



# Oracle 11g DBA Fundamentals Overview

Lesson 14 Moving Data

# Objectives

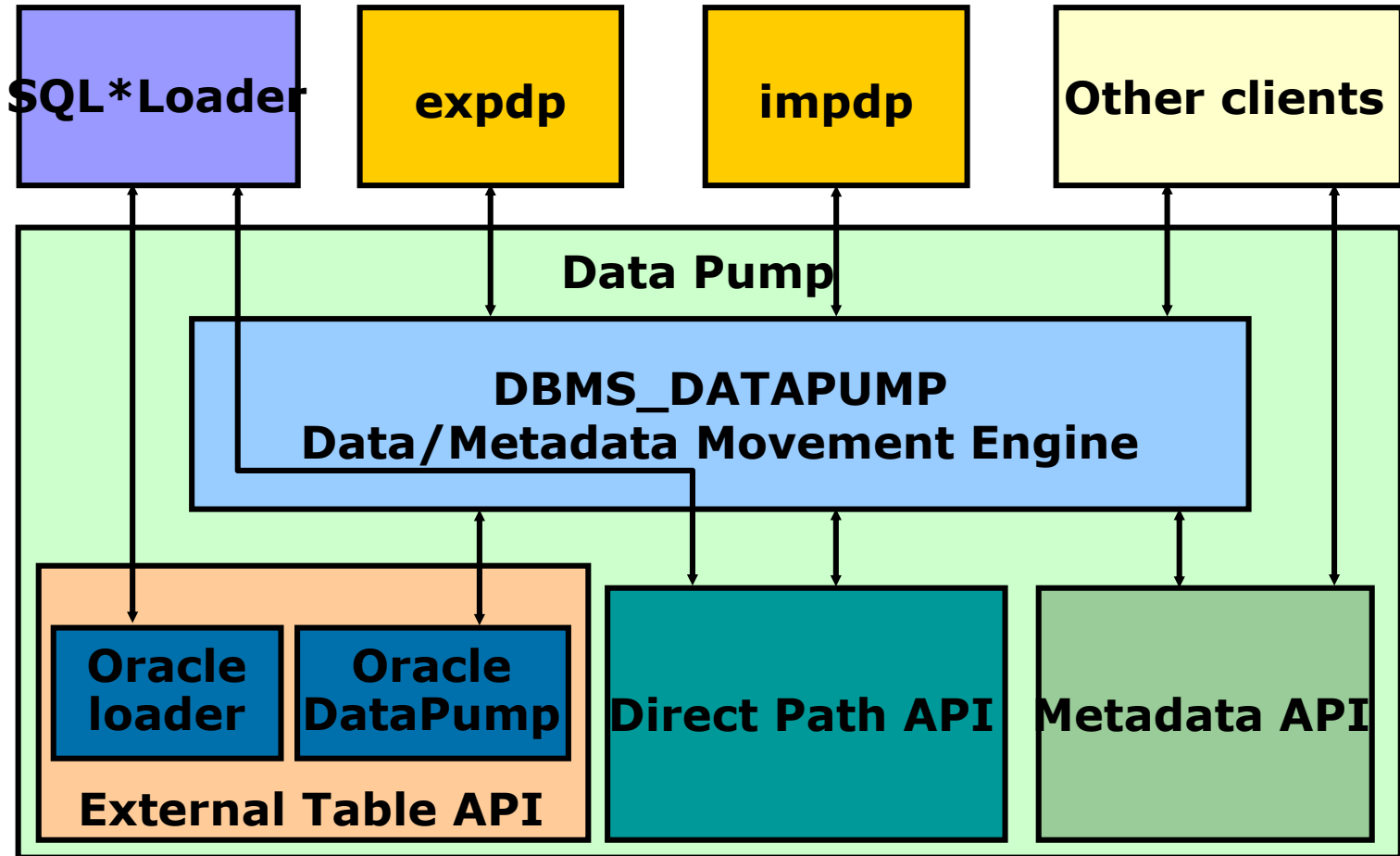


After completing this lesson, you should be able to do the following:

- Describe available ways for moving data
- Create and use directory objects
- Use SQL\*Loader to load data from a non-Oracle database (or user files)
- Explain the general architecture of Data Pump
- Use Data Pump Export and Import to move data between Oracle databases
- Use external tables to move data via platform-independent files



# Moving Data: General Architecture





# Directory Object: Overview

## Directory Objects

### Search

Object Name

By default, the search returns all uppercase matches beginning with the string you entered. To run an exact or case-sensitive match, double quote the search string. You can use the wildcard symbol (%) in a double quoted string.

