

Oracle Real Time Collaboration 10g Technical Overview

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Oracle Real Time Collaboration Technical Overview

ABSTRACT

Oracle Real-Time Collaboration (RTC) is a set of integrated real-time collaboration services. RTC is the only secure, integrated, presence-aware solution designed to meet the real-time collaboration needs of an enterprise. It provides one integrated solution to enable users to collaborate using presence-awareness, instant messaging, web conferencing and voice capabilities. A single Oracle RTC system can accommodate all global IT and line of business requirements - efficient use of hardware resources enables RTC to easily scale to an enterprise-wide deployment. High availability can also be incorporated into the RTC deployment. Oracle RTC is a secure environment for real-time collaboration and integrates seamlessly with any business application for contextual collaboration. Its' security features extend from the underlying secure standards-based 10g architecture through to its administrative and end user preferences.

Oracle RTC is part of the Oracle Collaboration Suite (OCS), a single integrated system for your organization's communication and information sharing needs. In addition to RTC, OCS also includes content services, calendar, e-mail, voice mail, fax, wireless, workspaces and discussions.

This paper is intended as a technical overview of the 10g release of Oracle RTC. It discusses the system's design, deployment, user management, system services, security, scalability, high availability and integration services.

INTRODUCTION

Oracle Real-Time Collaboration facilitates real-time collaboration between users connected by IP networks. Real-Time Collaboration is becoming a widely used tool and platform for organizations as they realize the benefits of conducting communication over enterprise intranets and the public Internet. Every employee is connected to every other employee via the corporate intranet and public Internet. The Oracle Real-Time Collaboration system is designed for the network computing infrastructure of today's enterprise. It does not require any reconfiguration for the enterprise firewalls and uses an LDAP-based directory for user management.

Oracle RTC architecture is discussed in the first section, with RTC deployment, user management, and system management following. Details about scalability and high availability support of Oracle RTC are covered in the next sections. Collaboration security and integration services are explained in the last sections.

ARCHITECTURE

ARCHITECTURE OVERVIEW

Oracle RTC is built on top of the secure standards-based Oracle Application Server *10g* and the Oracle Database *10g*. In addition to providing client tools to access its services inside and across firewalls, Oracle RTC can seamlessly expose its services through other business applications with the help of a rich set of integration APIs. Figure 1 describes the main components of the Oracle RTC architecture.

