

ORACLE®

Dr. Norbert Leiendecker
Server Technologies
Competence Center

PL/SQL and Java Performance

- Java can be faster than plsql, it can be slower
- Do not recode all of your PL/SQL in java
- Interaction between Java and PL/SQL is potentially faster than the interaction between Java and a Java stored procedure
 - Java to call a java stored procedure: java types → turn them into sql types → turn them into java types and do the reverse on the way out
 - Java to call a plsql stored procedure: java type → turn it into a sql type and do the reverse on the way out
- Execution speed of PL/SQL ↔ (un)tuned series of queries/statements in PL/SQL routine.

Debugging/Analyse von PL/SQL

- Supplied PL/SQL Packages and Types Reference
 - DBMS_APPLICATION_INFO
 - DBMS_PROFILER
 - DBMS_UTILITY.FORMAT_ERROR_STACK
 - DBMS_UTILITY.FORMAT_CALL_STACK

Debugging/Analyse von PL/SQL

- **DBMS_PROFILER**

- profile existing PL/SQL applications and identify performance bottlenecks

UNIT_NAME	OCCURED	TOT_TIME	LINE	TEXT
NUMBER_TEST	1	.000004	2	n number:=1;
NUMBER_TEST	1	.000002	3	b binary_integer:=1;
NUMBER_TEST	1	.000001	4	p pls_integer:=1;
NUMBER_TEST	1001	.001170	7	FOR i IN 1..1000 LOOP
NUMBER_TEST	1000	.002871	8	n:=n+1;
NUMBER_TEST	1000	.004834	9	b:=b+1;
NUMBER_TEST	1000	.000991	10	p:=p+1;
NUMBER_TEST	1000	.002891	11	dummy:='counts for ENDLOOP';
NUMBER_TEST	1	.000006	13	dummy:='end of PLSQL';

Debugging/Analyse von PL/SQL

SQLCODE and SQLERRM:

only information about the last error

- **DBMS_UTILITY.FORMAT_ERROR_STACK**
 - returns a string containing the entire stack dump of all errors that are currently being handled
- **DBMS_UTILITY.FORMAT_CALL_STACK**
 - returns a string that contains the current list of calls in context (context at the point at which format_call_stack was called)

Oracle C++ Call Interface OCCI

- Built on OCI
 - Similar control and performance of OCI
- Based on Standards
 - ANSI/ISO C++ Standard, including STL
 - Associative access API design similar to JDBC
- Performance
 - Prefetching, client-side cache, array operations, data buffering, thread safe
- API easy to use
 - API design consistent with C++ programming paradigm (e.g. **new** operator overloaded for creating persistent objects)

Oracle C++ Call Interface OCCI



- Migration of existing applications
 - Complex C++ programs
 - Up to 1000 classes

http://hep-proj-database.web.cern.ch/hep-proj-database/workshop-July2001/workshop_agenda.htm

Pro*Fortran 1.8

New command-line option, UNSAFE_NULL

UNSAFE_NULL=YES

**disables „ORA-01405 fetched column value is NULL“
messages when precompiling applications that fetch
data into host variables that do not have associated
indicator variables.**

SQL Extensions

- CASE-Statement
- USING and ON-Clause (ISO 99 SQL)
- LEFT-, RIGHT- and FULL OUTER JOIN
- MERGE
- Scalar Subqueries

CASE-Statement instead of DECODE

```
SELECT last_name, state_code,  
(CASE state_code  
    WHEN 'AL' THEN 'Alabama'  
    WHEN 'AK' THEN 'Alaska'  
    WHEN 'AR' THEN 'Arkansas'  
    WHEN .....  
    ELSE 'N/A'  
END ) state_name  
FROM employees  
ORDER BY last_name;
```

CASE-Statement II

```
SELECT last_name, job_id, salary,  
       (CASE  
         WHEN job_id LIKE 'SA_MAN' AND salary < 12000 THEN '10%'  
         WHEN job_id LIKE 'SA_MAN' AND salary >= 12000 THEN '15%'  
         WHEN job_id LIKE 'IT_PROG' AND salary < 9000 THEN '8%'  
         WHEN job_id LIKE 'IT_PROG' AND salary >= 9000 THEN '12%'  
         ELSE 'NOT APPLICABLE'  
       END ) Raise  
FROM employees;
```

