Agenda

- Introduction
- Institutional Background
- Migration Criteria
- Database Migration Methodology
- SQL/Oracle Tool for Data Migration
- Questions
Institutional Background

- The Superior Court of California (SacCourt), County of Sacramento is part of the statewide justice system of 58 trial courts, Appellate Courts and the California Supreme Court.
- Each county operates a Superior Court that adjudicates criminal, civil, small claims, landlord-tenant, traffic, family law, and juvenile dependency and delinquency matters.
- SacCourt has 60 judicial officers and 760 staff who processed over 400,000 new cases filed in FY 2008-09.

“Our Mission is to assure justice, equality and fairness for all under the law.”
Database Environment

- **SQL Server**
  - SQL Server 6.5, 2000, 2005 32-bit on Window
  - SQL Server 2008 64-bit on VMWare/Physical Hardware

- **Oracle**
  - Oracle 10G R2, 10G R2 RAC on Sun SPARC Solaris 10
  - Oracle Enterprise Manager, Grid Control on Window
  - Oracle Application Express
  - Oracle Migration Workbench
Migration Objectives

- Validate the purpose of migration.
- Achieve Return of Investment.
- Compatibility of Hardware and Software.
- Accomplish Physical and Logical Model.
- Meet Source and Target Application/Database Criteria.
- Minimize Outage Time.

“No single best method for all cases!”
Migration Process

- Analyze
  - Database Architecture
  - Cost-Effectiveness
  - Risk Mitigation

- Plan
  - Routines
  - Downtime

- Perform
  - Data Migration

- Verify
  - Migration Success
Migration Methodology

- Recommend approaches
  - Traditional Waterfall System Life Cycle over Rapid Application Development
  - “As-Is” approach
- Upgrade after migration.
- Automate using Oracle Migration WorkBench.
- Create custom installation scripts.
SQL to Oracle Migration

1. Physical and Logical Structure
   1.1 Characteristics
   1.2 Data Types/Storage
   1.3 Recommendations

2. Stored Procedures

3. SQL Migration

4. Database Design

5. Schema Design

6. Data Migration

7. Security
Physical and Logical Structure

- Map Similar Database Objects
  - Schema objects, data types
  - Referential integrity, constraints, rules
  - Triggers, stored procedure, system catalogs

- Map Different Database Objects
  - Connection types or models
  - Temporary tables
  - Application programming
  - Data migration
Physical and Logical Structure

**Oracle Instance/Database**

- **Memory**
  - SMON
  - PMON
  - MMON
  - ......

- **Process**
  - (Dedicated/Shared)

- **Database**
  - System = Sys Objects
  - Sysaux = 10g Nonsys Objects
  - Temp = Sorting
  - Undo = Rollback, Recover

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**SQL Server**

- **Memory**

- **Process**

- **Database**
  - Master DB, Msdb, Tempdb, resource (2008)
  - Database 1
  - Database 2

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**Oracle Instance/Database**

- **System Tablespace**
  - (System, Sysaux, Temp, Undo)

- **User Tablespace**
  - User 1 Tablespace
  - User 2 Tablespace

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**Oracle Instance/Database**

- **Database**
  - Master = System Tablespace
  - Model = Template
  - Tempdb = Undo
  - Msdb = Agent Services

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**SQL Server**

- **Memory**

- **Process**

- **Database**
  - Master = System Tablespace
  - Model = Template
  - Tempdb = Undo
  - Msdb = Agent Services
# Physical and Logical Structure

## 1.1 Characteristics

<table>
<thead>
<tr>
<th>SQL</th>
<th>Oracle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instances/Database</td>
<td>SGA/SID</td>
</tr>
<tr>
<td>Case Insensitive</td>
<td>N/A</td>
</tr>
<tr>
<td>Database</td>
<td>Database</td>
</tr>
<tr>
<td>Database and Database Owner (DBO)</td>
<td>Schema</td>
</tr>
<tr>
<td>Database</td>
<td>Tablespace</td>
</tr>
<tr>
<td>T-SQL Stored Procedure</td>
<td>PL/SQL Procedure, Function or Package</td>
</tr>
<tr>
<td>Triggers</td>
<td>After Triggers</td>
</tr>
<tr>
<td>Complex Rules</td>
<td>Before Triggers, Trigger for Each Row</td>
</tr>
<tr>
<td>Identity Property for a Column</td>
<td>Sequences</td>
</tr>
<tr>
<td>View</td>
<td>View, M-View</td>
</tr>
</tbody>
</table>
## Physical and Logical Structure

### 1.1 Characteristics (Cont.)

<table>
<thead>
<tr>
<th>SQL</th>
<th>Oracle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transaction Logs Per Database</td>
<td>Transaction Logs for Entire Database</td>
</tr>
<tr>
<td>Auto Commit</td>
<td>Manual Commit or Rollback</td>
</tr>
<tr>
<td>Manual Exception</td>
<td>Default Exception</td>
</tr>
<tr>
<td>SA Account</td>
<td>System/manager Account</td>
</tr>
<tr>
<td>sysconfig</td>
<td>spfile</td>
</tr>
</tbody>
</table>