Selection Mode

Actions

Select	Name	Path
<input checked="" type="radio"/>	<a href="#">ADMIN DIR</a>	/ade/aime_10.2_inx_push/oracle/md/admin
<input type="radio"/>	<a href="#">DATA FILE DIR</a>	/u01/app/oracle/product/10.2.0/db_1/demo/schema/sales_history/
<input type="radio"/>	<a href="#">DATA PUMP DIR</a>	/u01/app/oracle/product/10.2.0/db_1/rdbms/log/
<input type="radio"/>	<a href="#">LOG FILE DIR</a>	/u01/app/oracle/product/10.2.0/db_1/demo/schema/log/
<input type="radio"/>	<a href="#">MEDIA DIR</a>	/u01/app/oracle/product/10.2.0/db_1/demo/schema/product_media/
<input type="radio"/>	<a href="#">SUBDIR</a>	/u01/app/oracle/product/10.2.0/db_1/demo/schema/order_entry/2002/Sep
<input type="radio"/>	<a href="#">WORK DIR</a>	/ade/aime_10.2_inx_push/oracle/work
<input type="radio"/>	<a href="#">XMLDIR</a>	/u01/app/oracle/product/10.2.0/db_1/demo/schema/order_entry/

## Schema

### Database Objects

- [Tables](#)
- [Indexes](#)
- [Views](#)
- [Synonyms](#)
- [Sequences](#)
- [Database Links](#)
- [Directory Objects](#)
- [Reorganize Objects](#)

# Creating Directory Objects



## Create Directory Object

1

Show SQL Schedule Job Cancel OK

General Privileges

\* Name EXTAB\_LOG\_DIR

\* Path /home/oracle/labs/extab2

2

Test File System

## Create Directory Object

3

Show SQL Cancel OK

General Privileges

This page shows the list of users who have privileges for this directory

5

Add

Select Remove

Select All | Select None

Select	User Name	Read Access	Write Access
<input type="checkbox"/>	HR	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

