



Unified Messaging with Microsoft Exchange Server 2007

Dell Product Group

Dell White Paper

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Executive Summary

The traditional communication methods such as voice mail and fax have increasingly given way to e-mail as the primary means of enterprise communication. However, these methods co-exist and are being managed as completely separate systems. The Microsoft Exchange Server 2007 Unified Messaging feature is designed to integrate these communications by connecting Exchange and telephony networks to deliver and store e-mail, voice mail, and fax messages to a single location—the e-mail in-box. The specialized features in Unified Messaging also allow users to access their e-mail, calendar, personal contacts, and directories and perform other operations over the phone. By providing a centralized message repository, Unified Messaging helps save time, reduce cost and simplify communication management for both users and administrators.

The integration of Exchange Server with the telephone networks can add some complexity to the enterprise datacenter and requires proper planning. This paper discusses the basic architecture of a Unified Messaging solution to provide a better understanding of the components involved and additional configuration requirements.

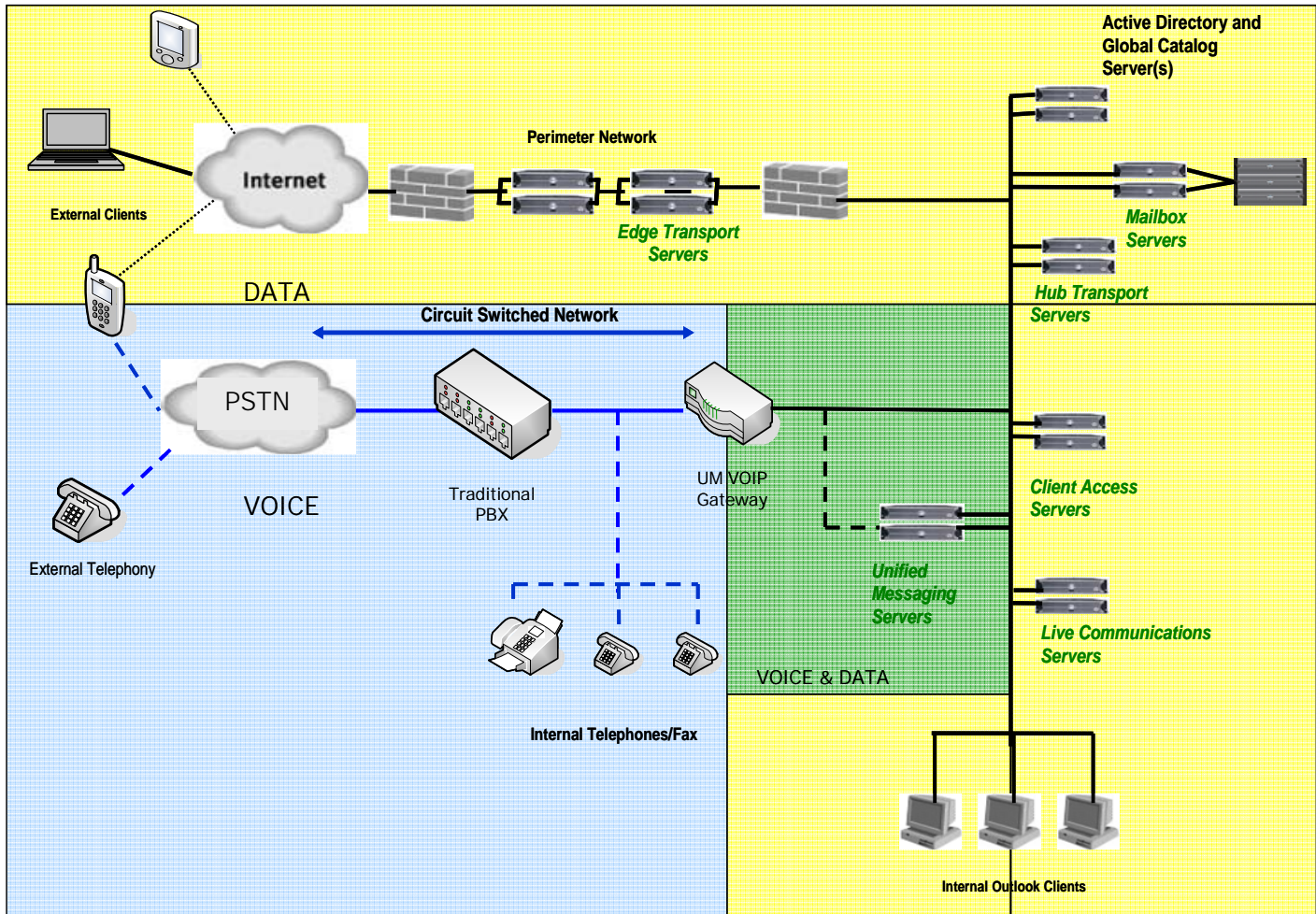
Introduction

E-mail and the telephone are the most essential and important productivity tools for businesses. Whether in the office or on the road, communicating internally or externally with customers, business users depend on e-mail as well as phone for their communication needs. But sometimes it becomes difficult to manage both tools at the same time or on occasions when there is no access to the email and the phone seems to be the only option available to use. In such scenarios users require a solution with easy management for both types of communications and allow them to have access to their email or voice data from anywhere they like. Such a solution should be less complex to manage and also increase efficiency within the bound of informational assets already available. Microsoft® Exchange Server 2007 Unified Messaging solution incorporates features that enable businesses to effectively meet those challenges by integrating the telecom network with the Messaging infrastructure. The unified solution delivers email; voice-mail and fax data into user's Inbox and allows them to retrieve this data over the phone.