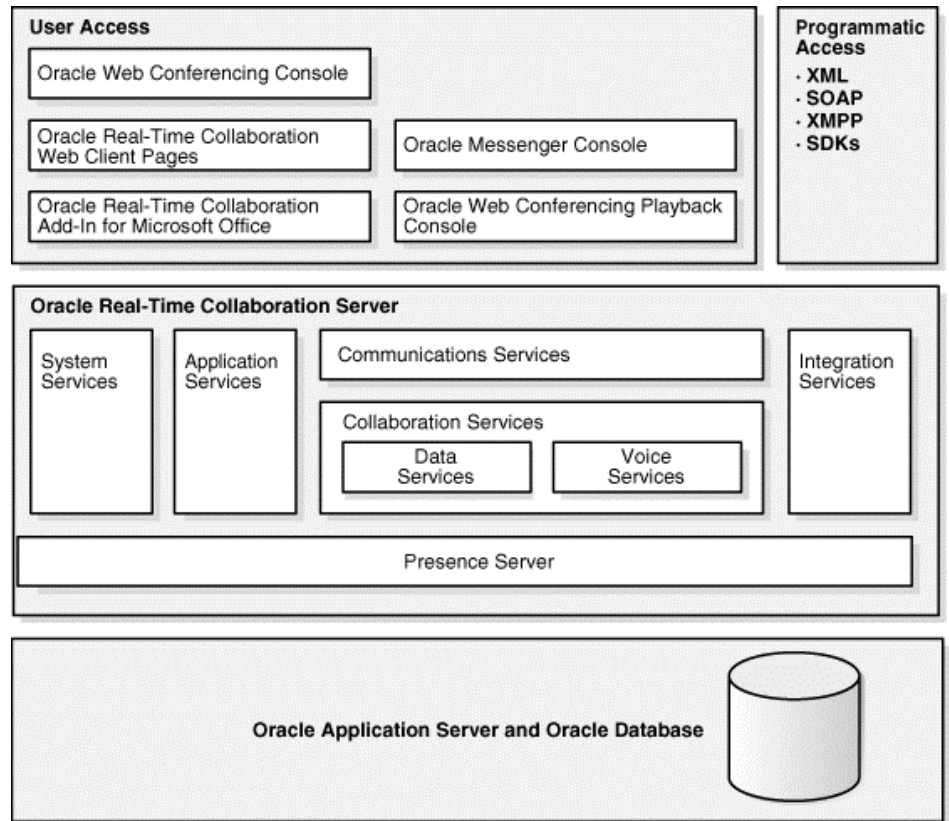


Figure 1: Oracle Real-Time Collaboration Architecture

The components of the Oracle RTC architecture are described below.

- **User and Programmatic Access**

End users access the Oracle RTC system using the Oracle Web Conferencing console, the playback console (a subset of the conferencing console), Oracle Messenger, or the Oracle RTC Add-In for Microsoft Office. Users also interact with the system through the Web Client pages that let them schedule and join conferences, download clients, and view archived conferences and messages.

Programmers using the Oracle RTC Integration Services can connect to the system using a number of different Web services and software development kits.

- **Real-Time Collaboration (RTC) Server**

The Oracle RTC Server consists of a number of software modules that work together to deliver the Oracle RTC services. The modules include:

- The **Communications Layer**, which responds to both user and programmatic requests to the system, and handles connections, from within and across firewalls, to the Data Services.
- The **Data Services** module, which controls sharing of Web conferencing screen data and chat text data
- The **Voice Services** module, which handles streaming voice data within conferences and voice chat sessions.
- The **System Services** module, which provides system management through properties, statistics reporting, and process monitoring.
- The **Application Services** module, which provides the scheduling and reporting features of the Web Client pages.
- The **Integration Services**, which can be used to tightly integrate any application to the Oracle RTC functions.
- The **Presence Server**, which supports the declaration and detection of individual and group presence (availability for chat and other collaboration tasks).

The Oracle RTC server is designed to be seamlessly and securely deployed in middle-tier server boxes along with the Oracle Application Server *10g*.

- **RTC Repository**

The RTC Repository stores web conference and message archives, scheduling information, monitoring and reporting data as well as any materials uploaded by RTC users. It is deployed in the secure Oracle Database *10g*,

- **Application Server *10g* Infrastructure**

The Application Server *10g* Infrastructure provides user management and authentication services for Oracle RTC. It also contains the Oracle Internet Directory (OID), Oracle's LDAP directory and an instance of the Oracle Database *10g*, which can be used to deploy the RTC Repository.

- **Voice Conversion Server (optional)**

The Voice Conversion Server provides an alternative to pc microphone voice streaming provided by the core RTC server. It converts PSTN voice streams from regular phones to a proprietary format for streaming along with web conferences.

The voice conversion server is deployed along with the Oracle Application Server *10g*. It is designed to be deployed on separate servers from the servers running the core RTC Server.

- **Document Conversion Server (optional)**

The Document Conversion Server converts Microsoft Office documents into HTML and PNG formats for use in the document presentation mode during a web conference. Without a document conversion server, Microsoft Office documents can still be shared through desktop sharing. The document conversion server is deployed along with the Application Server *10g* but it cannot be deployed on servers running the core RTC server. It can be deployed on the same servers running the voice conversion server.

RTC COMMUNICATION LAYER

The RTC Communication layer provides the communication channels for RTC client-server interaction. It consists of the following software modules:

- **Oracle HTTP Server and mod_imeeting**

The Oracle HTTP Server (OHS) is used as the only listening point for end-user connection requests over the Internet to the Oracle RTC system. The mod_imeeting is a plug-in within OHS that brokers client connections to the RTC server. The mod_imeeting handles both direct client connections as well as connections through firewalls via the standard HTTPS port 443.

- **Multiplexer**

The Multiplexer component acts as a communications hub between Oracle Web Conferencing console clients (end users participating in a conference) and Oracle Web Conferencing Servers. It accepts inbound connections from Oracle Web Conferencing console clients and Oracle Web Conferencing Servers. It also Routes data traffic between all clients and all Oracle Web Conferencing Servers on a system.

