

Oracle Collaboration Suite 10g Mail

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Oracle Mail 10g Technical White Paper

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EXECUTIVE OVERVIEW

Oracle Collaboration Suite 10g Mail is better-built messaging from the ground up. Oracle Mail harnesses the power and scalability of the Oracle Database 10g as its foundation, and builds upon it the flexibility and manageability of Oracle Application Server 10g. This unique infrastructure enables organizations to reduce costs as they consolidate dispersed mail systems onto a centralized, secure store that requires less hardware and software, while also saving time and money through simplified administration. The Oracle Database and Application Server also provide Oracle Mail with the reliability, and fault tolerance required by today's enterprises, employing advanced technology like Real Application Clusters to guarantee that service is maintained at the highest levels.

The Oracle Mail infrastructure is designed to scale its benefits as you scale to support more users and broaden functionality. Organizations can provide Unified Messaging functionality with support for voicemail and fax messages so that communications of all types are stored in one place – a proposition that serves to further simplify administration and cut costs by moving voice into the data center. Organizations also benefit with easier search and archiving of communications, so that Oracle Mail becomes an integral part of an organization's ability to meet regulatory compliance requirements.

As a part of Oracle Collaboration Suite 10g, Oracle Mail is tightly integrated with other components – from Voicemail & Fax, to Discussions, to Mobile Collaboration and Workspaces, to streamline business processes and ease communication and collaboration. And through system-wide management tools like Oracle Enterprise Manager, administration of all components is simplified and standardized. Oracle Mail's integration capabilities further extend beyond the Collaboration Suite, with a set of rich Java-based APIs that allow easy integration with other enterprise applications.

With Oracle Mail 10g, organizations get the messaging system today that competing solutions are still struggling to provide – from its scalable, secure, extensible infrastructure right through to flexible and integrated access, it's better-built messaging from the ground up.

INTRODUCTION

A brief review of electronic mail systems would reveal a fairly well-defined grammar for mail content and for routing mail messages anywhere in the world. The problem of proprietary mail systems only communicating with other systems from the same manufacturer has been solved by standards such as Multipurpose Internet Mail Extension (MIME) and Extended Simple Mail Transport Protocol (ESMTP). Standards such as IMAP4 and POP3 also delineate how mail clients cooperate with mail servers. The most important aspect of these standards is that they are supported by a wide range of vendors. Interoperability actually does work.

Mail is, and will continue to be, used for more and more purposes – beyond interpersonal communication and voice mail. It is a common medium for bearing workflow information, “front ending” applications, and even application-to-application communications.

Oracle Mail is a completely integrated suite of collaborative applications and provides a comprehensive solution for all of your email, voice mail and fax mail requirements. No matter what type of mail or how the mail is used, Oracle Mail provides the best solution available today, with capabilities that grow as your needs grow.

EMAIL COMPONENTS

A complete email solution consists of:

- **One or more mail stores** – the actual number depending on the number of accounts, amount of mail messages to manage, and consideration of your organization structure.
- **One or more standard protocol servers for access to the mail store** – the actual number depending upon the number of concurrent clients accessing the store(s) during peak load.
- **One or more mail servers to support the routing of mail** – the actual number depending upon the numbers of messages sent and received over a period of time.
- **One or more mail clients** – usually a minimum of two clients per user of the system (for telephone access and traditional email client), but could support a number of different clients depending upon the mobility and needs of each individual user.

