Oracle8*i*™ Release 2 New Features Summary

Features Overview
November 1999

This document covers new features introduced in Oracle8*i* Release 2. For an overview of all new features introduced in initial release of Oracle8*i* and in Oracle8*i* Release 2, see the "Oracle8*i* New Features Summary".

INTRODUCTION

Oracle8*i* Release 2 is the latest release of the Oracle8*i* database. In addition to a number of advanced new features, Oracle8*i* Release 2 includes many bug fixes, performance improvements, and user interface enhancements. The enhancements and new features in Oracle8*i* Release 2, formerly known as Oracle8*i* Release 8.1.6, can be categorized as:

- Data Warehouse Enhancements
- Enhanced Support for Internet Computing and Java
- High Availability Enhancements
- Performance and Quality Improvements
- Additional Functionality

DATA WAREHOUSE ENHANCEMENTS

Analytic Functions

Oracle8*i* Release 2 introduces a powerful new family of SQL functions for business intelligence and data-warehousing applications. These functions are collectively called "analytic functions", and they

provide significantly improved performance and simplified coding for many business analysis queries. Some examples of the new capabilities are:

- Ranking ("Find the top 10 sales reps in each region.")
- Moving aggregates ("What is the 200-day moving average of our company's stock price?")
- Period-over-period comparisons ("What is the percentage growth of January 1999 over January 1998?")
- Ratio-to-report ("What is January's sales as a percentage of the entire year's?")
- Other functions include: Cumulative aggregates and lag/lead expressions

These functions significantly extend the capabilities of Oracle8*i* for analytic applications. Moreover, these new SQL functions are now being reviewed by ANSI for addition to the SQL standard in 2000, which will encourage third-party analytic tools and applications to leverage the scalability and performance of these new functions.

Materialized View Enhancements

Materialized views, first introduced in the initial release of Oracle8*i*, have been an indispensable feature for high-performance data warehousing.

Materialized views include the functionality to create and maintain summary tables, resulting in dramatic performance improvements in aggregation queries. New functionality in Oracle Enterprise Manager supports the creation and management of materialized views and related dimensions and hierarchies via a graphical interface, greatly simplifying the management of materialized views.

For further improved performance, an ORDER BY clause can be used when creating a materialized view and when inserting records using INSERT…SELECT. This allows rows in the table or the materialized view to be inserted in the specified desired order, resulting in better performance of query sorts when the sort order is the same as the inserted order.

Enhanced Partitioning

Many data warehouses and data marts use partitioning to implement a "rolling window" scheme. In a rolling window, new data is added and old data is purged from a data warehouse on a regular periodic basic. For example, a data warehouse may store the most recent 13 months of historical data. Every month, a new month's data (corresponding to a single range partition) is added to the warehouse, and the 14-month-old data (also corresponding to a single partition) is dropped from the warehouse. Release 2 includes enhancements to the functionality of materialized views and composite partitioning to better support the management of "rolling window" operations.

The refresh capabilities of materialized views has been enhanced to allow partition maintenance operations to be executed on base tables without requiring a full refresh of associated materialized views. For example, a material view is not marked as "stale" if partitions are dropped and a materialized view can be fast-refreshed as a new partition is added.

> The administration functionality of composite partitioning, the combination of range partitioning and hash partitioning, has also been improved such that it is much easier to support a "rolling-window" data application. An entire hash-partitioned table, with all of its partitions, can be exchanged with a composite-partitioned table's range partition and all of its hash subpartitions. Therefore, when a new "rolling-window" range needs to be added or dropped, multiple subpartitions can be added efficiently.

ENHANCED SUPPORT OF INTERNET COMPUTING AND JAVA

Oracle8*i* includes significant enhancements in Release 2 to keep pace with the technological requirements of demanding Internet applications. Oracle JServer, the integrated Java Virtual Machine (VM) introduced with the initial release of Oracle8*i*, has improved performance, support for Java2 and XML, and various other enhancements. Security and support of the LDAP standard have been enhanced in Release 2, allowing applications to efficiently implement and manage robust security policies.