Exchange Unified Messaging Infrastructure

Exchange Unified Messaging feature was introduced with Microsoft Exchange Server 2007. Exchange Server 2007 provides or distributes its features and functionality through five newly defined server roles: Mailbox, Hub Transport, Client Access, Edge Transport and Unified Messaging. A server role provides a defined set of Exchange 2007 functionality and can be deployed standalone on a hardware server system or, with certain restrictions, be combined with other roles. Exchange Unified Messaging is built upon the base Exchange 2007 infrastructure. The Unified Messaging Server role of Exchange Server 2007 hosts the services to implement this functionality and acts like a bridge between the telephony voice network and the Exchange data networks. The major elements typically required to implement Unified Messaging in an existing Exchange Server 2007 infrastructure include, a telephony system, a voice over IP (VoIP) gateway, and a Unified Messaging server.

Traditional Public switched telephone networks (PSTN) use time-division multiplexing (TDM)-based circuit-switched links. However, Exchange UM server is designed to process only IP-based voice packets also called Voice over IP (VoIP). Therefore a VoIP gateway or an IP-PBX is required to convert the TDM packets into VoIP packets. Figure 1 shows a typical Exchange UM infrastructure that uses a traditional PBX and VoIP gateway along with other Exchange 2007 components.



- Data
- Voic
- Voice & Data

Figure 1. Overview of Exchange Unified Messaging Infrastructure

Telephony System

Enterprise telephony systems typically use private branch exchange (PBX) equipment, which acts like a small telephone switching network to connect calls between telephones within the enterprise and to external plain old telephone service (POTS) lines on the public switched telephone network (PSTN). Two common interfaces found in analog PBX systems are the Foreign Exchange Office (FXO) and Foreign Exchange Subscriber (FXS) ports. FXO ports are designed to receive line voltage and ringing current from the PSTN office, and FXS ports are designed to supply the dial tone. FXS ports are configured with unique IDs that correspond to the extension numbers for devices connected to the internal telephone network. These extension numbers or resources are configured into *hunt groups* to help efficiently distribute incoming and outgoing calls. Certain routing tables are implemented to normalize the phone numbers for local, national or international calls. In a traditional PBX environment, phone users are configured to store voice-messages in the PBX subsystem.

VoIP Gateway

Telephone networks use circuit-switched protocols to provide dedicated links between users. Microsoft Exchange uses a packet-switched protocol, where information travels as packets over a shared link, so routing voice transmissions to the Exchange network requires converting information from one protocol to the other. This conversion is typically performed by a VoIP gateway, which provides an interface connecting incoming calls from a PBX system to the Exchange Unified Messaging server, although advanced IP-PBX hardware can directly implement VoIP and communicate with the Unified Messaging server without this gateway.

Figure.2 shows a simplified architecture using an FXO based VoIP gateway connecting to a PBX system through voice mail lines and to an Exchange Unified Messaging server through an IP network.

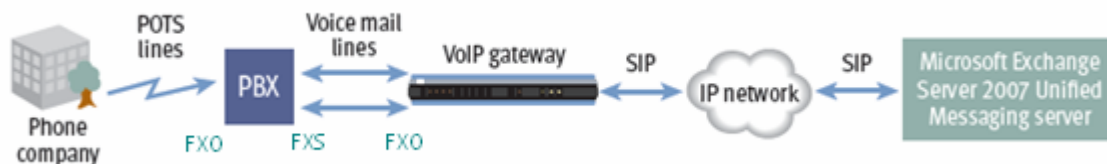


Figure 2. Simplified Microsoft Exchange Server 2007 Unified Messaging architecture

The voice-message redirection for users is configured on the PBX to route it to the Exchange Unified Messaging server through the VoIP gateway rather than storing in the PBX voice-mail subsystem. The FXO ports on the VoIP gateway receive line voltage and ringing current from the PBX system and deliver voice mail or fax messages to recipients in the messaging domain.

Besides voice-mail and fax settings, there are dedicated access numbers configured on the PBX to provide Outlook Voice Access and Auto-attendant functionalities. These access numbers transfer the call directly to the Unified Messaging server for proper call routing.

Unified Messaging Server

While other Exchange Server 2007 server roles enhance features such as internal and external message handling, in-transit message policy configuration, and message filtering and security, the Unified Messaging server role hosts the services and functionality required to implement Unified Messaging and integrate Exchange and telephony networks. This server accepts incoming call requests from a VoIP gateway or IP-PBX and communicates with the rest of the messaging system. Active Directory objects on the server logically represent hardware entities and implementation policies associated with Unified Messaging-enabled Exchange users. For each mailbox user, the phone extension stored in Active Directory must match the information stored in the PBX system. Users may be grouped together in Unified Messaging dial plan objects based on geographic site, specific features, or PBX system, which helps ensure the uniqueness of associated phone extensions. To enable communication between a Unified Messaging dial plan and the VoIP gateway, administrators can configure Unified Messaging hunt groups on the Unified Messaging server, which are logical representations of PBX hunt groups and coordinate with one another to both verify information and route incoming calls.