USING-Clause

ORACLE8i:

```
SELECT last_name, department_name  
FROM  
employees e, departments d  
WHERE  
e.department_id = d.department_id;
```

ORACLE9i:

```
SELECT last_name, department_name  
FROM  
employees e, departments d  
USING (department_id);
```

ON-Clause

ORACLE8i:

```
SELECT last_name, department_name  
FROM  
employees e, departments d  
WHERE  
e.department_id = d.dept_id;
```

ORACLE9i:

```
SELECT last_name, department_name  
FROM  
employees e, departments d  
ON (department_id = dept_id);
```

**LEFT-
RIGHT-
FULL OUTER JOIN**

SQL92 compliant, elegant and intuitive!

LEFT OUTER JOIN

ORACLE8i: SELECT p.part_id, s.supplier_name
FROM part p, supplier s
WHERE p.supplier_id = s.supplier_id (+);

ORACLE9i: SELECT p.part_id, s.supplier_name
FROM part p **LEFT OUTER JOIN** supplier s
ON p.supplier_id = s.supplier_id;

PART SUPPLIER_NAME

```
----  -----  
P1    Supplier#1  
P2    Supplier#2  
P3  
P4
```


RIGHT OUTER JOIN

ORACLE8i: SELECT p.part_id, s.supplier_name
FROM part p, supplier s
WHERE p.supplier_id (+) = s.supplier_id;

ORACLE9i: SELECT p.part_id, s.supplier_name
FROM part p **RIGHT OUTER JOIN** supplier s
ON p.supplier_id = s.supplier_id;

PART SUPPLIER_NAME

```
----  -----  
P1    Supplier#1  
P2    Supplier#2  
      Supplier#3
```

FULL OUTER JOIN

```
SELECT p.part_id, s.supplier_name  
FROM part p, supplier s  
WHERE p.supplier_id (+) = s.supplier_id (+);
```

ERROR at line 3:

ORA-01468: a predicate may reference only one
outer-joined table

FULL OUTER JOIN *8i*

```
SELECT p.part_id, s.supplier_name
FROM part p, supplier s
WHERE p.supplier_id = s.supplier_id (+)
UNION
SELECT p.part_id, s.supplier_name
FROM part p, supplier s
WHERE p.supplier_id (+) = s.supplier_id;
```

PART SUPPLIER_NAME

```
----  -----
P1    Supplier#1
P2    Supplier#2
P3
P4
      Supplier#3
```

FULL OUTER JOIN *9i*

```
SELECT p.part_id, s.supplier_name  
FROM part p FULL OUTER JOIN supplier s  
ON p.supplier_id = s.supplier_id;
```

```
PART SUPPLIER_NAME
```

```
----  
-----  
P1    Supplier#1  
P2    Supplier#2  
P3  
P4  
      Supplier#3
```

Scalar Subqueries

Oracle 8i:

„in line views“, i.e.

Subquery-Select in FROM-Clause

Oracle 9i:

„scalar subqueries“, i.e.

Subquery-Select in SELECT-Clause

Scalar Subqueries - Examples

```
SELECT
  (SELECT max(salary) FROM emp) highest_salary,
  emp_name employee_name,
  (SELECT avg(bonus) FROM commission) avg_commission,
  dept_name
FROM
  emp,
  (SELECT dept_name FROM dept where dept = 'finance');
```

Scalar Subqueries, Examples

```
INSERT into max_credit  
(name, max_credit)  
VALUES  
(  
  'Bill',  
  SELECT max(credit) FROM credit_table  
  WHERE name = 'BILL'  
);
```

MERGE

```
CREATE TABLE bonuses  
(employee_id NUMBER, bonus NUMBER DEFAULT 100);
```

```
INSERT INTO bonuses(employee_id) (SELECT e.employee_id  
FROM employees e, orders o WHERE e.employee_id = o.sales_rep_id  
GROUP BY e.employee_id);
```

```
MERGE INTO bonuses D  
USING (SELECT employee_id, salary, department_id  
        FROM employees WHERE department_id = 80) S  
ON (D.employee_id = S.employee_id)  
WHEN MATCHED THEN UPDATE SET D.bonus = D.bonus + S.salary*.01  
WHEN NOT MATCHED THEN INSERT (D.employee_id, D.bonus)  
VALUES (S.employee_id, S.salary*0.1);
```