- **Client Connection Manager**

The Client Connection Manager handles all connections between Oracle Messenger clients (end users participating in chat sessions) and the Oracle Presence Server.

- **Redirector**

The Redirector redirects accepted connections to the appropriate Oracle RTC communication processes: the Multiplexer for Web conferences or the Client Connection Manager for chat sessions. The Redirector also load balances between all requests, sending the connections to whichever multiplexer or connection manager is available as appropriate.

The RTC Consoles communicate with the RTC Server over a bi-directional communication channel using XMPP/XMPPS protocols for instant messaging and a proprietary protocol (MX) for web conferencing that is securely tunneled through the standard firewall and proxy ports.

CONNECTION MECHANISMS AND FIREWALL TRAVERSAL

The RTC Web Conferencing and Oracle Messenger Consoles communicate with the RTC Server using one of the following methods, attempting them in the following order until successful:

- Direct connection – Clients within a corporate intranet connect directly to the RTC Redirector, which hands off connections to the Client Connection Manager (for instant messages) or RTC Multiplexer (for web conferences), using Jabber XMPP/XMPPS protocols for instant messaging, or proprietary protocols (MX) on TCP/IP or SSL for web conferences.
- HTTPS direct – Clients in the open Internet or across transparent proxies connect via HTTPS. The mod_immeeting plug-in uses the Oracle HTTP Server as the single listening point over port 443, then hands the socket off to the Client Connection Manager (for instant messages) or RTC Multiplexer (for web conferences).
- HTTPS Tunnel – Clients that are part of a different intranet and behind their own internal proxy connect via HTTPS Tunnel. The RTC Console client automatically retrieves the browser settings on the client machine and relies on the HTTP proxy's HTTPS CONNECT method to establish the connection via the RTC server's Oracle HTTP server and mod_immeeting to the Client Connection Manager (for instant messages) or RTC Multiplexer (for web conferences). Again the listening port is 443.

The following figure illustrates these three methods for connection.

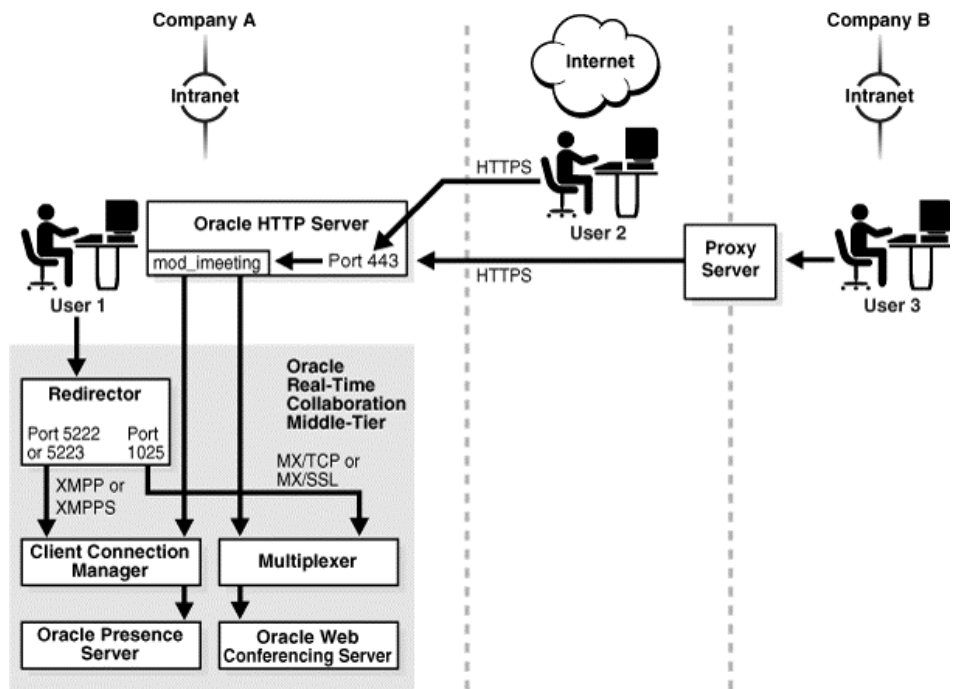


Figure 2. RTC Console Connections

In order to support user access across corporate firewalls, Oracle RTC requires an internet routable address for each of its middle tier servers running the core RTC server. These middle tiers only need to be accessible on the recommended standard HTTPS port, 443 (or any other HTTPS port of choice). This can typically be accomplished by deploying the RTC middle tiers either in the De-Militarized Zone (DMZ) or, alternatively, behind a Network Address Translator (NAT).