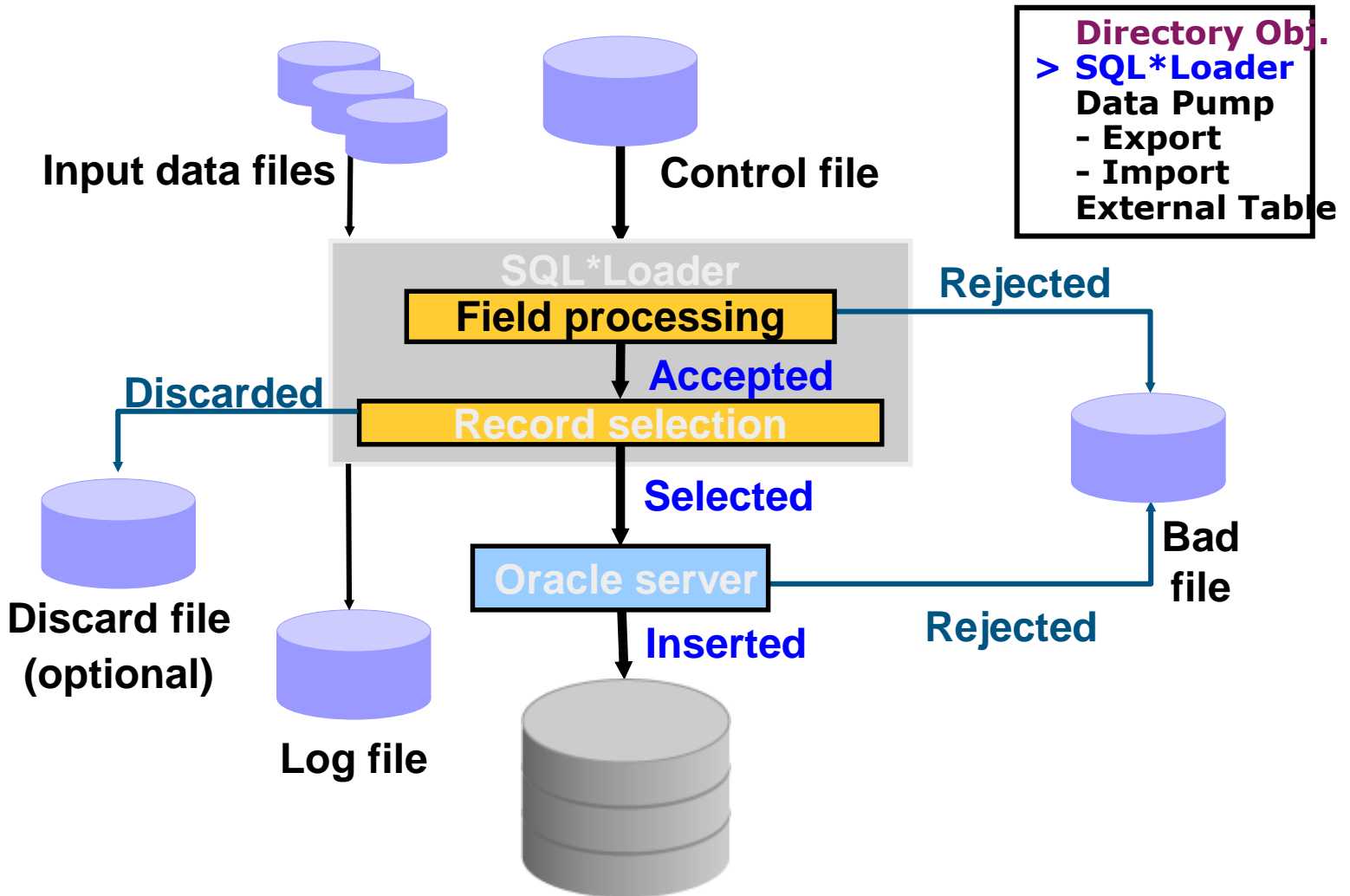
## Show SQL

4

Return

```
CREATE DIRECTORY "EXT_DAT_DIR" AS '/home/oracle/labs/extab1'  
GRANT READ ON DIRECTORY "EXT_DAT_DIR" TO "HR"  
GRANT WRITE ON DIRECTORY "EXT_DAT_DIR" TO "HR"
```

# SQL\*Loader: Overview





# Loading Data with SQL\*Loader

## Data Movement

### Move Row Data

[Export to Export Files](#)

[Import from Export Files](#)

[Import from Database](#)

[Load Data from User Files](#)

[Monitor Export and Import Jobs](#)

## Load Data: Generate Or Use Existing Control File

Database **orcl.oracle.com**

### ☒ Automatically Generate Control File

A control file will be generated after you define the structure of the data file.

### ☐ Use Existing Control File

Allows you to use an existing control file that defines the structure of the data file.

## Host Credentials

\* Username

\* Password

☒ Save as Preferred Credential



## Load Data: Control File

Database **orcl.oracle.com**

A control file is used to describe what will be loaded and how. Specify the full path and name of the control file on the database server machine.





# SQL\*Loader Control File

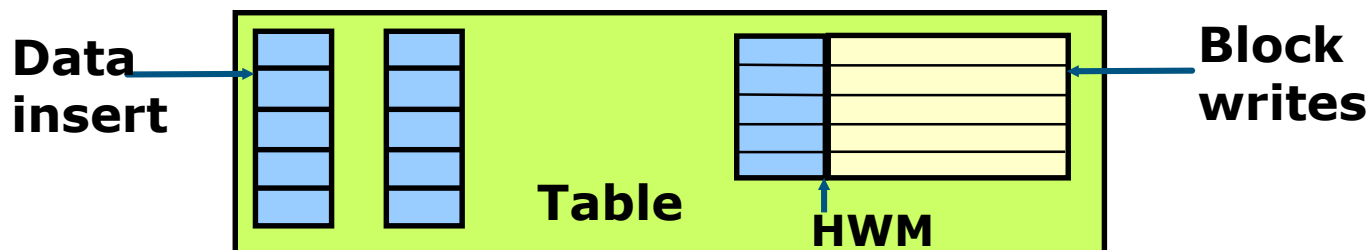
The SQL\*Loader control file instructs SQL\*Loader about:

- Location of the data to be loaded
- The data format
- Configuration details:
  - Memory management
  - Record rejection
  - Interrupted load handling details
- Data manipulation details





# Loading Methods



Conventional Load	Direct Path Load
Uses COMMIT	Uses data saves (faster operation)
Always generates redo entries	Generates redo only under specific conditions
Enforces all constraints	Enforces only PRIMARY KEY, UNIQUE, and NOT NULL
Fires INSERT triggers	Does not fire INSERT triggers
Can load into clustered tables	Does not load into clusters
Allows other users to modify tables during load operation	Prevents other users from making changes to tables during load operation



# Data Pump: Overview

As a server-based facility for high-speed data and metadata movement, data pump:

- Is callable via DBMS\_DATAPUMP
- Provides the following tools:
  - expdp
  - impdp
  - Web-based interface
- Provides data access methods:
  - Direct path
  - External tables
- Detaches from and reattaches to long-running jobs
- Restarts Data Pump jobs