The VoIP gateway establishes sessions with the Unified Messaging server using Session Initiation Protocol (SIP) and transfers live voice traffic using Real-Time Transport Protocol (RTP). The Unified Messaging server processes the voice information and compresses it into a supported digital format using one of three audio codecs: Microsoft Windows Media® Audio (WMA), Global System for Mobile Communications (GSM) Full Rate (European Telecommunications Standards Institute [ETSI] 06.10), or linear pulse-code modulation (International Telecommunication Union Telecommunication Standardization Sector [ITU-T] G.711). These codecs have different bit rates and compression properties, which administrators should take into account when configuring an appropriate balance between sound quality and file size: high bit rates typically enhance sound quality while increasing message size, whereas high compression typically decreases sound quality while also reducing file size.

Incoming fax messages from the VoIP gateway are transported to the Unified Messaging server using the ITU-T T.38 fax relay protocol and encoded as Tagged Image File Format (TIFF) files. For voice mail or fax messages, the Unified Messaging server creates a Multipurpose Internet Mail Extensions (MIME) format file with the encoded audio message or TIFF image attachment and sends it to the Exchange Hub Transport server using Simple Mail Transfer Protocol (SMTP). The Hub Transport server then relays the messages to the appropriate Exchange Mailbox servers, which stores them in user in-boxes.

Voicemail routing with Unified Messaging

Unified messaging can act as the voice-mail provider of a telephony system. Figure 3 shows the routing sequence for an unanswered call between two internal users: Internal User-1 and Internal User-2 within an Exchange Unified Messaging environment.

1. Internal User-1 calls the desk phone of Internal User-2 in Step 1
2. Desk phone of Internal User-2 rings in Step 2
3. Based on the configuration on the PBX, the unanswered phone call gets routed to the VoIP gateway.
4. The VoIP gateway converts the voice call from circuit switched to IP packets and forwards to the Unified Messaging Server. The PBX in this setup is configured to route all voice-mails to the Unified Messaging Server through the VoIP gateway.
5. The Unified Messaging server performs an LDAP (Lightweight Directory Access Protocol) query to the Active Directory server to retrieve the mailbox information corresponding to the dialed phone number in Steps 5, 6 & 7.
6. The Unified Messaging Server then routes the Voice message through the Hub Transport server and into the Exchange Mailbox Server as shown in Steps 8, 9 & 10.
7. The Voice mail remains stored in the Exchange Mailbox Server and can be fetched into user's Inbox. Call from an external phone user will also follow the same routing path for the voice message.

