Part 10

Oracle
Oracle - The Corporation

Second largest software company in the world
(Microsoft is the largest).
Currently about $4.2 billion in revenues
Largest vendor of information management
software in the world
Offices in 93 countries
Over 20,000 employees worldwide
About 11% of revenue spent on R&D
Wide product offering
Headquartered in Redwood Shores, CA
Founded in 1977
Built first commercial relational database
management system
Delivered the first products employing SQL
Oracle Product Offerings

Oracle Server Technology
  Oracle server, parallel server, trusted server, workgroup server
  OracleWare /Netware /Unixware
  SQL*Net
  Oracle MultiProtocol Interchange
  Oracle Open Gateway Technology
  Oracle Transparent Gateway for IBM DRDA, SQL/400, DB2, APPC
  Oracle Advanced Networking
  Oracle Enterprise Manager
  Oracle Web Server
  SQL*TextRetrieval
  Oracle*Mail and X.400 Gateway
  Oracle Office and MHS and Unix Gateway
  Oracle ConText
  Oracle CoAuthor
  Oracle Messaging
  Oracle OLAP
  Oracle Spatial Data
  Oracle Video

Oracle Services
  Oracle Services
  Oracle Education
  Oracle Support (Bronze, Silver, Gold)
  Oracle Industries
Oracle Tools Technology

Oracle Open Client Adapter for ODBC
Oracle Browser
Oracle Book
Oracle Data Query
Oracle Forms and Forms Generator
Oracle Reports and Reports Generator
Oracle Graphics
Oracle Precompilers and Pro*C Precompiler
SQL*Module
Oracle Call Interface
PL/SQL
Oracle SQL*Plus
Oracle CASE Method, Dictionary, Designer,
    Discoverer, Developer, Exchange
Oracle Glue
Oracle Power Objects
Oracle Media Objects
Oracle Cooperative Applications

General Applications
Oracle Alert, Business Manager, Internet Commerce, Sales Analyzer, Sales and Marketing

Finance Applications
Oracle General Ledger, Payables, Receivables, Assets, Cash Management, Financial Analyzer, Organization Editor

Project Control Applications
Oracle Inventory Project Costing, Project Billing, Project Business Analyzer

Manufacturing Applications
Oracle Order Entry, Bill of Material, Engineering, Master Scheduling, MRP, Capacity, Work in Process, Cost Management, Purchasing, Inventory, Workflow, Manufacturing, Quality, Supply Chain Planning, Configurator, Service, Inventor

Public Sector Applications

Human Resources Applications
Oracle Human Resources, Payroll, Training Administration, Sales Compensation
Oracle Products
Some Category Expansion

OLAP (On-Line Analytical Processing)
Oracle Express
Oracle Express Web Agent
Oracle Express Objects
Oracle Express Analyzer
Oracle Financial Analyzer
Oracle Financial Controller
Oracle Sales Analyzer

Groupware
Oracle Book
Oracle Inter Office
Oracle Office
Oracle MHS Mail Gateway
Oracle X.400 Mail Gateway
Oracle Unix Mail Gateway

Websystem
Oracle Web Server
Oracle PowerBrowser
Oracle Electronic Commerce
Oracle - The Database Management System

Product history
1976: IBM System/R Project, SQL paper
1977: Oracle begins work
1979: Oracle delivers 1st relational DBMS
1982: SQL/DS - IBM’s 1st relational DBMS
1986: ANSI adopts SQL as a standard
1987: 800 employees, $131 million revenue
1995: 18,000 employees, $3 billion revenue
1996: 20,000 employees, $4.2 billion revenue
**Oracle Servers Run On**

