Oracle9*i*

Database New Features

Release 1 (9.0.1)

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Oracle9*i* Database New Features, Release 1 (9.0.1)

Part No. A90120-01

Primary Authors: Cathy Baird, Gayle Geurin

Contributing Authors: Mark Niebur, Mark Townsend

Contributors: Lance Ashdown, Ruth Baylis, Ted Burroughs, Michele Cyran, Mark Kennedy, Paul Lane, Diana Lorentz, Colin McGregor, Jack Melnick, Rita Moran, Chuck Murray, James Rawles, Kathy Rich, Vivian Schupmann, Chitra Sharma, Richard Smith, Deborah Steiner, Simon Watt, Rick Wessman

Graphic Designer: Valarie Moore

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Preface

This book introduces the new features, new options, and enhancements of Oracle9*i* Database. It references documentation available for Oracle9*i*, and identifies deprecated or desupported features. A list of features and options by edition (Standard Edition, Enterprise Edition, and Personal Edition) is given in the Oracle9*i* Readme.

This preface contains these topics:

- Audience
- Organization
- Related Documentation
- Conventions
- Documentation Accessibility

Audience

Oracle9i Database New Features is addressed to people familiar with previous versions of the Oracle server who would like to become familiar with Oracle9*i* Database new features, enhancements, and new options.

Organization

This document contains:

Chapter 1, "Overview of Oracle9i"

This chapter introduces Oracle9*i*.

Chapter 2, "Oracle9i Database New Features"

This chapter describes the new features of Oracle9*i*.

Chapter 3, "Oracle9i Documentation"

This chapter lists documentation for Oracle9*i* and briefly describes the contents of each book.

Chapter 4, "Deprecated and Desupported Features"

This chapter describes Oracle features that are deprecated or desupported.

Appendix A, "Oracle8i Options and Features"

This appendix contains a summary of the options and features added in the Oracle8*i* release.

Appendix B, "Oracle8 Options and Features"

This appendix contains a summary of the options and features added in the Oracle8 release.

Related Documentation

Many of the examples in this book use the sample schemas of the seed database, which is installed by default when you install Oracle. Refer to *Oracle9i Sample Schemas* for information on how these schemas were created and how you can use them yourself.

In North America, printed documentation is available for sale in the Oracle Store at

```
http://oraclestore.oracle.com/
```

Customers in Europe, the Middle East, and Africa (EMEA) can purchase documentation from

```
http://www.oraclebookshop.com/
```

Other customers can contact their Oracle representative to purchase printed documentation.

To download free release notes, installation documentation, white papers, or other collateral, please visit the Oracle Technology Network (OTN). You must register online before using OTN; registration is free and can be done at

```
http://technet.oracle.com/membership/index.htm
```

If you already have a username and password for OTN, then you can go directly to the documentation section of the OTN Web site at

```
http://technet.oracle.com/docs/index.htm
```

Conventions

This section describes the conventions used in the text and code examples of this documentation set. It describes:

- Conventions in Text
- Conventions in Code Examples

Conventions in Text

We use various conventions in text to help you more quickly identify special terms. The following table describes those conventions and provides examples of their use.

Convention	Meaning	Example
Bold	Bold typeface indicates terms that are defined in the text or terms that appear in a glossary, or both.	When you specify this clause, you create an **index-organized table**.
Italics	Italic typeface indicates book titles or emphasis.	*Oracle9i Database Concepts*
		Ensure that the recovery catalog and target database do *not* reside on the same disk.

Convention	Meaning	Example
UPPERCASE monospace (fixed-width font)	Uppercase monospace typeface indicates elements supplied by the system. Such elements include parameters, privileges, datatypes, RMAN keywords, SQL keywords, SQL*Plus or utility commands, packages and methods, as well as system-supplied column names, database objects and structures, usernames, and roles.	You can specify this clause only for a NUMBER column. You can back up the database by using the BACKUP command. Query the TABLE_NAME column in the USER_TABLES data dictionary view. Use the DBMS_STATS.GENERATE_STATS procedure.
lowercase monospace (fixed-width font)	Lowercase monospace typeface indicates executables, filenames, directory names, and sample user-supplied elements. Such elements include computer and database names, net service names, and connect identifiers, as well as user-supplied database objects and structures, column names, packages and classes, usernames and roles, program units, and parameter values. **Note:** Some programmatic elements use a mixture of UPPERCASE and lowercase. Enter these elements as shown.	Enter sqlplus to open SQL*Plus. The password is specified in the orapwd file. Back up the datafiles and control files in the /disk1/oracle/dbs directory. The department_id, department_name, and location_id columns are in the hr.departments table. Set the QUERY_REWRITE_ENABLED initialization parameter to true. Connect as oe user. The JRepUtil class implements these methods.
lowercase monospace (fixed-width font) italic	Lowercase monospace italic font represents placeholders or variables.	You can specify the *parallel_clause*. Run U*old_release*.SQL where *old_release* refers to the release you installed prior to upgrading.

Conventions in Code Examples

Code examples illustrate SQL, PL/SQL, SQL*Plus, or other command-line statements. They are displayed in a monospace (fixed-width) font and separated from normal text as shown in this example:

```
SELECT username FROM dba_users WHERE username = 'MIGRATE';
```

The following table describes typographic conventions used in code examples and provides examples of their use.

Convention	Meaning	Example
[ ]	Brackets enclose one or more optional items. Do not enter the brackets.	`DECIMAL (digits [ , precision ])`
{ }	Braces enclose two or more items, one of which is required. Do not enter the braces.	`{ENABLE	DISABLE}`
|	A vertical bar represents a choice of two or more options within brackets or braces. Enter one of the options. Do not enter the vertical bar.	`{ENABLE	DISABLE}`  `[COMPRESS	NOCOMPRESS]`

...	Horizontal ellipsis points indicate either:
	
	■ That we have omitted parts of the code that are not directly related to the example
	
	■ That you can repeat a portion of the code
		`CREATE TABLE ... AS subquery;`
		
		`SELECT col1, col2, ... , coln FROM employees;`

. . .	Vertical ellipsis points indicate that we have omitted several lines of code not directly related to the example.	

Other notation	You must enter symbols other than brackets, braces, vertical bars, and ellipsis points as shown.	`acctbal NUMBER(11,2);`
		
		`acct    CONSTANT NUMBER(4) := 3;`

Italics	Italicized text indicates placeholders or variables for which you must supply particular values.	`CONNECT SYSTEM/system_password`
		
		`DB_NAME = database_name`

UPPERCASE	Uppercase typeface indicates elements supplied by the system. We show these terms in uppercase in order to distinguish them from terms you define. Unless terms appear in brackets, enter them in the order and with the spelling shown. However, because these terms are not case sensitive, you can enter them in lowercase.	`SELECT last_name, employee_id FROM employees;`
		
		`SELECT * FROM USER_TABLES;`
		
		`DROP TABLE hr.employees;`

Convention	Meaning	Example

lowercase	Lowercase typeface indicates programmatic elements that you supply. For example, lowercase indicates names of tables, columns, or files.
	
	Note: Some programmatic elements use a mixture of UPPERCASE and lowercase. Enter these elements as shown.
		`SELECT last_name, employee_id FROM employees;`
		
		`sqlplus hr/hr`
		
		`CREATE USER mjones IDENTIFIED BY ty3MU9;`

Documentation Accessibility

Oracle's goal is to make our products, services, and supporting documentation accessible to the disabled community with good usability. To that end, our documentation includes features that make information available to users of assistive technology. This documentation is available in HTML format, and contains markup to facilitate access by the disabled community. Standards will continue to evolve over time, and Oracle is actively engaged with other market-leading technology vendors to address technical obstacles so that our documentation can be accessible to all of our customers. For additional information, visit the Oracle Accessibility Program Web site at

`http://www.oracle.com/accessibility/`

JAWS, a Windows screen reader, may not always correctly read the code examples in this document. The conventions for writing code require that closing braces should appear on an otherwise empty line; however, JAWS may not always read a line of text that consists solely of a bracket or brace.

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Overview of Oracle9*i*

This chapter presents an overview of the Oracle9*i* Database. It contains the following sections:

- Introducing Oracle9i
- Oracle9i Database New Features

Introducing Oracle9*i*

Oracle9*i* takes business where it needs to be: meeting and exceeding stringent demands for high-quality service in a service-driven marketplace. Oracle9*i* is designed to optimize traditional, internet and intranet applications, and to stimulate the emerging hosted application market on the internet.

Oracle9*i* builds on historic strengths to offer the first complete *and* simple software infrastructure for the internet's next generation of intelligent, collaborative applications. The Oracle9*i* new features expedite delivery of critical performance, scalability, and availability essential to providing hosted service software for anyone, anywhere, anytime.

Oracle9*i* architecture is depicted in Figure 1–1.

Figure 1–1   Oracle9i Architecture
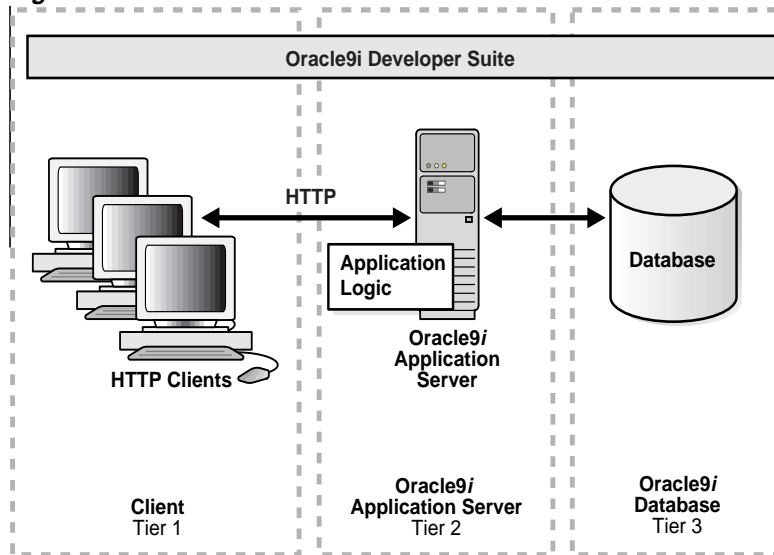
Oracle9*i* components include the following:

- Oracle9i Database

- Oracle9i Application Server

- Oracle9i Developer Suite

Oracle9*i* Database

The Oracle9*i* Database introduces the following advanced and automated design features that refine Oracle9*i* Application Server and Oracle9*i* Developer Suite to optimize performance for traditional applications and the emerging hosted application market.

Oracle9*i* Real Application Clusters

The next evolutionary step after Oracle Parallel Server, Oracle9*i* Real Application Clusters provides out-of-the-box, linear scaling transparency, compatibility with all applications without redesign, and the ability to rapidly add nodes and disks.

Systems Management

Integrated system management products create a complete view of all critical components that drive e-business processes. From the client and application server to the database and host, Oracle9*i* quickly and completely assesses the overall health of an e-business infrastructure.

High Availability

Setting a new standard for high availability, Oracle9*i* introduces powerful new functionality in areas of disaster recovery, system fault recovery, and planned downtime.

High Security

Oracle9*i* offers the most secure internet platform for protecting company information through multiple layers of security for data, users, and companies. Included are features for building internet-scale applications, for providing security for users, and for keeping data from different hosted user communities separate.

Oracle9*i* Application Server

Recognized as the leading application server for database-driven Web sites, Oracle9*i* Application Server offers the industry's most innovative and comprehensive set of middle-tier services.

Comprehensive Middle-tier Services

Continued innovation within comprehensive middle-tier services, ranging from self-service enterprise portals, to e-stores and supplier exchange, sustains the

Oracle9*i* Application Server as the industry's preferred application server for database-driven Web sites.

New Caching Technology

The new caching technology in Oracle9*i* can dramatically increase Web site performance, scalability, and availability. Greater numbers of users can be provided with more personalized, dynamic Web content without adding more application or database servers.

Scalability and Performance

Superb scalability and performance now is made available for all Web applications. Oracle Portal services make it easy for Web site developers to deploy enterprise portals with centralized management and unified security. Standard Java, with rich XML and content management support, as well as back-office transactional applications built using Oracle Forms Developer, can easily be deployed.

Wireless Device Access

Information in any database or internet application is easily available through Oracle9*i*. Support for each wireless device's specific markup language is no longer necessary.

Business Intelligence

Oracle9*i* Application Server has built-in reporting and ad hoc query functionality to derive business intelligence after Web site deployment.

Oracle9*i* Developer Suite

Oracle Internet Developer Suite combines leading Oracle applications development tools, business intelligence tools, and enterprise portal building tools in a single, integrated product. Built on internet standards such as Java, XML, CORBA, and HTML, the Oracle Internet Developer Suite provides a high-performance development environment with tools needed to respond to rapidly changing markets and user demands.

Extensive Development Alternatives

Oracle Internet Developer Suite tools are suitable for any kind of development approach, including component-based development, Java coding, and visual modeling, and offer rapid application development based on 4GL. Applications can

be developed for all clients, including High Productive Java Client, Universal HTML Client, and Anywhere Mobile Client.

Tools

Oracle Internet Developer Suite tools include: Oracle Forms Developer; Oracle Designer; Oracle JDeveloper and Business Components for Java; Oracle Reports Developer; and Oracle Discoverer.

Other Features

All applications are single, middle-tier deployable with an Oracle9*i* Application Server. Oracle Portal is available for an integrated, personalized portal view with all applications. Integrated business intelligence for enterprise reporting and ad-hoc query is available.

Oracle9*i* Database New Features

Important new features are introduced with the release of the Oracle9*i* Database, including advancements in Real Application Clusters, systems management, availability, scalability, and security.

Summaries of primary new features are introduced in this chapter and organized according to users' interests and requirements. Links are given to Chapter 2, "Oracle9i Database New Features", where a greater number of new features are described in detail.

Availability

Oracle9*i* dramatically extends Oracle's leadership in Internet database availability, which is critical for any e-business application. Key areas in Oracle9*i* include:

Enhanced Disaster Recovery Environment

Many tasks for managing a standby database are now automated. LogMiner now supports log queries based on changes and has comprehensive log analysis for additional datatypes, plus an easy-to-use graphical user interface.

Online Data Evolution

Oracle9*i* contains a new online reorganization and redefinition architecture that allows much more powerful reorganization capabilities, including an online CREATE TABLE AS SELECT operation.

Precision Database Repair

Oracle9*i* includes better prevention and improved handling of disk corruption, and is able to restore the database to a consistent state after recovery.

Scalability

Oracle9*i* allows e-business to scale the most demanding e-business applications with intensive transactions loads. Key areas include:

Increased Transaction Throughput on Oracle9i Real Application Clusters

Scalability opportunities are increased with little or no performance cost through Oracle9*i* Real Application Clusters. Customers can horizontally scale the database tier as needed.

Scalable Session State Management

The footprint required for each user on Oracle9*i* is substantially reduced, allowing more users to be hosted on the same, or larger, hardware platforms.

Fine-Grained, Automatic Resource Management

Administrators gain more granular control over resources through new features, and can specify the maximum active sessions per consumer group.

Performance

Oracle9*i* is the continued performance leader in all relevant areas. Measurement and tuning projects continue to improve Oracle9*i* runtime performance. A major focus performance improvements in Oracle9*i* are in areas critical for e-business.

Native Compilation and Improved PL/SQL Optimization

Support for native compilation and optimization of PL/SQL improves performance of many business applications.

Latch Contention Improvements

 Oracle9*i* includes general I/O improvements, as well as latch contention issues affecting highly active systems.

Enhanced Java Performance

Various improvements contribute to enhanced Java performance.

Network and Distributed Database Performance

Network and distributed database performance has been improved by database-to-database communication with OCI.

Security

Oracle9*i* continues to provide the most secure application development and deployment platform in the industry. Key areas include:

Strong Three-Tier Security

Three-tier security is enhanced by proxy authentication, including credential proxy of X.509 certificates or distinguished names (DN), support for thick JDBC, connection pooling for application users (thick and thin JDBC and OCI), and integration with LDAP.

Security for Hosting Environments

Hosting security is provided through enhancements in Virtual Private Database (VPD), fine-grained auditing, and Web-based single sign-on.

Standards-Based Public Key Infrastructure (PKI)

PKI includes support for PKCS#12 certificates, which enable existing PKI credentials to be shared by an Oracle Wallet, thus reducing PKI deployment costs and increasing interoperability.

Improved User and Security Policy Management

A large number of enhancements have been made in areas ranging from management of network naming and password-based user management to new replication queue management and reconciliation tools.

Data Encryption and Label Security

Oracle Label Security provides an out-of-the-box fine-grained access control solution. Encryption enhancements support most popular algorithms for encryption and data integrity.

Development Platform for Developing E-Business Applications

Oracle9*i* continues to offer the best development platform for e-business and traditional application development. Key areas include:

Enterprise Java Engine

The Oracle9*i* JVM (previously JServer) embedded in both Oracle9*i* and Oracle *i*AS allows reliable, flexible, scalable, and secure e-business applications deployment.

Oracle XML Developer's Kit

Several enhanced database operations store XML in Oracle9*i* through SQL and render traditional database data as XML. Included is a native XML datatype These functionalities are required to support e-business, packaged applications, and Internet content management.

SQL and PL/SQL Improvements

Among the many SQL and PL/SQL improvements are multilanguage server-side debugging and support for inheritance and multilevel collections, which make it possible to build complex models inside the database.

Manageability

Management is one of the key areas of improvement for Oracle9*i*, and now, all essential management functions can be managed from a Web browser. You can use the Oracle9*i* management approach to do the following tasks:

Database Self-Management

Oracle9*i* databases can manage their own undo (rollback) segment. Dynamic memory management improvements allow buffer cache and shared pool resizing, providing advisories to help size the SGA for optimal database performance.

Streamlined Operational Management of the Database

Traditional management areas of the database are also improved, including parameter initialization persistence across multiple shutdowns, which is of immense help in database performance tuning.

Simplification of Oracle9i Administration Through Oracle Enterprise Manager

Many features have been automated to streamline operational processes through self management and tuning. Oracle Enterprise Manager has been enhanced to include guided, expert diagnostics and problem resolution. All essential management functions can be managed from a Web Browser.