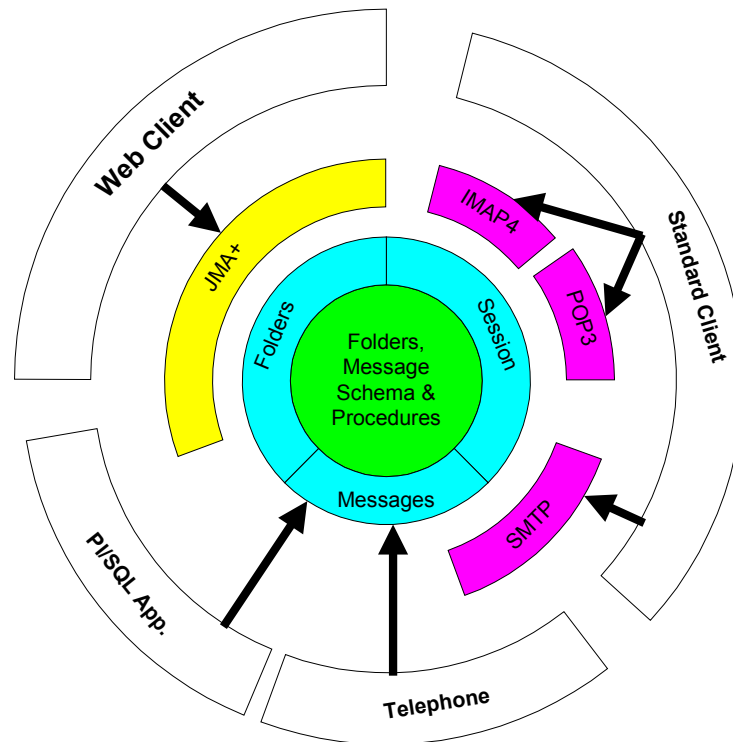
Oracle Mail turns an Oracle database into a high performance, scalable mail store, and turns an Oracle Collaboration Suite middle tier servers into the rest of the complete email solution with Internet standard mail protocol services, and web and telephone handset clients. These services can run on one host or scale across several, as required. Oracle Mail offers unprecedented flexibility in the numbers of

accounts and messages, concurrent loads, utilization behavior, and the type of mail client used.

The Intelligent Mail Store

The core of Oracle Mail is its “intelligent” mail store. If a message is destined for many accounts on that mail store, only one copy of the message is stored and links to the message are sent to all recipients. Folders can be private, shared, or public. A single mail store can store mail for one domain or several different domains. If you have an extremely large domain, it is possible to have multiple nodes support a single domain.

Applications can make direct PL/SQL calls to act upon messages similar to the voice mail client, standard protocol servers and JMA+ libraries. Calls made to these stored procedures are executed in the message store.



The mail store utilizes stored procedures enabling extremely powerful features including:

- A high-level interface for application programming
- Mail processing close to the physical location of the mail, optimizing performance
- Tertiary storage, allowing manageability of storage costs
- Simple extensibility mechanisms, allowing customization of mail processing directly in the server

A High-Level Interface

The Oracle Mail store exposes a comprehensive and high-level interface. Client programs make PL/SQL calls to the Intelligent Mail Store. Because the logic takes place inside the store (an Oracle10g database), close to the actual data, mail transactions are greatly simplified and more reliable. Performance implications of network traffic are virtually eliminated.

Email, by definition, consists of multiple clients and client types, all accessing the same mail store. By having all clients enter through the same interface and perform processing in the mail store, all clients achieve the same goals with the same behavior.

For example, a typical Oracle Mail installation allows an Oracle Collaboration Suite Voice user to listen to voice mail messages from any one of three clients:

- a telephone handset client
- a standard IMAP4 mail client
- a web client

If a voice mail message has not been heard, the Message Waiting Indicator (MWI) light on the user's telephone is lit. If all voice mail messages have been played, the light is turned off. Because the MWI logic is placed inside the mail store and not in the web client, standard client, or telephone handset, the solution consistently and appropriately turns the light off regardless of which client was used to play the voice mail messages.

Process Close to the Data

All of the scaleable protocol servers perform tasks within the PL/SQL stored procedures running at the mail store.

One can quickly and efficiently query an entire mail store with a simple request. This comprehensive high-level interface allows effective support for system-wide rules, personal user rules, server side filters, SPAM control, etc., for a very large and very dynamic mail store without serious degradation. It also affords Oracle Mail the ability to query and update the mail store more efficiently than any other product on the market today.

Tertiary storage

Mailboxes are dynamic in nature. Mail is constantly entering the store, being processed, and removed. Users often store mail from when they first joined your company (just in case), never cleaning up their folders. The Mail housekeeping feature not only cleans up deleted messages, it can move mail messages that are old and not often referred to or acted upon to a "tertiary" tablespace, which can be located on a less expensive disks.

Extensible Store

The mail store can be extended by or integrated with other Oracle product capabilities. Filters, or Server Side Rules, can be applied (see “Filters” below) that automatically act upon all mail messages. These filters can either perform common mail tasks on a mail message, or they can pass the mail message to any external program.

For example, the Oracle Mail Center product filters all mail messages sent to an abstract “Helpdesk” mailbox of a company. Each message is broken down into its main body and any attachments. Each part is then passed, individually, through the Oracle Text engine. The results can then be routed to the appropriate support representative, who can choose from a list of possible responses to the specific request or create and log a new response.

