Enabling The Information Age

Web Application Server 4.0

Agenda

- Oracle Application Server
  - Architecture Overview
  - Features
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Oracle Application Server (OAS) 4.0

Strategy

- Provide High Enterprise Quality of Service
  - Scalable: Multithreaded, Distributed Server
  - Reliable: Fault Tolerant, Dynamic Load Balancing, Auto Recovery
  - Manageable: One Console integrated with OEM, SNMP
  - Secure: LDAP, X.509 Certificates, DB Security

- Leverage & Extend Basic Web Technologies
  - Web/HTML (JWeb, PL/SQL, C, Perl, LiveHTML Cartridges)
  - CORBA (JCORBA Cartridge)

- Unified Framework that Supports Middleware Functionality

Complex Deployment Simplified

- Access to any client, any data
- Runs any application
- One server install
- One management environment
Oracle Application Server 4.0

Architecture Overview

Oracle Application Server
Open and Standards Based Architecture

- Available on all major UNIX and NT platforms
- Supports HTTP/HTML, CGI, CORBA, JDBC, ODBC, Java, SQL, X/Open
- Supports Web/HTML and CORBA Application Models
- Open Cartridge API: Java, JavaScript, C, C++, PL/SQL, Perl, LiveHTML
- End-to-End Security: SSL, Authentication, ANO
- Listener Independent
- Built around CORBA 2.0 Compliant ORB
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Oracle Application Server
Project Milestones

• WebServer 2.0
  – First Web Request Broker
  – First Cartridge Architecture
  – First Integrated Java VM

• WebServer 2.1
  – First HTTPD independence

• Web Application Server 3.0
  – First ORB based Web server
  – First Transactional Web server

• Application Server 4.0
  – First pure Java (JWEB) cartridge
  – First CORBA (JCORBA) cartridge

Oracle Application Server
Conceptual Architecture

Application Cartridges

Application Server

Web Request Broker

HTTP Listeners

Oracle Application Server

Conceptual Architecture

Application Cartridges

Application Server

Web Request Broker

HTTP Listeners

Oracle Application Server

Conceptual Architecture

Application Cartridges

Application Server

Web Request Broker

HTTP Listeners
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Oracle Application Server Architecture

- Browser
  - Displays HTML
- HTTP Server
  - Listens for Requests
- Web Request Broker
  - Dispatches Requests
- Cartridges
  - Applications that Communicate with RDBMS
- Database
  - Stores the Data

Oracle Web Request Broker

- Distributed, Multi-Threaded, Multiprocess Architecture
- Portable Across Range of Operating Systems & Web Servers
- WRB API Language Independent Development Environment
- Dynamic Load Balancing, Security, Directory, Transaction Services
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Cartridge Safety

- Cartridges managed by WRB
- Separate process spaces
- Process Isolation
- Scalability & Reliability
- Portability of Cartridges

- Functionality linked into HTTPD
- Everything in one process space
- Potential danger for listener
- Functionality tied to API, no portability
- Hard to diagnose problems
- Not Scalable / No Load Balancing

Oracle Cartridges

- Web Request Broker
- URL
- HTML
- Browser
- Any HTTP Server
- Cartridges
- Oracle Database
- WRB
- PL/SQL
- C
- Java
- PL/SQL
- Perl
- JCORBA
- C, HTML, Custom
- JWeb
- JCORBA
- ODBC
- VRML
- LiveHTML
- Perl

Oracle

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Database Connectivity

- Native Access to Oracle RDBMS via OCI in PL/SQL, C
- Access to Oracle & Non-Oracle RDBMS via ODBC, JDBC, SQLJ, X/A

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Features

- Fully Distributed Architecture
- Multithreaded Architecture
- Load Balancing
- Support of Java CORBA Objects
- Transaction Services
- Security
- Easy Administration & Management
- Failure Recovery
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Oracle Application Server
Distributed Architecture

HTTP Servers
Web Browsers
Application Cartridges
Databases

Multithreaded Cartridges

- Cartridge Server Factory
  - Creates new Cartridge Servers

- Cartridge Server
  - Runs 1 Application
  - Hosts Cartridge Instances

- Cartridge Instance
  - Accepts & Executes Requests
  - Can be Multithreaded

- Threads (NEW)
  - Shared Across Instances
  - Serve Multiple Requests
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Load Balancing

- Min/Max Cartridge Servers
- Min/Max Cartridge Instances
- Min/Max Threads
- New Cartridges Started When Needed
- Cartridge Clean Up if Idle

Mathematical Algorithms Determine Which Cartridge Instance Should Handle Each Request

Weighting Nodes
- Specify a percentage of cartridges that each host should run

Adaptive Load Balancing
- monitor system resource consumption
  - cpu usage
  - RAM
  - swap space
- instantiate new cartridges on lower loaded systems