Apple - Macintosh  
DEC - VAX/VMS, Alpha/VMS, Unix  
Encore - Infinity 90  
HP - MPE/XL  
IBM - VM/CMS, MVS/XA, HA/6000, SP1  
IBM PC - Dos, Windows 3.1/95/NT, OS/2, Netware  
ICL  
Kendall Square Research - KSR1  
Meiko Computing Surface  
NCR - 3600  
nCUBE 2 Scalar Supercomputer  
PARSYS - Supernode 1000  
Pyramid - Data Center  
Sequent - ptx  
Siemens  
Sun/OS  
Unix - Any Unix Platform  
... and many others
Components of Oracle

End User:
   PC’s
   Terminals

Client:
   Client Process

Server:
   User Process
   Server Process

Database:
   Data Base
## Oracle Front-End and Client Programs

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
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<tbody>
<tr>
<td>SQL*Plus</td>
<td>SQL with built-in report writer</td>
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<td>Oracle Forms</td>
<td>Forms definition and editing for forms-based access</td>
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<td>Oracle Menu</td>
<td>Menu definition and editing for menu-based navigation</td>
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<tr>
<td>Oracle Library</td>
<td>Repository of PL/SQL code</td>
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<tr>
<td>Oracle Reports</td>
<td>Report writer</td>
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<td>Oracle Book</td>
<td>Document-viewing facility</td>
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<td>Oracle Loader</td>
<td>Bulk data conversion and loading</td>
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<td>SQL*Connect</td>
<td>Connect to a non-relational database</td>
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<td>Applications</td>
<td>Off-the-shelf generic applications</td>
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<td>Oracle Office</td>
<td>Office suite with mail, scheduling</td>
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<td>2000 Series</td>
<td>Developer/Designer/Discoverer to build client-server applications graphically (with forms, reports, and graphics)</td>
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<td>Objects</td>
<td>Power Objects for O-O development and Media Objects for MM authoring</td>
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<tr>
<td>CASE</td>
<td>Dictionary / Forms Generator / Reports Generator / Designer to design complete systems</td>
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</tbody>
</table>
Oracle Back-End / Server Programs

Back-End Services
  Relational operations
  Data definition and manipulation (SQL92)
  Security
  Declarative Integrity Constraints
  Transaction processing
  Concurrency control and reliable results
  Backup and Recovery
  Lock manager
  Embedded SQL - PL/SQL (for 3GL’s)
  Space Management
  Open Connectivity
  Development Tools

Back-End Mechanisms
  SQL parsing
  Query modification
  Query optimization
  Query execution
  Database triggers
  Stored procedures in PL/SQL
  Packages
  Distributed queries and transactions
  Parallel server option
  Parallel query option
  High Availability
Oracle Communications Programs

SQL*Loader
   Allows Oracle to read (static) data from any file

SQL*Connect
   Allows Oracle to read (dynamic) data from a non-relational database

Access Managers
   Allow non-Oracle database access to Oracle data

Oracle Gateways
   Allows Oracle to read and write (dynamic) data from and to selected non-relational databases
   Two varieties - procedural and transparent

Replication
   Allows duplicate copies of the data to be maintained in a synchronized manner across multiple platforms and multiple sites

SQL*Net
   Allows arbitrary table collections from multiple sites using different hardware and different SQL-compliant servers to function as a single database.
   (Join tables across machines)
Oracle Data Definition

Create base tables or end-user views

Destroy base tables or end-user views:

Support for null field values

In Oracle, system information itself can be stored in tables that can be queried
   DICTIONARY contains a list of data dictionary tables
   DICT_COLUMNS contains a list of columns for all tables in the data dictionary

Can update a table definition
   ALTER TABLE command in SQL allows columns to be added and integrity constraints to be added or deleted. This does not require unloading the data in the table, dropping the table, creating a new table, and re-loading the data.