DEPLOYMENT

DEPLOYMENT OPTIONS

Oracle RTC supports various deployment options spanning from a single box system to several multi-box and, if needed, geographically distributed, systems.

- **Single-Box Deployment**

In a single box deployment, the Oracle RTC middle tier server as well as the Oracle Application Server 10g and Oracle Database 10g are installed on the same box. The optional voice and document conversion servers, if installed, would need to run on a second server.

- **Multi-Box Deployments**

The software components of Oracle RTC can be deployed across multiple servers. The Oracle Application Server 10g Infrastructure, the Oracle Database 10g and the Oracle RTC middle tier can each be deployed on a separate machine. Moreover, multiple instances of the Oracle RTC middle tier can be installed on multiple machines and will work in full synchrony behind a load balancer. Similarly, the Oracle Database 10g can be installed on multiple machines for high availability using the Real-Application Clusters (RAC) features of the database.

- **Geographically Distributed Deployments**

If multiple geographically distant corporate locations will use Oracle RTC, then a geographically distributed deployment with an Oracle RTC cluster for each location might be an optimal choice. With a geographic load-balancer, distant locations can benefit from a local Oracle RTC cluster and avoid unnecessary network latencies due to network traversal across geographies.

Figure 3 illustrates an Oracle RTC deployment with multiple middle tier boxes behind a load balancer. The Oracle Internet Directory and the Oracle RTC repository can reside in the same Oracle 10g database, which can be RAC-enabled for high availability.

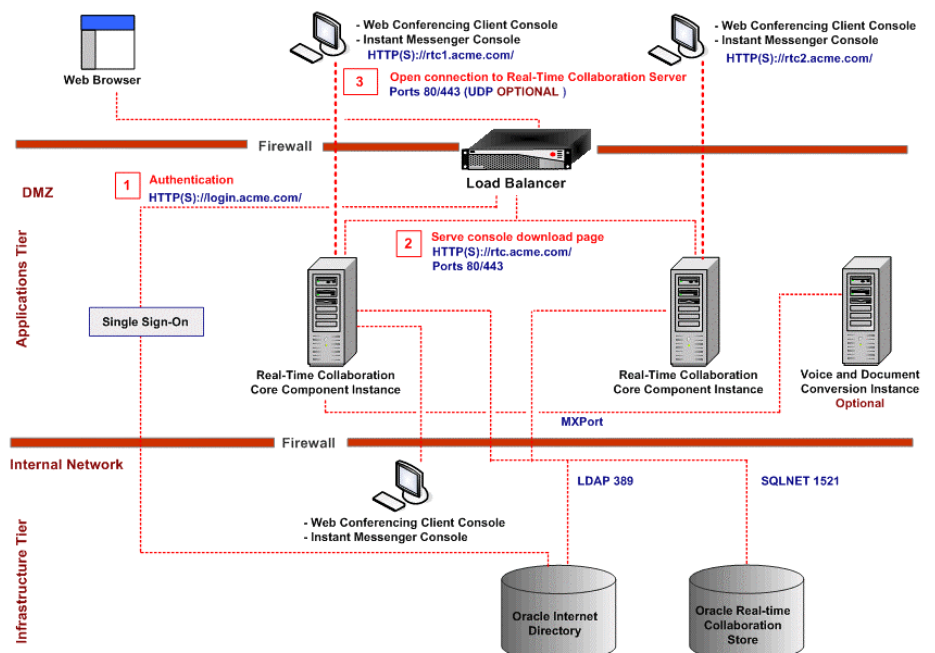


Figure 3: A Multi-Box Oracle RTC Deployment

BUSINESS INTEGRATIONS AND CUSTOMIZATIONS

A single deployment of Oracle RTC can be easily configured to meet the needs of various lines of business by creating individual a site, a logical view of the Oracle RTC system, for each line of business and customizing its properties. Oracle RTC functions can also be integrated into business applications by creating a site with which the integrating service can interact.

