Voice mail and fax have increasingly given way to e-mail as the primary means of enterprise communication. The Microsoft Exchange Server 2007 Unified Messaging feature is designed to integrate these communications by connecting Exchange and telephony networks to deliver e-mail, voice mail, and fax messages to a single location—the e-mail in-box. Unified Messaging also enables Outlook Voice Access, which allows users to access their e-mail, calendar, personal contacts, and directories and perform other operations (such as accepting or rejecting meeting requests and responding to e-mail messages) over the phone. By providing a centralized message repository, Unified Messaging helps simplify communications management for both users and administrators.

Microsoft Exchange Server 2007 Unified Messaging infrastructure

The major elements typically required to implement Unified Messaging in an existing Exchange Server 2007 infrastructure include a telephone system, a voice over IP (VoIP) gateway, and a Unified Messaging server.

Telephone system

Enterprise telephone 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.

VoIP gateway

Telephone networks use circuit-switched protocols to provide dedicated links between users. Exchange Server 2007 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 1 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. The FXO ports on the VoIP gateway receive line voltage and ringing current from the PBX system. The PBX system and VoIP gateway are configured through a set of routing tables to deliver voice mail or fax messages to recipients in the messaging domain, with each subscriber’s access verified through the user information stored in the Microsoft Active Directory directory service.

**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 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 store them in user in-boxes.

In addition to receiving and processing incoming messages, the Unified Messaging server provides an Outlook Voice Access feature that allows users to access their mailboxes from internal or external phones and perform various tasks: listening to voice mail or e-mail messages, calendar appointments, and contact information; accepting or rejecting meeting requests; sending “running late” messages to meeting participants; connecting to contacts; or searching their directory. The Unified Messaging server uses the Automated Attendant feature to direct external calls to the appropriate user extension.

**Example Microsoft Exchange Server 2007 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. Figure 2 shows...
“Unified Messaging helps simplify both message management for enterprise users and archiving and compliance tasks for IT administrators.”

an example deployment created by the Dell Enterprise Solutions Engineering Lab, which uses Dell™ PowerEdge™ 2950 servers for the Unified Messaging, Mailbox, and Hub Transport and Client Access servers, with mailboxes hosted by a Dell PowerVault™ MD1000 storage system. The Unified Messaging server uses a Unified Messaging dial plan to process incoming calls from the VoIP gateway. The two example mailbox users have their own phone extensions and are configured to use the Microsoft Office Outlook® 2007 e-mail client.

The AudioCodes MediaPack 118 VoIP gateway 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. The FXO ports accept direct connections from the PSTN and voice mail lines (of the simulated PBX), and communicate with the Unified Messaging server over the IP network. Busy or unanswered phone signals redirect to the Unified Messaging Automated Attendant feature. Both PBX and the Unified Messaging server are also configured with a hunt group to enable routing for incoming calls.

This deployment can support multiple key operations for Unified Messaging–enabled Exchange users, including receiving voice mail and fax messages as audio or TIFF files in their Exchange in-boxes and using Outlook Voice Access to access and manage mailbox data, as described in the “Unified Messaging server” section in this article.

Integrated enterprise communications
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.

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