ENHANCED JAVA SUPPORT

Oracle8*i* Release 2 includes performance and functionality improvements to Oracle JServer for building and running Java-based applications. These enhancements include:

- Java2 support (JDK 1.2)
- JDBC 2.0 core support plus connection pooling and distributed transactions
- Multi-byte character set support
- Improved performance through lower per-session and per-call overhead and through optimized server JDBC and SQLJ execution
- Remote Java debug support, accessible from many Java debuggers including Oracle JDeveloper
- Performance gains and reduced footprint due to Java support for shared, read-only object memories
- Java Message Service (JMS) support, allowing easy integration with Oracle's Advanced Queuing functionality via the standard JMS API
- Object type support for Advanced Queuing through the Java API

XML SUPPORT

XML has emerged as the de facto standard for describing business data for business to business commerce on the Internet. Just as HyperText Markup Language (HTML) is the universal language of Web pages on the Internet, businesses have sought a similar language for describing business data. The adoption of eXtensible Markup Language (XML) by the World-Wide Web Consortium (W3C) was the first step towards identifying a common format for businesses to exchange information over the Internet. Similar to HTML, XML provides the facility to embed business descriptors along with raw business data in a message. Oracle provides several XML parsers that convert XML data into a form that can be easily understood by the Oracle8*i* database.

Oracle's XML products include the XML Parser for Java - version 1 and version 2 (which includes an XSLT processor), the XML Class Generator, and the XML Parsers for C, C++, and PL/SQL. Since the Oracle XML Parser for Java is implemented in Java, it runs efficiently in the Oracle8*i* Java VM, Oracle JServer. Release 2 includes the Oracle XML Parser for Java, where the Java XML parser classes (DOM/SAX APIs) are pre-loaded into Oracle JServer.

PL/SQL PAGES

Oracle8*i* Release 2 introduces PL/SQL Server Pages, which are server-side Web pages written in HTML and/or XML with embedded PL/SQL scripts designated with special tags. This functionality allows for fast development and deployment of web pages with dynamic content, where the "code" can reside on the server while only the invocation is present in the HTML page.

Developed using HTML with embedded PL/SQL, the PL/SQL Server Page is loaded into the database and invoked via a URL. When executed, the PL/SQL Server Page dynamically creates standard HTML on the server-side that is then interpreted by a client-side browser or Internet-aware program. To develop and deploy PL/SQL Server Pages, Oracle8*i* Release 2 or later is needed, together with a PL/SQL web gateway, such as the WebDB PL/SQL Gateway or the Oracle Application Server PL/SQL Cartridge. In a later release of Oracle8*i*, an embedded PL/SQL web gateway in the database will be provided.

*INTER*MEDIA

Oracle *inter*Media enables Oracle8*i* to manage text, documents, images, audio, video and geographic location information in an integrated fashion with structured enterprise information.

Oracle8*i* *inter*Media Text provides content-based retrieval on free text with both literal (word) predicates and thematic predicates. Several improvements have been made to *inter*Media Text Release 2:

- The ABOUT algorithm has been greatly enhanced for better precision and recall
- With the MULTI lexer, multi-lingual databases can now store documents of different languages
- Enhanced XML support includes indexing and searching attribute text, using "nest within" for sophisticated queries, and support for doctype-limited tag detection

Other components of *inter*Media have been enhanced in Release 2, including adding native support in *inter*Media Audio for Real Networks RealAudio, and support for all layers of audio formats MPEG1 and MPEG2, including layer 3 (more commonly known as MP3). Similarly, *inter*Media Video now includes native support for Apple Quicktime 3.0, Microsoft AVI, and RealNetworks RealVideo. Also, the Set_Properties method has been enhanced across all *inter*Media image, audio,

and video formats. When present in these formats, interMedia can extract application metadata and store them as an XML string within the media object. Finally, *inter*Media web agent support has been extended to include the Apache web server.

ORACLE SPATIAL

Oracle8i Spatial is an integrated set of functions and procedures that enables spatial data to be stored, accessed, and analyzed quickly and efficiently in an Oracle database. Oracle Spatial data is any data with a location component. New Oracle Spatial features include:

- Explicit map projection transformations of vector and raster objects from one coordinate system to another
- Facilities for managing multiple versions of a single database schema along with capability to query and update specific versions of a database
- Support storage of "measurement" information as part of an Oracle Spatial linear geometry (useful in transportation applications, utility networks, Internet street routing applications)
- Oracle Enterprise Manager graphical wizard for tuning a spatial database
- Ability to store, index and query geo-referenced raster images using a combination of Oracle Spatial and interMedia Image
- A Java based API for managing, accessing and manipulating Oracle Spatial object types; a class hierarchy for Geometry and respective subclasses is provided
- Support for R*Tree index to complement Oracle's B*Tree index using the Oracle extensible indexing framework (useful in 3D indexing problems encountered in oil exploration, architecture and engineering, and scientific applications)

SECURITY AND DIRECTORY SERVICES

Security Enhancements

Oracle8*i* Release 2 introduces several key features needed to support the advanced security requirements of businesses today.

