages <language code>
- <http://technet.microsoft.com/en-us/library/dd638119.aspx>

# Linguistic Issues Part 2

- Avoid confusion, for non English speaking users disable ASR
  - Set -UMMailbox vitnell -  
AutomaticSpeechRecognitionEnabled \$false
- TTS will use the language of the email
  - Email in Simplified Chinese to English User, will perform TTS in Chinese\*
    - If appropriate UM Language packs are installed

# UM Security Considerations

- **Executives Contactable via Directory Search**
  - Set-UMMailbox exec –AllowUMCallsFromNonUsers \$False
- **Executives Contactable by Anonymous Users**
  - Set-UMMailbox exec  
–AnonymousCallersCanLeaveMessages \$False
- **Toll Fraud**
  - Ensure external dialling rules are tightly controlled
- **Configure SIP security method to secure data in transit**
  - SIP Secured – Signaling Secured
  - Secured – Signaling and media encrypted

# Protected Voicemail

- Exchange 2010 and Rights Management Service Required
- Protected Voicemail ensures
  - Users can reply to protected voice messages.
  - Recipients of a voice message can't forward it.
  - Users can't save a copy of the voice message.
  - Users can't save or copy the attached audio of the voice message.
  - A voice mail message can be opened only by the intended recipient or recipients.

# Updating Grammar

- Generates grammar for Primary & Phonetic values of;
  - Display Name, Firstname, Lastname, Company, Department
- Generates a set of files for
  - System Commands (OVA control and navigation)
  - Custom Grammars for GAL, Dial Plan, Address Lists and Distribution Groups
  - Directory for each UM language enabled.
- Runs on each UM server at Dial Plan join, Schedule (every 24hrs @ 2am) or Manually
- A UM enabled user will not be contactable via Subscriber Access until they exist in a Grammar.

# Customizing Grammar Filters

- 13 Default Grammar Rules
- Build a customized Grammar filter
  - *SpeechGrammarFilterList.xml*
- Example – Anthony Vitnell - Sydney
  - `<Pattern>`
    - `<!-- Firstname Lastname – BU -->`
    - `<Input>(\w+)\s+(\w+)\s+[\-']\s+(\w+)\s+</Input>`
    - `<!-- ==> Firstname Lastname -->`
    - `<Output>$1 $2</Output>`
  - `</Pattern>`
- Result – Anthony Vitnell

# Phonetic Names

- **Many possible uses**
  - Help Exchange understand names that don't sound like they are written
  - Support alternate or nicknames for users
- **Phonetic Names available for Users, Groups, Contacts, Mail-Enabled Public Folders**
  - Display Name set using PowerShell commands
    - `Set-User -Identity James.Bond@DimensionData.com -PhoneticDisplayName "DoubleOSeven"`

# Dial Plan Dialling Rules

- Specify the numbers that can be dialed as outbound calls
- Modify the number before sending it out to the PBX
  - Used by
  - Play on Phone
  - Call someone from
    - Directory Search
    - Auto Attendant
    - Personal Contacts
- Dialing Rules are grouped in Dialing Groups and assigned to Dial Plans as either
  - In Country or Region
  - International
- Applied to components via
  - UM Mailbox Policy
  - Auto Attendant
  - UM Dial Plan

# Reverse Number Lookup

- All phone numbers should be populated in Active Directory, Mobile, Office and Fax
- Requires end user education to use a consistent format in personal contacts IE E.164 format
- Exchange UM will lookup personal contacts and the GAL to match the calling Party

# Exchange Unified Messaging Limitations

- Transfer directly to Voicemail\*
- Support for only two greetings\*
  - Standard and Out of Office
- Faxing\*
- Prompt Customization
  - Not supported to change  
“system prompts”

# Migration Strategies

- Exchange 2007 UM mailboxes
  - Upgrade UM servers to Exchange 2010
  - E2007 UM requires /UnifiedMessaging vDIR
    - E2007 CAS server must be internet facing until all users moved to E2010 UM

# Auto-Attendants/Call handlers Part 1

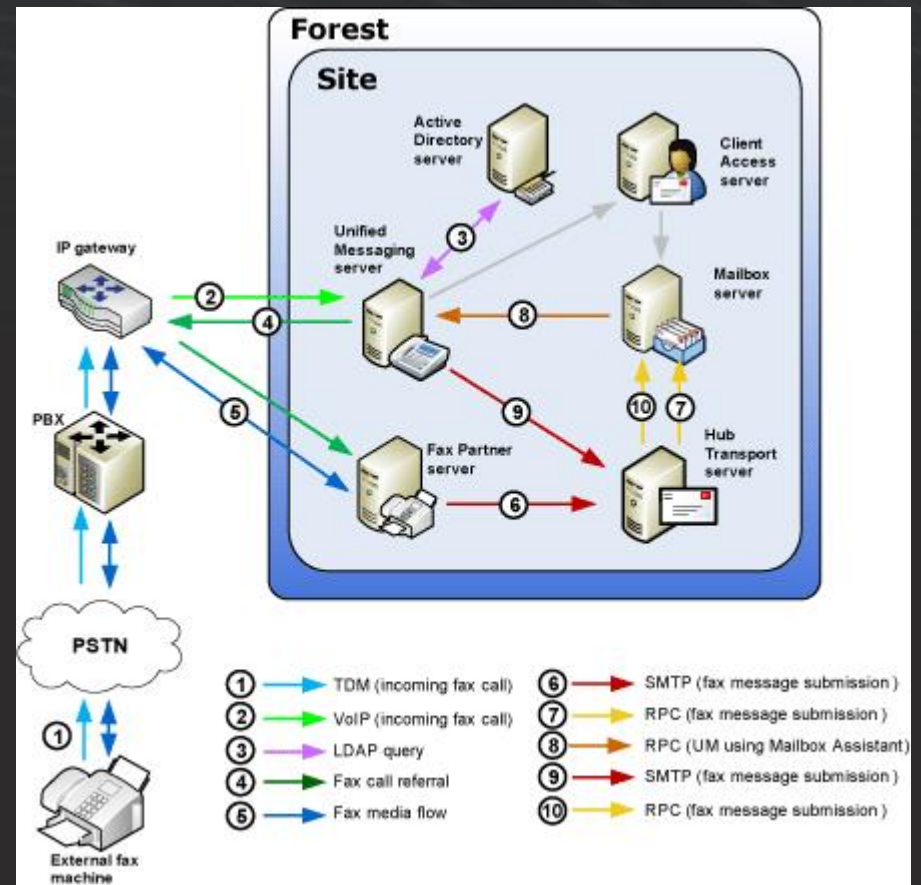
- Often overlooked when planning Exchange UM deployments
- Fully document and understand the existing requirements, and validate in a LAB
- Migration from existing systems may require re-recording/encoding of prompts
- System Prompts cannot be modified