Can precompile a view
   ALTER VIEW allows a view to be pre-compiled (if valid) or marked as invalid.
Oracle Transaction Processing Features

Multithreaded Server Architecture
Scalable SMP performance
Shared database buffer cache
Shared SQL cache (SQL statements, PL/SQL procedures, functions, packages, and triggers)
Shared dictionary cache
Fast and Group Commits
Deferred Writes
Serializable Transactions
Oracle7 Parallel Server Option Features

Clustered, MPP, and hybrid parallel systems support
Multiple nodes share access to a single Oracle7 database
Easy incremental expansion of processing resources
Linear scalable increases in performance
High availability applications
Consolidated system administration
Parallel Disk Affinity
Oracle SQL Optimizer Features

Cost-based, syntax-independent optimization
ANALYZE table statistics generation
Nested-loop and sort-merge join selection
"Star" query algorithm support
Manual UNION ALL predicate push-down
Histograms
Oracle Transactional Data Access Features

B-tree single column and concatenated column indexes
Clustered tables, hash-clusters, application-specific hash functions
ROWIDs
Query results directly from index lookup
Integrated bitmapped indexes
Oracle Concurrency Control and Reliable Results Features

Unrestricted row-level locking
No lock escalation
Contention-free queries
Unique sequence number generation
Non-blocking, multiversion read-consistent query results
Oracle7 Parallel Query Option Features

Parallel execution of table scans, sorts, joins, and aggregates
Parallel direct database reads and direct database writes
Parallelization of user-written code
Parallel CREATE INDEX and CREATE TABLE AS SELECT
Parallel, direct-path data loading
Oracle7 Parallel Server for SMP and MPP architectures*
Fully integrated parallel query architecture
Application transparency
Supports all standard server features and options
Dynamic workload balancing
Dynamic data partitioning
Oracle High Availability Features

Online backup by file, table-space, or database
Online recovery
Parallel recovery
Parallel backup/restore utility
Read-only tablespaces
Mirrored multisegment log files
Checksums on database and redo log file blocks
Dynamic resizing of database files
Oracle7 Parallel Server for highly available applications*
Standby database
Oracle Distributed Queries and Transactions Features

Transparent remote and distributed query
Distributed, optimized joins
Location transparency, network transparency
Integrated distributed query architecture
Transparent, multisite distributed transactions
Distributed SQL updates and remote procedure calls (RPCs)
Commit transparency
Automatic failure detection and resolution
Oracle Open Gateways Features

Data source transparency
Transparent SQL gateways
Transparent procedural gateways
Distributed queries and update transactions
Compliant with XA standard for TP-monitor
  coordinated two-phase commit*
Oracle Data Replication Features

Multiple, read-only snapshots (basic primary site replication)
Full transactional consistency and data integrity
Full and subset table replication
Incremental refresh of snapshot copies
Event and demand based refresh
Symmetric Replication
Updateable snapshots (both master and snapshot tables updateable)
Multiple master configurations (full table replication between master sites)
Hybrid configurations (combine snapshot and multiple master configurations)
Fail-over configuration support
Automatic conflict detection and resolution
Distributed schema management
Synchronous and Asynchronous Replication support
Oracle SQL Implementation Features

100-percent ANSI/ISO SQL 92 Entry Level compliant-NIST tested

ANSI/ISO standard precompilers applications interface (API)

Robust SQL extensions including UNION, INTERSECT, MINUS, outer join, and tree-structured queries (CONNECT BY)

SQL3 inline views (query in the FROM clause of another query)

Updateable join views
Oracle Declarative Integrity Constraints

Features

100-percent ANSI/ISO standard declarative entity and referential integrity constraints
CHECK, DEFAULT, not NULL constraints
PRIMARY, FOREIGN, UNIQUE keys
Optional DELETE CASCADE
Oracle Stored Procedures Features