Standard Client Access Servers

The scalable mail protocol servers of Oracle Mail offer Internet standard services for accessing and manipulating mail, leveraging the latest technology available on Oracle 10g. This permits a wide variety of mail clients to natively act on mail stored in an Oracle database. Oracle Mail offers two types of mail store access protocol servers depending upon the type of mail service you plan to offer.

Post Office Protocol version 3 (POP3)

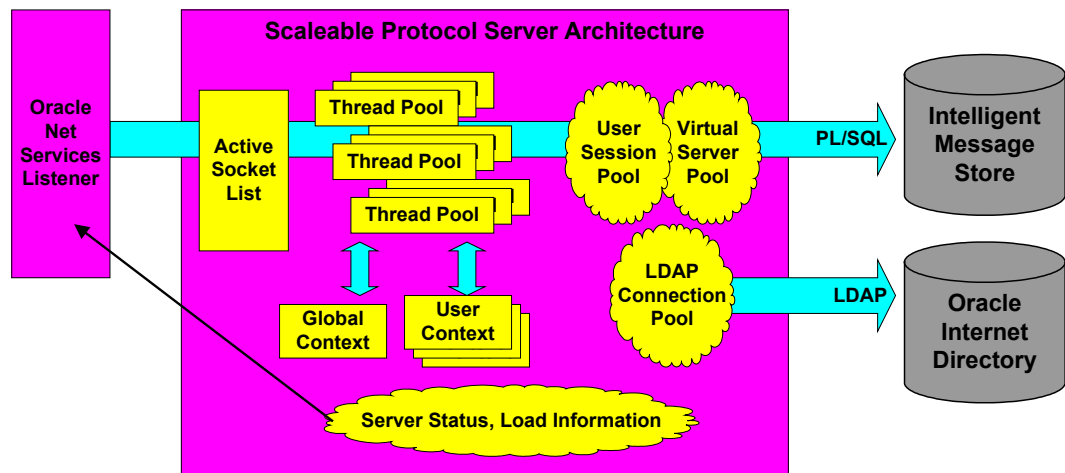
POP3 offers simple basic mail store access. Each user can connect to the message store, download messages, and optionally delete them from the server. This service offers only “Inbox” storage. There are no folder capabilities. Service Providers commonly offer this type of mail store access to provide basic mail features with little value add beyond the mail store.

Internet Messaging Access Protocol version 4 (IMAP4)

IMAP4 offers a rich set of mail storage services including folders, sub-folders and the ability for a disconnected client to re-synchronize with a mail store. Mail clients open a session with their mail store and manage mail items that are kept on the mail server.

Both of these mail store protocol servers are built on a multithreading, load balancing, and connection sharing architecture capable of supporting thousands of simultaneous logged-on users on inexpensive hardware. Both servers can work over a network, separating the processes that access mail from those of the intelligent message store. When running on a separate host, these servers can leverage all of the capabilities of Oracle Net Services including security features. For added security, these servers can listen on a secure SSL port. Neither server is mutually exclusive of the other. Support for IMAP4, POP3, IMAP4 SSL, POP3 SSL, or any combination is deployment specific.

All mail protocol servers listen on the well-known mail ports and route commands to the Intelligent Mail Stores or LDAP Server using pre-allocated connection pools for optimal efficiency and performance.