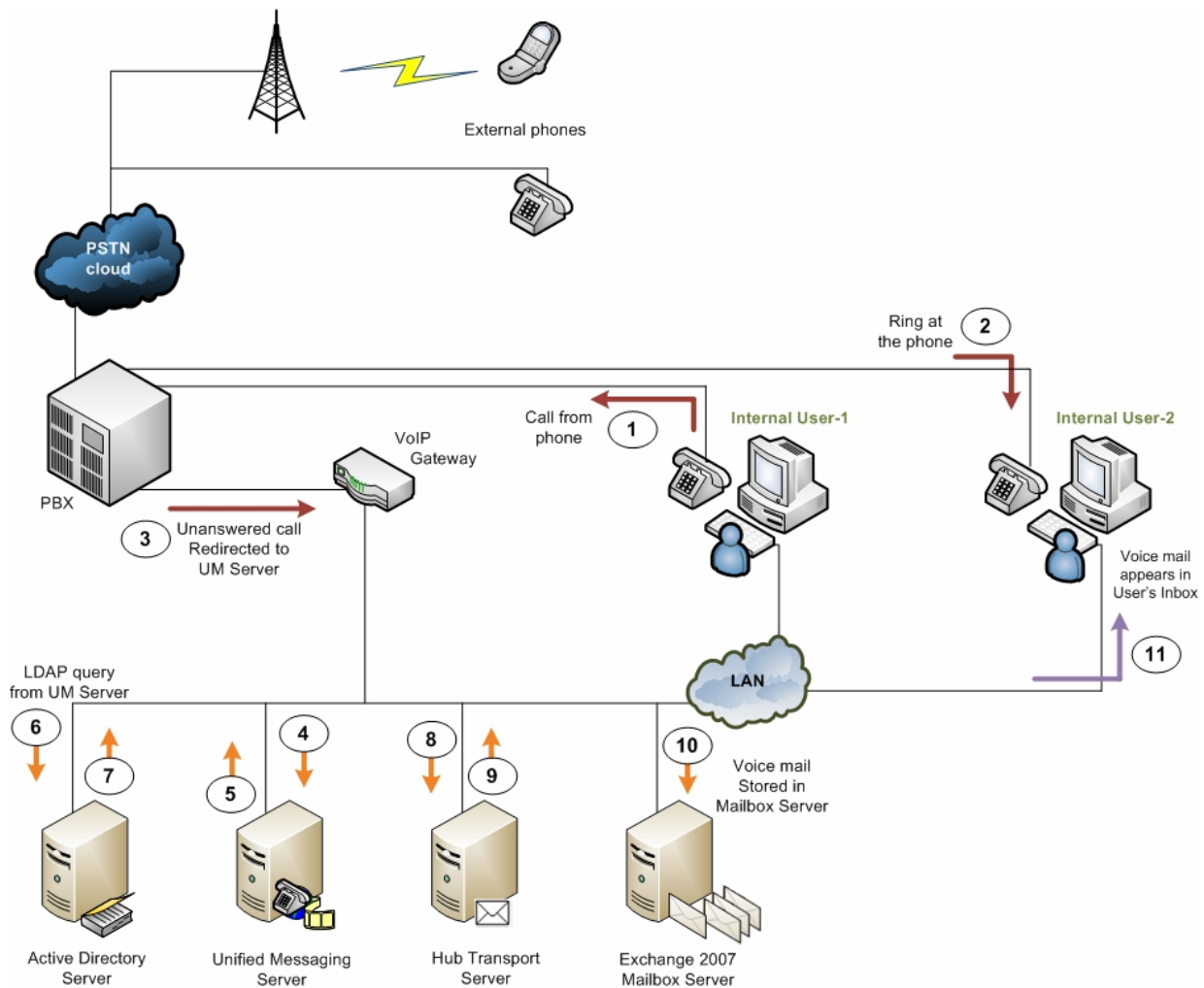


Figure 3. Routing sequence for Unanswered Phone call in a Unified Messaging Setup

In addition to receiving and processing incoming messages, the Unified Messaging server uses dedicated numbers assigned on PBX to provide Outlook Voice Access and Auto-attendant functionalities, as mentioned earlier. The Outlook Voice Access feature allows subscribers access to their mailboxes from internal or external phones and perform various tasks: listen to voice mail or e-mail messages, calendar appointments, and contact information; accept or reject meeting requests; send “running late” messages to meeting participants; connect to contacts; or search their directory.

Outlook Voice Access Call routing

Figure 4 shows the call routing sequence for a subscriber accessing their inbox from an external location. The sequence numbering shows User-2 calling the Voice Access number through a mobile phone in Step 1. The Voice Access number configured on the PBX matches the number preset on the Unified Messaging Server to activate the Outlook Voice Access Operator in Steps 2 & 3. The Outlook Access feature verifies the subscriber in Steps 4, 5 & 6 and grants permission to access mailbox and perform various operations.