**Directory Obj.**  
**SQL\*Loader**  
**> Data Pump**  
**- Export**  
**- Import**  
**External Table**

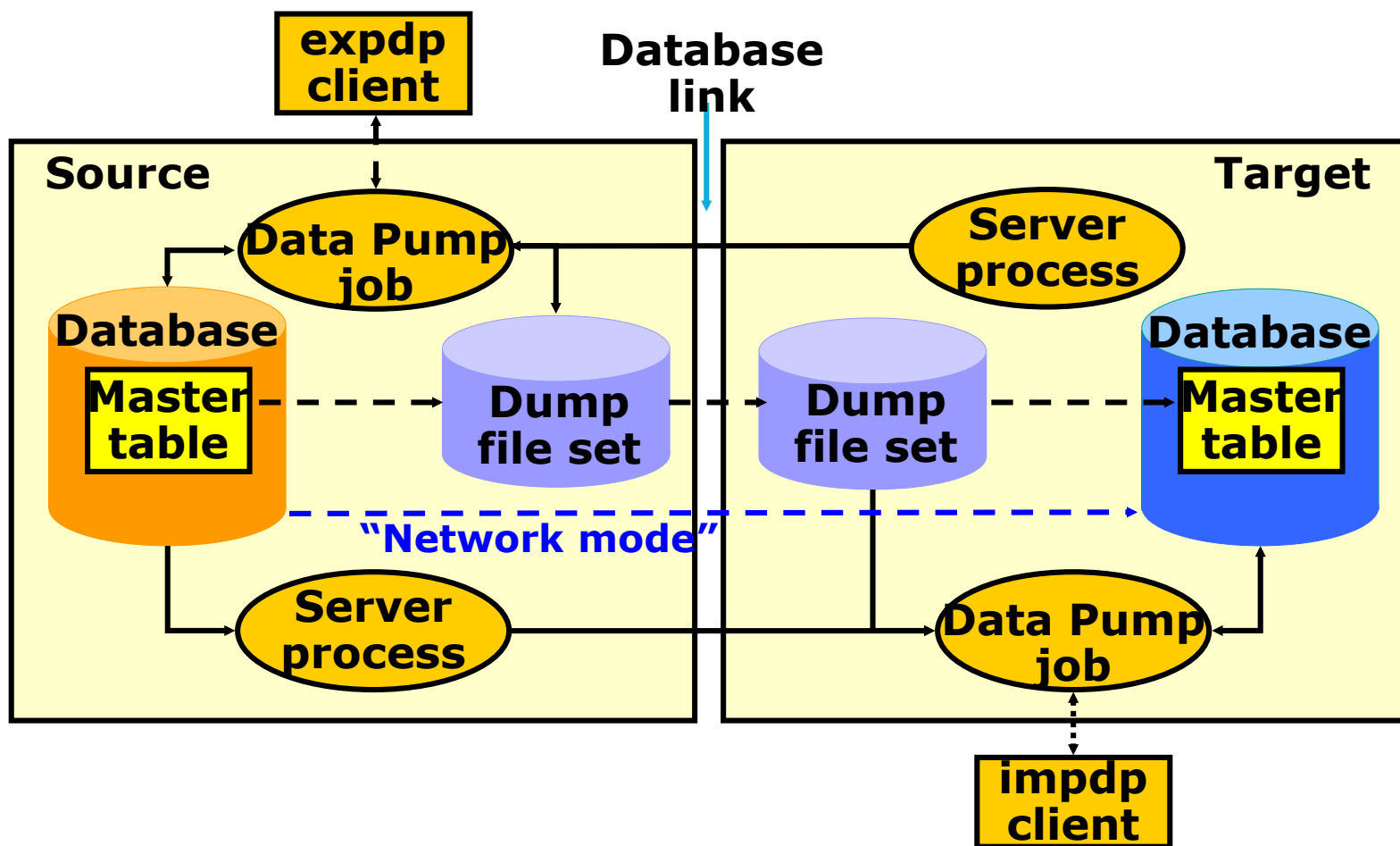




# Data Pump: Benefits

- Fine-grained object and data selection
- Explicit specification of database version
- Parallel execution
- Estimation of the export job space consumption
- Network mode in a distributed environment
- Remapping capabilities during import
- Data sampling and metadata compression

# Data Pump Export and Import: Overview





# Data Pump Utility: Interfaces and Modes

## Data Pump Export and Import interfaces:

- Command line
- Parameter file
- Interactive command line
- Database Control

## Data Pump Export and Import modes:

- Full
- Schema
- Table
- Tablespace
- Transportable tablespace





# Fine-Grained Object Selection

## Content

What to Export from the Source Database ☒ All  
Export both metadata and data

☐ Data Only  
Export only table row data

☐ Metadata Only  
Export only database object definitions

Export Content ☒ Include All Objects  
☐ Include Only Objects Specified Below  
☐ Exclude Only Objects Specified Below

### Objects to Include or Exclude

Select	Object Type	Object Name Expression
<input type="checkbox"/>		No items found

Object Name Expression example: "IN('EMP','DEPT') or, to include every object except those of a particular type not beginning with PRO, select EXCLUDE with an expression of "NOT LIKE 'PRO%'"

## Flashback

☐ Export read-consistent view of data

☒ As the specified System Change Number (SCN)  
SCN

☐ As the SCN which most closely matches the specified time  
Date

Time     ☒ AM ☐ PM

## Query

Specify SELECT statement predicate clauses to be applied to tables being exported. If a Table Name is not supplied for a particular Predicate Clause, the Predicate Clause is applied to (and must make sense for) all tables being exported.

Select	Predicate Clause	Table Name
<input type="checkbox"/>		No items found

**Directory Obj.  
SQL\*Loader  
Data Pump**  
**> - Export  
- Import  
External Table**



## Advanced Feature: Sampling

Task: Create test data.

- Method: Specify a percentage of data to be sampled and unloaded from the source database.

Example to unload 44% of the HR.EMPLOYEES table:

Example: **SAMPLE="HR"."EMPLOYEES":44** (specified):

```
expdp hr/hr DIRECTORY=DATA_PUMP_DIR  
DUMPFILE=sample1.dmp SAMPLE=30
```



# Export Options: Files



## Export: Options

Database **orcl.oracle.com**

Cancel

Finish

Back

Step 2 of 5

Next

Maximum Number of Threads in Export Job

1

This option allows you to make tradeoffs between resource consumption and elapsed time. Parallelism is only available in Enterprise Edition.