Management of the Oracle Stack Through Oracle Enterprise Manager

Administrators can monitor the response of their entire Oracle-based system and ensure meeting required business service level agreements. This capability is critical to any business that must maintain superior response time, performance, and availability of their IT systems.

Windows Integration

Oracle9*i* continues to lead as the platform of choice for organizations using Windows 2000. Key areas include the following:

Integration Capabilities

Oracle9*i's* PKI infrastructure and single sign-on capabilities have also been well integrated with Windows 2000, Active Directory, and Microsoft Certificate Store. Oracle9*i* supports better integration with Microsoft Transaction Services, Microsoft Message Queuing and Internet Information Services.

Development and Deployment Improvements

For Windows developers, Oracle9*i* offers an enhanced native OLE DB provider. XML, COM+ Events, and Oracle9*i* extensions have been supported through Oracle Data Objects for Windows (formerly Oracle Objects for OLE).

Internet Content Management

Oracle9*i* allows customers to store, manage, and aggregate all types of multimedia content into a single database. Oracle9*i* significantly enhances the capabilities of the Oracle8*i* database to serve as a platform to create, manage, and deliver internet content. Key areas include the following:

Storage, Management, and Aggregation of All Types of Content

Oracle9*i* includes the version 1.2 release of the Oracle Internet File System (*i*FS), a revolutionary extension to the Oracle database that provides the best of both the relational database and file system worlds.

Efficient Searching and Indexing of All Types of Content

Oracle9*i* adds Internet search, powerful facilities to extract and index metadata from rich content, and the ability to search XML and catalog structures.

Collaborative Projects

Oracle9*i* adds the ability to create shared workspaces to support collaborative, long-duration projects. Multiple, concurrent database-backed projects can coexist simultaneously against different versions of content.

Location-Enabled, Mobile-Ready Content

For e-business and mobile applications, Oracle9*i* and Oracle Spatial offer the ability to search, index, and deliver data based on the location attributes of the content or the proximity.

E-Business Integration

Oracle9*i* introduces new e-business products and technologies. Key areas include the following:

Provides a Standard Infrastructure

Oracle9*i* includes a set of pre-developed, pretested, and pre-integrated business service objects developed in Java and compliant with J2EE, which are used to create nine storefronts, exchanges and portals. This enables faster time to market for customers, and allows development and integration of Web-based storefronts, exchanges and hosted applications.

Supports Industry Standard Business Messaging Formats

Oracle9*i* provides a standard infrastructure that makes it easier for customers to integrate storefronts, exchanges, and portals with other backend and external systems.

Packaged Applications

Oracle9*i* packaged applications include new features that more fully enable globalization and improve deployment and hosting.

Database Globalization

Oracle9i significantly reduces the cost of developing and deploying applications globally on a single database instance. Developers now can develop fully globalized applications by setting up or migrating their database character set to UTF8 to support multiple languages simultaneously.

Development Features for Independent Software Vendors

Oracle9*i* continues to be the best platform for independent software vendor development, deployment, hosting, and migration. Enhancements to stored outlines and default column values allow improved deployment and hosting of packaged applications.

Business Intelligence

Oracle9*i* continues to provide the best platform support for business intelligence in medium to large-scale enterprises, focusing especially on challenges raised by the large volume of data and the need for near real-time complex analysis in an e-business environment.

Performance, Scalability, and Manageability

Oracle9*i* offers considerable new enhancements in each of these areas. For example, partitioning capabilities have been expanded to support list partitioning, which allows explicit control over how rows map to partitions. A list of discrete values can be specified for the partitioning column in the description for each partition.

Integrated Analysis and Personalization Capabilities

Oracle9*i* provides ground-breaking new functionality in three areas:

- online analytical processing (OLAP)
- Extraction, transformation and loading (ETL)
- Data mining

> **See Also:** Oracle9*i* ReadMe for new features and options by edition

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Oracle9*i* Database New Features

This chapter discusses Oracle9*i* Database new features and describes their relevance to the Oracle9*i* Application Server and Oracle9*i* Development Suite. New features are organized to report advancements in the categories listed below.

- Availability

- Scalability

- Performance

- Security

- Manageability

- Development Platform for E-Business Applications

- Windows Integration

- Internet Content Management

- E-Business Integration

- Packaged Applications

- Business Intelligence

- Other Oracle9i New Features

Oracle9*i* Database

The Oracle9*i* Database contains important new features that optimize traditional business applications, facilitate critical advancement for internet-based business, and stimulate the emerging hosted application market. New Oracle9*i* Database features deliver the performance, scalability, and availability essential to hosted service software made available to anyone, anywhere.

The Oracle9*i* Database offers new transparent, rapid growth clustering capabilities, along with powerful and cost-effective security measures, zero-data-loss safeguards, and real-time intelligence to deliver the power needed in today's dynamic marketplace.

Availability

Oracle9*i* extends Oracle's leadership in internet database availability, which is critical for any e-business application. Key areas in Oracle9*i* include the following:

- Enhanced Disaster Recovery Environment
- Online Data Evolution
- Precision Database Repair

Enhanced Disaster Recovery Environment

Oracle9*i* sets a new standard for high availability with the introduction of four powerful new features that protect against the most disruptive event an e-business can encounter: downtime. New features provide protection in the following areas:

- Disaster Recovery
- System Fault Recovery
- Human Error Safeguards
- Planned Downtime

Disaster Recovery

Oracle9*i* offers many new features for disaster recovery. Key areas include the following:

LogMiner   LogMiner provides the information necessary for performing recovery operations, tuning, and capacity planning. The Oracle9*i* LogMiner utility makes it possible to query redo log files, both online and archived, through a SQL interface.

LogMiner provides optional tracking of DDL statements, the ability to limit queries to committed transactions, and the ability to perform queries based on actual data values.

LogMiner has also been enhanced in Oracle9*i* to provide comprehensive log analysis for additional datatypes. LogMiner now supports the following:

- Clustered tables
- Chained and migrated rows
- `LOB` and `LONG` datatypes
- Direct loads
- Scalar object types
- Data definition statements (DDL)

LogMiner also displays the primary key and supports queries on the logs based on the content of changes (for example, show all changes to an employee named Smith).

A new graphical user interface as well as other database features make the product easier to learn and use.

Oracle9*i* LogMiner Viewer The Oracle LogMiner Viewer provides an easy-to-use graphical user interface to the Oracle9*i* LogMiner. The LogMiner GUI may be used to query online and archived redo log files to analyze the activity that has taken place in a database. Users can select redo log files, specify filters to be applied to the data, view query results and save the query and results for future use. Oracle LogMiner View is a component of Oracle Enterprise Manager.

> **See Also:** *Oracle9i Database Administrator's Guide* for more information about LogMiner

Oracle9*i* Data Guard The Oracle9*i* Data Guard gives customers new tools for fast recovery in disaster situations through complete, simple, and fully automated "graceful switchover," which makes the former primary usable as the new standby and allows the production processing to be switched back at any time. Data Guard is developed to address real-world failure scenarios, minimizing the need for administrative intervention.

Data Guard Monitoring and Automation The Oracle9*i* Data Guard Broker introduces an important advancement in physical standby database management through automated monitoring and control features. Previously, switching to the standby

database had been a highly complex administrative task, and switch-back had been very difficult. Data Guard now presents a primary and its standby system as one environment, thus unifying configuration, monitoring and control. Oracle9*i* Data Guard continually monitors both the primary and standby databases.

Zero Data Loss Log Transport   Oracle9*i* Data Guard maintains a physical standby database that assures no loss of data during log transport. Log file updates are synchronously written directly from the primary database to the physically identical standby database, making it fully up-to-date at the point of failure in any disaster recovery situation. During log file updates, only log entries for the current transaction are stopped, instead of the entire log file. This "no-loss" disaster recovery solution makes third-party products that mirror online redo logs unnecessary.

Delayed Mode   Delayed mode guards against database administrator mistakes by enabling a time lag that protects against the application of corrupted or erroneous data from the primary to the standby database. Under most circumstances, the standby database automatically applies achieved redo logs by default when they arrive from the primary database. Delayed mode bypasses this default to protect data in the standby database.

System Fault Recovery

Oracle9*i* provides fast recovery with products improved by the following new features:

Real Application Clusters: Within-seconds Failover   Clustered architecture provides better availability than a single-node configuration by diminishing the server as a single point of failure. In a two-node clustered configuration, a system crash on one node allows the application to continue running on the surviving node. Using Oracle9*i* Real Application Clusters, failover of operations from a failed primary node to a secondary node occurs automatically within seconds, minimizing impact on application and data availability.

Oracle Application Clusters Guard   Oracle Application Clusters Guard, formerly Oracle Parallel Failsafe, is an enhanced configuration of Oracle9*i* Real Application Clusters. It tightly integrates enhanced recovery features with the cluster framework of the platform to provide a configuration that leverages the best high-availability technology each partner has to offer.

The Oracle Application Clusters Guard architecture is designed to build on the strengths of traditional high-availability solutions and provide the following functions:

- Automated, fast recovery and bounded recovery time from instance failures.

- Automatic capture of diagnostic data when certain types of failures occur.

- Enforced primary and secondary configurations. Clients connecting through Oracle Net Services are properly routed to the primary node even if connected to another node in the cluster.

- Elimination of delays experienced when reestablishing connections after a failure.

Oracle9*i* Fail Safe: Four-Node Failover Oracle9*i* Fail Safe Configuration for Windows provides the high availability and protection from system failures e-businesses demand on Windows NT and Windows 2000 clustered architectures. Oracle9*i* Fail Safe provides failover processes for database and application servers in both 2- and 4-node Windows NT and Windows 2000 clusters.

Fast-Start Fault Recovery Oracle9*i* introduces an enhancement to Fast-Start Fault Recovery that allows database administrators to specify the expected mean time to recover (MTTR), which is the expected amount of time Oracle takes to recover a single instance.

Fast Instance Freeze and Resume A common challenge facing database administrators is the trade-off between identifying the cause of a failure and ensuring that normal service is resumed as soon as possible. By invoking Flash Freeze, the database administrator can take a diagnostic snapshot of the entire system at the time of failure, quickly restart the database, then make a diagnostic analysis offline.

Human Error Safeguards

Oracle9*i* eases the challenge of failures or downtime due to human errors, including erroneous or out-of-sequence updates.

Oracle9*i* Flashback Query Oracle9*i* Flashback Query lets users and applications query data as it appeared in the past. Using this flashback parameter, a user can specify a date and time, then issue standard queries on the data as it appeared on the specified time. Once the errors are identified, undoing the updates is a straightforward process that can be done without intervention from the database

administrator. More importantly, the restoration can be achieved with no database downtime.

Comprehensive Log Analysis Identification of updates is also achieved by analyzing of the database log files. Oracle9*i* LogMiner is a utility that allows log files, online or archived, to be read, analyzed, and interpreted using a SQL interface. By using Oracle9*i* LogMiner, database administrators can now examine all updates to the database, including all data manipulation, definition, and administration commands.

Resumable Space Allocation Certain large, long-running operations such as data uploads and complex update processes may run out of resources (disk space, for example) before completion. Unsuccessful completion of long-running operations can be time-consuming to resolve. Oracle9*i* addresses this challenge by enabling database administrators to suspend operations that cannot be completed. Once the operation has been suspended, the database administrator can resolve the resource issue, then allow the statement to resume from the point of interruption.

Planned Downtime

Oracle9*i* allows comprehensive planned maintenance operations, which previously required downtime, to run during normal usage.

Online Schema Changes Oracle9*i* provides the mechanism to redefine the table structures while keeping them online and fully accessible to users and applications.

Online Table and Index Reorganization Oracle9*i* also provides a simple mechanism to reorganize and redefine tables while keeping them online and available to application users. Oracle9*i* online table and index reorganization reduces planned downtime, increases application availability, reduces disk fragmentation, and improves application performance.

Complete Online Index Operations With Oracle9*i*, all table indexes can be created and re-created online. With this capability, users can continue to run their applications during table index creation.

Dynamic Database Parameters Oracle9*i* database parameter settings that affect database server memory use can now be reset online. This allows the database administrator to take databases offline and then restart them for parameter settings to take effect.

Online Data Evolution

Oracle9*i* contains a new online reorganization and redefinition architecture that allows much more powerful reorganization capabilities. Administrators can now perform a variety of online operations to table definitions, including online reorganization of heap-organized tables. This makes it possible to reorganize a table while users have full access to it.

New Online Architecture

Oracle9*i* now allows an online CREATE TABLE AS SELECT operation. In this new architecture, contents of a table are copied into a new table. While the contents are copied, updates to the original table are tracked by the database. After the copy is made, updates are applied to the new table.

After the updates are applied, indexes can be created on the new table. After indexes are created, any additional updates are applied and the result table replaces the original table. The table is only locked in exclusive mode, very briefly, at the beginning and end of the operation, when the dictionary data is updated.

This new online architecture provides the following capabilities:

- Any physical attribute of the table can be changed online. The table can be moved to a new location. The table can be partitioned. The table can be converted from one type of organization (such as a heap-organized) to another (such as index-organized).

- Many logical attributes can also be changed. Column names, types, and sizes can be changed. Columns can be added, deleted, or merged. One restriction is that the primary key of the table cannot be modified.

- Online creation and rebuilding of secondary indexes on index-organized tables (IOTs is supported. Secondary indexes support efficient use of block hints (physical guesses.) Invalid physical guesses can be repaired online.

- Indexes can now be created online and analyzed at the same time. Online Fix-up of Physical Guess component of logical ROWIDs (used in Secondary Indexes and Mapping Table on Index-Organized Tables) also can be used.

- A new capability can fix the physical guess component of logical ROWIDs stored in secondary indexes (on index-organized tables). This allows online repair of invalid physical guesses

Other New Capabilities

Administrators can also rapidly quiesce the database to perform operations that demand no active transactions. Also, with Oracle9*i,* the buffer cache and the shared pool can be resized dynamically. Oracle9*i* can also validate the structure of an object (`ANALYZE VALIDATE`) while the object is online and accessed by users.

Precision Database Repair

Oracle9*i* includes better prevention and improved handling of log file corruption, reducing the risk of extended downtimes due to these failures. It is able to restore the database to a consistent state after log corruption is detected during recovery. If corruption needs to be repaired through media recovery, a new block media recovery feature allows only the corrupt blocks to be recovered while the remainder of the table is online.

Rapid Crash Recovery

Oracle9*i* can also recover from crashes more quickly using a new two-pass recovery algorithm that ensures that only the blocks that need to be processed are read from and written to the datafiles. A new time-based mean time to recover (MTTR) parameter also makes it much easier to set a limit on crash recovery time.

Improved Failed State Diagnostics

Oracle9*i* also includes improved diagnosis of a failed instance and allows diagnostics to be read after recovery on the failed state. This helps diagnose the cause of the failure after its first occurrence, rather than requiring users to set events that capture data in future failures.

Faster Failure Detection

For multi-node systems, Oracle9*i* provides faster failure detection, for instance, node and network failures, and reconfiguration for Oracle9*i* Real Application Clusters, reducing downtime due to a system fault.

Oracle Fail Safe Enhancements

Oracle Fail Safe for Windows has been enhanced to take advantage of multi-node clusters, using the enhanced functionality of Windows 2000. This allows for configurations where multiple databases on multiple nodes share a common backup node, reducing the cost of providing redundancy to multiple applications.

See Also:

- *Oracle9i Real Application Clusters Concepts*

- *Oracle9i Real Application Clusters Deployment and Performance*

- *Oracle9i Real Application Clusters Installation and Configuration*

- *Oracle9i Real Application Clusters Administration*

- *Oracle Fail Safe Concepts and Administration Guide*

- *Oracle9i Backup and Recovery Concepts* for more information about MTTR

- *Oracle9i Database Administrator's Guide* for information about detecting and fixing block corruptions

- *Oracle9i Application Developer's Guide - Fundamentals*

Scalability

Oracle9*i* makes it possible to scale the most demanding e-business applications with intensive transaction loads, and thus support large populations of Internet users. Key areas of advancement include the following:

- Increased Transaction Throughput on Oracle9i Real Application Clusters

- Scalable Session State Management

- Fine-Grained, Automatic Resource Management

Increased Transaction Throughput on Oracle9*i* Real Application Clusters

The new phase of Cache Fusion, as well as a new clustered file system, allows customers to take advantage of the scalability provided by Oracle9*i* Real Application Clusters with little or no performance overhead. Oracle9*i* Real Application Clusters is the next evolutionary step up from Oracle Parallel Server.

Because the full Cache Fusion implementation in Oracle9*i* eliminates the latencies associated with disk-based cache coordination, applications can scale effectively without having to be cluster-aware. By using the collective caches of all the nodes in the cluster to satisfy database requests, Oracle9*i* Real Application Clusters provide these unique capabilities:

- Out-of-the-box linear scaling transparency

- Compatibility with all applications, with no redesign required

■ Fast-growth clusters: the ability to rapidly add nodes and disks

Cache Fusion Architecture

In the Cache Fusion architecture, read requests can be served by any of the memory caches in the cluster database. When data is being updated, coordination between the caches of each server becomes necessary so that both the data being read and the data being updated are consistent and correct.

Automatic "Fusing of Caches"   If the query request is served by a remote cache, then the block is transferred across the high speed cluster connection from one node's cache to another. This "fusing of the caches" happens automatically and is transparent to the application. This process is the key technology that provides fast, efficient scaling of Real Application Clusters.

Reduces Disk I/O   Query requests can now be satisfied by the local cache or any of the other caches. This reduces disk I/O. Update operations do not require disk I/O for synchronization because the local node can obtain the needed block directly from any of the cluster database node caches. Expensive disk I/Os are performed only when none of the collective caches contain the necessary data and when an update transaction performs a `COMMIT` operation that requires disk write guarantees. This implementation effectively expands the working set of the database cache and reduces disk I/O to dramatically speed up database operation.

Cluster Treated as Scalable Single System   Oracle9*i* Cache Fusion directly ships data blocks from one node's cache to another node's cache when there is read/read, write/read, and write/write contention. This builds on the previous Oracle8*i* Cache Fusion implementation that handled read/write contention. This is the first time in an off-the-shelf application that a cluster can be treated as a truly scalable single system.