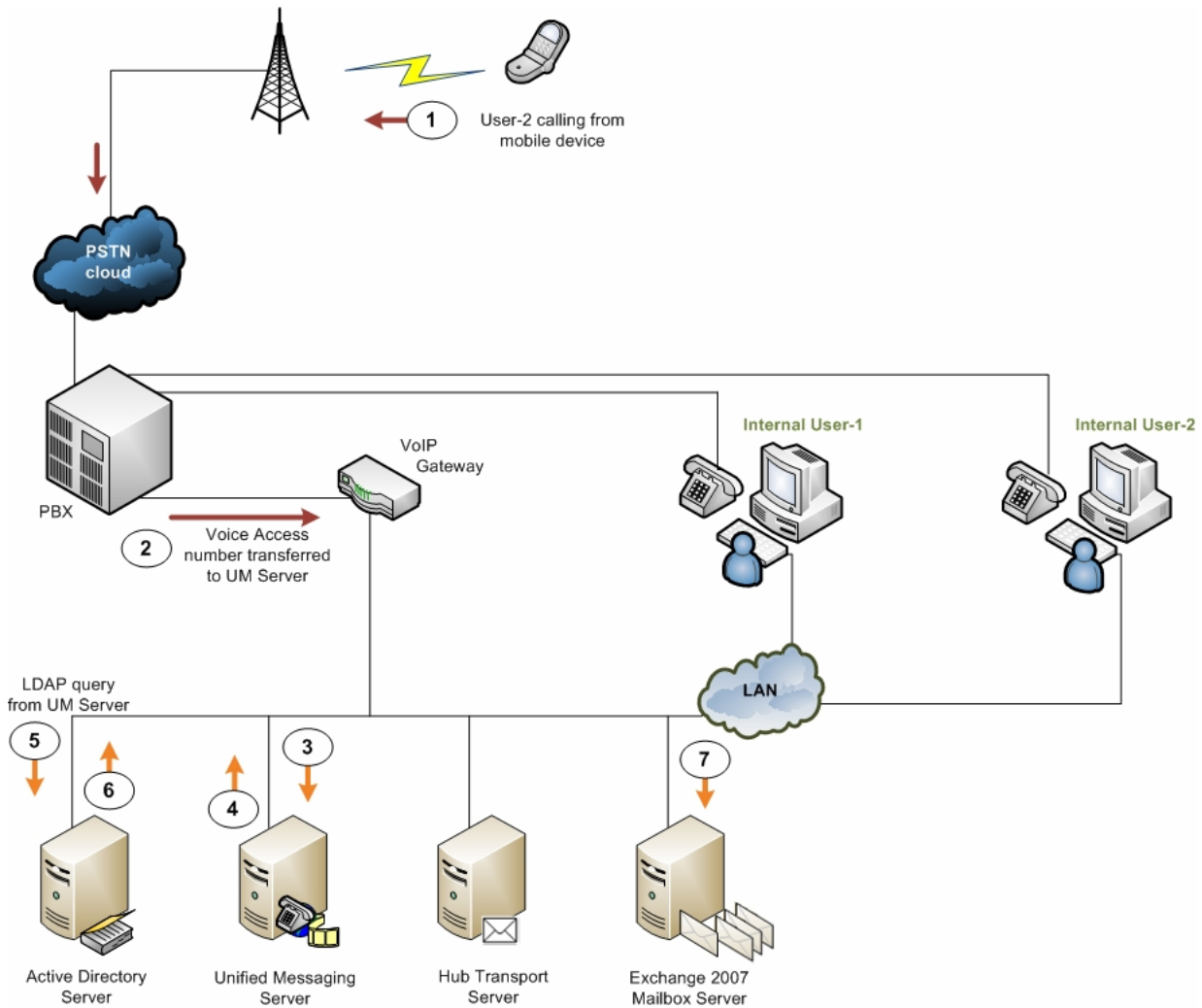


Figure 4. Routing sequence for Outlook Voice Access

Unified Messaging Auto-attendant

The Auto-attendant feature in Unified Messaging works as a Phone Operator for an external or anonymous caller who is presented with a set of options to contact UM-enabled user by name or phone extension. Multiple Auto-attendants can be created depending on organization's requirements. Figure 5 shows the routing path for a phone call placed by an anonymous caller to User-1. The numbering sequence initially follows the same path as mentioned for the Outlook Voice Access feature in previous section. The Unified Messaging Server accepts the Auto-attendant call in Steps 1, 2 & 3 and fetches the phone information about the called person in Steps 4, 5 & 6. The call is then routed to the destination phone number through PBX as shown in Steps 7, 8 & 9. If the call goes unanswered, then the routing sequence in Figure 3 is carried out to store it as a voice-mail in the Exchange Mailbox server.

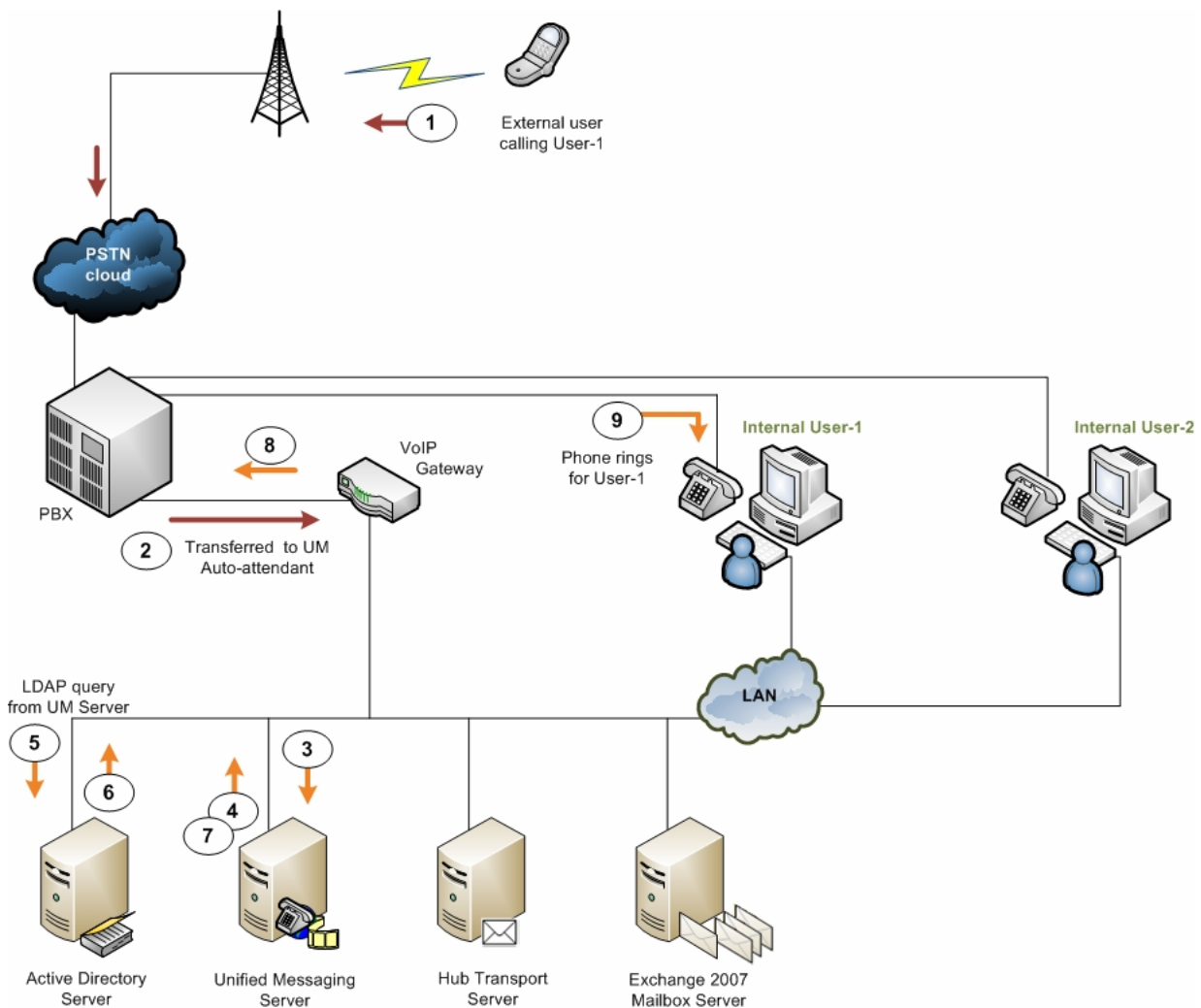


Figure 5. Routing sequence for Auto-Attendant Call

Exchange Unified Messaging Deployment

Administrators can deploy an Exchange Unified Messaging infrastructure using industry- standard components, helping them avoid being locked in to a proprietary system. This section will explain the deployment of a “Proof of Concept” Unified Messaging environment built at the Enterprise Solutions Engineering Lab at Dell. The setup uses Dell™ PowerEdge™ 2950 servers for the Mailbox, Hub Transport, Client Access and Unified Messaging servers, with mailboxes hosted by a Dell PowerVault™ MD1000 storage system. The Unified Messaging deployment requires additional configuration for the UM server and its integration with telephony network and the rest of the Exchange servers settings remain the same.