### Estimate Disk Space

Calculates an estimate of how much disk space the export job will consume (in bytes). The estimate is for table row data only and does not include metadata.

#### ☒ Blocks

Estimate will be calculated by multiplying the number of database blocks used by the target objects times the appropriate block sizes. This method will provide the quickest rough estimate.

#### ☐ Statistics

Estimate will be calculated using per-table statistics. This method will provide the most accuracy if all target tables have been recently analyzed.

**Estimate Disk Space Now**

Calculate the estimate of space that will be consumed without actually performing the export operation. This may take a few minutes.

### Optional File

#### ☒ Generate Log File

Directory Object

DATA\_PUMP\_DIR

**Create Directory Object**

Log File

hrexpl.log

**Show Advanced Options**





# Data Pump File Locations

The order of precedence of file locations:

- Per-file directory
- The DIRECTORY parameter
- The DATA\_PUMP\_DIR environment variable
- DATA\_PUMP\_DIR directory object

**Export: Files**

Database **orcl.oracle.com** Cancel Finish Back Step 2 of 4 Next

Specify the directory object and file name, and maximum size for the export files on the database server machine. Create Directory Object

Select	Directory Object	File Name
<input type="radio"/>	ADMIN_DIR	EXPDAT%U.DMP
<input type="radio"/>	ADMIN_DIR	
<input type="radio"/>	DATA_FILE_DIR	
<input type="radio"/>	DATA_PUMP_DIR	
<input type="radio"/>	LOG_FILE_DIR	
<input type="radio"/>	MEDIA_DIR	
<input type="radio"/>	SUBDIR	
<input type="radio"/>	WORK_DIR	
<input type="radio"/>	XMLDIR	

You can w

%U' in the filename.

Directory Object Cancel Finish Back Step 2 of 4 Next

Copyright reserved. [Setup](#) | [Preferences](#) | [Help](#) | [Logout](#)

# Scheduling and Running a Job



OptionsFilesScheduleReview

## Export: Schedule

Database **orcl.oracle.com**

CancelBackStep 3 of 4Next

Specify a name and description for the export job. Specify a date to start the job.

### Job Parameters

Job Name

hexp

Description


Export HR schema

### Job Schedule


#### Start


☒ Immediately☐ Later

Database Instance: orcl.oracle.com > Export: Export Type

 **Processing**

**Submit job is progressing. This may take some time.**  
This may take several minutes. This page will automatically forward to the next page when done.

  
Process is in progress.

 **TIP** This operation cannot be cancelled. It will continue even if the browser window is closed.



# Data Pump File Naming and Size

Options

Files

Schedule

**Review**

---

## Export: Review

Database **orcl.oracle.com**

CancelBackStep 4 of 4Submit Job

---

Export Type	<b>Database</b>
Statistics type	<b>Estimate optimizer statistics when data is imported</b>
Parallelism	<b>1</b>
Files to Export	<b>DATA_PUMP_DIR EXPDAT%U.DMP</b>
Log File	<b>DATA_PUMP_DIR /home/oracle/labs/hrexp.log</b>

▼ Hide PL/SQL

Export PL/SQL

```
declare
  h1 NUMBER;
begin
  begin
    h1 := dbms_datapump.open (operation => 'EXPORT', job_mode => 'FULL', job_name => 'hrexp', version =>
'COMPATIBLE');
  end;
  begin
    dbms_datapump.set_parallel(handle => h1, degree => 1);
  end;
begin
```



# Data Pump Import

Directory Obj.  
SQL\*Loader  
Data Pump  
- Export  
> - Import  
External Table

## Import: Files

Database **orcl.oracle.com** Cancel Continue

Database Version of Files to Import 10g or later Go  
Changing the version affects attributes below. Note: if the files were produced using the original 'exp' command, select "Prior to 10g" regardless of the database version.

### Files

Specify the directory name and file name of the import files on the database server machine. Create Directory Object Remove

Select	Directory Object	File Name
<input type="radio"/>	DATA_PUMP_DIR	EXPDAT%U.DMP

Add Another Row

You can wildcard a set of dump files using "%U" in the filename.

### Import Type

- ☒ Entire files
- ☐ Schemas  
Allows you to choose one or more schemas and to import the objects in those schemas.
- ☐ Tables  
Allows you to choose one or more tables to import from a selected schema.
- ☐ Tablespace  
Allows you to import the tables from one or more selected tablespaces. Note: the tablespaces themselves will not be imported and must exist in the database.