EM – Diagnostic Pack

Oracle Enterprise Manager Console, Administrator:SYSMAN, Management Server:nleiende-de.de.oracle.com

File Navigator Object Event Job **Tools** Configuration Help

Network

- Events
- Jobs
- Report Definitions
- Application Servers
- Databases
 - iasdb.nleiende_de.de.oracle.com
 - infra
 - oms.world
 - orcl
 - orcl.world - SYS AS SYSDBA
 - Instance
 - Configuration**
 - Stored Configurations
 - Sessions
 - Locks

Database Tools

- Application Management
- Change Management Pack
- Database Applications
- Diagnostics Pack**
 - Capacity Planner
 - Lock Monitor
 - Performance Manager
 - Performance Overview**
 - Top Sessions
 - Top SQL
 - Trace Data Viewer
- Service Management
- Tuning Pack

Memory Recovery Resource Monitors Undo

State

Show

Database

Host Name: nleiende-de.de.oracle.com

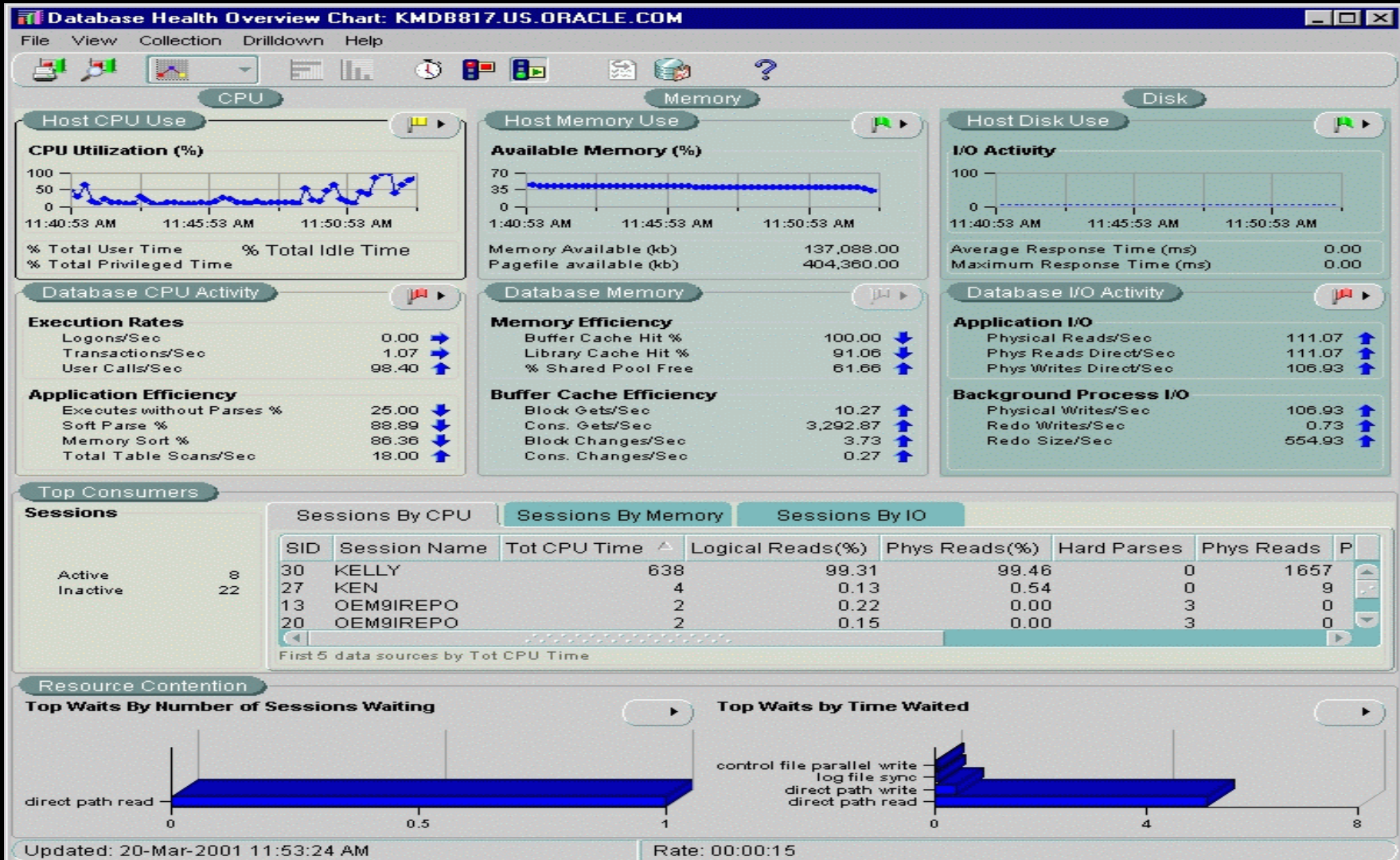
DB Name: ORCL

DB Version: Oracle9i Enterprise Edition Release 9.2.0.2.1 - Production
With the Partitioning, Spatial,
OLAP, and Oracle Data Mining options

Instance Name: orcl

Instance Start Time: 14-Feb-2003 08:13:50 AM

EM – Performance Overview



EM – Top Sessions

Top Sessions: SYS@ORCL.WORLD

File View Collection Drilldown Help

Top Sessions

SID	Session Name	OS Username	Sort Statistic	Status	Machine	Terminal	Program	Module	Action	Serial #	SPID	Phys
1	PMON	SYSTEM	0.00	ACT						1	1944	
2	DBW0	SYSTEM	0.00	ACT						1	1956	
3	LGWR	SYSTEM	0.00	ACT						1	1960	
4	CKPT	SYSTEM	0.00	ACT						1	1964	
5	SMON	SYSTEM	0.00	ACT						1	1968	
6	RECO	SYSTEM	0.00	ACT						1	1972	
7	CJQ0	SYSTEM	0.00	ACT						1	1976	