VoIP & Telephony Configuration

To implement a telephony network with a VoIP output to the Unified Messaging server, this deployment uses AudioCodes MediaPack-118 gateway which includes both FXO and FXS interfaces. In the absence of a PBX unit, the FXS ports are configured to supply the dial tone and simulate a virtual PBX to connect to the phone extensions (as shown in Figure 6). The FXO ports accept direct connections from the PSTN (POTS connection) and voice mail lines (of the simulated PBX), and communicate with the Unified Messaging server over the IP network.

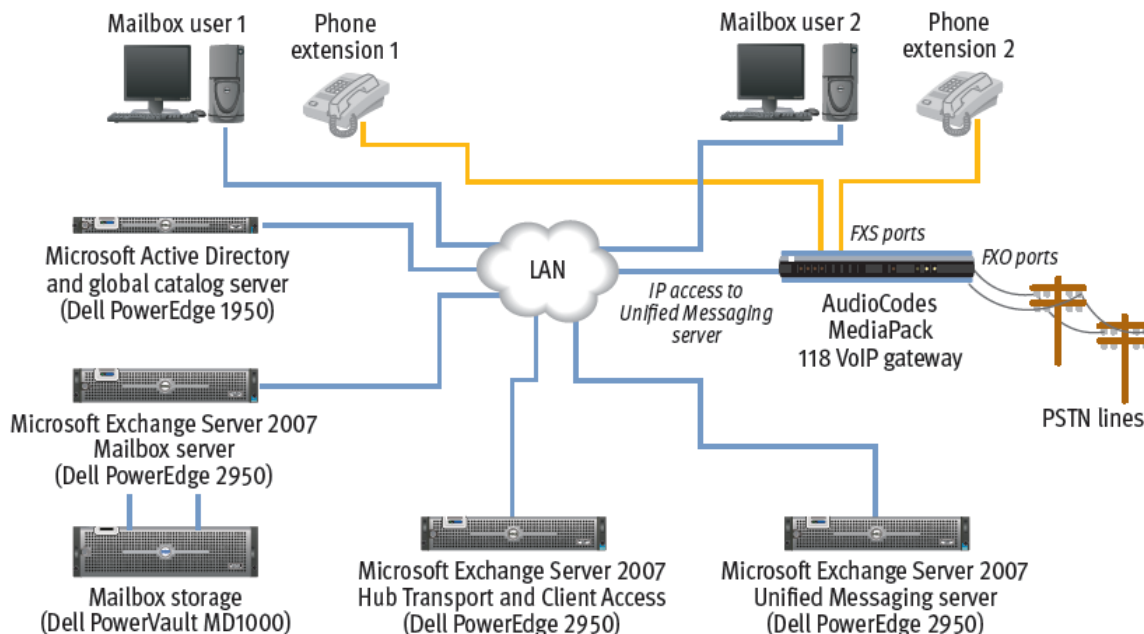


Figure 6. Exchange Server 2007 Unified Messaging Deployment

The phone-extensions for FXS ports are associated with the user desk phone numbers and are configured in the same Hunt group to communicate with each other. The internal “IP to Telephone” and “Telephone to IP” routing tables of the VoIP gateway are set to route calls from:

- One phone extension to other phone extension between FXS ports.
- Phone extensions to UM server IP for unanswered or busy calls.
- UM server IP to Phone extensions for Auto-attendant calls.
- PSTN lines or POTS connection to UM server IP for Outlook Voice Access calls.

Unified Messaging Server Configuration

The Unified Messaging server status is enabled by default but it will not process any incoming calls from the VoIP gateway until it is associated with a UM dial plan and a UM IP gateway.

UM Dial Plan

The UM dial plan is a logical representation of telephony dial plan and holds its Active Directory related objects. Figure 7 shows a new dial plan which can be configured either through Exchange Management console or Exchange Management Shell.