The Mail Routing Server

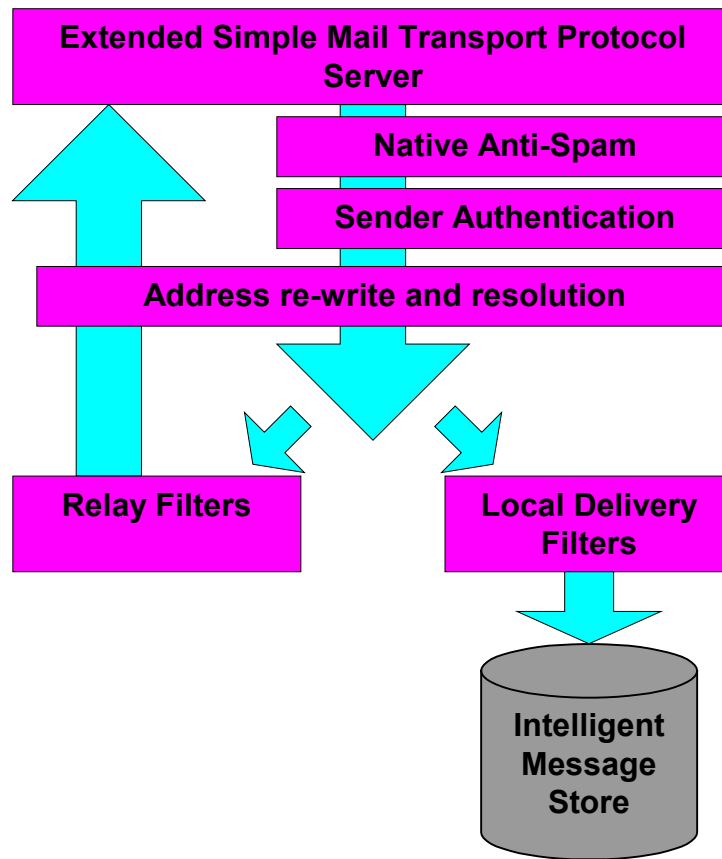
The Oracle Mail ESMTP server listens for incoming connections from standard clients, the web client, and other SMTP servers. Like the IMAP4 or POP3 protocol servers, it is built on a multithreading, load balancing, and connection sharing architecture. The ESMTP server can handle thousands of messages simultaneously.

The ESMTP server provides the following array of functionality:

- The system's LDAP server can be queried to authenticate the sender
- Addresses can be rewritten based on very flexible rewriting rules
- Anti-spam filters can be applied
- Two different sets of filter paths can be applied. (See below the discussion of "Filters" in "Controlling Mail")

If the intended recipient (or recipients) is local, the message is placed in the local delivery queue. Local delivery picks up the message, applies any filters, and delivers it to the user's Inbox. If the intended recipient(s) is external to the system, the message is placed in a relay/submission queue. The server queries the DNS server, applies any filters, and sends the message out.

Extended Simple Mail Transport Protocol Server with two different filter rule sets depending on whether a mail message is destined for a local or remote mail store.



Web Access Client

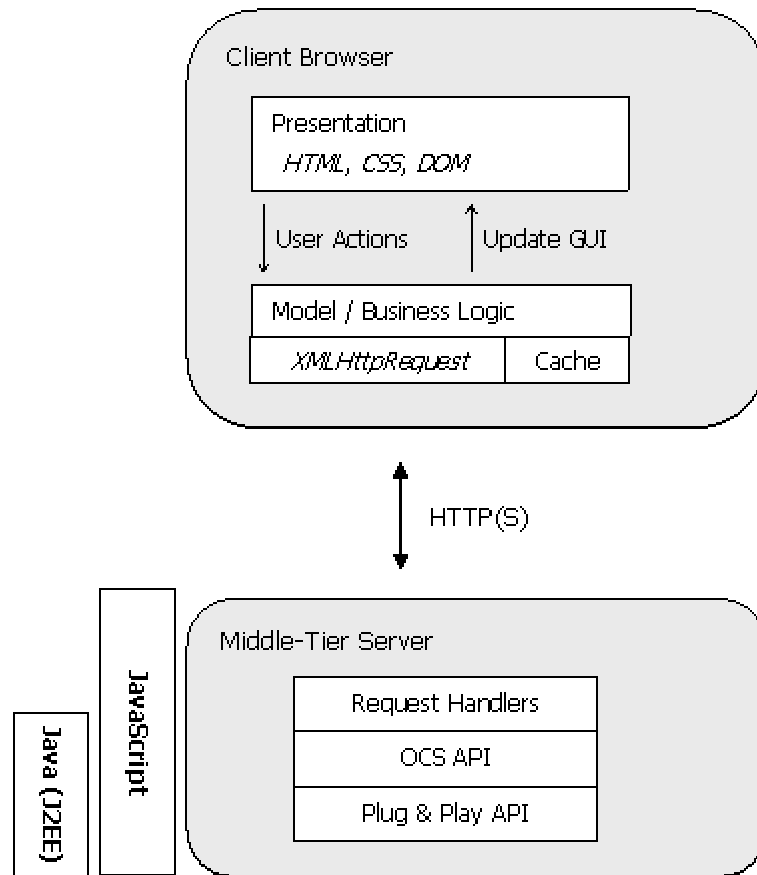
Oracle Mail provides a high performance enterprise Web mail solution. Although Web Access Client's architecture is very similar to traditional web applications from a high level, there are a couple of key differences that make Web Access Client better suited for an enterprise deployment.