8	QMNO	SYSTEM	0.00	ACT						9	1508	
10	STRMADMIN		0.00	ACT						2110	1512	
18	SYS	NLEIENDE-DE\nleierende	0.00	ACT						3	2228	

Options

Data Session Filtering Options

Show only the Sessions that meet all of the following conditions:

Filtering Conditions

Phys Reads(%) is greater than 10

Tot CPU Time is greater than 16

Memory Sorts is greater than 10

Parse CPU is greater than 0

More Fewer

OK Cancel Help

EM – Top Sessions - Drilldown

The screenshot displays the Oracle Enterprise Manager interface with three main windows:

- Top Sessions:** A table listing active sessions. Session 14 (SYS) is highlighted.
- Current SQL:** Shows the SQL statement: `select count(*) from dba_objects`.
- SQL Explain Plan:** Shows the execution plan for the query, including steps like SORT (AGGREGATE), SYS.DBA_OBJECTS VIEW, UNION-ALL, FILTER, NESTED LOOPS, and various table accesses.

SID	Session Name	OS Us
20	SYS	SYSTE
18	SYS	NLEIE
17	SYS	NLEIE
16		
15		
14	SYS	NLEIE
13		
12	SYS	NLEIE
10	STRMADMIN	
1	PMON	SYSTEM
8	QMNO	SYSTEM
7	CJQ0	SYSTEM
6	RECO	SYSTEM
5	SMON	SYSTEM
4	CKPT	SYSTEM
3	LGWR	SYSTEM
2	DBW0	SYSTEM
9	SYS	SYSTEM

SQL
select count(*) from dba_objects

Step Name	Step #	Cost	Rows	KBytes
SQL SELECT STATEMENT	14			
SORT (AGGREGATE)	13			
SYS.DBA_OBJECTS VIEW	12			
UNION-ALL	11			
FILTER	7			
SYS.OBJ\$ TABLE ACCESS (BY INDEX ROW 4				
NESTED LOOPS	3			
SYS.USER\$ TABLE ACCESS (FULL) 1				
SYS.I_OBJ2 INDEX (RANGE SCAN) 2				
SYS.IND\$ TABLE ACCESS (BY INDEX ROW 6				

EM – Tuning Pack

Oracle Enterprise Manager Console, Administrator:SYSMAN, Management Server:nleiende-de.de.oracle.com