For applications with special requirements to secure sensitive data from view, even from DBAs, Oracle8*i* Release 2 provides a PL/SQL package to encrypt and decrypt data, including string inputs and raw inputs, using the industry-standard Data Encryption Standard (DES), in exportable key lengths. This functionality allows data to be natively encrypted in the server to protect especially sensitive data, such as credit card numbers, "application user" passwords, or session cookies.

Oracle8*i* introduced the Virtual Private Database, functionality which allows easy implementation and efficient operation of security policies to enforce row-level security. The application context feature can be used to improve the performance of Virtual Private Database by functioning as a secure data cache. Application context has been enhanced in Release 2 so that additional attributes, including external name, proxy user and userid, protocol, port number, and full DN (distinguished name) from an X.509 certificate, are now accessible and can be used to limit access to data. For example, you could use the OU (Organizational Unit) component of a DN to limit users to viewing their own organization's records only.

Enterprise User Management

Enterprises today face tremendous challenges in managing information about users, keeping user information current, and securing access to all the information in an enterprise. To address these challenges, Release 2 introduces enterprise user management. Enterprise users and their authorizations are managed in Oracle Internet Directory, an LDAP-based directory service, using Oracle Enterprise Security Manager, a tool accessible through Oracle Enterprise Manager.

In Release 2 enterprise users can be assigned *enterprise roles* (which are containers of database-specific *global roles*), that determine their access privileges in databases. For example, the enterprise role CLERK could contain the global role HRCLERK on the Human Resources database, and the global role ANALYST on the Payroll database.

In general, users do not need their own accounts – or their own schemas – in a database, they merely need to access an *application* schema. Release 2 allows you to separate users from schemas, so that many enterprise users can access a single, shared application schema. Instead of creating a user account (that is, a user schema) in each database a user needs to access, you need only create an enterprise user in the directory, and "point" the user at a shared schema that many other enterprise

users can also access. Now, you can truly create an enterprise user once, in the directory, who nonetheless can access multiple databases using only the privileges she needs to perform her job, thus lowering the cost of managing users in an enterprise. Another benefit of schema-independent users is that you can manage many more users than could otherwise be done with users tied to individual database accounts. Schema-independent users thus enables scalability of user management for the Internet.

Oracle's LDAP version 3-compliant directory server, Oracle Internet Directory, is fully integrated with Oracle8*i* and supports "off-the-shelf" enterprise user management. Other LDAP directories, including Novell Directory Service (NDS) and Microsoft's Active Directory for Windows 2000 will be certified to operate with Release 2. Oracle Advanced Security includes a restricted use license of Oracle Internet Directory for enterprise user and authorization management.

Oracle Advanced Security

Oracle Advanced Security has improved configuration and management tools to simplify security management. Oracle Advanced Security also provides new forms of network encryption, to ensure the security of all protocols accessing the Oracle8*i* database, and enhanced single sign-on.

Oracle8*i* Release 2 enhances Oracle's support for the SSL (Secure Sockets Layer) standard. SSL encryption for Internet Intra-ORB Protocol (IIOP) communications is now available, enabling secure Enterprise Java Beans (EJBs). Also, JavaASO, a Java version of the Oracle Advanced Security encryption libraries, is now available to secure "thin" JDBC connections. JavaASO provides DES encryption, with anonymous Diffie-Hellman key exchange, in 100% Java.

Oracle Advanced Security thus secures all protocols into the Oracle8*i* database, whether IIOP, "thick" or "thin" JDBC, or Net8.

Oracle Advanced Security has also completed the operational testing phase of FIPS-140 level 2 (Federal Information Processing Standard) certification, a United States government standard that relates to the security of cryptographic products. Completion of the FIPS-140 certification, which is expected in Q4 1999, is required by many organizations, among them the United States federal government and many financial markets.

Oracle Advanced Security already supports many forms of single sign-on for database users, among them Kerberos, SESAME, and DCE. Release 2 adds support for SSL-based single sign-on.