Web Access Client requires no installation by end users, yet supports rich interactivity similar to desktop applications. For instance, users can drag-n-drop messages into folders, open context menus to quickly access common actions, and use keyboard shortcuts. Being a web application, the user interface is easily customizable. The client is developed using industry standard technologies that are found in modern web browsers: Cascading Style Sheets (CSS), Document Object Model (DOM), XMLHttpRequest, and JavaScript.

While traditional web applications have an extremely thin client-tier, Web Access Client takes advantage of the processing power of the client machine to host a lightweight JavaScript runtime. The capabilities go beyond just the presentation layer – Web Access Client's JavaScript runtime includes business logic and a data cache. For example, the current folder's message list is stored in cache so that the browser can sort messages on the client side. This provides faster response times to the user as well as offloads processing from the middle-tier.

In cases where the client needs to fetch data from the middle-tier, only data (not markup) is requested by Web Access Client's JavaScript engine. In most cases, this data is requested asynchronously, allowing users to continue working. This is a big contrast to traditional web applications, where each user action triggers an HTTP request that loads a new page.

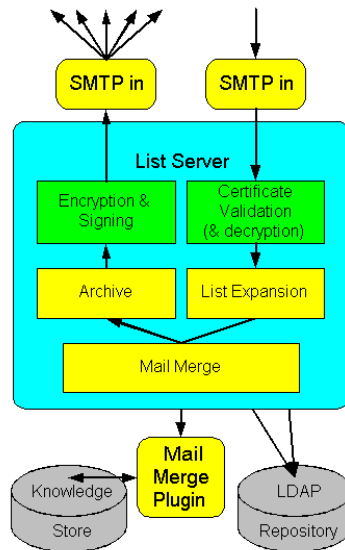
The middle-tier server is architected to allow for interoperability and extensibility. The Plug & Play API defines standard Java interfaces for connecting to backend services. In this release, WAC ships with two mail implementations, one connecting via J2EE JMA (IMAP) and the other connecting via OJMA. Swapping the two implementations is as easy as flipping a switch.



List Server

Oracle Mail includes a list server. This provides a means of public list management as well as integration with other messaging services for applications.

Oracle Collaboration Suite 10g Mail list server can send S/MIME messages with bodies containing PL/SQL procedure tags. These tags are replaced with the values the procedure returns.



The Oracle Mail list server allows users to own and administer public mailing lists. These lists can be set up as a means of distributing information to groups of people. For example, all members of a list could be people in a specific organization in a company, with the list managed by the vice president's administrative assistant. Another list could be made up of people who are interested in sailing. These list server lists can be set up with restricted membership, where users must be approved before becoming a member. For example, the vice president in the example above probably wants only people in her own organization to be on her list. List server lists can also be set up so that any messages sent out are moderated, where only certain members can send out messages. For example, the administrator of the sailing list may screen out advertisements.

APIs provided with the Oracle Mail list server enable users to customize lists and messages sent out to a list. These Oracle Mail list server features can be used for applications such as marketing campaigns where special non-transferable offers are sent to and readable only by the intended recipients. For example, a user can use the list server APIs to query a database of sales information to create a list of all customers who have made purchases in the past three months, then send coupons

by email to each of the customers with discounts based on the amount of their purchases.

Oracle Mail can archive individual list server lists. When creating a list on the list server, the administrator can set the list to be archived on the NNTP news server. Users can refer to messages sent to those lists through a newsgroup in the NNTP news server (included as a component of Oracle Collaboration Suite 10g). Access to archived list messages can be limited to just list members or can be left open to the public.

ADMINISTRATION

Oracle Enterprise Manager

Oracle Enterprise Manager is a single, integrated solution for administering and monitoring global e-Business enterprises. The Enterprise Manager with Oracle Collaboration Suite 10g provides tools to correlate computing performance to business service performance across all components of the Collaboration Suite – host, database, web server, and applications; enabling identification and resolution of service performance problems from within a single framework.