Additional New Features for Oracle9*i* Real Application Clusters

Oracle9*i* Real Application Clusters has the following additional new features and improvements:

■ The ability of the Server Management (SRVM) component of Oracle Enterprise Manager to discover, start up, and shut down Oracle9*i* Real Application Clusters.

■ Oracle Enterprise Manager has a console with 23 new statistical charts.

■ Integration of Oracle Intelligent Agent on all instances allows Server Management to add, remove, or rename instances.

- Scalable inter-instance messaging is available with multiple Global Cache Service Processes (LMS*n*).

- A new persistent initialization parameter file allows different parameter settings for different instances.

- Extension of automatic undo management from single instance Oracle to Oracle9*i* Real Application Clusters.

- Revisions to Auto Discovery methodology, including Java implementation of the Global Services Daemon for UNIX and Windows NT.

- On Windows NT and Windows 2000, there is an improved Database Configuration Assistant (DBCA) tool for installing the operating system dependent software.

- The Transport Network Services (TNS) listener previously provided load balancing across nodes online shared servers (formerly called multithreaded servers). Starting with Oracle9*i,* listener load balancing and failover is provided for dedicated server configurations.

- The Database Configuration Assistant has new administrative features such as instance and template management.

   See Also:

   - *Oracle9i Real Application Clusters Concepts*

   - *Oracle9i Real Application Clusters Deployment and Performance*

   - *Oracle9i Real Application Clusters Installation and Configuration*

   - *Oracle9i Real Application Clusters Administration*

Scalable Session State Management

New shared memory capabilities, improvements in Java session support, and networking and Oracle shared server improvements substantially reduce the footprint required for each user on Oracle9*i.* This allows more users to be hosted on the same or larger hardware platforms.

Fine-Grained, Automatic Resource Management

Oracle9i includes several new features that enhance resource management.

Granular Control Over Resources

The Database Resource Manager has been significantly enhanced in Oracle9*i* to allow for more granular control over resources. It adds features such as automatic consumer group switching, maximum active sessions control, query execution time estimation, and undo pool quotas for consumer groups. Administrators are able to specify the maximum number of concurrently active sessions in each consumer group. Once this limit is reached, Database Resource Manager queues all subsequent requests and runs them only after existing active sessions complete.

Automatic Consumer Group Switching

The automatic consumer group switching feature of Oracle9*i* allows the administrator to specify criteria which, if met, will cause the Database Resource Manager to automatically switch the consumer group of a long-running session: for instance, from a consumer group set up for OLTP operations, to one more suited for batch reporting.

Administrators are also able to set a maximum estimated execution time for each consumer group. The Database Resource Manager then estimates the approximate query execution time for each operation before it begins, and will abort the operation if it exceeds the limit specified.

Undo Pool Quota

With the undo pool quota feature, administrators can specify a maximum on the total amount of rollback data generated per resource consumer group. This prevents a rogue transaction from consuming excessive rollback space and thus impacting system operation.

Performance

Oracle9*i* continues to demonstrate leading performance in all relevant areas. Various performance measurement and tuning projects continue to measure, tune, and improve Oracle9*i* runtime performance in all areas.

Native Compilation and Improved PL/SQL Optimization

A major focus of Oracle9*i* is improving performance in areas critical to e-business solutions. Support for native compilation and improved optimization of PL/SQL improves the performance of many of today's business applications, often significantly. The addition of memory and CPU costs to the cost-based optimizer

results in better optimization plans, less resource usage, and faster overall performance.

Latch Contention Improvements

in several areas has been eliminated or reduced, which improves performance on highly active systems. General I/O improvements, including self-tuning direct I/O, prefetching, and skip/scan row source operations on indexes also improve performance in data warehouse and OLTP environments.

Enhanced Java Performance

For Java, improved garbage collection, better native compilation, increased object sharing, and session pinning have all improved the performance of built-in Java executing inside the database. JDBC and SQLJ performance improvements have also improved the performance of Java in the middle tier or on the client.

Network and Distributed Database Performance

has been improved by the rework of database-to-database communication using OCI. In addition, specific network interface optimization, new improved virtual circuit I/O, and a unified event/wait model all substantially improve client/server communication performance. Improved distributed query optimization has also been built into the optimizer.

> **See Also:**
>
> - *Oracle9i Database Performance Guide and Reference*
> - *Oracle9i Data Warehousing Guide*
> - *Oracle9i Database Administrator's Guide*

Security

Oracle9*i* provides the most secure internet platform for protecting company information by minimizing risks through enhanced security for data, users and for companies.

Security for Data

The best way to minimize security risk is to provide multiple layers of security mechanisms, so that failure of a single mechanism does not compromise critical information. This concept is referred to as deep data protection, or security for data.

The Oracle9*i* database provides deep data protection through enhancements to the Virtual Private Database (VPD) and Selective Data Encryption capabilities, as well as through new technologies called Oracle Label Security and fine-grained auditing.

Virtual Private Database offers partitioned fine-grained access control whereby each user can only access rows of data that pertain to them. Oracle Label Security extends VPD functionality by offering label-based data access. By attaching access control directly to the data, security cannot be bypassed. This technology is ideal for application service providers who host multiple companies' data in the same database and therefore need to separate the data securely.

Selective data encryption ensures that very sensitive data in the database is hidden from database administrators, from privileged database users who may abuse their privileges, and from malicious users attempting to read data files from the operating system.

Fine-grained auditing keeps track of all database activity, including what statements users execute and the information that was returned. This hinders users from abusing their privileges since auditing tracks illegal actions. All of these technologies provide deep data protection, so that if one security mechanism fails, there are subsequent lines of defense.

Security for Users

Security mechanisms must be large enough to support thousands or millions of users over the Internet, yet still be practical to administer. Oracle9*i* offers a number of security features tailored to building internet-scale applications to provide security for users. These include enhancements to the database's proxy authentication, Public Key Infrastructure (PKI) support, and the new applications server feature for Web Single Sign-On. Together, these features allow enterprises to identify users throughout all tiers of the network. No longer does the middle tier establish a single connection to the database on behalf of the Web user. Proxy authentication creates multiple, scalable lightweight database sessions to carry the identity of the Web user, enabling fine-grained access control and fine-grained auditing of the Web user.

Web Single Sign-On is offered with the Login Server component of the application server's portal services. With Single Sign-On, users need to only maintain a single user name and password account for accessing all Web applications throughout the enterprise. System administrators have a single LDAP directory, the Oracle Internet Directory, to manage all access control information. By centralizing user access information, Oracle Internet Directory not only provides better security for the enterprise, but also lowers total cost of ownership.

Oracle also supplies PKI integration for easier deployment and management of PKI in the enterprise. For example, digital certificates issued by Entrust can be used to authenticate to the Oracle environment.

All of these technologies allow companies to increase access management without increasing administrative complexity.

Security for Companies

A critical security requirement confronting the hosting environment is keeping data from different hosted user communities separate. One way of doing this is to create physically separate systems for each hosted community; however, this approach is costly.

The Oracle9*i* database greatly reduces cost for a hosting provider by offering mechanisms to allow multiple user communities to share a single hardware and software instance. This scheme ensures each user community's data is kept separate by using Oracle9*i*'s Virtual Private Database and Oracle Label Security technologies.

Oracle9*i* continues to provide the most secure application development and deployment platform in the industry. Key areas include the following:

- Strong Three-Tier Security

- Security for Hosting Environments

- Standards-Based Public Key Infrastructure (PKI)

- Improved User and Security Policy Management

Strong Three-Tier Security

Three-tier security is enhanced by proxy authentication, including:

- Credential proxy of X.509 certificates or Distinguished Names (DN)

- Support for thick JDBC

- Connection pooling for application users (thick and thin JDBC and OCI)

- Integration with LDAP

An extensible, secure application role can force a user to access the database through a middle tier. Another feature assures that user identities are maintained securely through all tiers of an application, with centralized user and privilege management in LDAP-based directories.

API Enhancements

To aid the developer in using LDAP server functionality, enhancements in several APIs have been made. The PL/SQL API to LDAP (known as DBMS LDAP) permits any PL/SQL code to perform any LDAP operation. This API is now supported through all database operation modes (Oracle Shared Server and dedicated server). In addition, a new API set has been added to the PL/SQL UTL_HTTP package. New API functions have also been added to provide asynchronous operations.

Other New Packages

Other new packages include UTL_URL and UTL_ENCODE, which is used to encode email messages, and the UTL_URL package which performs exit and return functions on URLs.

Existing UTL_TCP and UTL_SMTP packages have been enhanced to support transfer time-out in Oracle9*i*. The existing UTL_INADDR package has been enhanced to support reverse domain name resolution (DNS) in Oracle9*i*.

Directory Access Utilities

Additional utilities to access directory structures have been added to the C API to LDAP. JNDI standard protocol extensions can now be recognized by Oracle Internet Directory.

Proxy authentication allows users without schemas to access the database through the middle tier.

> **See Also:**
>
> - *Oracle9i Application Developer's Guide - Fundamentals* for more information about proxy authentication
>
> - *Oracle Internet Directory Application Developer's Guide* for more information about LDAP
>
> - *Oracle9i Supplied PL/SQL Packages and Types Reference* for more information on DBMS LDAP

Security for Hosting Environments

Hosting security is provided through the following:

- Virtual Private Database (VPD) enhancements
- Fine-grained auditing

- Web-based Single Sign-On

Virtual Private Database (VPD) Enhancements

Virtual Private Database enhancements include partitioned fine-grained access control (security enforcement depending on which application accesses data) and connection pooling through a global or shared application context.

Fine-grained auditing offers selective audit of SELECT statements, with bind variables, based on relevant column access, significantly enhancing per-user accountability.

Login Server (included with Oracle Portal 3.0) provides web-based Single Sign-On and integration with legacy applications. With Single Sign-On, users are able to authenticate (log in) once and gain access to multiple Web services, without having to remember credentials and authenticate again for each service.

> **See Also:**
>
> - *Oracle9i Application Developer's Guide - Fundamentals* for more information about fine-grained auditing
>
> - *Single Sign-On Application Developer's Guide* for information about the Login Server and Single Sign-On
>
> - Oracle Portal online documentation

Standards-Based Public Key Infrastructure (PKI)

Standards-based public key infrastructure (PKI) includes support for PKCS#12 certificates. They enable existing PKI credentials to be shared by an Oracle Wallet, thus reducing PKI deployment costs and increasing interoperability. Wallets can be downloaded from LDAP directories, supporting mobile users. The SSL libraries used in Oracle9*i* now also support hardware acceleration for improved performance. Oracle9*i* supports enhanced wallet password management.

> **See Also:** *Oracle Advanced Security Administrator's Guide*

Improved User and Security Policy Management

Oracle9*i* supports LDAP technology to centrally manage network naming, easing deployments whether customers have one or hundreds of databases with tens of thousands or millions of users. Oracle9*i* supports Oracle Internet Directory, Novell Directory Services, and Microsoft Active Directory. Oracle9*i* supports native authentication using Microsoft Active Directory.

Enterprise User Management Enhancements

Improved user and security policy management is provided through Enterprise User Management enhancements, include management of password-based users in LDAP directories and a management tool for VPD policies. Security policies can be organized into groups. By referring to the application context, the Oracle server determines which group of policies should be in effect at runtime. The server enforces all the policies which belong to that policy group.

Password Encryption

User passwords can also be encrypted using either standard or custom crypto schemes. Oracle Internet Directory supports an IETF LDAP standard for representing prefixed user passwords where the prefixes identify the crypto scheme used for hashing the password values. A default hashing mechanism may be chosen from a variety of standard schemes, including MD5, SHA-1, and Unix "crypt." Values hashed by external agents may also be stored. This is useful when external authentication service agents want to use custom crypto schemes.

Secure Random Number Generator

The DBMS_OBFUSCATION_TOOLKIT now includes a secure random number generator, GetKey. Secure random number generation is a very important aspect of cryptography; predictable cryptographic keys can easily be decrypted by a person or machine performing crypto analysis.

> **Note:** DBMS_RANDOM is unsuitable for generating cryptographic keys, and should never be used for this purpose.

Oracle Internet Directory Administration Improvements

Administration of Oracle Internet Directory replication server has also been improved with the provision of new replication queue management and reconciliation tools. The replication queue management tool allows administrators object-by-object control over the elements in the human intervention queue, for the purposes of retrying object processing at will and deletion of objects from the queue. The replication reconciliation tool permits administrators to detect and correct inconsistencies among directory replicas.

A new web-based Oracle Internet Directory Self-Service Administration servlet enables users to administer their own personalized data over the Web. Directory administrators can restrict the set of attributes users are allowed to self-administer, including group memberships. Extended support for ACLs governing user

self-administration of membership allows authenticated users to add their own Distinguished Names (DNs) to membership of a LDAP group object or any object type that holds membership information, including roles and proprietary subscriber lists.

Directory Services Availability Improvements

Several enhancements have also been made to increase the availability of directory services. Certification with certain limited Oracle9*i* Real Application Cluster configurations improves availability both for the front end, where the LDAP directory service and replication processes reside, and the back end Oracle RDBMS, where the directory data is stored. Support for logical hosts in clusters allows failover to a different physical host within the same cluster and also transparently supports continued availability of directory replication. New procedures allow for multi-node topology reconfiguration and upgrade with no directory service downtime.

LDAP server scalability and performance

Several key enhancements have further increased LDAP server scalability and performance. Multi-process support for higher-concurrency LDAP access has been improved through a more scalable directory metadata cache coherency protocol. IETF-compliant support for LDAP referral objects enables partitioned LDAP directories. This allows delegated administration of physical directory segments and is critical for service providers and enterprises hosting large directories for a federation of autonomous organizations. By employing parallelism, the capacity of bulk-load, bulk-delete, and bulk-modify tools have been enhanced to handle much larger data sets.

Optimization of Server-Side Caching

Optimization of server-side caching at startup on group objects reduces LDAP server startup latency and improves performance of access control evaluations. Finally, the ability of Oracle Internet Directory to consult access control information has been enhanced significantly such that the evaluation decisions are made efficiently even when there are very large numbers of ACL policies to be consulted.

See Also:

- *Oracle9i Application Developer's Guide - Fundamentals* for more information about application contexts and secure application roles

- *Oracle Internet Directory Administrator's Guide*

Data Encryption and Label Security

Encryption enhancements include Java Cryptographic Architecture (JCA) and Java Cryptographic Extensions (JCE), supporting most popular algorithms for encryption and data integrity.

Oracle Label Security

Oracle Label Security is a fine-grained access control product. It adds a special label to data rows, providing sophisticated and flexible row label security. It is built on the Oracle9i Virtual Private Database technology. Oracle Label Security is based on labeling concepts used by government and defense organizations to protect sensitive information and provide data separation. Application hosting, health care and other industries can also take advantage of data labeling to help solve security requirements in the Internet Age. For example, in application hosting, a subscriber label can be used to separate data among subscribers in the same application.

Oracle Label Security is enforced within the database, providing security even if the application is bypassed. Label provides a dimension of access control that is not easily achieved using existing application data. Oracle Label Security also includes a sophisticated policy management tool, to manage policies, labels, and user label authorizations. Oracle Label Security is an out-of-the-box fine-grained access control solution.

Oracle Policy Manager

Oracle Policy Manager is an extension to Oracle Enterprise Manager that administers Oracle Label Security. The Oracle Policy Manager graphical user interface contains a tree structure that lists policies, along with their labels, authorizations, and protected objects.

See Also:

- *Oracle Advanced Security Administrator's Guide*

- *Oracle Label Security Administrator's Guide*

- *Oracle9i Application Developer's Guide - Fundamentals* for more information about VPD

Manageability

Oracle9*i* Systems Management

Management is one of the key areas of improvement for Oracle9*i.* One of the major objectives of Oracle9*i* has been to make the database server inherently self managing/tuning. Features such as Automatic Undo Management, Automatic SQL Execution Memory Management and Automatic Segment-Space Management are some of the features that enable database administrators to delegate many day-to-day administrative tasks to the server.

Oracle9*i*'s integrated system management tools create a complete view of all processes critical to the database and host, making it possible to quickly and completely assesses the overall health of an e-business infrastructure.

Oracle9*i* management advancements include the following features:

- Database Self-Management

- Streamlined Operational Management of the Database

- Enhanced Recovery Manager (RMAN) Performance

- Simplification of Oracle9i Administration Through Oracle Enterprise Manager

- Management of the Oracle Stack Through Oracle Enterprise Manager

Database Self-Management

Oracle9*i* includes several new features that make the database server more autonomous and self-managing.

Self-Managing Undo Features

Oracle9*i* databases are capable of managing their own undo (rollback) segments. No longer will administrators need to carefully plan and tune the number and sizes of rollback segments or decide how to strategically assign transactions to a particular

rollback segment. Oracle9*i* also allows administrators to allocate their undo space in a single undo tablespace with the database taking care of issues such as undo block contention, consistent read retention, and space utilization.

> **See Also:** *Oracle9i Database Administrator's Guide*

Memory Management

Memory management is another area which has been given significant attention in Oracle9*i*. Traditionally, administrators have needed to shut down the instance in order to grow or shrink System Global Area (SGA) components. Oracle9*i* introduces a dynamic memory management feature which allows for dynamically resizing the buffer cache and shared pool. It also includes a buffer cache size advice mechanism that predicts the performance of running with different sizes for the buffer cache.

> **See Also:** *Oracle9i Database Administrator's Guide*

Working Memory Management

Oracle9*i* provides transparent management of working memory for SQL execution by self-tuning the initialization runtime parameters that control allocation of private memory. This feature helps low-end users to reduce the time and effort required to tune memory parameters for their data warehouse and reporting applications, while high-end users are able to avoid memory tuning for individual work loads.

> **See Also:** *Oracle9i Database Performance Guide and Reference*

Streamlined Operational Management of the Database

Several new features simply administration of the Oracle9*i* database.

Persistent Initialization Parameters

Other traditional management areas of the database are also improved. With the introduction of a persistent parameter initialization feature in Oracle9*i*, parameter changes persist across database shutdowns and startups. This feature also allows the administrator to start the database from remote machines without a local copy of the parameter initialization file. This helps database performance tuning because parameter changes made by performance management tools, such as Oracle Enterprise Manager and changes made by internal self-tuning, now persist across shutdowns.