Sites are created by the administrator. For every site created, the integrating application or line of business uses a unique site ID when communicating with the Oracle RTC system to identify the relevant property settings. Integrating applications also use a unique token along with the site ID for authentication purposes.

Creating a site provides the following benefits to lines of business:

- Customized system, Web Client, conference, and messaging properties
- Support for custom integrated flows that can bypass the Web Conferencing Client pages or the Oracle Messenger contact window to start Web conferences, chat sessions, or chat conferences
- Support for custom Web Conferencing console behavior based on the properties set for the site
- Site-level reports that give the same depth and breakdown of data as the global Oracle Real-Time Collaboration site reports
- Custom user interfaces, including a separate application login page listing public conferences only for the specific site
- Custom branding to uniquely identify the integrating line of business

USER MANAGEMENT

Oracle RTC uses the Oracle Application Server *10g* Identity Management to manage users. The administrator can create user accounts and selectively provision users to access RTC functionality using the Oracle Internet Directory (OID), Oracle's LDAP-based directory. Once provisioned to use RTC, users can securely log in to RTC using Oracle's Single Sign-On (SSO) server.

The Registered User: A user registered and provisioned in the OID, has access to the entire end-user feature set of Oracle RTC. The **registered user** can schedule and hold conferences, send and receive instant messages, view and publish presence, or manage conference and message materials and archives. However, the registered user does not have access to any administrative tools and is denied access to any features that the administrator chooses to disable as part of the system or site configuration.

The Non-Registered User/Guest User: Oracle RTC provides the option to allow guest user access to a limited set of RTC features. **Guest users** are not registered in the OID and so cannot be authenticated. If an administrator chooses to enable guest user access, guest users can attend web conferences hosted by willing registered users and view related published archives. Similarly, guest users can participate in controlled instant messaging sessions with registered users. Guest user access is crucial for enabling real-time collaboration in certain business contexts such as remote customer support. However, the administrator can disable guest user access or limit it to the lines of business that need it within the enterprise as part of Oracle RTC's sites feature.

Oracle Internet Directory can be easily synchronized with major corporate LDAP directories facilitating quick user provisioning from existing directories that you may have.

Guest user access to limited RTC functionality can be enabled to facilitate real-time collaboration with users that are not registered and provisioned in the enterprise LDAP.

Controlled guest user access is crucial to enabling real-time collaboration in business contexts such as remote customer support and web seminars.

The Administrator Roles: In addition to basic provisioning in OID, an administrator that has access to the `rtctl` command-line functionality can assign administrative roles to certain registered users and share the administrative duties. A **Business Monitor**, **Business Administrator**, **Site Business Monitor** or a **Site Business Administrator** role grants a registered user access to some of Oracle RTC's web-based administrative tools.

- *The Business Monitor Role:* A registered user with this role has access to the **Monitor** and **Reports** tabs in the Oracle RTC web application. Through these tabs, the user can monitor web conferences in progress and view various system reports.
- *The Business Administrator Role:* A registered user with this role has access to the **Monitor**, **Reports**, **Sites** and **System** tabs in the Oracle RTC web application. The user can monitor web conferences in progress and view various system reports. Furthermore, the user can create sites and perform basic sites administration. The user can also monitor the status of the system, stop and start processes and check service availability.
- *The Site Business Monitor and Site Business Administrator Roles:* Registered users with these roles have the same access rights as the Business Monitor and Business Administrator users. However, the monitoring of web conferences, the report statistics and the site administration are limited to the specific site for which the role is granted.

SYSTEM MANAGEMENT AND ADMINISTRATION

Administrators of Oracle RTC can use several tools to manage the system.