As part of this framework, Oracle Mail administration can leverage all of the advanced features, including process administration, tuning, change management, capacity planning, system monitoring, real-time monitoring, event-based notifications, and system target discovery. The framework provides the same web-based look-and-feel for Oracle Mail administration as other Oracle products. The framework is Internet standard based with all displays using HTML, and all connections made via HTTP. A simple web browser is all that is required as a single administrative point to manage the system and view monitoring data. .

Delegated Administration

Oracle Mail can be administered on different levels. A system administrator can manage the entire Oracle Collaboration Suite 10g system, including all hosts, processes and programs associated with Oracle Mail. Large installations and hosted deployments can also delegate basic user administration, such as adding and removing users, resetting passwords, and managing domain-level system parameters, within a domain. A single mail node can store mail for two or more companies, with each company securely administering their own name service.

Oracle Mail exposes several administrative capabilities to the end user as well, available as self-service from the web client. End users can change their own passwords, create server side filters, activate or inactivate filters, and recover deleted messages.

Archiving messages

Archiving email messages has grown in importance, for knowledge management as well as legal reasons. Administrators can set up multiple archiving policies for the Mail system. Individual Mail users can now be set up with an associated “archive policy” property stating whether or not mail to/from an account should have a copy made and delivered somewhere offline.

The system can handle multiple archive destinations. For example, Fred’s mail can be archived in SF and Tom’s mail can be archived in NY.

Every “archive” message would include envelope information with a completely resolved distribution list. This journaling feature is similar to ones used by our competitors. The Mail implementation can be configured such that a special process, other than the MTA’s that route mail, do the work of journaling, minimizing the effect on throughput, if that is a concern. Note that voice mail messages pass through the same mechanism and can be archived as well.

RELIABILITY

The value of a company’s mail differs from company to company ranging from simple email communication, to mail messages containing the basis of million dollar deals. Today, many companies expose mail accounts so that their customers can obtain support, receive important notices, or purchase goods and services through the electronic mail system. Oracle Mail, built on the Oracle 10g database, offers the high availability, or fault tolerance, as required for your needs.

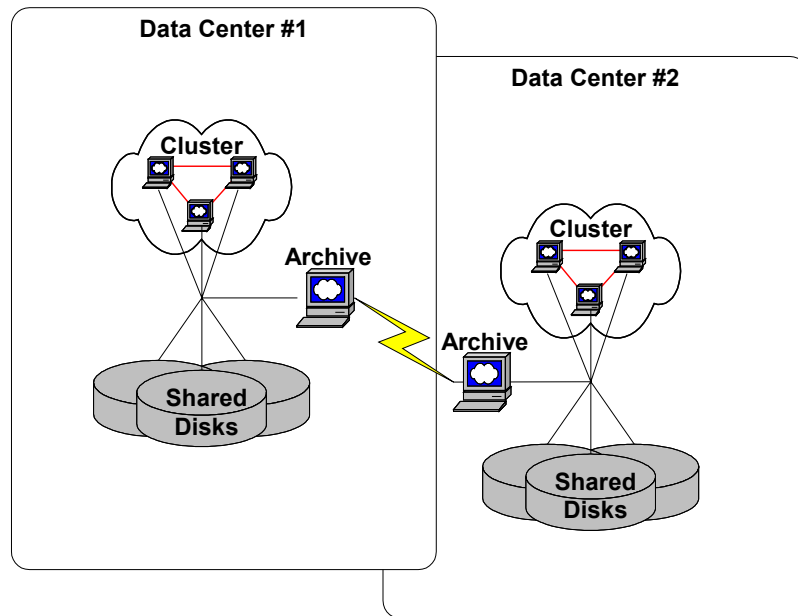
Email on Reliable Application Clusters

By creating an Oracle Mail message store on a Reliable Application Cluster (RAC), one can actually increase availability and scale at the same time. Users enjoy uninterrupted service. Additional hardware servers add scale. A larger number of smaller systems can actually increase performance and reliability at a reduced cost.

Disaster Proof Email

Some mail systems must be disaster proof. In cases where the uses warrant an investment to make everything redundant in multiple locations, Oracle has the solution. Even a catastrophic failure of your data center will only cost a few minutes of downtime.

Each deployment can store mail on a standard Oracle10g database, a Oracle10g Reliable Application Cluster database, or a fully redundant backup data center.



FILTERS

A filter is an action taken based upon a set of conditions being met by a mail message, at a particular event point in that mail message's life span. A condition can be set on any information in the mail header, the envelope, and the message size.