Oracle Database Configuration Assistant

The Oracle Database Configuration Assistant has been redesigned to include saved definitions of databases in the form of templates. The templates may be used to generate databases. Oracle provides templates. In addition, users can create their own by modifying existing templates, defining new ones, or by capturing the definition of an existing database.

When creating a database with the Database Configuration Assistant, users can include Oracle's new Sample Schemas, or they may be added later add as an option. These schemas are the basis for many of the examples used in Oracle documentation.

Oracle-Managed Files

Oracle9*i* introduces also the concept of Oracle-managed files. This simplifies database administration because it is not necessary for administrators to directly manage files comprising an Oracle database. Instead, Oracle9*i* uses standard file system interfaces internally to create and delete files as needed. While administrators still must be involved in space planning and administration, Oracle-managed files automates the routine task of creation and deletion of database files. Operating system files associated with a temporary file can be deleted. With the introduction of default temporary tablespace, the SYSTEM tablespace is no longer used as the default storage location for temporary data.

Resumable Space Allocation

 Resumable Space Allocation, another feature introduce in Oracle9*i*, allows an administrator to temporarily suspend a large operation, such as a batch update or data load, if they start to encounter out-of-space errors. This allows the administrator to fix the problem, and resume the operation from the point of interruption without disrupting normal database operation.

Corresponding Sub-Cache Configuration

 Oracle9*i* also supports databases created with multiple block sizes and allows administrators to configure corresponding sub-caches within each alternative block size. This capability allows administrators to locate objects in tablespaces of appropriate block size in order to maximize I/O performance. It also allows tablespaces more easily to be transported between different databases, for example, from an OLTP environment to a data warehousing environment.

> **See Also:**   *Oracle9i Database Administrator's Guide*

Mean Time to Recover (MTTR) Specification

Oracle9*i* also allows for better control over database downtime by enabling administrators to specify the mean time to recover (MTTR) from system failures in numbers of seconds. This feature, coupled with more dynamic initialization parameters, helps administrators further improve database availability.

SQL Queryable Through V$SQL_PLAN View

The execution plan of a SQL statement in the shared pool is now queryable through the view V$SQL_PLAN. The data contained within this view is similar to that of EXPLAIN PLAN; the difference is EXPLAIN PLAN shows a theoretical plan should the statement be executed, whereas V$SQL_PLAN shows the actual plan used to execute the statement.

Parameter Changes Persist Across Shutdowns

Database administration is simplified because parameter changes made through performance management tools, such as Oracle Enterprise Manager and changes made by internal self-tuning parameters, now persist across shutdowns.

> **See Also:**   *Oracle9i Database Performance Guide and Reference*

Enhanced Recovery Manager (RMAN) Performance

To ease backup and recovery operations, Recovery Manager in Oracle9*i* provides the following new features:

- One-time backup configuration that applies to any session
- Automatic management of backups and archived logs based on a user-specified recovery window
- Block media recovery
- Restartable backups and restores

Persistent RMAN Configuration

Oracle9*i* introduces many new features and enhancements that increase manageability and greatly expand functionality. Persistent RMAN settings can be created for automatic channels, channel parallelism, retention policies, backup options, and auxiliary filenames, and applied to any session. Thus, channel settings no longer have to be manually allocated.

Recovery Window

Recovery Manager implements a recovery window, which is a new policy that controls when backups expire. Recovery Manager also automatically marks as obsolete all backups and archived logs no longer required to restore the database to a point in time during the recovery window. These features are designed to reduce the time and effort administrators spend in performing routine backup activities tasks through automation of the most commonly performed tasks.

Block Media Recovery

Block media recovery can perform media recovery on individual blocks in a datafile while the datafile remains online. The block media recovery feature is only available with RMAN.

Miscellaneous Manageability Enhancements

The new control file auto backup feature allows for restoring or recovering a database even when a Recovery Manager repository is not available. Recovery Manager in Oracle9i also features enhanced reporting and a more user-friendly interface.

> **See Also:** *Oracle9i Recovery Manager User's Guide*

Improvements in user-managed backup and recovery include the following:

- Batch termination of online backup mode

- The ability to perform a trial media recovery

- Multiple conversion pairs for the *_FILE_NAME_CONVERT parameters

- System-managed database files

> **See Also:** *Oracle9i User-Managed Backup and Recovery Guide*

Simplification of Oracle9i Administration Through Oracle Enterprise Manager

In Oracle9i, Oracle Enterprise Manager (OEM) continues to provide easy-to-use management tools that support the new capabilities of the database and the entire e-business platform.

Oracle Enterprise Manager GUI

The Oracle Enterprise Manager graphical interface makes it simple to adopt and manage new components such as Oracle 9*i*FS, Oracle Internet Directory, Oracle Express, and Oracle *i*AS.

Connection Established Before Start-up

In Oracle9*i*, Oracle Enterprise Manager has the ability to connect to multiple target databases without having started the Oracle Management Server.

Diagnostics, Problem Resolution, and Reporting

To further simplify management tasks, Oracle Enterprise Manager has been enhanced to include guided, expert diagnostics and problem resolution, as well as greatly enhanced reporting capabilities. Oracle has consolidated the wealth of expert knowledge and experience of its development and consulting teams into Oracle Enterprise Manager.

Advice-Incorporated Tools

Advice and recommendations about properly configuring an Oracle environment, effectively monitoring its performance, and quickly resolving problems has been incorporated directly into the Oracle Enterprise Manager management tools. For example, administrators can instantly display a set of overview charts that show the overall health of their system, with indicators that automatically alert administrators to potential problem areas. Drilldowns from these problem areas then quickly guide administrators through the proper steps required to diagnose problems.

Browser-Managed Functions

All essential management functions are also Web-based, so administrators can manage their systems directly from a Web browser. Tools such as DBA*Studio are consolidated into the integrated management console. Oracle Enterprise Manager can also publish detailed reports to a Web site, allowing administrators easy access to any systems management information they wish to publish.

Management of the Oracle Stack Through Oracle Enterprise Manager

In Oracle9*i*, Oracle Enterprise Manager also allows administrators to go beyond monitoring the performance of single systems like a database. In this release, administrators are able to monitor the response of their entire Oracle-based system and ensure that they are meeting the required business service level agreements.

This capability is critical to users such as application service providers, e-business sites, or any business whose success depends on maintaining superior response time, performance, and availability of their IT systems.

Service-Level Degradation Alerts

Oracle Enterprise Manager allows administrators to monitor service levels and automatically alert to any degradation in performance. Extensive service level reports are also available, giving a complete picture of the performance of the system.

Reporting Capabilities Enhanced

In addition to service level reports, reporting capabilities throughout all of Oracle Enterprise Manager have been significantly enhanced. A comprehensive set of predefined reports are included that document the configuration and health of the entire Oracle environment. Reports can be generated, for example, on the configuration of databases, the performance of applications over the last week, or the current load on the system. Customized reports can also be generated using a site's own data or by mixing and matching the predefined report topics that Oracle Enterprise Manager provides. These reports can be automatically generated and posted to a Web site for convenient access across the organization.

Development Platform for E-Business Applications

Oracle9*i* continues to offer the best development platform for e-business and traditional application development. Key areas include the following:

- Enterprise Java Engine
- New XML Features in the Server
- Oracle XML Developer's Kit
- SQL and PL/SQL Improvements

Enterprise Java Engine

Oracle9*i* JVM (previously JServer) extends its support for Java 2 Enterprise Edition APIs and containers through the following features:

- A robust base architecture including session-based, optimized process and memory management, and Unicode support

- A comprehensive set of infrastructure services, including JNDI, JTA, Java 2 Security, JMS, RMI/IIO, and Persistence.

- A Servlet 2.2-compliant Oracle Servlet Engine, and a JavaServer Pages 1.1-compliant OracleJSP Engine, for assembling Web components

- A comprehensive CORBA and EJB architecture including support for Entity EJB, XML deployment descriptors and a persistence service interface for CMP-EJB, for e-business processes and components development

- A comprehensive set of JDBC 2.0 drivers, including an OCI client driver, 100% Java thin driver, a server-side driver and an "Ultra thin" client-side proxy driver, an ANSI ISO-compliant SQLJ translator and optimized Java stored procedures support for data access and management

- A native Java bytecode Accelerator and Memory profiler, for deployment performance

The Oracle9*i* JVM that is embedded in both Oracle9*i* and Oracle *i*AS allows reliable, flexible, scalable, and secure e-business applications deployment.

New XML Features in the Server

Oracle9*i* introduces the following new XML features in the server:

XMLType

XMLType stores XML content natively and allows XML operations to be run from SQL.

XMLType enables non-native XML data to be treated as XML by allowing users to create an XML View over standard database tables, documents, or web content. Thus, the same high-performance access to XML data is available whether data is natively XML, or an artifact generated from existing data.

XML Generation

In response to the challenge of generating XML in bulk from a database, XML generation capabilities have been moved into the database and application server kernels and made available as built-in SQL operators. The kernel proximity of these operators ensures massively sustainable throughputs, enough for the largest content repositories or the busiest exchanges.

Arrive Data Types

A universal content model for all kinds of data and documents can be created through a set of native Arrive data types, which can hold references to XML documents or fragments (inside or outside the database). Just as applications locate HTML files using URL, a set of native Arrive data types can locate XML content, native or generated, inside the database or outside, using Arrive. URI-Refs play a major role in creating database-backed content repositories, which can be used to be feed portals, archives, or other content management systems.

> **See Also:** *Oracle9i SQL Reference* for information about datatypes

Oracle XML Developer's Kit

Oracle9*i* features several enhanced database operations to store XML through SQL and render traditional database data as XML. These functionalities are required to support business-to-business and business-to-customer e-business, packaged applications, and internet content management. The main area of XML support in Oracle9*i* is built-in XML Developer Kits (XDKs).

With Java pre-loaded and the C XDK linked into Oracle9*i*, developers are able to easily access World Wide Web Consortium (W3C) functionalities that generate, manipulate, render, and store XML-formatted data in Oracle9*i*. Also available in PL/SQL and C++, the XDKs offer XML/XSLT parsers, XML schema processors, XML Class Generators, XML Transviewer Beans, and the XSQL Servlet, providing basic building block features that allow developers to quickly enable their applications for XML.

> **See Also:**
>
> - *Oracle9i Application Developer's Guide - XML*
> - *Oracle9i XML Reference*

SQL and PL/SQL Improvements

SQL and PL/SQL have continued to be improved in Oracle9*i* to meet current development requirements.

Multi-language server side debugging has been added, allowing integrated development environments to debug both Java and PL/SQL within the same framework.

Support for inheritance and multilevel collections completes the modeling capabilities of the object-relational subsystem in Oracle9*i*. This makes it possible to

build complex models inside the database. In addition, Oracle9*i* supports type evolution: certain changes may be made to object types even if instances of the types exist in the database. Both types of support make it easier to deploy complex applications in real-life environments.

New ANSI requirements are also supported, including support for the CASE statement, ANSI-compliant joins, and reserved name versioning. To aid migration to Oracle9*i* from other databases, scrolling cursor support has been added, and stored procedures can now return result sets that can be easily passed and pipelined between both database and client side processes.

SQL Improvements

The following datatypes are new for Oracle9*i*:

```
TIMESTAMP
TIMESTAMP WITH [LOCAL]TIME ZONE INTERVAL YEAR TO MONTH
INTERVAL DAY TO SECOND
XMLtype,  native XML datatype
SYS.UriType, SYS.UriFactoryType
SYS.ANYType, SYS.AnyData, SYS.AnyDataSet

MDSYS.SDO_GEOMETRY,  new spatial datatype

ORDSYS.ORDImage -  media type
ORDSYS.ORDVideo -  media type
ORDSYS.ORDAudio -  media type
```

The following built-in SQL functions are new for Oracle9*i*:

```
ASCIISTR
COMPOSE
COALESCE
CURRENT_DATE
CURRENT_TIMESTAMP
DBTIMEZONE
DECOMPOSE
FIRST
FROM_TZ
LAST
LOCALTIMESTAMP
NULLIF
NUMTOYMINTERVAL
```

```
INTERVAL YEAR to MONTH
NUMTODSINTERVAL
INTERVAL DAY TO SECOND
PERCENTILECONT
PERCENTILEDISC
SESSIONTIMEZONE
SYS_EXTRACT_UTC
SYSTIMESTAMP
TO_DSINTERVAL
TO_TIMESTAMP
TO_YMLITERAL

TZ_OFFSET
UNISTR
WIDTH_BUCKET
```

The following built-in SQL expressions are new for Oracle9*i*:

```
DATETIME EXPRESSION
EXTRACT
INTERVAL
```

The following built-in SQL condition is new for Oracle9*i*:

```
IS OF type condition
```

The following top-level SQL statements are new for Oracle9*i*:

```
CREATE PFILE
CREATE SPFILE
MERGE
```

> **See Also:** *Oracle9i SQL Reference* for new datatypes and SQL definitions.

PL/SQL Improvements

Oracle9i includes a PL/SQL package, DBMS_METADATA, which provides interfaces for extracting complete definitions of database objects. The definitions can be expressed either as XML or as SQL DDL. Two styles of interface are provided:

- A flexible, sophisticated interface for programmatic control
- A simplified interface for ad hoc querying

Other improvements to PL/SQL include:

- Integrated front-end for SQL compilation: PL/SQL immediately supports all SQL syntax changes to embedded SQL.

- SQL parallel query mechanism has been extended to stored procedures written in 3GL languages (which includes Java and external routines, as well as PL/SQL). Stored procedures can now incrementally return data to the calling SQL statement.

- Full support for ANSI-style CASE statements and expressions

- Better support for compute-intensive applications through native compilation support

- The SQL and PL/SQL runtime engines have been more tightly integrated to improve performance.

- The overhead of calling PL/SQL procedures from SQL has been reduced.

- PL/SQL offers improved assistance in data conversion between RAW and numeric datatypes. The UTL_RAW package offers CAST_TO_NUMBER, CAST_FROM_NUMBER, CAST_TO_BINARY_INTEGER, and CAST_FROM_BINARY_INTEGER

- *i*SQL*Plus is a browser-based implementation of SQL*Plus. It can be used over the Internet to connect to an Oracle RDBMS to perform the same actions as through the SQL*Plus command line. The *i*SQL*Plus implementation uses a web browser, an Oracle HTTP Server with the *i*SQL*Plus Server, and an Oracle RDBMS Server.

> **See Also:** *Oracle9i Supplied PL/SQL Packages Reference* for more information about DBMS_METADATA

Windows Integration

Oracle9*i* reinforces Oracle's lead as the platform of choice for organizations deploying on Windows 2000. Key areas include the following:

- Integration Capabilities
- Development and Deployment Improvements

Integration Capabilities

Oracle9*i* supports several versions of Microsoft Windows, including Windows 2000 and Windows NT.

Oracle9*i* supports enhanced integration with Microsoft Transaction Services and Internet Information Services. The PKI infrastructure and Single Sign-On capabilities in Oracle9*i* have also been well integrated with Windows 2000, Active Directory, and Microsoft Certificate Store.

Development and Deployment Improvements

Oracle9*i* Development and Deployment Improvements are as follow:

- In Oracle9*i*, IIS web services allows seamless, high-performance access to Oracle Java and PL/SQL web components in Microsoft IIS environment.

- Oracle9*i* also provides an enhanced solution to allow the Oracle database to participate as a Resource Manager in Microsoft Transaction Server/COM+ Transactions environment, providing enhanced performance and scalability.

- Windows security supports Oracle wallets in the registry/ActiveDirectory and allows Oracle products to use Microsoft Certificate Store.

- Customers who implement Oracle Internet Directory as their central Directory while using Active Directory to support desktop environments can use Microsoft ADSI to access Oracle Internet Directory from the Windows desktop environment.

- Meta-directory synchronization between Active Directory and Oracle Internet Directory facilitates centralized scheduling and configuration of Oracle and third party meta-directory components. Synchronization between Active Directory and Oracle Internet Directory can be achieved by deploying Oracle Directory Integration Platform and an Active Directory Synchronization agent from Siemens.

- For Windows developers, Oracle9*i* offers an enhanced native OLE DB provider. XML, database Events, and Oracle9*i* extensions are supported through Oracle Objects for OLE. The COM Automation Feature now supports Java stored procedures.

See Also:

- *Oracle9i Network, Directory, and Security Guide for Windows*

- *Using Microsoft Transaction Server with Oracle*

- *Oracle Provider for OLE DB Developer's Guide*

- *Oracle Objects for OLE*

- *Oracle Objects for OLE C++ Class Library*

- *Oracle COM Automation Feature Developer's Guide*

Internet Content Management

Oracle9*i* allows customers to store, manage and aggregate all types of multimedia content into a single database. Oracle9*i* significantly enhances the capabilities of the database to serve as a platform to create, manage, and deliver internet content. Key areas are:

- Storage, Management, and Aggregation of All Types of Content

- Efficient Searching and Indexing of All Types of Content

- Collaborative Projects

- Location-Enabled, Mobile-Ready Content

Storage, Management, and Aggregation of All Types of Content

Oracle9*i* includes the version 1.2 release of the Oracle Internet File System (Oracle 9*i*FS). Providing the best of both the relational database and file system worlds, Oracle 9*i*FS delivers an out-of-the-box file system with built-in capabilities unavailable in other file systems.

- Oracle 9*i*FS can store all content, from e-mail, to Web content, to word processing documents, in the same folders. Users can access this content through Windows, the Web, FTP, and an e-mail client without any special client installation.

- Oracle 9*i*FS also provides content management features to better manage creation and publishing of file-based content:

  - Versioning

  - Content-based searching using Oracle9*i* Text

- Multiple foldering of files
- Extensible file attributes
- ACL-based security
- Check-in and check-out capability

All of this functionality has the ease of the file systems' interface that users already know how to use.

Oracle 9*i*FS exposes all of its capabilities through Java, making it an excellent platform for building applications with content management applications.