PL/SQL procedural extension to ANSI/ISO standard SQL
Strongly typed variable declarations (SQL data types)
Block structure
Flow control including FOR and WHILE loops, IF/THEN/ELSE
SQL cursor support
Static and dynamic SQL support
Robust exception handling
Subprogram types: procedures, functions, and packages
Subprograms stored in shared, compiled form
Called from Oracle and third-party tools**, Oracle Precompilers,** Oracle Call Interface,
SQL*Module,** other stored procedures, database triggers
Remote procedure calls (RPCs) protected by transparent two-phase commit
User-defined PL/SQL functions in SQL
Cursor Variables for easy retrieval of multi-row result sets
Wrapper utility hiding PL/SQL application code in binary source format
Server side file I/O

** Requires Oracle or 3rd-party tool, Oracle Precompiler, or Oracle SQL*Module
Oracle Database Triggers Features

Procedural code executed automatically on INSERT, UPDATE, or DELETE
Triggers execute either BEFORE or AFTER operations
Triggers fire once per statement or once per row
Modeled after ANSI/ISO SQL3 specification
Oracle Programmatic Interfaces Features

Oracle Precompilers**
Embedded SQL and PL/SQL application development
100-percent entry-level ANSI/ISO X3.135-1992 compliant
FIPS flagger meets FIPS 127-2 requirements
Oracle Call Interface: procedure/function call interface

Oracle SQL*Module**
SQL Module language application development
Multi threaded client application support

** Requires Oracle or 3rd-party tool, Oracle Precompiler, or Oracle SQL*Module
Oracle National Language Support
Features

Full 8- and 16-bit NLS support for European and Asian languages
Unicode UTF-2 variable width encoding
Per-session control of language preference with system defaults
Character set conversion for heterogeneous client/server and distributed database environments
National calendar support
Oracle Data Security Features

Choice of internal or external user authentication
External choices include: operating system, OS security package, network operating system,*** security service,*** authentication device***
Encrypted passwords
Full data stream encryption through DES and RSA RC4 encryption algorithms***
Complete protocol support and application transparency
Fine-grained database privileges
Hierarchical role-based security for group-level access control
Site customized DBA roles
Roles are basis for ANSI/ISO SQL3 security standard
Evaluated at US TCSEC C2, European ITSEC E3
Automatic auditing on per-session or per-object basis
Application-specific or context-sensitive auditing via PL/SQL stored procedures and database triggers

*** Requires Oracle Advanced Networking Option
Oracle Enterprise Manager Features

Systems Manager-easy to use, GUI, menu-driven DBA utility for Windows
Secure remote database administration
Data Dictionary and Dynamic Performance Tables
Application Identification Facility
PROFILEs limit user resource consumption
Job Queues for automatic scheduling of PL/SQL stored procedure execution
Remote SQL Tracing
SNMP Support: public RDBMS MIB, Oracle7 private MIB, Replication MIB
Table TRUNCATE
 Enable/disable constraints and triggers
Advanced space management features
Oracle Expert and Oracle Trace
Oracle Developer/2000 Key Features
(Page 1 of 2)

WYSIWYG Layout Editor
Integrated PL/SQL Debugger
Image and Graphics File Formats
Unlimited Data Access
National Language Support
Storage Methods
User Interface Portability
Product Integration
Forms Features
Application Generation Capabilities
Procedural Capabilities
GUI Applications
Form Security
Reports Features
Default Report Styles
Powerful Data Control
Extensive Aggregation Capabilities
Windows Enhancements
Common Graphical Painter
Oracle Developer/2000 Key Features
(Page 2 of 2)

Procedural Capabilities
Printer Portability
Report Security
Graphics Features
Charting Capabilities
Multimedia Capabilities
Procedural Capabilities
Programmatic Control
Database Connectivity Features
SQL Support
SQL Support
Commit Processing
Data Access
PL/SQL Support
User Productivity
# Oracle Open Gateways: Support

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<th>Database</th>
<th>Trans-parent Gateway for</th>
<th>Trans-parent Gateway for EDA/SQL</th>
<th>Trans-parent Gateway for IBM DRDA</th>
<th>Proced-ural Gateway for APPC</th>
<th>Access Manager for AS/400</th>
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