In Release 2, Oracle Wallet Manager provides secure management of PKI (public key infrastructure)-based user credentials. Oracle Wallet Manager creates a private and public key pair for a user, and issues a PKCS#10 certificate signing request which can be fulfilled by a Certificate Authority (CA). After the CA issues an X.509 certificate, the user can load the certificate into his wallet. Oracle Wallet Manager also manages user trustpoints, the list of root certificates that the user trusts, and is pre-configured with root certificates from PKI vendors such as VeriSign and Cybertrust. Wallets are protected using password-based, strong encryption.

In most cases, a user need never access a wallet once it has been configured, but can easily access his wallet using Oracle Enterprise Login Assistant, a new simple-to-use login tool that hides the complexity of a private key and certificate from users. Once users have securely opened their wallets, they can then connect to multiple databases over SSL, without providing additional passwords. This provides the benefit of strong authentication as well as single sign-on.

SSL for single sign-on can be used alone, or in conjunction with enterprise user management, described above.

Now, as an alternative to Oracle Names, Oracle Internet Directory or Microsoft Active Directory can be used to store and retrieve Net service names. This feature, Net8 directory naming, allows this information to be accessible by any machine in the network depending on how access control is set up.

Oracle Advanced Security now includes support for a particular type of database link, called a current user database link, which allows a user to connect to a second database as another user, with that user's privileges, without storing the first user's credentials in the database link definition. For example, Jane, an Accounts Payable user, is able to access the HR database by executing a procedure which connects to HR as Scott, using Scott's credentials.

HIGH AVAILABILITY ENHANCEMENTS

HIGH-SPEED FAILOVER CONFIGURATION

Oracle Parallel Server has been optimized for high availability in a two-node configuration. In this special high availability mode of Oracle Parallel Server, one node acts as the primary database instance, while the other node can be used for DBA tasks, report generation, and other non-buffered write database activities. If the primary node fails, the secondary node becomes the primary instance. In Release 2, this configuration is optimized to provide better throughput by efficiently managing the locks on only the primary node, resulting in less overhead and better response times. This means that now you can migrate from a single instance Oracle database to a highly available Oracle Parallel Server database configuration while maintaining the same performance level with no code or application modifications.

ORACLE FAIL SAFE 3.0

Oracle Fail Safe 3.0 is an easy-to-use high-availability solution for businesses that deploy business critical applications on Windows NT clusters. It provides failover not only for Oracle8*i*, but for Oracle Application Server, Oracle WebDB, and Oracle Applications. Oracle Fail Safe integrates with the MSCS (Microsoft Cluster Server) software to ensure fast, automatic failover during planned or unplanned outages. Oracle Fail Safe is included at no charge with Oracle8*i* on Windows NT and is administered with the graphical Oracle Fail Safe Manager utility.

ORACLE8*i* PERFORMANCE AND QUALITY IMPROVEMENTS

A main focus of Release 2 is to maintain stability and to improve on the quality, performance, and manageability of the Oracle8*i* database server.

PERFORMANCE IMPROVEMENTS

Various components of the Oracle8*i* server have been optimized to perform better in Release 2.

The performance of SQL*Loader direct path load has been dramatically improved for loading simple files encoded using single-byte character sets (e.g. ASCII, Latin1). In the case where the input data fields are either terminated by a single byte delimiter (e.g. comma separated values) or positional (or is a combination of the two), the load performance can be up to two times as fast.. This should be of special interest to customers loading large volumes of data, such as data warehousing customers.

PL/SQL performance has been optimized in several areas, including enhanced performance of C callouts and the manipulation and use of varrays and nested tables.

Applications (including many packaged applications) that use literals instead of bind variables in SQL can see improved performance because Release 2 can automatically substitute bind variables in place of the literal values. This allows multiple users to share the parsed SQL, regardless of the literal value, dramatically reducing the SQL parse time and saving memory in these applications.

Oracle8*i* Release 2 improves performance for Object-Relational constructs in a number of ways. Common sub-expression elimination for object methods means that expressions are no longer evaluated for each row – a significant performance gain. Memory optimizations have been put in place for collections in the object cache. A number of optimizations have been done for references in object views.

IMPROVED INSTALLATION AND MANAGEMENT

Installation of Oracle products is now much easier with the consolidation in the Oracle8*i* install process of Oracle Enterprise Manager, the DBA Management Pack and Oracle Internet Directory. To do this, Oracle Universal Installer has been enhanced to support installations that have software on multiple CDs.