File Navigator Object Event Job **Tools** Configuration Help

The screenshot shows the Oracle Enterprise Manager console interface. On the left is a tree view under 'Network' containing 'Events', 'Jobs', 'Report Definitions', 'Application Servers', and 'Databases'. Under 'Databases', there are several instances: 'iasdb.nleiende_de.de.oracle.com', 'infra', 'oms.world', 'orcl', and 'orcl.world - SYS AS SYSDBA'. The 'orcl.world' instance is expanded to show 'Instance' with sub-items 'Configuration', 'Stored Configurations', and 'Sessions'. The 'Configuration' item is highlighted with a blue box. A 'Tools' menu is open over the 'Configuration' item, listing: 'Database Tools', 'Application Management', 'Change Management Pack', 'Database Applications', 'Diagnostics Pack', 'Service Management', and 'Tuning Pack'. The 'Tuning Pack' item is highlighted with a blue box and has a sub-menu open showing: 'Index Tuning Wizard', 'Oracle Expert', 'Outline Management', 'Reorg Wizard', 'SQL Analyze', and 'Tablespace Map'. The 'SQL Analyze' item is highlighted with a blue box. In the background, the 'Memory' tab is active, showing 'State' with a 'Shutdown' button. Below the menu, database details for 'orcl' are visible, including 'DB Version: Oracle9i Enterprise Edition Release 9.2.0.2.1 - Production With the Partitioning, Spatial, OLAP, and Oracle Data Mining options' and 'Instance Name: orcl'.

EM – SQL Analyze

The screenshot displays the Oracle SQL Analyze application window. The title bar reads "Oracle SQL Analyze - SYSMAN@nleiede-de.de.oracle.com". The menu bar includes "File", "Edit", "View", "SQL", "TopSQL", "History", "Tools", and "Help". The "Tools" menu is open, showing options: "Virtual Index Wizard..." (Ctrl+Shift+I), "Hint Wizard..." (Ctrl+Shift+H), and "SQL Tuning Wizard..." (Ctrl+Shift+T). The "SQL Stater" tab is active, containing the following SQL query:

```
SELECT COUNT(*)
FROM all_policies v
WHERE v.object_owner = :b2
AND v.object_name = :b1
AND (policy_name LIKE '%xdblrs%'
OR policy_name LIKE '%fxd_%')
```

Below the query, the "Explain" tab is selected, showing the execution plan. The plan is a tree structure with the following steps:

Execution Step	Order	Est C
SELECT STATEMENT	121	
SORT (AGGREGATE)	120	
VIEW 'SYS.ALL_POLICIES'	119	
UNION-ALL	118	
FILTER	46	
NESTED LOOPS	41	
NESTED LOOPS (OUTER)	38	
NESTED LOOPS (OUTER)	35	
NESTED LOOPS (OUTER)	32	
NESTED LOOPS (OUTER)	30	
NESTED LOOPS	27	
NESTED LOOPS	24	
NESTED LOOPS	21	
VIEW 'SYS.DRA_POLICIES'	18	

At the bottom of the window, there is a status bar with the text "Opens the Virtual Index Wizard" and a button labeled "OVR".

EM – Virtual Index Wizard

Virtual Index Wizard, step 2 of 4: Virtual Index Definition

Define the properties for the virtual index:

Virtual Index Name:

Schema:

Index on Table

Schema:

Table Name:

Specify the columns for the index by clicking on the columns in


Order	Table Columns
2	ORD_ID
	ITEM_ID
	PRODUCT_ID
	PRICE
1	QUANTITY

Index Types: Unique Bitmap

Options: Parallel

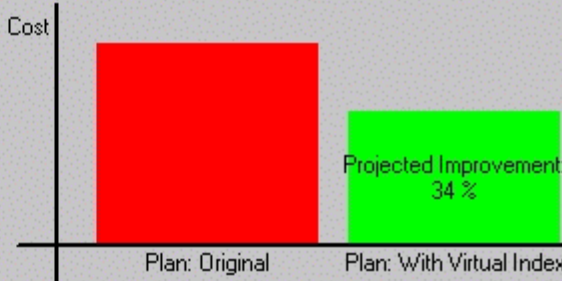
Define the virtual index

Virtual Index Wizard, step 4 of 4: Execution Plan Comparison



This graph estimates the projected cost improvement of the virtual index on the statement. The actual performance improvement may be different from the estimated cases.