- Developers can stop wasting time with systems integration, building special protocol servers, and coding the same content management features over and over again.
- All the inner workings of the file system are available to developers for customization, including extensive XML processing capabilities.

With Oracle9*i*, 9*i*FS adds more content management features, such as WebDAV, an emerging standard for Internet collaboration.

Oracle 9*i*FS also will be incorporated into the file system interMedia's capabilities to index, search, and manipulate graphics, audio, and video.

Oracle9*i* includes enhancements to *inter*Media image, audio, and video support. Oracle9*i* greatly simplifies the ability to add multimedia formats, processing, and rendering by incorporating Java Advanced Imaging (JAI) into the database and providing support for the Java Media Framework (JMF) in *inter*Media. *inter*Media now supports PNG and EXIF image formats.

A new browser-based version of the clipboard supports insert, retrieve and annotate media objects in Oracle9*i*. Improvements to the image search capabilities and support for storage and delivery of streaming media with new streaming formats and plug-ins are also part of Oracle9*i*. In addition, *inter*Media's audio, video, and image media processing services are now accessible in native form through relational PL/SQL and JAVA interfaces.

See Also:

- Oracle 9*i*FS documentation
- *Oracle interMedia User's Guide and Reference*

Efficient Searching and Indexing of All Types of Content

Oracle9*i* also adds Internet search, powerful facilities to extract and index metadata from rich content, and the ability to search XML and catalog structures. With this release, all content in Oracle9*i* can be location-enabled and mobile-ready to allow it to be searched and delivered based on where the request is coming from (such as mobile phone and internet personalization criteria) or its location association.

Oracle Ultra Search

New in the Oracle9*i* release, Oracle Ultra Search is able to search inside a database, as well as static HTML pages. Other search engines cannot see content inside a database, and would not be able to find documents, newspaper articles, etc., stored inside a database. Oracle Ultra Search unifies search areas across heterogeneous corporate repositories, Web sites, and groupware content. Oracle Ultra Search includes a Web interface, Web crawling, and search administration facilities to provide a unified interface for enterprise and vertical portal search applications.

Oracle9*i* Text

In order to meet the demands of e-business applications, Oracle9*i* Text indexing has been improved in Oracle9*i* with a new indextype designed to perform very fast searches across volumes of short textual descriptions. This is ideal for catalog and metadata search as well as for searching of auction data and resumes. With Oracle9*i*, text search of nested XML elements, search attribute values, XPath query syntax, and other advanced XML structures are also all supported.

*inter*Media Annotator

Media and document metadata can be extracted, indexed, and mapped to XML documents or database schema through Java APIs to the *inter*Media Annotator. These APIs allow for programmatic invocation of metadata services by any application or scripting language that can use Java APIs including JAVAscript, VBscript, and Apple Script.

Oracle Spatial

For e-business and mobile applications, the location capabilities in Oracle9*i* and Oracle Spatial have been greatly enhanced. Content stored in Oracle9*i* can now be associated with related location criteria and services. New support for online mapping, yellow pages, driving directions, traffic, and geocoding services allow online content to be merged with database content. Support for mobile devices and formats, such as WBMP, interactive voice response, microbrowsers and delivery

through Oracle *i*AS Wireless, make Oracle9*i* a complete platform for the delivery of content for mobile applications.

> **See Also:**   *Oracle interMedia User's Guide and Reference*

Collaborative Projects

Oracle9*i* adds the ability to create shared workspaces to support collaborative, long-duration projects. Workspaces support in-place, existing content and allow existing applications to run against the workspace view of the database transparently. Database content can be associated into a workspace and used for a specific application while the underlying transaction database continues to run unaffected. Multiple, concurrent database-backed projects can coexist simultaneously against different versions of content.

Location-Enabled, Mobile-Ready Content

For e-business and mobile applications, Oracle9*i* and Oracle Spatial offer the ability to search, index, and deliver data based on the location attributes of the content or the proximity.

Support for mobile devices, protocols (WAP) and formats (such as WBMP) and delivery through Oracle *i*AS Wireless (formerly Portal-to-Go), make Oracle9*i* a complete platform for the delivery of content for mobile applications. Content stored in Oracle9*i* can now be associated with related location criteria and services.

 Interactive Voice Response (IVR) formats used in mobile applications are now supported in *inter*Media. New support for online mapping, yellow pages, driving directions, traffic, and geocoding services allow online content to be merged with database content.

> **See Also:**
>
> - *Oracle iAS Wireless Edition Developer's Guide*
> - *Oracle Text Reference*

E-Business Integration

Oracle9*i* introduces new products and technologies essential to a successful e-business environment. Key advancements include the following:

- Provides a Standard Infrastructure

- Supports Industry Standard Business Messaging Formats

Provides a Standard Infrastructure

Oracle9*i* includes a set of pre-developed, pre-tested, and pre-integrated business service objects, developed in Java and compliant with J2EE, that provide faster time-to-market for customers to build and integrate Web-based storefronts, exchanges and hosted applications.

e-Business Service Objects

The e-business service objects seamlessly blend open Internet technologies and standards with reliable, scalable Oracle technologies and products. The e-business service objects allow developers to rapidly build complex multitiered Internet applications based on open standards, such as HTML, XML, JavaScript, Java Servlets, Java Beans, and Java Server Pages.

The e-business service objects also provide a flexible architecture for building multitier Internet applications. Components built with the framework can reside within the Oracle9*i* Java Virtual Machine (JVM) or within the Oracle Internet Application Server (*i*AS) that supports Java technologies, such as Java Server Pages (JSPs) and Java Servlets.

> **See Also:** *Oracle9i Java Developer's Guide*

The collection of Java-based services provided includes:

- Security and access control mechanisms
- Logging and tracing facilities
- Resource sharing and data protection facilities
- Session and state management functionality
- Globalization services

Dynamic Services

Oracle9*i* also provides an enhanced infrastructure for support of Internet service aggregation and syndication for portals, exchanges, and other Internet applications through Dynamic Services. Dynamic Services integrates the Oracle Internet Directory, XML services, and Advanced Queuing features with a policy and service management engine.

Queue information can be stored on an Oracle Internet Directory server, thus providing a single point of contact to locate the required topic or queue, without needing to know in which database the queue is located. The Oracle Internet Directory can also be used as the repository for event registration. Clients can register for database events even when the database is down.

Dynamic Services allows developers to easily manage, compose, reuse, and deploy local and remote Internet services (such as quotes, news feeds, exchange rates, or credit card processing) and database services (such as employee lookup, payroll, location services, or any PL/SQL procedure).

> **See Also:** *Oracle9i Application Developer's Guide - Advanced Queuing*

Supports Industry Standard Business Messaging Formats

Oracle9*i* also provides a standard infrastructure that makes it easier for customers to integrate these storefronts, exchanges, and portals with other backend and external systems.

XML-Based Messaging Over HTTP

XML-based messaging over HTTP is supported, allowing external, across-firewall systems to be more easily integrated. In addition, non-database, Internet based consumers are also supported, allowing for greater flexibility in homogeneous environments. To enable messaging operations such as enqueue and dequeue to be performed across the Internet, a new XML-based Internet Document Access Protocol (iDAP) is provided that allows message operations to be requested across firewalls. Message security itself has been improved with digitally signed messages, and message non-repudiation is supported both for messages and iDAP requests.

Built-In Message Transformation Architecture

Advanced Queuing agents can now also be defined in Oracle Internet Directory, providing a centralized, easy-to-manage, secure infrastructure for global messaging. In addition, global topic information can also be externalized in Oracle Internet Directory, providing a single place for the configuration and management for Advanced Queuing operations that span one or more systems.

Business Event System

Oracle Workflow now provides the Business Event System, a new application service the leverages the Oracle Advanced Queuing infrastructure to communicate

business events among systems within an enterprise as well as between enterprises. The Business Event System includes the Event Manager, for registering subscriptions to significant events, and event activities for modeling business events within workflow processes. This support allows Oracle Workflow users to deal with business objects and e-business integration flows powerfully and flexibly, with minimal intrusion into core applications.

Message Gateway

To support messaging between heterogeneous environments, the Message Gateway is provided in Oracle9*i*, that supports propagation of messages from Oracle9*i* to other proprietary message systems.

> **See Also:**
>
> - *Oracle Internet Directory Administrator's Guide*
> - *Oracle9i Application Developer's Guide - Advanced Queuing*

Packaged Applications

Oracle9*i* packaged applications enhancements provide new capabilities and new economies.

- Database Globalization
- Development Features for Independent Software Vendors

Database Globalization

Oracle9*i* also significantly reduces the cost of developing and deploying applications globally on a single database instance.

Unicode Datetime Enhancements

Requirements for multi-geographical applications include named time zones and multi-language support through Unicode. The datetime datatypes TSLTZ and TSTZ are time-zone-aware. Datetime values can be specified as local time in a particular region (rather than a particular offset). Using the time zone rules tables for a given region, the time zone offset for a local time is calculated, taking into consideration Daylight Savings time adjustments, and used in further operations.

Unicode Support Expansion

Unicode support has been greatly expanded in Oracle9*i* so that developers can easily find the right Unicode solution for their application needs. Developers can now develop fully globalized applications by setting up or migrating their database character set to UTF8 to support multiple languages simultaneously. National Character fields can be used to define columns that support one or more new languages for an existing monolingual database. Application developers can also use the Character Set Scanner utility to quickly identify potential issues in migrating an Oracle database to a new character set, thus easing migration of existing applications.

Oracle9*i* supports ISO 14651/Unicode Collation, and extended locale Unicode support including:

- New languages (all are for India)

- New territories (mostly for Latin America, plus Macedonian and Yugoslavian)

- New character sets

- New linguistic sorts

Linguistic Collation Capability Enhanced

Linguistic collation capability in Oracle9*i* is greatly enhanced based on the new proposed ISO 14651 standard for multilingual collation.   In addition, Oracle9*i* adds a set of new pre-defined linguistic sorts for Asian languages including Chinese, Japanese, and Korean. If customers have special needs that go beyond the extensive set of linguistic sorts provided Oracle9*i*, then they also have the flexibility of defining or customizing their own linguistic sorts by using a new easy-to-use graphical interface, Oracle Locale Builder.

Extensive Locale Definitions Set

Oracle9*i* provides an extensive set of locale definitions including 57 languages, 88 territories and approximately 200 character sets. If customers need to customize existing locale definitions, or create new definitions, the new Oracle Locale Builder provides an easy-to-use graphical user interface through which one can easily view, modify, and define the various locale-specific data.

> **See Also:**   *Oracle9i Globalization and National Language Support Guide*

Development Features for Independent Software Vendors

Oracle9*i* continues to be the best platform for independent software vendor development, deployment, hosting, and migration. Features such as updatable scrollable cursors as well as ANSI -compliant `CASE` statements, datetime data types, and join syntax facilitate migration of applications developed on other databases to Oracle9*i*. In addition, `LONG` data types can be easily converted to `LOB` data types by a simple `ALTER TABLE` statement.

Enhancements to stored outlines and default column values allow improved deployment and hosting of packaged applications. With stored outline editing, queries can be tuned without having to change the packaged application code. For the customer whose environment has unique characteristics that might cause an outline to yield a less-than-optimal execution plan, the ability to make adjustments to the outline enhances the ability to support specific customer needs.

In this sense, stored outlines are made more adaptive as users can make finely tuned adjustments to the saved plan. Use of the `SYS_CONTEXT` function to generate default column values simplifies implementation of Virtual Private Database security feature, providing a more scalable infrastructure for managing hosted applications.

Packaged applications also benefit from the numerous development, availability, scalability and security features provided in Oracle9*i*.

Business Intelligence

Oracle9*i* broadens the footprint of the relational database in a data warehouse by becoming a scalable data engine for all operations on data warehousing data, and not just in loading and basic query operations. As such, it is the first true data warehouse platform. Oracle9*i* provides new server functionality in analytic capabilities, ETL (Extraction, Transformation, Loading), and data mining.

As growth occurs in data volume and in numbers of end-users accessing the data warehouse, Oracle9*i*'s data server scales to handle larger volumes of data and/or more users by the addition of new hardware resources. Oracle9*i* new features keep the data-warehouse simple to maintain as volume and activity increase.

Oracle9*i* exceeds the requirements of a relational database for data warehousing through:

- Performance, Scalability, and Manageability
- Data Warehouse Manageability

- Integrated Analysis and Personalization Capabilities

Performance, Scalability, and Manageability

Index-Organized Tables

Index-organized tables include these advancements:

- Bitmap Indexes on Index-Organized Tables
- Parallel DML on Index-Organized Tables
- Partitioning by hash method
- B-tree index on UROWID columns

Bitmap Join Index

Oracle9*i* introduces bitmap join indexes, which provide further improved performance for a specific class of join queries. A 'join index' is an index structure which spans multiple tables and improves the performance of the joins of those tables.

Enhancements to Materialized Views

Oracle's materialized views, which provide a mechanism for improving the performance of almost any type of query, have been enhanced in Oracle9i in important ways:

- Materialized views now include more sophisticated query-rewrite mechanisms that enables a single materialized view to address a broader class of queries
- Enhanced refresh mechanisms allow fast, incremental refreshes for a wider variety of materialized views.

Automatic Memory Tuning

Oracle9*i* provides an automated mechanism for dynamically allocating runtime memory to each query. Up to 70% or more of the data warehouse server's physical memory is commonly allocated for runtime memory.

By automating the allocation of runtime memory, Oracle9*i* improves the overall throughput of the data warehouse and makes it possible to support larger numbers of users at the same levels of performance.

The automatic memory tuning feature ensures that memory-intensive queries receive sufficient memory, while memory-light queries are not given too much memory. By making more effective use of memory, Oracle9*i* increases overall query performance.

List Partitioning

Oracle Partitioning delivers significant improvements in the manageability, availability, and query performance of large tables and indexes. Partitioning is a key technology for data warehousing, where large tables are commonplace. Oracle's partitioning capabilities have been enhanced in Oracle9*i* with the addition of a new partitioning scheme, list partitioning.

List partitioning gives data warehouse administrators precise control over which data belongs in each partition. For each partition, the data warehouse administrator can specify a list of possible values for the partitioning key of the rows in that partition. Each partition in a list partitioning scheme corresponds to a list of discrete values.

Extraction, Transformation, and Loading Enhancements (ETL)

External Tables   To increase efficiency and reduce the time taken to load and refresh critical data warehouses, Oracle9*i* provides support for external tables, which allow data from external systems to be quickly loaded into the database. External tables do not reside in the database and may be in an format, for which a driver is provided. The `CREATE TABLE... ORGANIZATION EXTERNAL` statement specifies metadata describing the external table.

Multitable inserts   Other data load capabilities provided to increase data load scalability and reduce complexity include multitable `INSERT` and `MERGE` semantics. Both of these SQL enhancements allow more complex data loading to be processed within a SQL single statement, unlike the old way, where several process steps were required. With multitable inserts, data can be inserted into more than one table using a single SQL statement; this is more efficient than using multiple, separate SQL statements for each table.

Multitable inserts make SQL more useful for data transformations and conditional handling. An incremental refresh, also known as a `MERGE`, of a table requires two tasks: new records will be inserted and existing records will be updated. Rather than requiring two separate steps, the new `MERGE` statement allows both steps to be processing simultaneously within a single SQL statement. This new ETL functionality is also leveraged by Oracle Warehouse Builder.

> **See Also:** *Oracle9i Database Administrator's Guide* for information
> about database administrator utilities

Data Warehouse Manageability

Oracle9*i* addresses growing workloads of established data warehouses through
enhanced capabilities for managing larger numbers of users, and ensuring that:

- An appropriate amount of resources is allocated to each query

- The throughput of the entire warehouse platform is maximized

- The warehouse administrator and users can view the status of ongoing jobs

- The database can automatically abort or queue queries, based upon conditions
  pre-specified by the database administrator, in order to maintain optimal
  system load

Oracle9*i* introduces several new features to support these requirements.

Database Resource Manager

The Database Resource Manager provides a mechanism for allocating the resources
of a data warehouse among multiple populations of end-users. These groups, called
Resource Consumer Groups, are specified by the database administrator, and then
the database administrator can control how resources are allocated to each group.

The Oracle9*i*, the mechanism for allocating data warehouse resources among
multiple populations of end-users allows the number of active sessions for each
Resource Consumer Groups to be limited.

In addition, a simple query-governing capability allows the database administrator
to specify the maximum estimated execution time for Resource Consumer Group.

Another significant enhancement allows the resource manager to automatically
change the Resource Consumer Group of a given session based on criteria specified
by the database administrator.

Enhanced Statistics Gathering

Oracle's query optimizer uses statistics about the objects in the database (such as
the number of rows in each table). These statistics are gathered by database
administrator's using the `DBMS_STATS` facility.

In Oracle9i, the `DBMS_STATS` package has been enhanced to make it easier for
database administrators to gather the appropriate sets of statistics. It is now
possible to automatically determine the appropriate sampling percentage as well as

the appropriate columns for histograms. These enhancements simplify to database administrator's task in gathering accurate statistics.

Summary Advisor and Materialized View Manageability

The summary advisor has been enhanced in Oracle9i to enable it to make recommendations based on schema characteristics and previous workload history. It now supports a broader class of schemas, so database administrators can specify workloads as input to the summary advisor. Other enhancements have been made to materialized views so that it is now easier to manage environments.

Global Index Maintenance

Oracle9*i* permits an override of a default behavior, which permits an update of global indexes when partition maintenance is performed. Many table maintenance operations on partitioned tables invalidate (mark UNUSABLE) global indexes. Without the override, the entire global index must be built, or, if partitioned, all of its partitions. Global indexes are now updated when partition maintenance is performed, thus minimizing normal maintenance.

> **See Also:**
> - *Oracle9i Database Administrator's Guide*
> - *Oracle9i Database Performance Guide and Reference*
> - *Oracle9i Data Warehousing Guide*

Integrated Analysis and Personalization Capabilities

Oracle9*i* for business intelligence goes beyond the primary requirements of performance, scalability, and manageability.

Full Data Warehouse Platform

Oracle9*i* is designed to be a full data warehouse platform, leveraging the Oracle database as the scalable data engine for all operations on data warehousing data.