Oracle Enterprise Manager version 2.1 is available with Release 2. In this release, Oracle Enterprise Manager can manage twelve Oracle products, including replication, Oracle Parallel Server, *inter*Media Text, Oracle Applications, and Forms Server. Distributed Access Manager is a new component of Oracle Enterprise Manager that manages and administers heterogeneous distributed environments. Also, Oracle Internet Directory now includes Oracle Directory Manager, a configuration and management tool integrated in the Oracle Enterprise Manager framework.

Functionality has been enhanced to support improved target discovery, notification filtering, and administrative notification blackouts. Notification blackouts allow administrators to suspend email and paging notifications for events or jobs that are registered against targets that are being brought down for backups or any other maintenance.

The DBA Management Pack, a set of management tools bundled with Oracle Enterprise Manager, now supports many additional Oracle8*i* features, including dropping table columns, controlling database resources (such as CPU) by managing resource plans and consumer groups. New wizards are available for creating dimensions and materialized views, greatly simplifying data warehouse setup and management. Version 2.1 also introduces a new management tool and many new wizards, including DBA Studio which combines the functionality of Schema, Security, Storage, and Instance managers into one tool for improved workflow between various day-to-day DBA tasks. A new Create View Wizard is now available to easily create views. A new Analyze Wizard is included with Enterprise Manager for gathering statistics on tables, indexes, and clusters. In addition, the Create Table Wizard now provides the capability for creating partitioned tables. Finally, version 2.1 has numerous improvements to the graphical user interface, such as displaying descriptions for instance parameters, more information about control files and archived logs, and bar charts that readily display tablespace and datafile used space.

Oracle Universal Installer and the Net8 Configuration Assistant have been enhanced to support Oracle Parallel Server, simplifying the installation and network setup of Oracle8*i* running in a clustered environment. Also, the Database Configuration Assistant (DBCA), used to create or delete databases, now has improved multi-threaded server (MTS) support, supports the use of raw disk devices, and runs scripts during database creation that enable most Oracle database options, such as the Oracle Internet Directory, Oracle JServer, and the XML Parser for Java. The Oracle Data Migration Assistant continues to provide support for migrating Oracle7 databases to Oracle8*i* and upgrading Oracle8 databases to Oracle8*i*.

IMPROVED QUALITY AND SUPPORT

Release 2 is the first maintenance release of Oracle8*i* and contains many bug fixes, but it also has many enhancements to improve the reliability and availability of database operations.

Unplanned downtime due to hardware corruption is reduced in Release 2 with improved block checking functionality to protect the critical SYSTEM tablespace from corruption without impacting performance on other tablespaces. The SYSTEM tablespace is extremely critical because hardware corruption in it will cause the database to shutdown. In Release 2, block checking and checksums will always be turned on for the SYSTEM tablespace, allowing the Oracle server to detect and repair many SYSTEM tablespace corruptions before they are written to disk or read by other transactions. Error handling is improved because Oracle8*i* will re-read control file blocks from a different file if all attempts to read the primary control file resulted in checksum failure. Release 2 will also re-read redo blocks from non-multiplexed redo logs if previous reads resulted in checksum failure. These sophisticated corruption detection and repair mechanisms reduce downtime due to possible hardware-induced corruption.

Tracing PL/SQL code execution has been enhanced by storing trace data in tables, allowing easy access via standard SQL. Also, more data can be captured, such as SQL text and bind variables.

Additional Functionality

OBJECT RELATIONAL ENHANCEMENTS

The extensibility framework that was introduced in the initial release of Oracle8*i* is enhanced in Release 2 by adding Java wrappers to the ODCI (Oracle Data Cartridge Interface) API so that Data Cartridges can be seamlessly developed in Java. Other improvements to the Oracle8*i* object relational functionality include:

- Domain indexes, indexes created and maintained using the extensibility framework, are now supported in the Import/Export utilities.
- The SQL RETURNING clause now supports Object Types, Collections, References.
- Object views can now be updated if the object view is a multi-level object view or if it contains object constructors or a make_ref() construct.
- It is now possible to bind LONG values to LOBs, allowing smoother interoperability between LONG and LOB datatypes.