After reviewing performance improvements, click Finish to save this SQL statement and associated virtual index in the Navigator tree, or click Cancel to discard the changes.



Cost

Plan: Original

Plan: With Virtual Index

Projected Improvement: 34%

Use the Show Comparison button to compare the explain plans.

Show Comparison ...

See the results

EM – SQL Analyze

Oracle Enterprise Manager Console, Administrator:SYSMAN, Management Server:nleiende-de.de.oracle.com

File Navigator Object Event Job Tools Configuration Help

General Memory Recovery Resource Monitors Undo

Instance State

Oracle SQL Analyze - SYSMAN@nleiende-de.de.oracle.com

File Edit View SQL TopSQL History Tools Help

- Create New SQL (Ctrl+N)
- Create Like SQL
- Rename SQL (Ctrl+R)
- Delete SQL (Del)
- Get Explain Plan
- Execute SQL (F5, Ctrl+Enter)
- Show Object Properties...
- Start Plan Walk
- Step Forward
- Step Backward
- Show Plan Step Properties...
- Apply Changes
- Revert Changes
- Generate Virtual Index Script...
- Get Index Recommendations**
- Show Recommendation Details
- Generate Recommendation Script...
- Verify Index Recommendations...
- Cancel Operation (Esc)
- Report...

Step Description: Get index recommendations for this SQL statement

	Order	Est C
	121	
	120	
	119	
	118	
	46	
	41	
	38	
	35	
	32	
	30	
	27	
	24	
	21	
	18	

Apply Revert Help

14:44

Client / Server Interoperability Support

	Server Version							
Client Version	9.2.0	9.0.1	8.1.7	8.1.6	8.1.5	8.0.6	8.0.5	7.3.4
9.2.0	Yes	Yes	Yes	No	No	EMS	No	No #1
9.0.1	Yes	Yes	Yes	Was	No	EMS	No	Was
8.1.7	Yes	Yes	Yes	Was	Was	EMS	Was	Was
8.1.6	No	Was	Was	Was	Was	Was	Was	Was
8.1.5	No	No	Was	Was	Was	Was	Was	Was
8.0.6	EMS	EMS	EMS	Was	Was	EMS	Was	Was
8.0.5	No	No	Was	Was	Was	Was	Was	Was
7.3.4	Was	Was	Was	Was	Was	Was	Was	Was

Yes	Supported
EMS	Supported for customers under Extended Maintenance (EMS) only.
Was	Was a supported combination but one of the releases is no longer covered by Primary Error Correct support or Extended Maintenance Support so fixes are no longer possible.
No	Has never been Supported

JDBC, JDK, and Oracle Database Certification [Note:203849.1](#)

For JDBC clients information in [Note:203849.1](#) takes priority over information in the above matrix!

Client / Server Interoperability Support

JDBC, JDK, and Oracle Database

Certification [Note:203849.1](#)

JDK	Driver File Name	JDBC Version
1.1	classes111.zip	7.3.4 -
1.2	classes12.zip	8.1.6 -
1.3	classes12.zip	8.1.7 -
1.4	ojdbc14.zip	9.2 -

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- Migration Workbench
- Heterogeneous Services („Generic Connectivity“)
- Oracle Personal Edition

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- Migration Workbench
 - Wizard-driven tool
 - Download from <http://otn.oracle.com>
 - Visual representation of the source database and its Oracle equivalent
- Migration analysis
 - Summary report
 - Contextual log messages

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Oracle Migration Workbench Repository-Login (Datenbank)