Examples of conditions are:

- All messages from a certain user
- Messages from a particular domain
- All messages that have the word "urgent" in the subject
- All messages with an attachment with the extension ".exe"

The life span of a message begins when it is created. It is then sent to one or more recipients, used by the recipients, and eventually deleted and removed from the system. Oracle Mail defines the following event control points:

- Sending a message out of the mail system
- Receiving a message into the system
- Receiving a message into an inbox
- Deleting a message

At any particular event control point, messages are queried to see if a particular condition or set of conditions are met. This combination of conditions at an event control point make the filter. Each event control point can have as many filters as needed. Each filter, if it is true for a message, will execute an action. Actions are extensible. You can write a PL/SQL procedure action to perform virtually any action. Oracle Mail includes several common actions that do not require programming, including:

- Deleting a message
- Forwarding a message to an address
- Suspending the receipt of a message
- Suspending the sending of a message
- Replying to a message
- Moving or copying a message to a folder

Oracle Mail supports two types of filter: system filters and individual filters. System filters are managed by an administrator and are often hidden from users. Individual filters are self service managed by individual users.

While filters are often available through many vendor's email clients, these client side filters work only when the client is checking email using that particular client on the computer on which the user created the filter. Oracle Mail filters execute on the server, not on the client, which makes them extremely powerful. These filters run on all messages, regardless of when, where, or which client is used to access the system. It is through these filtering mechanisms that Oracle Mail offers additional control over the email service, including virus protection and spam filtering.

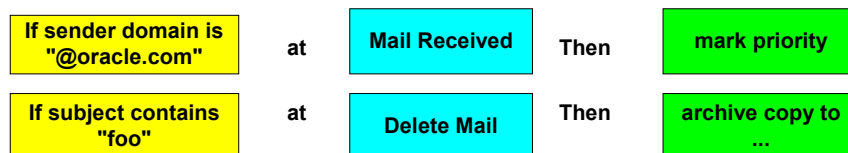
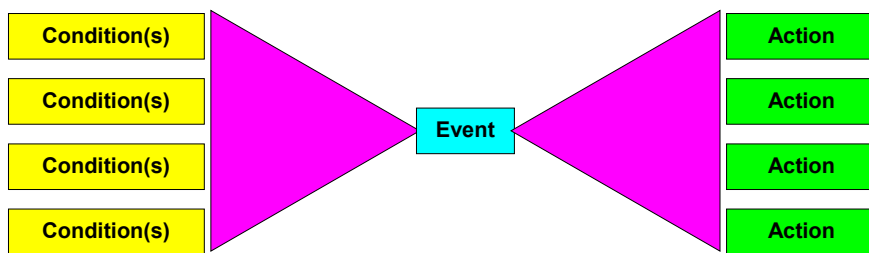
Filters for virus and spam control

System filters at the inbound event control point offer one inexpensive means to filter out many viruses. For example, all messages passing through the inbound SMTP server that contain "I love you" in the subject and have an .exe attachment should be put into the suspension queue. Filters can also be used for more expensive and thorough third party virus scans; for example, all inbound messages, no matter what, pass to a third party virus scanner.

New mail-born viruses are created and evolve all the time. There is a lag in time between the virus' creation and when it is found and understood. Often a new virus will already be in your mail store before your virus scanning software or inbound filters recognize it and can check for it. With Oracle Mail, this is of less concern than with many other mail systems. First, Oracle Mail scales, so there are fewer mail stores you need to scrub for infected messages. Second, the mail store is an Oracle database, which is the most effective place to have your information if you need to quickly query it to find these new viruses. Oracle Mail can apply the same concepts as filters. It can check a complete mail store for all instances of a message that meets a particular virus fingerprint and remove it from the store.

Filters are also useful in the control of spam. The site administrator can filter out all messages from known spam addresses. End users can filter out spam on an individual basis with their own personal rules.

At each event control point, each mail item is interrogated for condition sets and, if conditions are met, an action is executed.



Routing control

Oracle Mail provides system-wide routing control as an easier way for administrators to set policies for incoming and outgoing messages. Mail administrators can, for example, keep out messages from certain domains, certain users, with certain attachments, or even particular words in the Subject. Oracle Mail routing control should not be confused with content-based anti-virus or anti-spam filtering products which are offered by many third party vendors, but is a good means of fine-tuning Mail message routing.