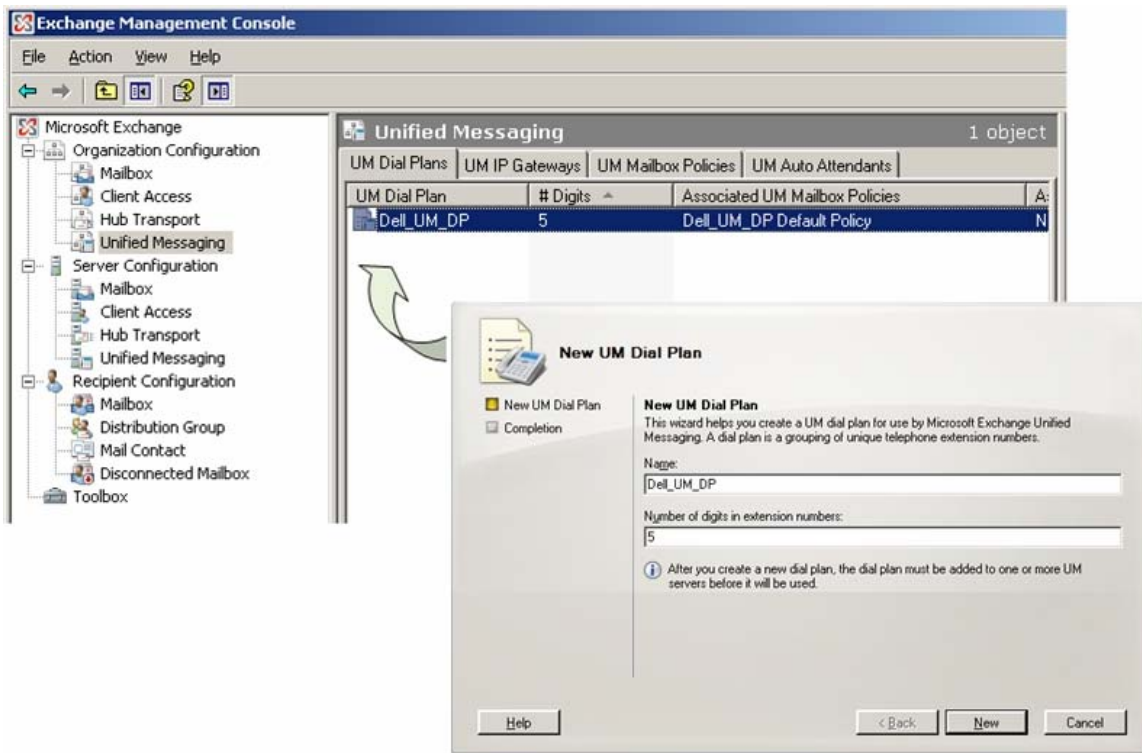


Figure 7. Creating new Dial Plan for the Exchange Unified Messaging Deployment

When a UM dial plan is created with specific number of digits in phone extension, a default UM Mailbox policy is also created which defines a common set of rules and security settings to be applied to the Unified Messaging enabled mailbox users. These settings can be viewed or changed through the properties of Mailbox Policies. The UM dial plan also allows to configure a specific phone number for the Outlook Voice Access or subscriber's Access.

UM IP Gateway

The UM IP gateway logically represents as a physical VoIP gateway in the Active directory. It works in coordination with the UM Hunt group to create a link between the UM dial plan and the VoIP gateway. Figure 8 shows the creation of new UM IP gateway and is assigned the same IP address as that of physical VoIP device (AudioCodes MP-118 gateway).