Node 1
- 25%

Node 2
- 50%

Node 3
- 25%
### Oracle Application Server 4.0 Application Models

<table>
<thead>
<tr>
<th>Web/HTML</th>
<th>Java CORBA Objects (JCO)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>JCORBA Cartridge</td>
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<tr>
<td></td>
<td>OMG-CORBA standard</td>
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<td></td>
<td>IIOP Access</td>
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<td></td>
<td>- Java Applet with client ORB</td>
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<td>- Identified via Object Reference</td>
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<td>- Method invocation through exposed interfaces</td>
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<td></td>
<td>- Stateful</td>
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<tr>
<td></td>
<td>- Return structured data</td>
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<tr>
<td>• Published API</td>
<td>• Identified via URL</td>
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<tr>
<td>• HTTP Access</td>
<td>• Request/response model</td>
</tr>
<tr>
<td>• Standard Web Browser</td>
<td>• Stateless</td>
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<tr>
<td>• Identified via URL</td>
<td>• Return MIME type data</td>
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</tbody>
</table>

### CORBA as Infrastructure for Network Computing

- **Speed Software Development by Assembling Complete Solutions from Reusable Software Components**

- **OMG Standards Body Dedicated to Defining Standards to Enable Distributed Component Computing**
  - CORBA Defines How Software Components Written in Different Languages Can be “Wrapped” in Uniform Way
  - “Wrappers” Define Set Methods Visible to Other Components
  - Components hosted on ORB’s that communicate using IIOP

- **CORBA-Compliant ORB’s & Associated RPCs Mask Underlying Communications Between Client & Server**

*Key to Network Computing Paradigm*
Problems with Web Server: No Transactions

Faking a transaction...

Who will clean up this “transaction”? 

Oracle Application Server
Transaction Services

Making the Complex Simple

Any Language
Any OS
Any HTTP Server
Any Client
Open Standards
Oracle Application Server
Transaction Services

- Used to group database operations into transactions that span multiple requests or cartridges or databases
- First to support Web Transactions over HTTP
- OTS and JTS
- XA/XOpen standard
- Transaction Demarcation:
  - URL: “Zero-code” Declarative (PL/SQL & C) transactions
  - API: Programmatic transactions via WRB*API
- Each Cartridge Type supports the Transaction Service differently
  - How it defines transaction demarcation
  - How it accesses the databases

Oracle Application Server
End to End Security

- Authentication Schemes
  - Basic, Digest, RDBMS
  - X.509V3 Digital Certificates (Cartridges Only) (New)
- Restriction Schemes
  - IP, Domain
- Encryption
  - SSLv3
  - Oracle Advanced Network Option (ANO)
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LDAP Directory Services & Digital ID Authentication

Cartridges Only!

LDAP Directory

SSL

Auth Server

LDAP

Dispatcher

Cartridge

OAS 4.0

Oracle Application Server 4.0

Wallet Manager

- Facilitates installation & use X.509V3 certificates
- Abstraction used store and manage security credentials
- Generates public/private key pairs for clients & servers
- Stores & manages certificates and associated private keys in encrypted wallet file
- Install & manage Certificate Authority (CA) Trustpoints to identify CA’s trusted to issue client certificates
Extensible Authentication Services enable all cartridges to re-use existing security systems, for example Oracle RDBMS users.

Oracle Application Server
Integrated Authentication Services

- Basic, Domain
- IP
- CA
- RDBMS
- LDAP
- Auth Svr
- Logger
- WRB System Services
- Content
- Oracle Web Request Broker
- HTTP

Oracle Application Server
Easy Administration & Management

- Single point of management for distributed sites
- Easy to Use Java/HTML based Interface
- Configure, Start/Stop, & Monitor all OAS components
- SNMP Support
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Failure Recovery

- No Single Point of Failure
- Parent Processes Detect Failure & Initiate Recovery
- In-flight Transactions Handled
- Failure Detection via Heartbeat Messages

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WWW, Intranets, & the Internet

Oracle’s Firewall Partners

- Sun Solstice Firewall-1
- IBM NetSP Firewall
- Border Technologies BorderWare
- CheckPoint Software Firewall-1
- NEC Firewall
- V-One SmartWall
- SideWinder
- TIS Gauntlet
- Raptor Eagle

Oracle’s Firewall Partners

- Digital Firewall Service
- IBM NetSP Firewall
- Border Technologies BorderWare
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What are Digital ID’s???

Encryption of data with private keys so others can read it with public keys

• Public Key Encryption
  – Each person gets pair keys: public key & private key
  – Each person’s public key is published & private key is kept secret
  – A message encrypted with public key can only be decrypted with corresponding private key
  – A message encrypted with a private key can only be decrypted with corresponding public key

Greatly Simplifies Key Management
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Failure Recovery Architecture

Oracle Application Server 4.0 Enterprise Edition

• Load Balancing: Weighted & Adaptive Scheduling
• Automatic Failover Support
• LDAP
• Transaction Support
  – X/Open TX API
  – Declarative Transactions
  – OTS/JTS
• ODBC