### Host Credentials

\* Username

\* Password

☐ Save as Preferred Credential



# Data Pump Import: Transformations

You can remap:

- Data files by using REMAP\_DATAFILE
- Tablespaces by using REMAP\_TABLESPACE
- Schemas by using REMAP\_SCHEMA

**REMAP\_DATAFILE = 'C:\oradata\tbs6.f':'/u1/tbs6.f'**



# Data Pump Import: Transformations

Using TRANSFORM, you can also :

- Exclude from tables and indexes:
  - STORAGE and TABLESPACE clauses
  - STORAGE clause only
- Re-create object identifiers of abstract data types
- Change extent allocations and file size

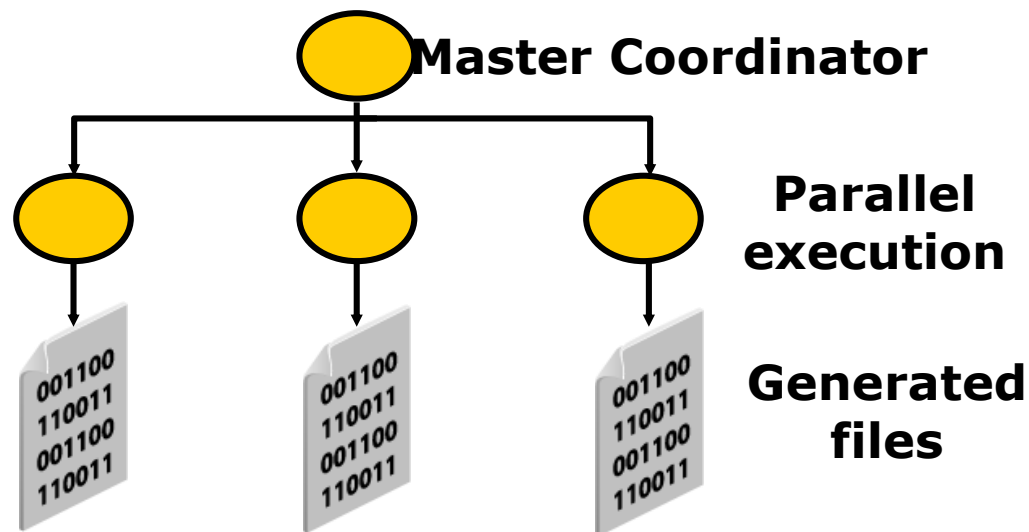
**TRANSFORM =  
SEGMENT\_ATTRIBUTES|STORAGE|OID|PCTSPACE:{y|n|v}[:*object type*]**



# Data Pump: Performance Consideration

Maximizing job performance with the PARALLEL parameter.

Example:



```
expdp hr/hr FULL=y  
DUMPFILE=dp_dir1:full1%U.dmp, dp_dir2:full2%U.dmp  
FILESIZE=2G PARALLEL=3  
LOGFILE=dp_dir1:expfull.log JOB_NAME=expfull
```



# Performance Initialization Parameters

Performance of Data Pump can be affected by:

- DISK\_ASYNC\_IO=TRUE
- DB\_BLOCK\_CHECKING=FALSE
- DB\_BLOCK\_CHECKSUM=FALSE

■ The following should be set high to allow for maximum parallelism:

- PROCESSES
- SESSIONS
- PARALLEL\_MAX\_SERVERS

■ The following should be sized generously:

- SHARED\_POOL\_SIZE
- UNDO\_TABLESPACE



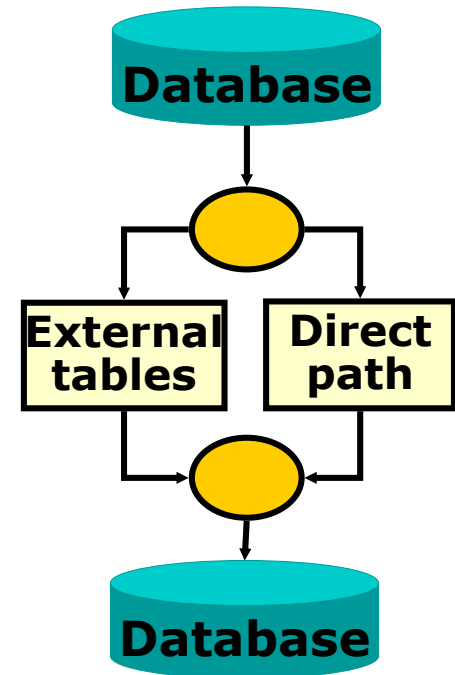




# Data Pump Access Path: Considerations

One of the following access paths is automatically selected by Data Pump:

- Direct path
- External tables, if data includes:
  - Encrypted columns
  - Clustered tables
  - Different partition at unload and load time, and others (see Notes)





# Using Enterprise Manager to Monitor Data Pump Jobs

Database Instance: EDRSR14P1\_01

[Home](#) [Performance](#) [Administration](#) [Maintenance](#)

The Administration tab displays links that allow you to administer the database. The Maintenance tab displays links that provide functions that control the flow of data.