OTHER ENHANCEMENTS

Oracle8*i* Release 2 includes many improvements to many areas of the Oracle server:

- Recovery Manager now automatically discovers which nodes of an Oracle Parallel Server cluster contain the backups needed for a restore operation
- Replication includes the Java RepAPI functionality, which provides improved integration with Oracle Lite, including support for IIOP connectivity and template functionality
- Oracle now supports native connectivity to heterogeneous systems through the ODBC and OLE DB protocols; this new generic connectivity for OLE DB is integrated into the server and allows scaled down access to any system that supports ODBC and OLE DB
- Reporting of the archiving of redo logs to a standby database site has been improved by providing a greater level of detail on the progression of the operation
- Pro*COBOL now supports multi-threaded applications
- To reduce contention for the FREELISTS of a table, you can now use the ALTER FREELISTS statement to add free lists
- CASE expressions are now supported
- WebDB now provides extensive National Language Support (NLS)
- National Language Support (NLS) now supports two new languages (Hindi and Tamil), a new territory (India), and a new character set (UTFE for EBCDIC platforms based on UTF-EBCDIC)
- Oracle Internet Directory now has full National Language Support (NLS)

FEATURE AND OPTION AVAILABILITY

Oracle offers three products in the Oracle8*i* product line: Oracle8*i*, Oracle8*i* Enterprise Edition, and Oracle8*i* Personal Edition. Oracle8*i* Personal Edition includes all features and options available with Oracle8*i* Enterprise Edition, except Oracle Parallel Server.

This document describes all new features and functionality found in Oracle8*i* Release 2. For details on what features are available with each edition of Oracle8*i*, consult the white paper "Oracle8*i*: A Family of Database Products" at www.oracle.com/database/availability.

ORACLE8*i* RELEASE 2 NEW FEATURE SUMMARY

DATA WAREHOUSING ENHANCEMENTS

- Analytic SQL functions (rank, moving average, percentile, etc.)
- Summary Management Manager
- Extended usage of ORDER BY when creating tables and materialized views
- Materialized view refresh enhancement for efficient partition additions
- "Rolling window" support for composite partitioning

ENHANCED SUPPORT OF INTERNET COMPUTING AND JAVA

- PL/SQL Server Pages
- *inter*Media enhancements
- Oracle Spatial enhancements

JAVA ENHANCEMENTS

- Lower per-session/call overhead
- Faster server-side JDBC and SQLJ
- Multi-byte support in Java
- Java2 support (JDK 1.2)
- JDBC 2.0 support
- Remote Java debug support through Sun's debug protocol
- Java object memory improvements
- Java Message Service (JMS) support
- Object support for Advanced Queuing through Java API
- XML Parser for Java

HIGH AVAILABILITY ENHANCEMENTS

- Oracle Parallel Server two-node failover performance improvement
- Oracle8i Fail Safe 3.0

ORACLE8*i* PERFORMANCE AND QUALITY IMPROVEMENTS

- Improved corruption prevention and error handling
- PL/SQL tracing enhancements
- TCP/IP and SMTP support in PL/SQL
- SQL*Loader performance enhancements
- Improved performance of PL/SQL collections
- PL/SQL C callout performance improvements
- Multi-threaded server performance improvements
- Auto-conversion of literals to bind variables for improved performance
- Native OLE/DB driver
- Oracle Enterprise Manager enhancements
- Distributed Access Manager

- Oracle Enterprise Manager DBA Studio
- Oracle Universal Installer multiple CD support
- Improved Oracle Parallel Server support in Oracle Universal Installer
- Enhanced Net8 Configuration Assistant to support Oracle Parallel Server
- Raw device support in Database Configuration Assistant

SECURITY AND NETWORKING

- Encrypt/decrypt package in PL/SQL
- Application context enhancements
- Single sign-on over SSL
- SSL over IIOP
- JavaASO for "thin" JDBC
- Net8 Directory Naming
- Oracle Names to LDAP migration
- Oracle Enterprise Login Assistant, Oracle Wallet Manager, and Oracle Enterprise Security Manager
- Enterprise user management
- Schema-independent users
- Current user database links

OBJECT RELATIONAL

- Java support in ODCI (Oracle Data Cartridge Interface)
- Import/Export of domain indexes
- Object support in SQL RETURNING
- Object view enhancements
- Enhanced LONG and LOB interoperability

OTHER ENHANCEMENTS

- Pro*COBOL support for multi-threaded applications
- Automatic location of backups in an Oracle Parallel Server configuration
- Java RepAPI support in replication
- Improved progress reporting while archiving redo logs to a standby database
- SQL CASE expression
- ALTER FREELISTS
- WebDB NLS support

Oracle Corporation
World Headquarters
500 Oracle Parkway
Redwood Shores, CA 94065
U.S.A.

Worldwide Inquiries:
+1.650.506.7000
Fax +1.650.506.7200
http://www.oracle.com/