Online Analytical Processing (OLAP) and Data Mining

Oracle9*i* provides ground-breaking new functionality in Online Analytical Processing (OLAP) and Data Mining. Oracle9*i* OLAP is a scalable, high-performance OLAP calculation engine with fully integrated management and administration. Leveraging Oracle Express Server technology and Oracle9*i*'s

analytic SQL capabilities, Oracle9*i* OLAP provides a robust platform for delivering analytic applications.

Enhanced Functionality and Performance SQL   Oracle has substantially enhanced both the functionality and performance of SQL to address the requirements of typical OLAP operations. Specifically, Oracle9*i* provides an extensive set of SQL capabilities for new types of analytic functions, as well as substantial enhancements for aggregation. Likewise, enhancements to materialized views includes optimizations for OLAP.

New Data Mining Capabilities   Oracle9*i* also includes new data mining capabilities. Based on Oracle's data mining (Darwin) product, Oracle9*i* provides personalization capabilities, which enable customers to implement accurate, real-time recommendations and personalization capabilities into their online operations. Oracle9*i* is the next step in tighter integration of data mining and the relational database, and includes in-database scoring along with the ability to manage data mining operations.

> **See Also:**   *Oracle9i OLAP Services Concepts and Administration Guide*

Other Oracle9*i* New Features

Oracle9i includes a number of miscellaneous features that increase the power and usability of the database server.

Heterogeneous Services

- Supports the SQL*Plus `DESCRIBE` command
- Supports `DATE/TIME` datatypes
- Supports `PIECEWISE`, `INSERT`, and `FETCH` of long columns
- Supports ref cursors only as stored procedure `OUT` arguments
- Introduces shared server agents to enable multiple user sessions to share the same agent process

Oracle Net Services

Oracle Net supports the Virtual Interface (VI) protocol

- Oracle Names LDAP Proxy servers enable Release 8.1.5 clients that do not support directory naming a way to use data stored in a directory server.

- Oracle Net Configuration Assistant enables creation of multiple Oracle Contexts

- In addition to shared server configurations, enables connection load balancing for dedicated server configurations

Replication

- Extended availability by reducing requirements for quiescing a replication group

- Support for user-defined types

- Multitier materialized views, which are materialized views based on other materialized views

- Fast refresh enhancements for materialized views

- Performance monitoring in replication environments

- Row-level dependency tracking for parallel propagation

- Replication support for CHAR column length semantics and Unicode

- Improvements to the Replication Management tool, including new reporting capabilities and improved wizards

> **See Also:** *Oracle9i Replication*

Oracle Spatial

- The SDO_GTYPE element of the SDO_GEOMETRY type has a new format that identifies the linear referencing dimension (if any).

- Methods are provided for the SDO_GEOMETRY type: GET_GTYPE, GET_DIMENSIONS, and GET_LRS_DIMS.

- Spatial aggregate functions are provided: SDO_AGGR_MBR, SDO_AGGR_UNION, SDO_AGGR_BUFFER, and SDO_AGGR_CONVEXHULL.

- The SDO_GEOMETRY type can be embedded in a user-defined data type.

- Partitioned indexes are supported.

- Coordinate system support has been enhanced: storage and conversion of coordinates in any datum and projection, Oracle Enterprise Manager interface to edit or create coordinate systems, user-defined transformations.

- Linear referencing support has been enhanced: 2D polygons and multiple line strings and 3D line strings (made of line segments), monotonically decreasing as well as increasing measure, Offset function for LRS geometry, aggregate concatenation.

- B-tree index statistics routines are provided.

- Columns have been added to the system metadata for spatial indexes.

- New views are provided for retrieving index metadata.

- `UNITS` support (for example, "`UNITS=mile`") is provided for relevant Spatial functions and operators.

- A commit interval can be specified when validating a geometry.

The 18-character limit for spatial index names is removed.

Oracle Text

Oracle Text, formerly *inter*Media Text, includes new features that provide greater flexibility in building text query applications.

- Document Classification is a new index type that enables classification of an incoming stream of documents based on their content.

- Local Partitioned Index Support is used to create local partitioned indexes on partitioned text tables and rebuild partitioned indexes.

- New Korean Lexer continues to support indexing and querying of Korean text with a new Korean lexer.

- New Japanese Lexer continues to support indexing and querying of Japanese text with a new Japanese lexer.

- UTF-16 Auto-detection supports UTF-16 conversion to the database character set with charset and Inso filters.

- XML path searching can specify direct parentage in queries.

- `CTX_OUTPUT` PL/SQL Package has procedures that allow logging of index file with rowid information, which is useful in debugging an index operation.

> **See Also:** *Oracle Text Reference*

3

Oracle9*i* Documentation

This chapter lists the generic books (not specific to a particular operating system) that document the Oracle9*i* database. Documentation for Oracle9*i* is available online. Some books are available in printed format.

This chapter contains the following sections:

- Online Documentation Structure
- Documentation Titles

Online Documentation Structure

All books are available in electronic format in the Oracle9*i Online Generic Documentation* CD-ROM. The following categories of documentation are available:

- Oracle9i Master Index and Master Glossary
- Oracle9i Server and SQL*Plus
- Oracle9i Directory, Networking, and Security Documentation
- Oracle9i Real Application Clusters
- Oracle9i Server Application Development
- Oracle Text
- Oracle9i OLAP Services
- Oracle Enterprise Manager
- Oracle Workflow, Release 2.5.2
- Oracle Internet File System, Release 1.1
- Oracle Ultra Search

Documentation Titles

The following tables list the book titles in the generic documentation areas. All documentation is available in hard copy, PDF, and HTML, unless otherwise indicated in the Note column.

> **Note:** This is the list of books and part numbers that were available at release time. The documentation CD may be slightly different than what is listed below.

Oracle9*i* Master Index and Master Glossary

Table 3–1   Oracle9i Master Index and Master Glossary

Documentation	Part Number	Note
Oracle9i Database Generic Documentation Master Index	A90256	
Oracle9i Database Master Glossary	A73068	HTML only

Oracle9*i* Server and SQL*Plus

*Table 3–2   Oracle9i Server and SQL*Plus Documentation*

Documentation	Part Number	Note
Administration, Concepts, and Reference		
Oracle9i Database New Features	A90120	
Oracle9i Database Administrator's Guide	A90117	
Oracle9i Database Concepts	A88856	
Oracle9i Database Performance Guide and Reference	A87503	
Oracle9i Database Performance Methods	A87504	
Oracle9i Database Error Messages	A90202	
Oracle9i Database Migration	A90191	
Oracle9i Globalization Support Guide	A90236	
Oracle9i Database Reference	A90190	
Oracle9i SQL Reference	A90125	
Oracle9i Database Utilities	A90192	
Backup and Recovery		
Oracle9i Backup and Recovery Documentation Online Roadmap	A90201	HTML only
Oracle9i Backup and Recovery Concepts	A90133	
Oracle9i Recovery Manager User's Guide	A90135	
Oracle9i Recovery Manager Reference	A90136	
Oracle9i User-Managed Backup and Recovery Guide	A90134	
Legato Storage Manager Administrator's Guide	A77218	

*Table 3–2   Oracle9i Server and SQL*Plus Documentation (Cont.)*

Documentation	Part Number	Note
Data Warehousing		
Oracle9i Data Warehousing Guide	A90237	
Replication and Heterogeneous Services		
Oracle9i Replication	A87499	
Oracle9i Replication Management API Reference	A87502	
Oracle9i Heterogeneous Connectivity Administrator's Guide	A88789	
SQL*Plus		
*SQL*Plus User's Guide and Reference*	A88828	
*SQL*Plus Quick Reference*	A88827	
Miscellaneous		
Oracle9i Sample Schemas	A90129	
Oracle9i Data Guard Broker	A88807	
Oracle9i Data Guard Concepts and Administration	A88808	

Oracle9*i* Directory, Networking, and Security Documentation

Table 3–3   Oracle9i Directory, Networking, and Security Documentation

Documentation	Part Number	Note
Networking and Security		
Oracle Security Overview	A90148	
Oracle9i Net Services Administrator's Guide	A90154	
Oracle9i Net Services Reference Guide	A90155	
Oracle Label Security Administrator's Guide	A90149	
Oracle Advanced Security Administrator's Guide	A90150	
Oracle Internet Directory		
Oracle Internet Directory Administrator's Guide	A90151	
Oracle Internet Directory Application Developer's Guide	A90152	
Oracle Directory Service Integration and Deployment Guide	A90153	

Oracle9 *i* Real Application Clusters

Table 3–4   Oracle9i Real Application Clusters Documentation

Documentation	Part Number	Note
Oracle9i Real Application Clusters Documentation Online Roadmap	A89871	HTML only
Oracle9i Real Application Clusters Concepts	A89867	
Oracle9i Real Application Clusters Installation and Configuration	A89868	
Oracle9i Real Application Clusters Deployment and Performance	A89870	
Oracle C++ Call Interface Programmer's Guide	A89869	
Oracle Real Application Clusters Guard Administration and Reference Guide	A88810	

Oracle9 *i* Server Application Development

Table 3–5   Oracle9i Server Application Development Documentation

Documentation	Part Number	Note
Application Development		
Oracle9i Application Developer's Guide - Fundamentals	A88876	
Oracle9i Application Developer's Guide - Advanced Queuing	A88890	
Oracle9i Application Developer's Guide - Object-Relational Features	A88878	
Oracle9i Application Developer's Guide - Large Objects (LOBs)	A88879	PDF only
Oracle9i Application Developer's Guide - Large Objects (LOBs) Using PL/SQL	A88879	PDF only
Oracle9i Application Developer's Guide - Large Objects (LOBs) Using OCI	A88883	PDF only
*Oracle9i Application Developer's Guide - Large Objects (LOBs) Using Pro*C*	A88884	PDF only
*Oracle9i Application Developer's Guide - Large Objects (LOBs) Using Pro*COBOL*	A88886	PDF only
Oracle9i Application Developer's Guide - Large Objects (LOBs) Using VB (OO4O)	A88888	PDF only
Oracle9i Application Developer's Guide - Large Objects (LOBs) Using Java	A88887	PDF only
Oracle9i Application Developer's Guide - Workspace Manager	A88806	
Oracle9i Application Developer's Guide - XML	A88806	
Oracle9i Case Studies - XML Applications	A88895	

Table 3–5   Oracle9i Server Application Development Documentation (Cont.)

Documentation	Part Number	Note
Oracle9i Data Cartridge Developer's Guide	A88896	
Language and Interface		
Oracle Call Interface Programmer's Guide	A88896	
Oracle C++ Call Interface Programmer's Guide	A89869	
PL/SQL User's Guide and Reference	A89856	
*Pro*C/C++ Precompiler Programmer's Guide*	A89861	
*Pro*COBOL Precompiler Programmer's Guide*	A89865	
Programmer's Guide to the Oracle Precompilers (release 7.3.4)	A42525	
*Pro*Fortran Supplement to the Oracle Precompilers Guide* (release 7.3.4)	A42523	
*SQL*Module for Ada Programmer's Guide* (release 8.0.4)	A58231	
Application Reference		
Oracle9i XML Reference	A88899	
Oracle9i Supplied Java Packages Reference	A88898	
Oracle Call Interface Programmer's Guide	A89857	
Oracle C++ Call Interface Programmer's Guide	A89869	
PL/SQL User's Guide and Reference	A89856	
*Pro*C/C++ Precompiler Programmer's Guide*	A89861	
*Pro*COBOL Precompiler Programmer's Guide*	A89865	
Programmer's Guide to the Oracle Precompilers (release 1.8)	A42525	
*Pro*Fortran Supplement to the Oracle Precompilers Guide* (release 1.8)	A42523	
*Pro*PL/I Supplement to the Oracle Precompilers Guide* (release 1.8)	A87540	
Oracle9i Supplied PL/SQL Packages and Types Reference	A89852	
*inter*Media, Spatial, and Dynamic Services**		
Oracle interMedia User's Guide and Reference	A88786	
Oracle interMedia Java Classes User's Guide and Reference	A88785	
Oracle interMedia Annotator User's Guide	A88784	
Oracle Spatial User's Guide and Reference	A88805	

Table 3–5   Oracle9i Server Application Development Documentation (Cont.)

Documentation	Part Number	Note
Oracle Dynamic Services User's and Administrator's Guide	A88783	
Oracle Syndication Server User's and Administrator's Guide	A88787	
JAVA		
Oracle9i Enterprise JavaBeans Developer's Guide and Reference	A90188	
Oracle9i CORBA Developer's Guide and Reference	A90187	
Oracle9i JDBC Developer's Guide and Reference	A90211	
Oracle9i Java Developer's Guide	A90209	
Oracle9i JPublisher User's Guide	A90214	
Oracle9i Java Stored Procedures Developer's Guide	A90210	
Oracle9i Servlet Engine Developer's Guide	A90213	
Oracle JavaServer Pages Developer's Guide and Reference	A90208	
Oracle9i SQLJ Developer's Guide and Reference	A90212	
Oracle9i Java Tools Reference	A90207	

Oracle Text

Table 3–6   Oracle Text Documentation

Documentation	Part Number	Note
Oracle Text Application Developer's Guide	A90122	
Oracle Text Reference	A90121	

Oracle9*i* OLAP Services

Table 3–7   Oracle9i OLAP Services Documentation

Documentation	Part Number	Note
Oracle9i OLAP Services Concepts and Administration Guide	A88755	
Oracle9i OLAP Services Developer's Guide to the OLAP DML	A86720	
Oracle9i OLAP Services Developer's Guide to the Oracle OLAP API	A88756	

Oracle Enterprise Manager

Table 3–8   Oracle Enterprise Manager Documentation

Document	Part Number	Note
Oracle Enterprise Manager Administrator's Guide	A88767	
Oracle Enterprise Manager Messages Manual	A88758	
Oracle Enterprise Manager Configuration Guide	A88769	
Oracle Enterprise Manager Concepts Guide	A88770	
Oracle Intelligent Agent User's Guide	A88771	
Oracle SNMP Support Reference Guide	A88768	
Getting Started with the Oracle Standard Management Pack	A88749	
Getting Started with the Oracle Diagnostics Pack	A88748	
Database Tuning with the Oracle Tuning Pack	A86647	
Getting Started with Oracle Change Management Pack	A88717	
Getting Started with Oracle Management Pack for Oracle Applications	A88720	
Oracle Universal Installer Concepts Guide	A88812	
Oracle Enterprise Manager Event Test Reference Manual	A89872	

Oracle Workflow, Release 2.5.2

Table 3–9   Oracle Workflow, Release 2.5.2 Documentation

Documentation	Part Number	Note
Oracle Workflow Guide	A90181	
Oracle Workflow Server Installation Notes	A90185	
Oracle Workflow Client Installation Notes	A90235	

Oracle Internet File System, Release 1.1

Table 3–10   Oracle Internet File System, Release 1.1 Documentation

Document	Part Number	Note
Oracle Internet File System Quick Tour	N/A	HTML only
Oracle Internet File System Setup and Administration Guide	A81197	
Oracle Internet File System User's Guide	A75154	
Oracle Internet File System Developer's Guide	A75172	
Oracle Internet File System Class Reference	N/A	HTML only
Oracle Internet File System Java Reference API	N/A	HTML only
Oracle Internet File System XML Reference	N/A	HTML only

Oracle Ultra Search

Table 3–11   Oracle Ultra Search Documentation

Document	Part Number	Note
Oracle Ultra Search Online Documentation	N/A	HTML only

4

Deprecated and Desupported Features

This chapter lists features and functionalities of the Oracle database server that have been desupported or are planned to be desupported. It contains the following sections:

- Overview of Deprecated and Desupported Features

- Oracle9i Desupported and Deprecated Features

- Oracle8 and Oracle8i Desupported and Deprecated Features

Overview of Deprecated and Desupported Features

This chapter contains a summary of deprecated and desupported features for Oracle9*i*. It also contains a summary of deprecated and desupported features in Oracle8 and Oracle8*i* for users who are migrating directly from Oracle7, or Oracle8, to Oracle9*i*.

Desupported features are features that are no longer supported in a release. **Deprecated features** are features that are not recommended for use because they are planned for desupport in a future release.

> **See Also:** *Oracle9i Database Migration*

Oracle9*i* Desupported and Deprecated Features

This section contains the following topics:

- The ANALYZE Statement
- CONNECT INTERNAL
- C_Rep API
- Default Temporary Tablespace
- INCREMENTAL functionality of Export/Import
- National Character Set
- Oracle Net Services (Net8) Unsupported Features
- Oracle Names
- User-Managed Tablespace Point-in-Time Recovery (TSPITR) on a Clone Database
- Relational Model of Oracle Spatial
- Server Manager
- Single-Task and Non-Deferred Linking
- FOR RECOVER Clause of ALTER TABLESPACE ... OFFLINE
- VARCHAR Datatype
- Visual Information Retrieval
- Desupported and Deprecated Initialization Parameters

The ANALYZE Statement

The `DBMS_STATS` package should be used to collect optimizer statistics instead of the `ANALYZE` statement. The `ANALYZE` statement may be desupported in a future release.

CONNECT INTERNAL

`CONNECT INTERNAL` and `CONNECT INTERNAL/PASSWORD` are not supported in Oracle9*i*. Instead, the following are the exact equivalents:

```
CONNECT/ as SYSDBA
CONNECT username/password AS SYSDBA
```

> **See Also:** *Oracle9i Database Administrator's Guide* for information about connection syntax

C_Rep API

Server-side support for the client-side `REP80.DLL` has been removed. This DLL enabled replication between Oracle server and Oracle Lite. See the Oracle Lite documentation for information about replacement functionality.

Default Temporary Tablespace

If a temporary tablespace has not been created for a user, Oracle must have somewhere to store temporary data for that user. Historically, Oracle has used `SYSTEM` for default temporary data storage.

In Oracle9*i*, users are encouraged to define a default temporary tablespace when creating the database. If this is not done, `SYSTEM` will still be used for default temporary storage. However, a warning will be shown in the alert log saying that a default temporary tablespace is recommended, and may be necessary in future releases.

INCREMENTAL functionality of Export/Import

The `INCREMENTAL` functionality of Export/Import is being deprecated. This functionality exports an entire table if any row in the table has changed since the last `INCREMENTAL` export.