## Physical and Logical Structure

### 1.2 Data Types/Storage

<table>
<thead>
<tr>
<th>SQL</th>
<th>Oracle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integer, Small Int, Tiny Int, Bit, Money, Small Money</td>
<td>Number (10, 6, 3, 1, 19, 10)</td>
</tr>
<tr>
<td>Real, Float</td>
<td>Float</td>
</tr>
<tr>
<td>Text</td>
<td>CLOB</td>
</tr>
<tr>
<td>Image</td>
<td>BLOB</td>
</tr>
<tr>
<td>Binary, VarBinary</td>
<td>RAW</td>
</tr>
<tr>
<td>DateTime, Small DateTime</td>
<td>Date</td>
</tr>
<tr>
<td>Varchar2 (max)</td>
<td>LONG, CLOB</td>
</tr>
<tr>
<td>Varbinary (max)</td>
<td>LONG RAW, BLOB, BFILE</td>
</tr>
</tbody>
</table>
### Physical and Logical Structure

#### 1.2 Data Types/Storage (Cont.)

<table>
<thead>
<tr>
<th>SQL</th>
<th>Oracle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Database Devices</td>
<td>Datafile</td>
</tr>
<tr>
<td>Page</td>
<td>Data Block</td>
</tr>
<tr>
<td>Extent</td>
<td>Extent and Segments</td>
</tr>
<tr>
<td>Segments</td>
<td>Tablespace (Extent and Segments)</td>
</tr>
<tr>
<td>Log Devices</td>
<td>Redo Log Files</td>
</tr>
<tr>
<td>Data, Dump</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Physical and Logical Structure

1.3 Recommendations

<table>
<thead>
<tr>
<th>SQL</th>
<th>Oracle</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS Applications tend to use ASP on Clients. ASP uses ADO to communicate to DB.</td>
<td>Use Oracle OLE/DB or migrate to JSP.</td>
</tr>
<tr>
<td>DB Library</td>
<td>Use Oracle OCI calls.</td>
</tr>
<tr>
<td>IIS/ASP</td>
<td>IAS/Fusion on JAVA 2 Platform, J2EE</td>
</tr>
<tr>
<td>Embedded SQL from C/C++</td>
<td>Manual conversion</td>
</tr>
<tr>
<td>Stored Procedure return Multiple Sets</td>
<td>Find driver support Reference Cursors (i.e. DataDirect).</td>
</tr>
<tr>
<td>Delphi, MS Access (Embedded SQL/C or MS Library)</td>
<td>Use ODBC Driver.</td>
</tr>
<tr>
<td>DBO.Database</td>
<td>Transform to Single or Multiple Schema.</td>
</tr>
<tr>
<td>DTS/SSIS</td>
<td>Warehouse Builder</td>
</tr>
</tbody>
</table>
2. Stored Procedures

- Use Package for nested procedures.
- Use Functions for User-Defined Functions.
- Use Hints or CBO.
- Remove Create/Drop temporary tables.
3. SQL Migration

- TOP function
- Dynamic SQL → No conversion
- Case statements → Decode
- Unique identifier (GUID) → ROWID or UROWID

Example:

```
select newid()
```

vs.

```
select sys_guid() from dual
```
4. Database Design

- Evaluate Constraints
  - Entity Integrity
  - Referential Integrity
  - Unique Key
  - Check

- Use Table Partitions.
- Apply Reverse Key for sequence generated columns.
- Apply Flashback for restoration.
- Use Oracle RAC, Active DataGuard for HA/DR.
- Use Transparent Data Encryptions and remove data encryptions.
4. Database Design (Cont.)

- Outer Joins
- Oracle Exceptions (i.e. no_data_found)
- Autonomous Transactions
- Records and Types
- Reverse Key for RAC environment
5. Schema Design

- **Table (Data Types, Constraints)**
  - Numeric (10, 2) → Number (10, 2)
  - Datetime (Oracle 4712 BC, SQL 01/01/0001 – 12/31/9999)

- **Views (Materialized views)**

- **Trigger (Functionality difference)**

- **Synonyms (Public or Private)**

- **Spatial**
  
  Create table abc (id number (10) not null, geo dsys.sdo_geometry) vs.
  
  Create table abc (id number (10) not null, geo geography)
5. Schema Design (Cont.)

- **Data Types**
  - Datetime
    - 1/300\textsuperscript{th} of a second vs. 1/100\textsuperscript{th} million of a second

- **Image and Text**
  - Image of data is stored as pointer vs. Image stored in BLOB and Text in CLOB

- **User-Defined**
  - Equivalent to PL/SQL data type

- **Table Design**

  **SQL**
  
  ```sql
  Create table sample
  (datetime_col datetime          not null,
   integer_col    int                   null,
   text_col         text                 null,
   varchar_col   varchar2 (10) null)
  ```

  **Oracle**
  
  ```sql
  Create table sample
  (datetime_col    date               not null,
   integer_col      number          null,
   text_col           long                null,
   varchar_col     varchar2 (10) null)
  ```
6. Data Migration

- SQL Loader
- Data Pump
- Stream
- Database Link or Transparent Gateway
  - Create table as select.
  - Insert as select.
7. Security

- Create user accounts in Oracle.
- Leverage default Role and Privs.
- Map user accounts to Role.
SQL/Oracle Tool for Migration

- Oracle Migration Workbench
- OEM/Grid Control
- Upgrade SQL to ver. 2005 with Transparent Gateway
- Oracle APEX
- Scripting
Questions

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