- The **rtctl Utility** provides a command-line interface for administering and configuring the Oracle RTC system. The utility lets administrators:
 - Start, stop, or restart Oracle RTC instances
 - Configure system attributes, such as features available in conferences
 - Monitor the system
 - Run diagnostics on the system
 - Troubleshoot system issues
- The **Oracle Enterprise Manager Grid Control** is used to manage the Oracle components on which Oracle RTC depends. Grid Control can also be used to see various metrics about Oracle RTC, such as conference server usage, total memory used by Web conferencing, number of users using messaging, total CPU usage by Oracle RTC processes, and so forth.
- The **Oracle Enterprise Manager Application Server Control for Oracle Collaboration Suite** provides basic instance management operations, such as starting and shutting down an instance, configuring an Oracle RTC component, and viewing system statistics such as system up time, CPU usage, and memory usage.
- The **Real-Time Collaboration Monitoring Interfaces** are available to plug into any external management framework. With the interfaces, you can run service availability tests and get real-time monitoring data that can be collected periodically and used for historical analysis to tune the system.

- The **Oracle Real-Time Collaboration Administrative Web Pages** provide a web-based tool for monitoring the system, conferences in progress, creating and administering sites and viewing usage, feedback, security and quality of service reports.

SCALABILITY

Oracle RTC is easy and fast to scale up as well as to scale out. Multiple instances of Oracle RTC processes can run on the same server. In addition, multiple Oracle RTC middle tiers can be installed on the same or different servers and work together in full synchrony behind a load balancer.

Oracle RTC's scaling up capabilities include:

- The ability to run multiple instances of the Oracle RTC web conferencing server and the multiplexer within an Oracle RTC middle tier.
- The ability to run multiple instances of the communication manager process within an Oracle RTC middle tier to handle a higher number of Oracle Messenger connections.
- The ability to install multiple Oracle RTC middle tiers on the same server to provide higher redundancy across the entire set of middle tier processes.

Additional Oracle RTC middle-tier servers can be easily installed and added into an existing environment with little additional configuration. Oracle RTC will leverage the additional hardware automatically and balance its load across all middle tiers.

- When a user arrives at the Oracle RTC application pages in a multi-middle tiers environment, the load balancer directs the user to the application services module on one of the middle tiers. If the user starts a web conference, the application module will instruct the Oracle Web Conferencing Console to connect to a middle tier that is the least loaded. This mechanism allows additional middle tiers to be immediately and effectively used in running web conferences as soon as they are installed and configured. The same assignment process applies when web conferences are started through integration services.
- In load-balanced environments with multiple middle-tiers, the Oracle RTC Messenger communicates with the load balancer and obtains a map of available middle-tiers. It then connects to the communication manager on one of the available middle tiers using round-robin logic. This mechanism enables additional middle tier servers to be immediately and effectively used to service chat and messaging connections as soon as they are installed and integrated with the load balancer.

HIGH AVAILABILITY

Oracle RTC's high availability support includes automatic process monitoring, service availability monitoring and software and hardware redundancy.

AUTOMATIC PROCESS MONITORING

The Oracle RTC software monitors the health and availability of its own processes.

The Oracle Real-Time Collaboration Process Manager (rtcpm), a Java-based process that runs as a daemon, manages all Oracle RTC processes in an instance. In addition to accepting requests to start and stop processes via an http listen point, the process manager periodically pings all running Oracle RTC processes in an instance to check if the processes are active. Any processes that do not respond to the pings are automatically restarted.

The Process Manager is integrated with the Oracle Process Management and Notification system (OPMN), part of the Oracle Application Server 10g, at the time of installation. The OPMN system monitors the Process Manager and automatically restarts rtcpm if it appears to be inactive. The Process Manager can recover its state without affecting the processes that it was monitoring before it went down.

The Oracle RTC processes managed by the Process Manager are:

- The Oracle Web Conferencing Server (confsvr)
- The Client Connection Manager (connmgr)
- The Oracle Presence Server (imrtr)
- The Multiplexer (mx)
- The Redirector (rdtr)
- The Voice Proxy Server (voiceproxy)

The Oracle Presence Server, which provides the services required for instant messaging, chat conferences, and publishing presence of Oracle Messenger users, has a special availability requirement. Exactly one Oracle Presence Server process can be running at any given time even if the RTC deployment includes multiple middle tier servers. For automatic monitoring purposes, each presence server process in the Oracle RTC system has a special high-availability monitoring process associated with it. The monitoring process is started when the server process is started and will attempt to restart the presence server process if it goes down. If the monitoring process is not able to restart its presence server process, the monitoring process for the next available presence server will make its server the active process.