# Auto-Attendants/Call handlers Part 2

- Unable to interrupt the AA greeting and enter in extension. Have to hit # then # again to call extension.
- When choosing a DTMF fallback to an AA you actually have to create 2 AA's. One that uses speech and one that uses DTMF.
- Timeout when not entering a key map option is 5 seconds. Unable to adjust this. Would be nice to limit to about 2-3 seconds has been a request.
- AA Welcome and key maps must be 2 files.
- many other systems have this as a single file. Will require re-recording

# What About Faxing

- Exchange 2007 provided T.38 faxing
- Exchange 2010 has removed this feature
- 3<sup>rd</sup> party fax provider is required



# Lync Integration

- Lync Front Ends use ExUMRouting to route to Exchange UM servers. In the core directory of link there is a file called exumrouting.exe.config. In this file, it is set by default to check the first two exchange UM servers before failing.

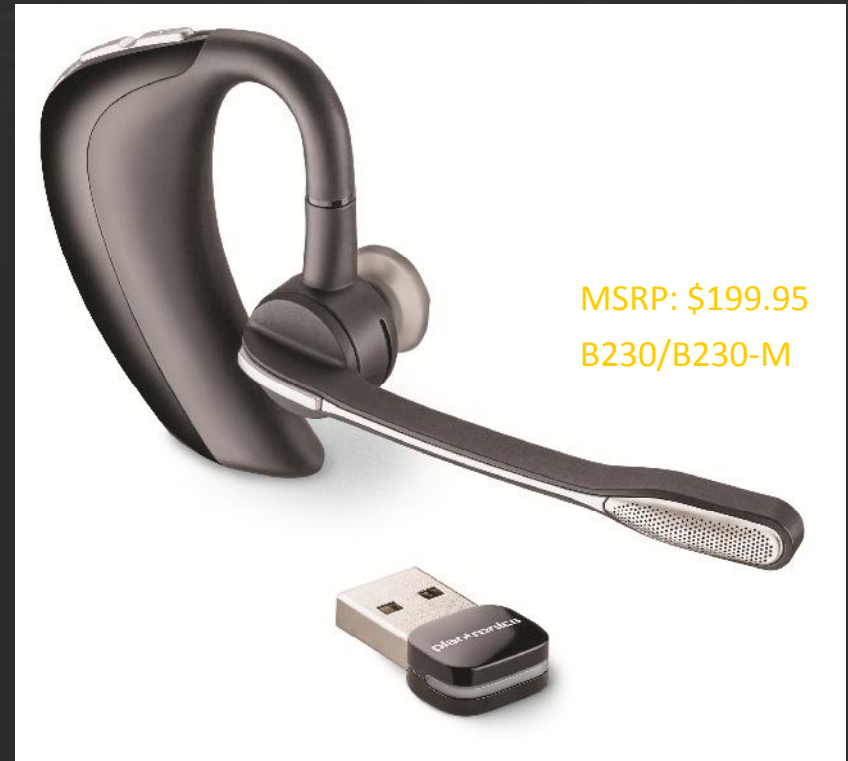
- 
- File:
- `<configuration>`
- `<runtime>`
- `<gcServer enabled="true" />`
- `</runtime>`
- `<appSettings>`
- `<!-- Time to wait for ExUM server to respond before giving up. Default is 10000 milliseconds-->`
- `<add key="ExumAttemptTimeLimit" value="10000"/>`
- 
- `<!-- Time to wait for the finalExUM server to respond before giving up. Default is 20000 milliseconds-->`
- `<add key="ExumFinalAttemptTimeLimit" value="20000"/>`
- 
- `<!-- Number of ExUM servers to try before giving up. -->`
- `<add key="ExumNumberOfServersToTry" value="2"/>`
- 
- `<!-- Port that all Exchange UM servers listen on. -->`
- `<!-- A value of 0 indicates the port is selected based on the transport (tcp=5060, tls=5061)-->`
- `<add key="ExumListenPort" value="5061"/>`
- 
- `<!-- Transport Exchange UM is configured to use (tcp or tls)-->`
- `<add key="ExumTransport" value="tls"/>`
- `</appSettings>`
- `</configuration>`



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