ORACLE® Migration Workbench

Oracle Migration Workbench Repository Login



Default Repository

Oracle8i/Oracle9i Repository

User Name

Password

Service

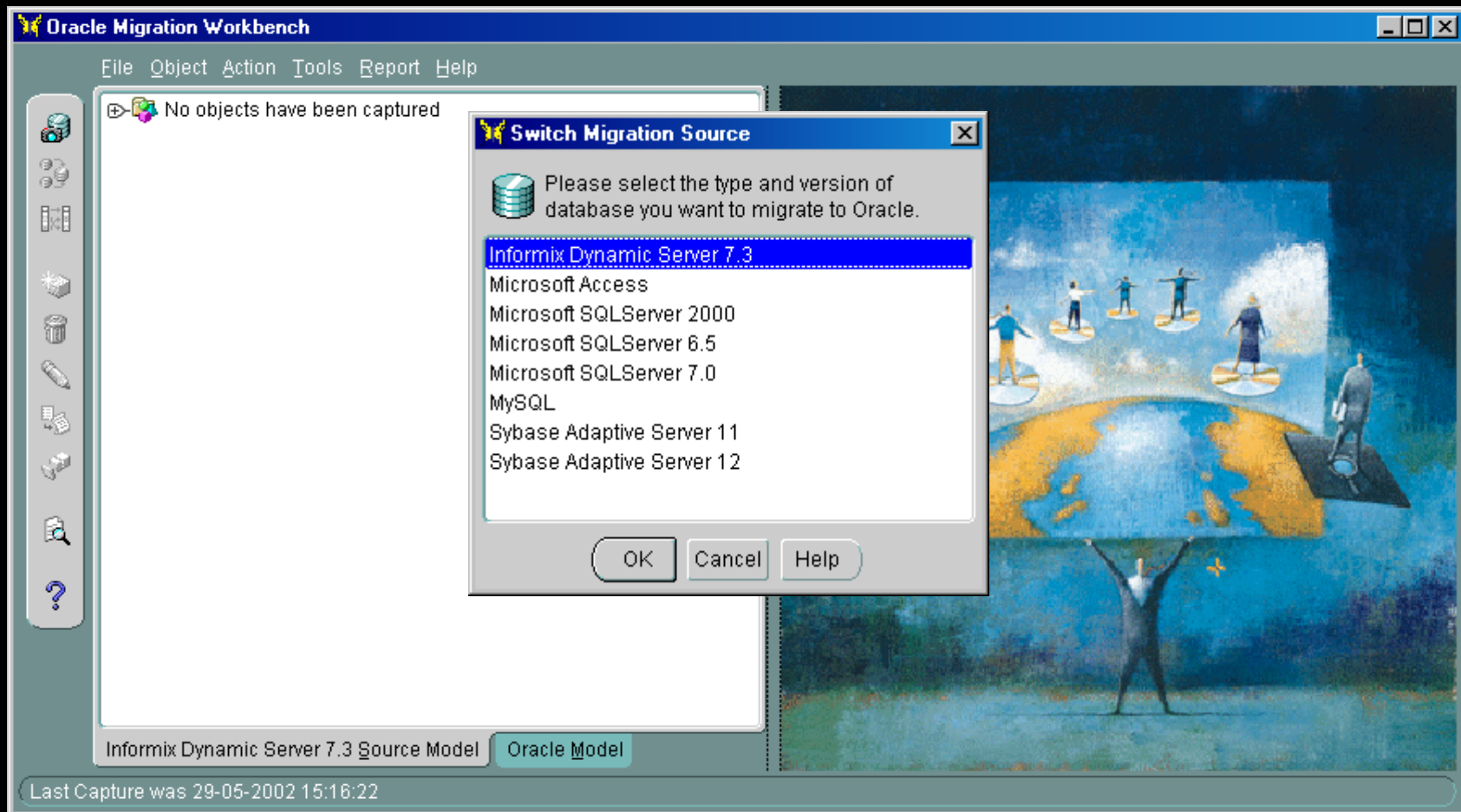
OK Exit Quick Tour Help

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Oracle Migration Workbench

Selecting Migration Source

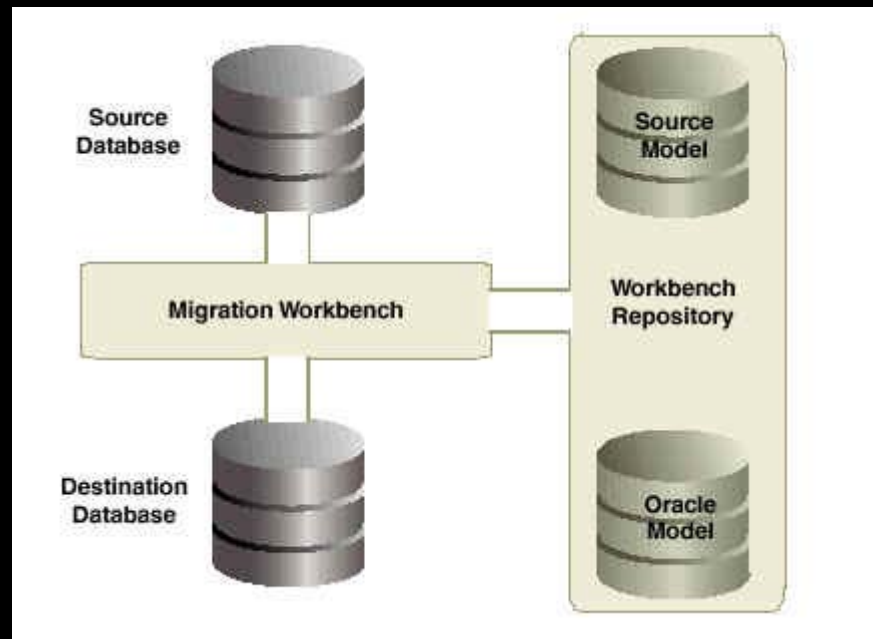


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- Migration Workbench



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- Migration Workbench Supported third-party Databases
 - Microsoft SQL Server 6.5, 7.0 and 2000
 - Sybase Adaptive Server 11 and 12
 - Microsoft Access 2.9, 95, 97 and 2000
 - Informix Dynamic Server 7.3
 - Informix Dynamic Server 9.1 (Beta)
 - **MySQL 3.22 and 3.23**
 - IBM DB2/400 V4R3 and V4R5
 - IBM DB2 UDB 6, 7.1 and 7.2 (Beta)

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- Migration Workbench
- Details:

**„Oracle Migration Workbench Reference
Guide for MySQL 3.22, 3.23 Migrations
Release 9.2.0 for Microsoft Windows 98/2000,
Microsoft Windows NT and Red Hat Linux 6.2“**

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- Heterogeneous Services („Generic Connectivity“)
 - Generic Connectivity Agents for ODBC and OLE DB
 - Customer responsible for drivers

- Details:

**Oracle9i Heterogeneous Connectivity
Administrator's Guide Release 2 (9.2)**

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- Heterogeneous Services („Cookbook“)
 - OUI: Install „Generic Connectivity using ODBC“
 - `@ORACLE_HOME/rdbms/admin/caths.sql`
(Test mit z.B. `SQL> describe SYS.HS_FDS_CLASS`)