**High Availability**

**Backup/Recovery**

- [Schedule Backup](#)
- [Perform Recovery](#)
- [Manage Current Backups](#)
- [Manage Restore Points](#)
- [Backup Reports](#)

**Data Movement**

**Move Row Data**

- [Export to Export Files](#)
- [Import from Export Files](#)
- [Import from Database](#)
- [Load Data from User Files](#)
- [Monitor Export and Import Jobs](#)

ORACLE Enterprise Manager 10g Database Control

[Setup](#) [Preferences](#) [Help](#) [Logout](#)

Database

Logged in As SYSTEM

## Export and Import Jobs

Page Refreshed Feb 9, 2005 6:55:12 AM OK

In database versions 10g and greater, Enterprise Manager uses data pump jobs to do the actual export and import operations. Although Enterprise Manager exports and imports can also be monitored from their corresponding Job Summary pages, data pump jobs defined outside of Enterprise Manager can only be monitored from here.

Data Pump Job	Owner	Job Status
<a href="#">NEW 1</a>	SYSTEM	DEFINING

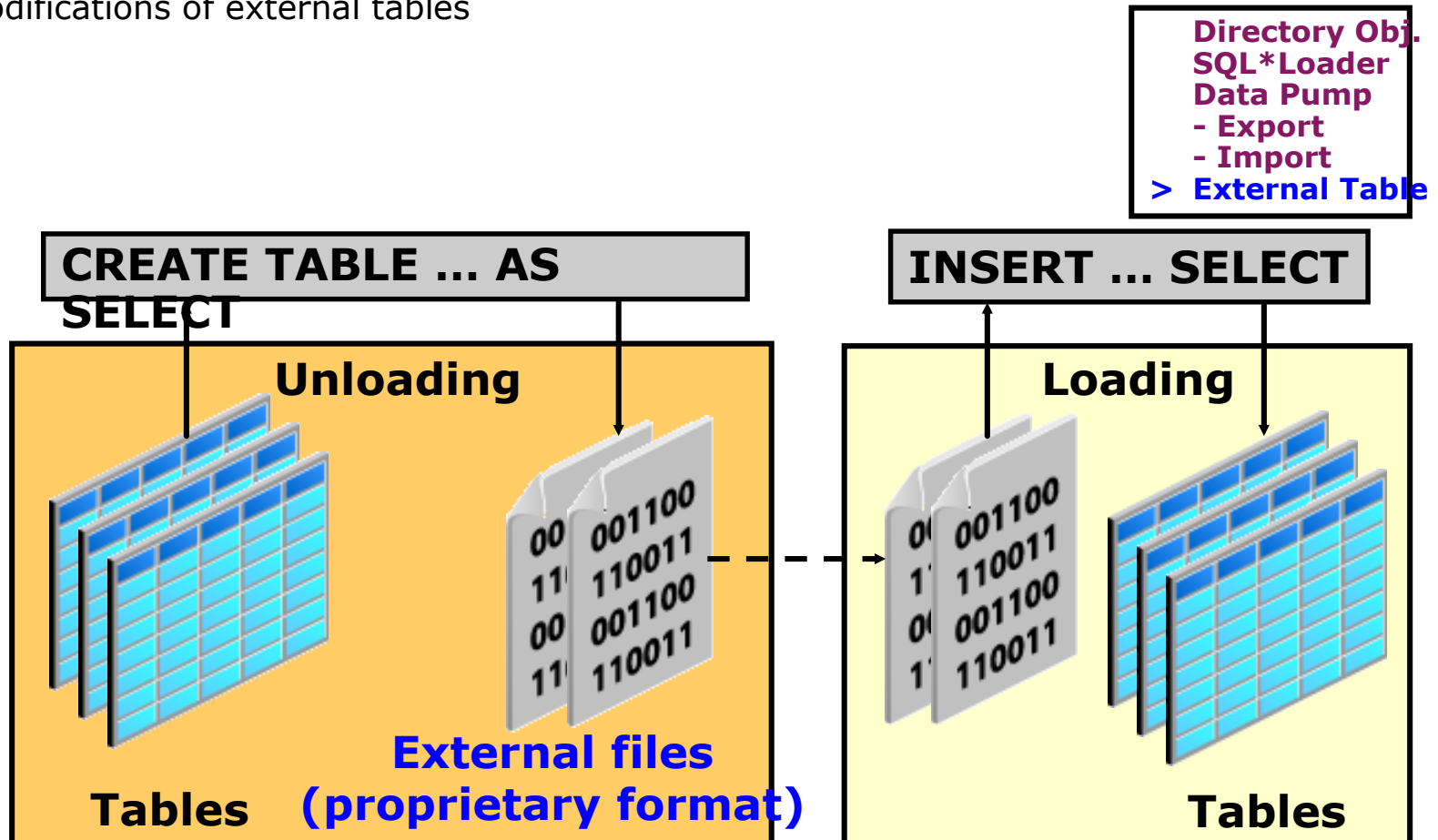
OK



# External Table Population

Unloading of data to external files with the ORACLE\_DATAPUMP access driver

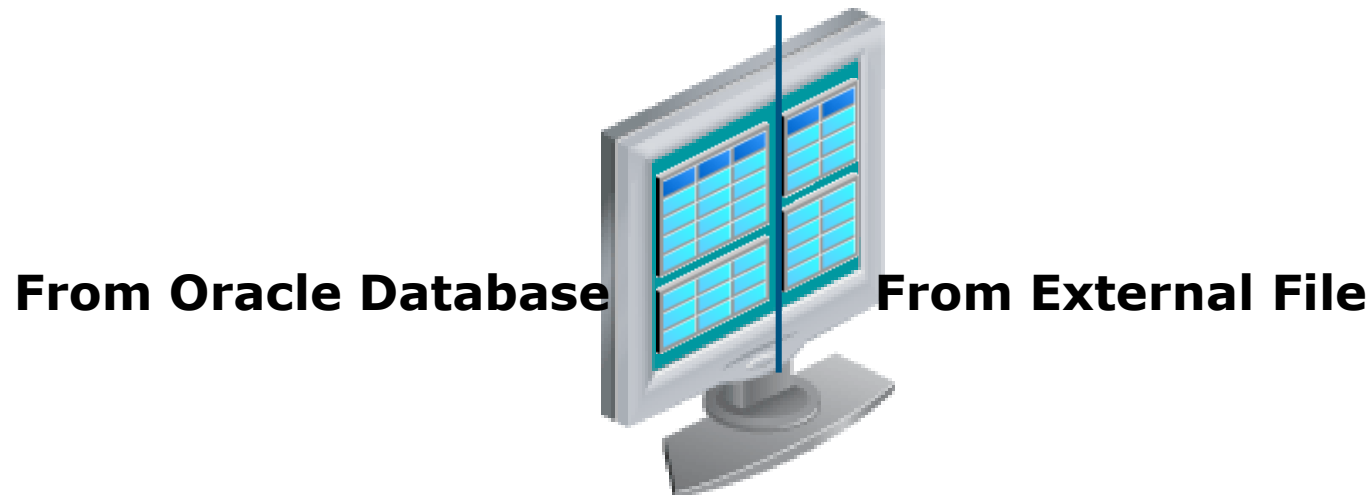
No modifications of external tables





# Using External Tables

Data can be used directly from the external file or loaded into another database.  
Resulting files can be read only with the ORACLE\_DATAPUMP access driver.  
You can combine generated files from different sources for loading purposes.





## External Table Population with ORACLE\_DATAPUMP

```
CREATE TABLE emp_ext  
  (first_name, last_name, department_name)  
  ORGANIZATION EXTERNAL  
  (  
    TYPE ORACLE_DATAPUMP  