SOFTWARE AND HARDWARE REDUNDANCY

As discussed in the Deployment section of this document, Oracle RTC deployment architectures can include several identical middle tier servers running multiple instances of RTC processes in parallel and in synchrony. A similar hardware redundancy is supported for the voice and document conversion servers. Moreover, Oracle RTC supports database server redundancy through the Real-Application Clusters (RAC) feature of the database.

MONITORING SERVICE AVAILABILITY

In addition to automatically monitoring Oracle RTC processes, Oracle RTC provides several service availability tests that check the availability of the Oracle RTC services on individual Oracle RTC instances. Using the `rtctl runTests` command, the administrator can verify that each Oracle RTC instance can successfully provide the Oracle RTC services to users of the system. The service availability tests include:

- The Web Conferencing Test
- The Instant Messaging Test
- The Voice Conversion Test
- The Document Conversion Test
- The `mod_immeeting` Test (firewall traversal test)

In addition to the command line tool, the service availability tests can be run through a set of servlet APIs that can be used to integrate Oracle RTC with any third party monitoring system.

SECURITY

Oracle RTC security features extend from its underlying secure standards-based 10g architecture through to its administrative and end user preferences.

ACCESS TO FUNCTIONALITY

Access to the full RTC functionality is limited to registered authenticated users. Guest user access to a limited feature set can be enabled across the system or for specific lines of business. As mentioned in the User Management section of this document, guest user access is also subject to the consent of registered authenticated end users that own the collaborative web conference or chat session.

In line with the above policy, Oracle RTC clients are available to registered authenticated users only through the post-login Oracle RTC application web pages. The only exceptions are the Web Conferencing and Playback consoles, which are accessible to guest users if guest user access is enabled. The Web Conferencing console is downloaded automatically to a user's machine the first time the user joins a web conference. It is then automatically launched on subsequent conference joins.

The Oracle Web Conferencing console is digitally signed and verified. The first time the console is installed the user is prompted to accept the download, signed by Oracle Corporation.

All Oracle RTC clients can use the standard HTTPS port, 443, to connect to the servers. Third party messaging clients can be used to connect to Oracle RTC. However, the administrator would need to enable XMPP/XMPPS access and make the respective ports available through the corporate firewall. Please note that while the admin can make only the XMPPS port accessible, it is not a guarantee that third party clients would use SSL encryption when connecting to the XMPPS port.

SECURE COLLABORATION

In addition to providing the flexibility for collaboration modes to be enabled or disabled to meet enterprise, line of business or global IT security preferences, Oracle RTC provides functionality designed with user privacy and security in mind.

All Oracle RTC services preserve the privacy and ownership of users to their data and materials. For example, a host of a web conference can control what the attendees of

her conference can or cannot do during the conference and can decide whether or not to make any part of the conference archive available to attendees. Administrators of the system can only view technical conference information that is necessary for their assigned administrative tasks. They cannot intrude into the private space of a user running a web conference or a chat or voice session.

When a collaboration task involves sharing a view or control of a user's desktop with other users, Oracle RTC protects the privacy and ownership of the user whose machine is shared. For example, inside a web conference, the user whose desktop is shared, or the control to which is shared, is the ultimate user in control over what can be done on his desktop. The owner of a desktop can voluntarily share a part or the entire desktop with other users and can at anytime unshare the entire desktop. Similarly, a user can choose to provide shared control access to individual users within a conference (shared mouse and keyboard control) and at any time, the user can revoke the sharing rights from any users. Furthermore, the sharing authorizations are centrally controlled by the RTC server and coordinated over a proprietary protocol.

SECURE DEPLOYMENTS

Oracle RTC can be deployed securely behind corporate firewalls in the de-militarized zones (DMZ) or behind a network address translator (NAT) with access to RTC features available through the standard HTTPS port 443. Moreover, all client-server communications and access to the web application pages can be SSL encrypted.