Users can still use the Export utility to selectively export tables. However, tables to be exported must be specified. Tablespace backups can be used if users want to backup specific tablespace, and not the entire database or schema, and if each table

is placed in its own tablespace. A tablespace backup or recovery is faster than the equivalent table export or import.

National Character Set

The NCHAR datatypes (NCHAR, NVARCHAR2, NCLOB) have been redefined in Oracle9*i* to be exclusively Unicode datatypes. You can store Unicode characters into columns of these datatypes regardless of the database character set.

National character sets for Unicode datatypes (NCHAR, NVARCHAR2, and NCLOB) are limited to AL16UTF16 or UTF8. The default character set is AL16UTF16.

Also, the AL24UTFFSS character set has been replaced by the UTF8 character set.

> **See Also:** *Oracle9i Globalization and National Language Support Guide*

Oracle Net Services (Net8) Unsupported Features

The following Oracle Net Services (formerly Net8) features are not supported in Oracle9*i*:

- NDS External Naming and NDS Authentication
- protocol.ora file
- SPX protocol
- Identix and SecurID authentication methods
- Net8 OPEN

The desupport of these features allows configuration decisions for the Internet to be streamlined.

> **See Also:** *Oracle Net Services Administrator's Guide*

Oracle Names

In future releases, Oracle Names will not be supported as a centralized naming method. Because no new enhancements are being added to Oracle Names, consider using directory naming or migrating an existing Oracle Names configuration to directory naming.

> **See Also:** *Oracle Net Services Administrator's Guide*

User-Managed Tablespace Point-in-Time Recovery (TSPITR) on a Clone Database

In Oracle9*i*, the traditional method of user-managed tablespace point-in-time recovery (TSPITR) that used a clone database is deprecated. Only user-managed TSPITR with the transportable tablespace option is supported. Users are encouraged to use the transportable tablespace feature (TTS) to accomplish tablespace point-in-time recovery.

Relational Model of Oracle Spatial

The relational geometry model of Oracle Spatial will not be supported in a future release. Only the object relational model will be supported.

Information about the relational model has been removed from the Oracle Spatial User's Guide and Reference and placed in a separate manual, Oracle Spatial Relational Model Guide and Reference, which is available on the Oracle Technology Network. Users should immediately begin using the object-relational model.

> **See Also:** *Oracle Spatial User's Guide and Reference*

Server Manager

Server Manager is not supported in Oracle9*i*. Use SQL*Plus instead. Most Server Manager scripts should work in a SQL*Plus environment, but some scripts may need to be modified.

> **See Also:** *Oracle9i Database Migration* for information about modifying Server Manager scripts

Single-Task and Non-Deferred Linking

Single-task linking and non-deferred linking are not supported in Oracle9*i*.

> **See Also:** *Oracle Call Interface Programmer's Guide*

FOR RECOVER Clause of ALTER TABLESPACE ... OFFLINE

The `FOR RECOVER` clause of `ALTER TABLESPACE ... OFFLINE` has been deprecated. The syntax is supported for backward compatibility. However, users are encouraged to use the transportable tablespaces feature for tablespace recovery.

VARCHAR Datatype

Use the `VARCHAR2` datatype instead of `VARCHAR`. The semantics of the `VARCHAR` datatype may change in a future release.

> **See Also:** *Oracle9i SQL Reference* for information about datatypes

Visual Information Retrieval

Oracle Visual Information Retrieval is not available in Oracle9*i*, and has been replaced by other image matching technology. In Oracle9*i*, image matching capability is available as part of *inter*Media.

Existing Visual Information Retrieval (VIR) applications will continue to be supported, but customers must convert the signature data and regenerate signature indices. Continued operation is facilitated by a VIR-compatible API that is implemented upon the new image-matching API. The VIR-compatible API is recommended for existing applications only and may be desupported in a future release. All new applications should be built using the *inter*Media image-matching API.

> **See Also:** *Oracle interMedia User's Guide and Reference*

Desupported and Deprecated Initialization Parameters

This section contains:

- Desupported Initialization Parameters in Oracle9i
- Deprecated Initialization Parameters in Oracle9i

Desupported Initialization Parameters in Oracle9*i*

ALWAYS_ANTI_JOIN

ALWAYS_SEMI_JOIN

JOB_QUEUE_INTERVAL

OPTIMIZER_PERCENT_PARALLEL

HASH_MULTIBLOCK_IO_COUNT

DB_BLOCK_LRU_LATCHES

DB_BLOCK_MAX_DIRTY_TARGET

SORT_MULTIBLOCK_READ_COUNT

DB_FILE_DIRECT_IO_COUNT

GC_DEFER_TIME

GC_RELEASABLE_LOCKS

GC_ROLLBACK_LOCKS

LM_LOCKS

LM_RESS

USE_INDIRECT_DATA_BUFFERS

Deprecated Initialization Parameters in Oracle9*i*

ROLLBACK_SEGMENTS

FAST_START_IO_TARGET

TRANSACTIONS_PER_ROLLBACK_SEGMENT

LOG_CHECKPOINT_INTERVAL

DB_BLOCK_BUFFERS

BUFFER_POOL_KEEP

BUFFER_POOL_RECYCLE

Oracle8 and Oracle8*i* Desupported and Deprecated Features

This section contains the following topics:

- Strings of Zero Length Not Equivalent To NULL
- Date Format Strings
- SELECT Privilege
- SERIALIZABLE=TRUE
- ESTAT ⁄ BSTAT
- Partition Views
- Use of "THE (subquery)" Expression
- The SGADEF File
- LONG Columns

■   Oracle Security Server and Cryptographic Toolkit

Strings of Zero Length Not Equivalent To NULL

A string of zero length (`' '`) is not equivalent to a NULL value. According to the ANSI SQL 1992 Transitional standard, a zero-length or empty string is not the same as NULL. Ensure that applications do not treat empty strings and NULL values equivalently.

Date Format Strings

In Oracle7, a space or punctuation character in the format string caused the corresponding character in the date string to be discarded. This caused incorrect dates to be entered into the database because alphanumeric characters were thrown out. In Oracle8*i*, an error occurs if an alphanumeric character is found in the date string when a punctuation character or space is found in the format string, as illustrated in the first row of the following table. The second row of the table displays an exception to the rule; the exception may be removed in future releases.

SQL Syntax	Oracle7 Result	Oracle8 Result
`TO_CHAR(TO_DATE('0297', 'MM/YY'), 'MM/YY')`	`02/97`	`ORA-1861`
`TO_CHAR(TO_DATE('1996-05-19 12:37:48.196000',` `          'YYYY-MM-DD HH24:MI:SS."00000"')`		`1996-05-19 12:37:48`

Also, Oracle8 allows matching of certain dates which produced an error in Oracle7. This matching occurs only when the correct date can be determined without ambiguity. However, this matching does not occur if the format model modifiers FX or FXFM are used.

The new matching rules are:

■   Time fields at the end of a date string are optional.

■   Punctuation may be omitted in the date string under certain conditions.

■   For a few date format elements, an alternative similar date format element is tried if the initial match fails.

The following example yields the result `05/25/1905` in Oracle8:

```
TO_CHAR(TO_DATE('May 25, 1905', 'MM/DD/RRRR HH:MI:SS'), 'MM/DD/RRRR')
```

See Also: *Oracle9i SQL Reference*

SELECT Privilege

The SELECT privilege may be required on tables that users update. Always grant the SELECT privilege to a user or role if you grant the UPDATE or DELETE privileges on the table.

> **See Also:** *Oracle9i Database Reference* and its discussion of the SQL92_SECURITY initialization parameter

SERIALIZABLE=TRUE

The initialization parameter SERIALIZABLE=TRUE is not supported in Oracle8. The default behavior henceforth is as if SERIALIZABLE was set to FALSE. Use the SET TRANSACTION ISOLATION LEVEL SERIALIZABLE statement to achieve similar transaction isolation behavior.

ESTAT/BSTAT

BSTAT/ESTAT is not up to date with many of the new features introduced since 8.0, and eventually will be desupported.

Users who require help for performance tuning, and are running any release above Oracle 8.0, are asked to provide Statspack output rather than BSTAT/ESTAT. Statspack is much easier to interpret, provides more detailed information, and makes tuning faster and more effective.

Partition Views

Partition views are desupported in release 8.1.6. Instead, use partitioned tables.

Use of "THE (subquery)" Expression

In releases prior to Oracle8, the *table_collection_expression* clause was expressed as "THE (*subquery*)". That usage is desupported.

> **See Also:** *Oracle9i SQL Reference*

The SGADEF File

The contents of this file have been deleted, but the file remains because its existence is required by the Oracle database server. Do not delete this file. It may be desupported in a future release.

LONG Columns

LONG columns may be desupported in a future release. You are advised to migrate LONG data into LOB columns.

Oracle Security Server and Cryptographic Toolkit

The Oracle Security Server and Cryptographic Toolkit products do not exist in Oracle8*i* and later, however their functionality has been integrated into Oracle Advanced Security and Oracle Internet Directory.

A

Oracle8*i* Options and Features

This appendix contains the following sections:

- Oracle8i Options
- Oracle8i Features
- The V$OPTION Table

> **Note:**
>
> - This information is from Oracle8*i*, Release 3 (8.1.7). When information for Oracle9*i* is available for Oracle9*i* Features and Options by Edition, the information about Oracle8*i*, Release 3 (8.1.7) will replace this information.
>
> - Oracle9*i* Features and Options by Edition is located in the Oracle9*i* Release 1 README.
>
> - Oracle8*i* Releases 1 and 2 are different from Release 3. Users should consult the version of the document corresponding to the software being used.

Oracle8*i* Options

Table A–1 describes options available in each edition of Oracle8*i*, Release 3 (8.1.7).

> **See Also:** Oracle8*i* documentation at
> `http://technet.oracle.com` for detailed information about
> specific options

Table A–1   Oracle8i Release 3 (8.1.7) Options

Option	Oracle8*i* Standard Edition	Oracle8*i* Enterprise Edition	Notes
Oracle Advanced Security	N	Y	Oracle Advanced Security provides a comprehensive range of network security features that increase security and user reliability in distributed networks. Through support of industry standards such as SSL and X.509 for public key infrastructure and RADIUS for integration with existing infrastructures and enhanced authentication choices, Oracle Advanced Security protects your investment in hardware and software. Through support of single sign-on services such as Kerberos, and enhanced user authentication devices including smartcards and biometric devices, Oracle Advanced Security ensures user reliability and simplifies account management. Encryption technology provided by Oracle Advanced Security provides strong protection for all data in your network.
			Oracle Advanced Security also includes a restricted use license of Oracle Internet Directory for enterprise user and authorization management.
Oracle *inter*Media	Y	Y	Oracle *inter*Media enables Oracle8*i* to manage text, documents, image, audio, video, and locator data in an integrated fashion with other enterprise information. It includes Internet services supporting popular Web client interfaces, Web development tools, Web servers, and streaming media servers. It provides a higher level of services for database applications written in Java, C++, and traditional 3GLs using modern class library interfaces, or PL/SQL and Oracle Call Interface, through native support for image, audio and video data types, data attribute management, and operators. Functionality previously found in separate Oracle products, such as ConText, has been significantly enhanced and is now part of the *inter*Media product.

Table A–1   Oracle8i Release 3 (8.1.7) Options (Cont.)

Option	Oracle8*i* Standard Edition	Oracle8*i* Enterprise Edition	Notes
Oracle Internet Directory	Y	Y	Oracle Internet Directory is an LDAP (Lightweight Directory Access Protocol) v3 compliant directory server built on top of Oracle8*i* Enterprise Edition. A directory server is an object-oriented database repository and application that maintains hierarchically organized information. LDAP directory services are used to manage information about network objects such as user information (user names, group names, security/authorization information, preferences), application information (interfaces, locations, load-balancing information), and network asset information (databases, application servers, printers, file servers, hardware). Oracle Internet Directory is designed to leverage the scalability, availability, and security features of the Oracle8*i* platform to meet the needs of carriers, service providers, and large extranet sites.
			Oracle Internet Directory is a stand-alone product that includes a restricted use license of Oracle8*i* Enterprise Edition. However, all editions of the Oracle8*i* database include a restricted use license of Oracle Internet Directory v2.0.6 for the purposes of storing RDBMS instance names, enterprise domains, user-schema mappings, enterprise roles, and storage of Net8 naming and connect descriptor information.

Table A–1 Oracle8i Release 3 (8.1.7) Options (Cont.)

Option	Oracle8*i* Standard Edition	Oracle8*i* Enterprise Edition	Notes
Oracle Internet File System (*i*FS)	Y	Y	Oracle *i*FS brings the worlds of structured and unstructured data together into a powerful, easy-to-manage document-centric repository accessible via all major Internet protocols. Oracle *i*FS makes it possible to treat an Oracle8*i* database like a shared network drive. This means that users can store and retrieve files managed by the database as if they were files managed by a file server. End users can easily access files and folders in Oracle *i*FS via a variety of protocols, such as HTML, FTP, and IMAP4, giving them universal access to their data. Advanced searching capabilities make it easy to rapidly locate information contained in Oracle *i*FS, other content management features help organize and manage data in ways not possible on other file systems. The *i*FS development environment makes it easy to develop applications using a wide range of content, all with a single skill set using Internet standard languages like XML and Java. And, finally, everything in Oracle *i*FS is built on top of the reliable, portable, scalable, and secure Oracle8*i* server. *i*FS is included at no charge with all editions of the Oracle8*i* database.
Oracle8*i* JVM	Y	Y	Oracle has integrated a fast, scalable, highly available, and secure Java Virtual Machine (Java VM) with the Oracle8*i* database server. The Oracle8*i* JVM, formerly known as Oracle JServer, provides an ideal platform on which to deploy enterprise applications written in Java.
			Oracle8*i* JVM supports a variety of application programming models including Java stored procedures and triggers, Java methods of object-relational types, CORBA objects, Enterprise JavaBeans, Java Servlets and JavaServer Pages. It also supports a variety of standards-based protocols such as IIOP and HTTP, in addition to Net8. The Oracle8*i* JVM also includes the JVM Accelerator, which provides the ability to deploy Java code in natively compiled form for execution on the Oracle8*i* server, producing significant performance enhancement.

Table A–1   Oracle8i Release 3 (8.1.7) Options (Cont.)

Option	Oracle8i Standard Edition	Oracle8i Enterprise Edition	Notes
Oracle8i Lite	N	N	Oracle8i Lite is a small footprint Java-enabled database that brings enterprise applications to mobile devices such as laptops, handheld computers, PDAs, information appliances, or wherever a persistent network connection is unavailable. Oracle8i Lite provides the following services: ■ Internet Lite, a set of services that facilitate deployment, development, and management of mobile Web applications. ■ EnterpriseSync Lite, a set of services that enables reliable and scalable synchronization of data and applications between Oracle8i Lite and central database servers. ■ Advanced Queuing Lite provides application messaging services that are compatible with Oracle8i advanced queuing and enables development of mobile and message based applications. Oracle8i Lite can replicate to Oracle8i and Oracle8i Enterprise Edition and is an optional product.
Oracle Parallel Server	N	Y	The Oracle Parallel Server architecture and management infrastructure combines the benefits of cluster scalability and availability with single system management capabilities. Oracle Parallel Server fully exploits clustered systems for database applications by delivering the following benefits: ■ *High Availability:* Cluster technology insulates application and database users from hardware and software failures. Oracle Parallel Server architecture enables all the nodes of the system to access all the data and provides inherent fault resilience. ■ *Cluster Scalability:* Clustering enables more users and greater transaction throughput, especially for enterprise applications and Internet commerce applications. Oracle Parallel Server achieves greater scalability by fully exploiting the expanded CPU, memory and disk resources of the clustered system to drive more transactions. ■ *Single System Manageability:* Oracle Parallel Server's Single System View technology simplifies manageability by reducing the complexity of managing a server cluster. With Single System View, an entire cluster of servers appears as one system to the administrator.

Table A–1   Oracle8i Release 3 (8.1.7) Options (Cont.)

Option	Oracle8i Standard Edition	Oracle8i Enterprise Edition	Notes
Oracle Partitioning	N	Y	Oracle Partitioning enhances the data management environment for OLTP, data mart, and data warehouse applications by adding significant manageability, availability, and performance capabilities to large underlying database tables and indexes. Oracle Partitioning permits large tables to be broken into individually managed smaller pieces, while retaining a single application-level view of the data. Range, hash, and composite (range combined with hash) partitioning methods are supported. Oracle Partitioning is also especially useful in an Oracle Parallel Server configuration, improving performance in clustered environments, as well as large OLTP and data warehouse sites.
Oracle Portal	Y	Y	Oracle Portal (formerly WebDB) offers a complete solution for configuring and deploying an Enterprise Information Portal. It provides a framework for integration and secure access to corporate information, a customizable environment for personalization, and a set of services to manage portal deployment and expansion.
Oracle Programmer	N	N	Oracle Programmer provides a rich set of interfaces for developers who build enterprise applications that access and manipulate Oracle8i data and schemas. To fully support Java, Oracle Programmer includes SQLJ, the embedded SQL interface for Java that simplifies Java access to the Oracle8i database, and JPub, which is used to map SQL objects and collections to Java and vice versa. Oracle Programmer is a family of products consisting of: ■ Three embedded SQL-style interfaces: Precompilers, SQL*Module, and SQLJ ■ Three call level interfaces: Oracle Call Interface, ODBC, and JDBC ■ Oracle Objects for OLE ■ Two utilities to generate host-language bindings from database schemas: Object Type Translator and JPub

Table A–1   Oracle8i Release 3 (8.1.7) Options (Cont.)