    DEFAULT DIRECTORY ext_dir  
    LOCATION ('emp1.exp','emp2.exp','emp3.exp')  
  )  
  PARALLEL .....  
  AS  
  SELECT e.first_name,e.last_name,d.department_name  
  FROM   employees e, departments d  
  WHERE  e.department_id = d.department_id AND  
         d.department_name in  
         ('Marketing', 'Purchasing');
```



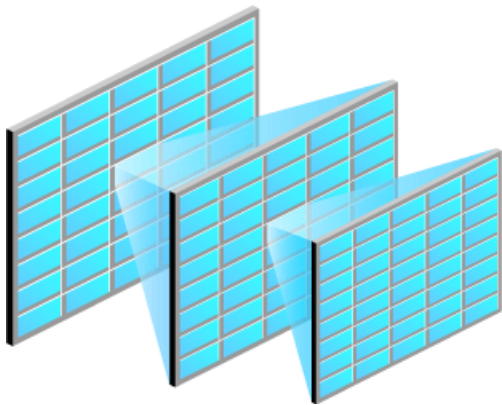
# External Table Population with ORACLE\_LOADER

```
CREATE TABLE extab_employees
    (employee_id    NUMBER(4),
     first_name      VARCHAR2(20),
     last_name       VARCHAR2(25),
     hire_date       DATE)
ORGANIZATION EXTERNAL
    ( TYPE ORACLE_LOADER DEFAULT DIRECTORY extab_dat_dir
      ACCESS PARAMETERS
        ( records delimited by newline
          badfile extab_bad_dir:'empxt%a_%p.bad'
          logfile extab_log_dir:'empxt%a_%p.log'
          fields terminated by ','
          missing field values are null
        ( employee_id, first_name, last_name,
          hire_date char date_format date mask "dd-mon-yyyy"))
      LOCATION ('empxt1.dat', 'empxt2.dat') )
PARALLEL REJECT LIMIT UNLIMITED;
```



View information about external tables in:

- [DBA| ALL| USER]\_EXTERNAL\_TABLES
- [DBA| ALL| USER]\_EXTERNAL\_LOCATIONS
- [DBA| ALL| USER]\_TABLES, and others



# SUMMARY

- In this lesson, you should have learned how to:
  - Describe available ways for moving data
  - Create and use directory objects
  - Use SQL\*Loader to load data from a non-Oracle database (or user files)
  - Explain the general architecture of Data Pump
  - Use Data Pump Export and Import to move data between Oracle databases
  - Use external tables to move data via platform-independent files