SECURITY REPORT

The Oracle RTC administrative pages include a weekly generated security report that provides information about the encrypted and key-protected conferences held on the system versus those that were not protected by these mechanisms.

The report shows the count of various events for the current week and the percentage change over the previous week. Status arrow indicators let you easily see whether a metric trend is up or down. Graphs show the trend of the events over the past months.

The metrics captured in the report include:

- Conference Accessibility Statistics depending on the type of user invited to participate; all users, registered users only or registered users by invitation only
- Key-Protected Conference Statistics
- SSL-Encrypted Conference Statistics
- Security Statistics for Recorded Conferences, which show the number of conference recordings that are published, downloadable, or require a conference key in order to be viewed.

STANDARDS-BASED INTEGRATION SERVICES

Oracle RTC Integration Services bring real-time collaboration within the context of the business applications in an enterprise. These services provide easy, industry-standard methods for any application to tightly integrate with Oracle RTC and extend existing interfaces with real-time collaboration features.

Oracle RTC Integration Services have been designed to use industry-standard SOAP XML messages and HTTP protocol for integration with Oracle RTC. The architecture facilitates a single deployment of Oracle RTC in an enterprise to meet the requirements of all types of integrating applications. The integrating applications do not have to be co-located and managed by the same administrator as Oracle RTC.

All interfaces of Oracle RTC Integration Services are defined as Web-based services. These interfaces are implemented as a set of servlets that can be accessed using a URL. The parameters of the interfaces are sent as XML documents. These documents are sent as the payload of the HTTP request.

Invoking a servlet requires a client with the ability to construct and parse XML schemas and send the XML document over HTTP. However, there is no dependence on any specific XML library.

Oracle RTC Integration Services can be used by various groups ranging from Lines of business wanting to easily use real-time collaboration functionality from within the context of their applications to on-line support, sales and learning organizations wanting to provide live user assistance and on-line presentations and recordings.

For example, Oracle RTC integration services can be used to provide live help on corporate support websites, sales websites, marketing websites and virtually any other websites. A customer, unable to find the information or the product that matches his needs, can request assistance as easily as a mouse click. That can launch a thin web-based chat client on the customer side through which the customer can pose his question. Leveraging the group presence of Oracle RTC, the request gets routed to a group of specialists within the corporate organization that can provide the necessary support to the customer. The request gets added onto a queue along with other customer requests. Members of the group of specialists on the corporate side can in turn pick customer requests off the queue and engage in one-on-one chat sessions to help customers. If needed, the specialists can escalate the interactions into web conferences and directly walk customers through the corporate website or provide them with direct desktop support.

CONCLUSION

Oracle Real-Time Collaboration is a component in the Oracle Collaboration Suite. This functionality is offered by the Oracle Real-Time Collaboration (RTC) system. The RTC Software architecture consists of: User and Programmatic Access, Real-Time Collaboration Server, Repository, Application Server 10g Infrastructure, the optional Voice Conversion Server, and the option Document Conversion Server.

Users can access Oracle RTC functionality through the Web Conferencing console, the playback console, Oracle Messenger and the Oracle RTC Add-in for Microsoft Office. RTC Integration Services enable connection to the RTC services from any business applications using web services and software development kits. The RTC Server architecture uses a multi-threaded process and a process pool model to scale up on SMP machines. Oracle RTC supports various deployment architectures spanning from a single box system to several multi-box and, if needed, geographically distributed, systems. A single deployment of Oracle RTC can be easily configured to meet the needs of various lines of business by creating an individual site, a logical view of the Oracle RTC system, for each line of business and customizing its properties. Oracle RTC functions can also be integrated into business applications by creating a site with which the integrating service can interact. Oracle RTC is easy and fast to scale

out. Additional Oracle RTC middle-tier servers can be easily installed into an existing environment with little additional configuration. Oracle RTC security features extend from its underlying secure standards-based 10g architecture through to its administrative and end user preferences.

Oracle Real-Time Collaboration works with major LDAP-based directories for user management, requires no changes to firewall configurations, and consumes least amount of network bandwidth, supports and scales to the real-time collaboration needs of *all* enterprises.



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