MAIL IN THE BIGGER PICTURE

Oracle Mail benefits from being a fully integrated component of Oracle Collaboration Suite. The product is tightly integrated in the installation process for Oracle Collaboration Suite and into the Collaboration Suite infrastructure LDAP server. The Web Access Client is tightly integrated into the Oracle Single Sign-On server. Because Oracle Mail and other Suite components run on a common technology stack under a common architecture, they are easier to integrate and simpler to administer.

A Common Installation

During installation, all middle tier mail processes and servers register themselves with the Infrastructure LDAP server. They become visible to each other and to the Enterprise Manager based framework. By simply providing access to the Oracle Internet Directory LDAP server, each middle tier inherits connection information from all other processes, services, and mail stores already known to the installation.

A Common Oracle User

Oracle Collaboration Suite 10g components share common directory schema standards for users as well as for applications. User management and provisioning are shared. Oracle Mail manages the mail of a “common” Oracle user. The administrator does not have to create a mail user for the mail system, a human

resources user for the HR system, and a portal user for the portal system, because a single user is created, capable of using the mail, HR, and portal systems.

Oracle Mail offers several different entry points for different mail clients. Some mail clients are part of a larger solution. An example is the Web Access Client behind an enterprise portal. Mixing the capabilities of these types of deployments can be difficult. Oracle makes it easy through the Oracle Single Sign-On server.

Oracle Mail protocol servers support third party clients. These clients log directly into the mail server; authenticate with a user name and password; and support mail capabilities. At the same time, an Enterprise Portal can accept a user name and password to enter a personal desktop with mail and other applications. Once a user logs into their portal, they do not need to log into their mail system a second time. Oracle products support Single Sign-On, which uses the Oracle Internet Directory LDAP server as its repository of users. Oracle Mail uses the same Oracle Collaboration Suite 10g infrastructure LDAP and common user as its repository for all suite components. Everything works seamlessly, no matter which entry point is used or what modifications take place. An administrator creates or removes one user for everything. A user changes one password, and that password is used for all their clients.

Programming Interfaces

Mail and mail systems are increasingly used as a common format and medium for performing an ever-broader set of tasks. List servers inexpensively keep employees and customers informed of important events. Programs intercommunicate over mail. Email forms are common. In this environment, the developer quickly realizes that sending a message can be easy, but receiving and understanding a message is not so trivial. Oracle Mail offers a broad range of programmatic interfaces to help the developer mail-enable applications or use the mail system to do work.

Oracle Mail supports the following interfaces:

- Java
- PL/SQL

Java Interface

Java has a common API for accessing and manipulating mail in a mail store called the Java Mail API (JMA) and a common API for the directory repository called Java Naming and Directory Interface (JNDI). Oracle Mail supports, and has extended, these interfaces to leverage the intelligence of the mail store. Features and extensions of the API include:

- **Shared Folders** – Find out if a folder is shared and manage access control information such as adding or removing a grantee from the access list or get the grantees list.

- **Authenticated sending** - Authenticate with the Oracle 10g Mail ESMTTP services.
- **S/MIME support** – Encrypt, sign decrypt or verify an S/MIME mail message.
- **Oracle Text support** – Get themes or highlights of a message.
- **Server Side Sorting** - Sort mail in a folder in the Mail Store, rather than in the Java client or web client middle tier. This has a dramatically positive affect on increasing the performance while lowering the middle tier resource requirements.

Furthermore, the Oracle Mail JMA directly communicates with one or more Intelligent Mail Stores, permitting unparalleled scale.

PL/SQL Interface

Applications such as order processing, bill payment, and marketing systems rely on email as a mechanism for customer interaction. Since most of these applications already have a database back-end, and in most cases the database is an Oracle database, applications can benefit greatly by having a PL/SQL SDK for messaging operations.

The Oracle Mail SDK has all the functionality needed to develop an email client. It exposes an easy to use, object based interface for all email functions. The developer should be knowledgeable about the basics of the RFC822 and MIME standards, enough to understand the meaning of various header and message structures, but is not expected to know details of encoding and decoding algorithms, character set conversions, and so on. All the data returned by the functions is in decoded format and the character set is converted to the client character set for the developer. The interface includes batch fetching and updates for reducing round trips and increasing performance; support for multiple sessions, multiple simultaneous fetches, and composing; and other email tasks.



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