Option	Oracle8*i* Standard Edition	Oracle8*i* Enterprise Edition	Notes
Oracle Spatial	N	Y	Oracle Spatial allows users and application developers to seamlessly integrate their spatial data into enterprise applications. Oracle Spatial facilitates analysis based on the spatial relationships of associated data, like the proximity of store locations to customers within a given distance and sales revenue per territory. Oracle Spatial manages spatial data in an industry-standard database, resulting in application integration that takes place at the data server. This enables vendor tools and applications to access spatial data directly from Oracle8*i*, increasing interoperability and minimizing costs.
Oracle Enterprise Manager Packs			
Oracle DBA Management Pack	Y	Y	Oracle Enterprise Manager includes at no charge the DBA Management Pack, which is a set of assistants and database management tools that automate and simplify the common tasks of database administration.
Oracle Tuning Pack	N	Y	Oracle Tuning Pack provides database administrators with expert performance management for the Oracle environment, including SQL tuning and storage optimization.
Oracle Diagnostics Pack	N	Y	Oracle Diagnostics Pack enables database administrators to perform advanced monitoring, diagnosis, and planning for the Oracle environment.
Oracle Change Management Pack	N	Y	Oracle Change Management Pack eliminates errors and loss of data when upgrading databases to support new applications. The pack analyzes the impact and complex dependencies associated with application change and automatically performs database upgrades.
Oracle Standard Management Pack	Y		Oracle Standard Management Pack is a subset of Oracle Tuning Pack, Oracle Change Management Pack and Oracle Diagnostics Pack. It provides advanced functionality to assist in managing and tuning Oracle8*i* standard edition databases and applications.

Oracle8*i* Features

Table A–2 lists the features available in Oracle8*i*, Release 3 (8.1.7).

> **See Also:** Oracle8*i* documentation at http://technet.oracle.com for detailed information about specific features, and "Oracle8i Lite" on page A-5 for Oracle8*i* Lite features and functionality

Table A–2   Oracle8i Release 3 (8.1.7) Feature Availability

Area	Feature	Oracle8*i* Standard Edition	Oracle8*i* Enterprise Edition	Notes
Java Support	SQLJ	Y	Y	Requires Oracle Programmer
Java Support	JDBC Drivers	Y	Y	
Java Support	Oracle8*i* JVM	Y	Y	Includes support for Java2 (JDK 1.2); Java triggers, functions, and procedures; Enterprise Java Beans 1.1; JavaServer Pages 1.1 ; Servlets 2.2; and CORBA 2.0
OLTP/High Availability	Optimizer statistics management	Y	Y	
OLTP/High Availability	Readable standby database	Y	Y	
OLTP/High Availability	Database resource management		Y	
OLTP/High Availability	Transparent Application Failover		Y	
OLTP/High Availability	Automated standby database		Y	
OLTP/High Availability	Online index build		Y	
OLTP/High Availability	Fast-start fault recovery		Y	
OLTP/High Availability	Advanced queuing		Y	
OLTP/High Availability	Plan stability		Y	
OLTP/High Availability	Oracle Parallel Server		Y	Extra cost option

Table A–2   Oracle8i Release 3 (8.1.7) Feature Availability (Cont.)

Area	Feature	Oracle8*i* Standard Edition	Oracle8*i* Enterprise Edition	Notes
Data Warehouse and Very Large Database Support	Star query optimization	Y	Y	
Data Warehouse and Very Large Database Support	Parallel load	Y	Y	
Data Warehouse and Very Large Database Support	CUBE and ROLLUP	Y	Y	
Data Warehouse and Very Large Database Support	Import transportable tablespaces	Y	Y	
Data Warehouse and Very Large Database Support	Direct Path Load API	Y	Y	
Data Warehouse and Very Large Database Support	Analytic functions (such as rank, moving average, and ratio-to-report)		Y	
Data Warehouse and Very Large Database Support	Export transportable tablespaces		Y	
Data Warehouse and Very Large Database Support	Materialized views		Y	
Data Warehouse and Very Large Database Support	Parallel bitmap star query optimization		Y	
Data Warehouse and Very Large Database Support	Bitmap indexes		Y	
Data Warehouse and Very Large Database Support	Sample scan		Y	

Table A–2   Oracle8i Release 3 (8.1.7) Feature Availability (Cont.)

Area	Feature	Oracle8*i* Standard Edition	Oracle8*i* Enterprise Edition	Notes
Data Warehouse and Very Large Database Support	Parallel query		Y	
Data Warehouse and Very Large Database Support	Automated parallel query degree		Y	
Data Warehouse and Very Large Database Support	Parallel data manipulation language (DML)		Y	Requires Oracle Partitioning
Data Warehouse and Very Large Database Support	Parallel index scans		Y	Requires Oracle Partitioning
Data Warehouse and Very Large Database Support	Parallel index build		Y	
Data Warehouse and Very Large Database Support	Parallel collection of table statistics		Y	
Data Warehouse and Very Large Database Support	Oracle Partitioning		Y	Extra cost option
Manageability	Oracle Enterprise Manager	Y	Y	
Manageability	Oracle Workflow Standard Edition	Y		
Manageability	Oracle Workflow Enterprise Edition		Y	
Manageability	Server managed backup and recovery	Y	Y	
Manageability	Recovery Manager	Y	Y	
Manageability	Online backup and recovery	Y	Y	

Table A–2   Oracle8i Release 3 (8.1.7) Feature Availability (Cont.)

Area	Feature	Oracle8*i* Standard Edition	Oracle8*i* Enterprise Edition	Notes
Manageability	Legato Storage Manager	Y	Y	
Manageability	Oracle Fail Safe for Oracle8*i* on NT	Y	Y	
Manageability	Parallel backup and recovery		Y	
Manageability	Incremental backup and recovery		Y	
Manageability	Point-in-time tablespace recovery		Y	
Manageability	Duplexed backup sets		Y	
Manageability	Oracle DBA Management Pack	Y	Y	
Manageability	Oracle Standard Management Pack	Y		
Manageability	Oracle Diagnostics Pack		Y	Extra cost option
Manageability	Oracle Tuning Pack		Y	Extra cost option
Manageability	Oracle Change Management Pack		Y	Extra cost option
Distributed	Replication to Oracle8*i* Lite	Y	Y	Extra cost product
Distributed	Distributed queries	Y	Y	
Distributed	Distributed transactions	Y	Y	
Distributed	Heterogeneous services	Y	Y	

Table A–2   Oracle8i Release 3 (8.1.7) Feature Availability (Cont.)

Area	Feature	Oracle8*i* Standard Edition	Oracle8*i* Enterprise Edition	Notes
Distributed	Single master replication	Y	Y	Single master replication fully supports bi-directional replication between a single, updatable master site and multiple, updatable snapshot sites. The entire replicated environment can be controlled from Oracle Replication Manager.
Distributed	Multiple master replication		Y	Multiple master replication supports multiple, n-way connected, updatable master sites, each capable of supporting multiple, updatable snapshot sites for improved scalability and availability. Oracle Replication Manager also provides support for multiple masters.
Networking and Security	Net8	Y	Y	
Networking and Security	Oracle Internet Directory	Y	Y	Restricted use license of Oracle Internet Directory v2.0.6 for the purposes of storing RDBMS instance names, enterprise domains and user-schema mappings, enterprise roles, and storage of Net8 naming and connect descriptor information
Networking and Security	Oracle HTTP Listener Powered by Apache	Y	Y	
Networking and Security	Oracle Names	Y	Y	
Networking and Security	Connection pooling	Y	Y	
Networking and Security	Oracle Connection Manager: Multiplexing, multi-protocol connectivity, network access control		Y	

Table A–2   Oracle8i Release 3 (8.1.7) Feature Availability (Cont.)

Area	Feature	Oracle8*i* Standard Edition	Oracle8*i* Enterprise Edition	Notes
Networking and Security	N-tier authentication/ authorization		Y	
Networking and Security	Oracle Advanced Security		Y	Extra cost option
Database Features	Objects and extensibility	Y	Y	
Database Features	LOB (large object) support	Y	Y	
Database Features	National language support (NLS)	Y	Y	
Database Features	PL/SQL stored procedures, triggers	Y	Y	
Database Features	PL/SQL Server Pages	Y	Y	
Database Features	Database event triggers	Y	Y	
Database Features	Instead-of triggers	Y	Y	
Database Features	Password management	Y	Y	
Database Features	Long operations monitor	Y	Y	
Database Features	Temporary tables	Y	Y	
Database Features	Index-organized tables	Y	Y	
Database Features	LogMiner	Y	Y	
Database Features	Locally managed tablespaces	Y	Y	
Database Features	Descending indexes	Y	Y	
Database Features	Reverse key indexes	Y	Y	
Database Features	Drop column	Y	Y	

Table A–2   Oracle8i Release 3 (8.1.7) Feature Availability (Cont.)

Area	Feature	Oracle8*i* Standard Edition	Oracle8*i* Enterprise Edition	Notes
Database Features	Virtual private database		Y	
Database Features	Index coalesce		Y	
Database Features	Function-based indexes		Y	
Database Features	Indexes on NLS collating sequences		Y	
Database Features	Automatic literal conversion		Y	This feature automatically converts literal strings in a WHERE clause to bind variables, improving performance in some packaged applications.
Programming Interfaces	Pro*C and other precompilers	Y	Y	Requires Oracle Programmer
Programming Interfaces	XML SQL Utility	Y	Y	
Programming Interfaces	Native ODBC/OLEDB driver	Y	Y	
Programming Interfaces	Microsoft Transaction Server integration	Y	Y	This feature is available on Windows NT.
Programming Interfaces	COM Automation Feature	Y	Y	This feature is available on Windows NT and Windows98.
Programming Interfaces	AppWizard for Visual Studio	Y	Y	This feature is available on Windows NT and Windows98.
Programming Interfaces	Objects for OLE	Y	Y	Requires Oracle Programmer
Programming Interfaces	Oracle Call Interface (OCI)	Y	Y	Requires Oracle Programmer
Programming Interfaces	Oracle Programmer	Y	Y	Extra cost option
Content Management	Oracle Internet File System (*i*FS)	Y	Y	
Content Management	Oracle *inter*Media	Y	Y	

Table A–2   Oracle8i Release 3 (8.1.7) Feature Availability (Cont.)

Area	Feature	Oracle8*i* Standard Edition	Oracle8*i* Enterprise Edition	Notes
Content Management	Oracle Portal	Y	Y	
Content Management	Oracle Spatial		Y	Extra cost option

The V$OPTION Table

To check the values for different options on your database, query the V$OPTION table as in the following example:

```
SQL> SELECT * FROM V$OPTION;
```

The response, of course, varies depending upon the specific installation. A sample result might be as follows:

PARAMETER	VALUE
Partitioning	TRUE
Objects	TRUE
Oracle Parallel Server	FALSE
Advanced replication	TRUE
Bit-mapped indexes	TRUE
Connection multiplexing	TRUE
Connection pooling	TRUE
Database queuing	TRUE
Incremental backup and recovery	TRUE
Instead-of triggers	TRUE
Parallel backup and recovery	TRUE
Parallel execution	TRUE
Parallel load	TRUE
Point-in-time tablespace recovery	TRUE
N-tier authentication/authorization	TRUE

PARAMETER	VALUE
Function-based indexes	TRUE
Plan Stability	TRUE
Online index segment creation	TRUE
Index segment coalesce	TRUE
Managed Standby	TRUE
Materialized view rewrite	TRUE
Materialized view warehouse refresh	TRUE
Database Resource Manager	TRUE
Spatial	TRUE
Export transportable tablespaces	TRUE
Transparent Application Failover	TRUE
Fast start recovery	TRUE

B

Oracle8 Options and Features

This appendix contains the following sections:

- Oracle8 Options
- Oracle8 Features

Oracle8 Options

Table B–1 describes the options available in Oracle8.

> **See Also:** Oracle8 documentation at http://technet.oracle.com for more detailed information about specific options

Table B–1   Oracle8 Options

Feature	Oracle8	Oracle8 Enterprise Edition	Notes and References
Oracle8 Options (available only for the Oracle8 Enterprise Edition, at extra cost)			
Objects Option	N	Y	The Objects option allows data to be represented, accessed, manipulated, and stored as business objects.
			It allows the definition of object types and all features that use object types, including object tables, object views, the object cache, extended Oracle Call Interface features, the object features of Pro*C, extended SQL and PL/SQL support of object capabilities.
			No CREATE TYPE, ALTER TYPE, or CREATE OR REPLACE TYPE statements are possible without this option.
			Note: INSTEAD OF triggers are available with the Oracle8 Enterprise Edition, even without the objects option, and can apply to relational views. Also note that LOBs (large objects) are included in both Oracle8 and the Oracle8 Enterprise Edition.
Partitioning Option	N	Y	The Partitioning option allows the definition of partitions of tables and indexes. This feature is useful for OLTP and Data Warehousing users. Note that this option is required for parallel index scans and parallel DML (insert, update, and delete). Note also that partition views, a feature of Oracle7 release 7.3, is included in the Oracle8 Enterprise Edition without this option.
			No CREATE PARTITION statements are possible without this option.

Table B–1   Oracle8 Options (Cont.)

Feature	Oracle8	Oracle8 Enterprise Edition	Notes and References
Advanced Networking Option	N	Y	The Advanced Networking option provides client/server, server/server network security using encryption and data integrity checking as well as enhanced user authentication services.
Enterprise Manager Performance Pack	N	Y	The Oracle Enterprise Manager Performance Pack provides an advanced set of tools for managing database environments. It consists of six applications for advanced diagnostics, monitoring, and tuning of Oracle environments.
Parallel Server Option	N	Y	The Parallel Server option allows multiple nodes of a loosely-coupled system (such as a cluster or massively parallel platform) to share access to a single database, for increased scalability and availability. It includes client-side failover and, on some platforms, inter-node parallel query.

Oracle8 Features

Table B–2 describes the features available in Oracle8.

> **See Also:**   Oracle8 documentation at http://technet.oracle.com for more detailed information about specific features

Table B–2   Oracle8 Features

Feature	Oracle8	Oracle8 Enterprise Edition	Notes and References
Systems Management and Availability			
Enterprise Manager	Y	Y	
Enterprise Manager Performance Pack	N	Y	
Server Managed Backup and Recovery	Y	Y	

Table B–2   Oracle8 Features (Cont.)

Feature	Oracle8	Oracle8 Enterprise Edition	Notes and References
Recovery catalog for online backup	Y	Y	
Online recovery	Y	Y	
Incremental backup and recovery	N	Y	
Parallel backup and recovery	N	Y	Oracle8 can only allocate one recovery manager channel at a time, thus limiting the parallelism to one stream. The Oracle8 Enterprise Edition allows unlimited parallelism.
Legato Storage Manager	Y	Y	
Point-in-time tablespace recovery	N	Y	
Fail Safe for Oracle8 on NT	Y	Y	This feature is available on Windows NT.
Datawarehouse/VLDB Features			
Bit-mapped indexes	N	Y	
Star Query optimization	Y	Y	In Oracle8, star query processing is the algorithm that utilizes B-tree indexes. In the Oracle8 Enterprise Edition, the parallel bitmap index join algorithm can also be utilized.
Parallel Execution	N	Y	
Parallel Load	N	Y	
Parallel Query	N	Y	
Parallel DML (`INSERT`, `UPDATE`, and `DELETE`)	N	Y	This feature requires the Partitioning Option.
Parallel index scans	N	Y	This feature requires the Partitioning Option.
Parallel Bitmap Star Joins	N	Y	
Parallel Index Build	N	Y	
Parallel Analyze	N	Y	This feature requires the Partitioning Option.
Programming Interfaces			

Table B–2   Oracle8 Features (Cont.)

Feature	Oracle8	Oracle8 Enterprise Edition	Notes and References
Oracle Call Interface	Y	Y	
Objects for OLE	Y	Y	
ODBC driver	Y	Y	
Pro*C/C++	Y	Y	This feature is available at extra cost as part of Oracle Programmer.
Object Features			
object references (REFs)	Y	Y	
object collections	Y	Y	
nested tables	Y	Y	
variable arrays (varrays)	Y	Y	
object views	Y	Y	
Distributed Features			
Distributed queries	Y	Y	
Distributed transactions	Y	Y	
Two-phase commit	Y	Y	
XA	Y	Y	
Heterogeneous Services	Y	Y	
Basic Replication	Y	Y	
Read-only snapshots	Y	Y	
Subquery subsetting	Y	Y	
Primary key based snapshots	Y	Y	
Internal triggers	Y	Y	
Replicated LOBs	Y	Y	
Advanced Replication	N	Y	
Updatable snapshots	N	Y	
Multimaster replication	N	Y	

Table B–2   Oracle8 Features (Cont.)

Feature	Oracle8	Oracle8 Enterprise Edition	Notes and References
Conflict detection and resolution	N	Y	
Replication Manager	N	Y	
Parallel propagation	N	Y	
Minimize communication	N	Y	
Networking Features			
Oracle Names	Y	Y	
Oracle Connection Manager	N	Y	
Connection Pooling	Y	Y	
Connection Multiplexing	Y	Y	
MultiProtocol Connectivity	N	Y	
Oracle Security Server	Y	Y	
Other Features			
Advanced Queuing	N	Y	Advanced Queuing supports two types of message payloads—RAW and structured (where the structure is specified by an object type). Without the Objects option, users can only use RAW queues. Both single-consumer and multi-consumer RAW queues are available without the objects option. See *Oracle8 Application Developer's Guide* for details.
Reverse key indexes	Y	Y	
Password management	Y	Y	
Index-organized tables	Y	Y	
PL/SQL stored procedures, triggers	Y	Y	
INSTEAD OF triggers	N	Y	This feature can be used with relational views as well as object views. Object capabilities require the Objects option.

Table B–2   Oracle8 Features (Cont.)

Feature	Oracle8	Oracle8 Enterprise Edition	Notes and References
External procedures	Y	Y	
National Language Support	Y	Y	
LOB support	Y	Y	
Data Cartridges (extended datatype support; available at extra cost)			
ConText Cartridge	Y	Y	The ConText Cartridge offers full text retrieval.
Video Cartridge	Y	Y	
Image Cartridge	N	Y	For more information, see *Oracle8 Image Cartridge User's Guide.*
Visual Information Retrieval Cartridge	N	Y	For more information, see *Oracle8 Visual Information Retrieval Cartridge User's Guide.*
Time Series Cartridge	N	Y	**Note:** To add functions or types to the Time Series Cartridge requires the Objects option. For more information, see *Oracle8 Time Series Cartridge User's Guide.*
Spatial Data Cartridge	N	Y	For more information, see *Oracle8 Spatial Cartridge User's Guide and Reference.*

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