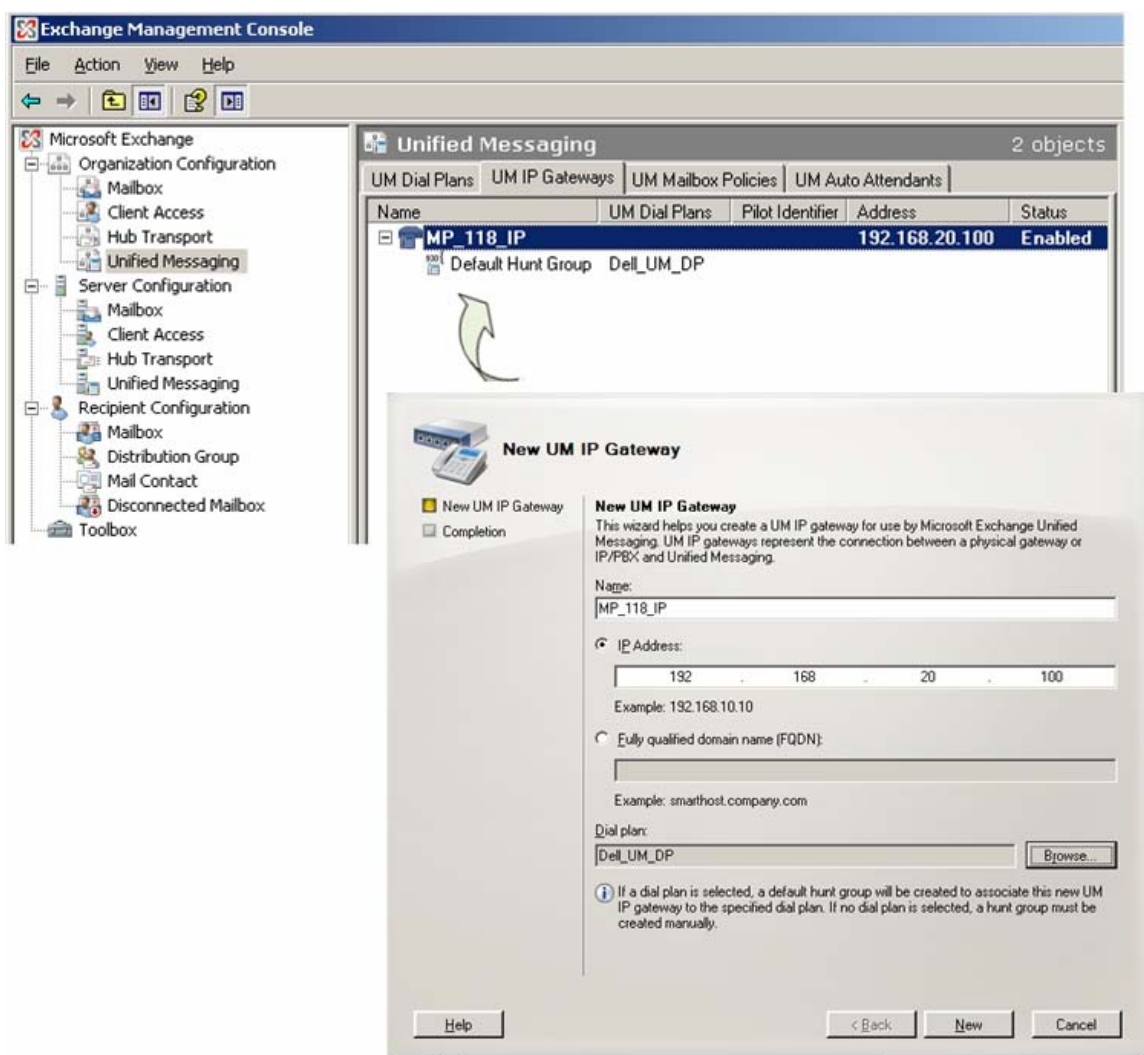


Figure 8. Setting UM IP gateway for the Exchange Unified Messaging Deployment

UM Auto-Attendant

A new UM Auto-Attendant with a specific number can be configured in the same dial plan (as shown in Figure 9) and a personalized greeting and menu can be set through its properties.

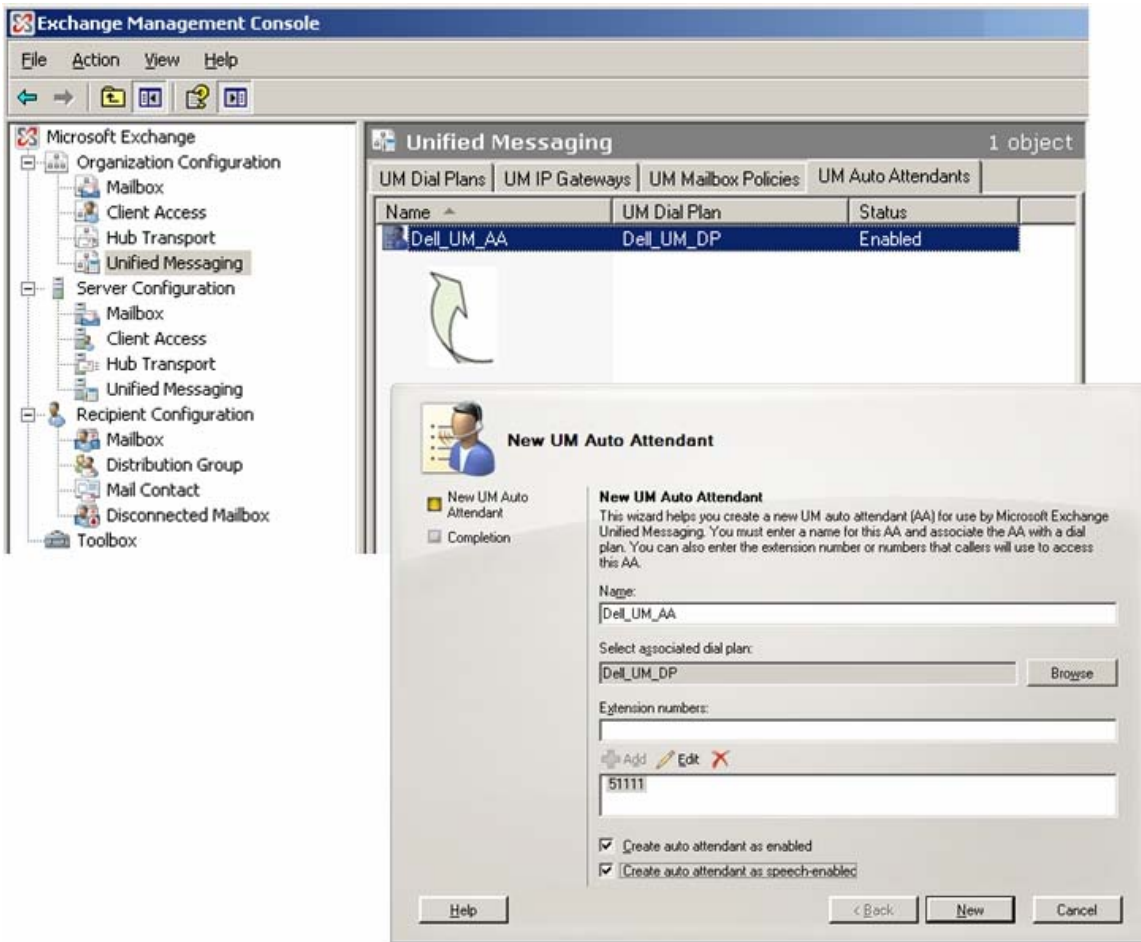


Figure 9. Creating new Auto-Attendant for the Exchange Unified Messaging Deployment

The final step in the configuration of the Unified Messaging server is enabling the mailbox users with Unified Messaging feature. The mailbox users are assigned to the UM mailbox policy and are allowed to specify a phone extension to be used with this mailbox and a PIN (Personal Identification number) to use with Outlook Voice Access feature.

Conclusion

The Microsoft Exchange Server 2007 Unified Messaging feature is designed to deliver e-mail, voice mail, and fax messages to user in-boxes and provide flexible access to mailbox data. By integrating and centralizing these various messaging networks, Unified Messaging helps simplify both message management for enterprise users and archiving and compliance tasks for IT administrators. A “Proof of Concept” deployment of a Unified Messaging environment built at the Enterprise Solutions Engineering Lab at Dell was presented. This proof of concept deployment is not meant to be a blueprint for designing and implementing Unified Messaging solutions. Rather, it is meant to provide a basic understanding of the components involved in implementing the Exchange 2007 Unified Messaging. For more information about Exchange Unified Messaging please visit www.dell.com/exchange.

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