 - Install MySQL ODBC-Driver
 - With ODBC Admin Utility configure a SYSTEM DATASOURCE, z.B. **mysqltest**



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- Heterogeneous Services („Cookbook“)

- Configure tnsnames.ora

```
MYSQLTEST.WORLD =  
  (DESCRIPTION =  
    (ADDRESS_LIST =  
      (ADDRESS = (PROTOCOL = TCP)(HOST = nleinde-de)(PORT = 1521))  
    )  
    (CONNECT_DATA =  
      (SID = mysqltest)  
    )  
    (HS = OK)  
  )
```



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- Heterogeneous Services („Cookbook“)
 - Configure listener.ora

```
(SID_DESC =  
  (SID_NAME = mysqltest)  
  (ORACLE_HOME = C:\oracle\ora92)  
  (PROGRAM = hsodbc)  
)
```

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- Heterogeneous Services („Cookbook“)
 - Configure ORACLE_HOME/hs/admin/initmysqltest.ora

HS_FDS_CONNECT_INFO=mysqltest

HS_FDS_TRACE_LEVEL = 4

HS_FDS_TRACE_FILE_NAME = mysqltest.trc

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- Heterogeneous Services („Cookbook“)

```
SQL> ALTER SESSION SET GLOBAL_NAMES=FALSE; (falls nicht in init.ora)
```

```
SQL> CREATE DATABASE LINK mysql CONNECT TO root  
IDENTIFIED BY root USING 'mysqltest';
```

```
SQL> SELECT * FROM "TEST"@mysql; (" " zwingend!)
```

Für den Test:

mySQL-Server Version 3.23 unter SuSE Linux 7.2 (Kernel 2.4.7)

In /etc/my.cnf unter [mysqld] "skip-grant-tables" eingetragen.

In System-DSN „mysqltest“ „Disable transactions“ eingetragen



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- Oracle Personal Edition

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Q U E S T I O N S
A N S W E R S