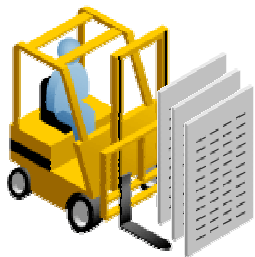


18

Moving Data



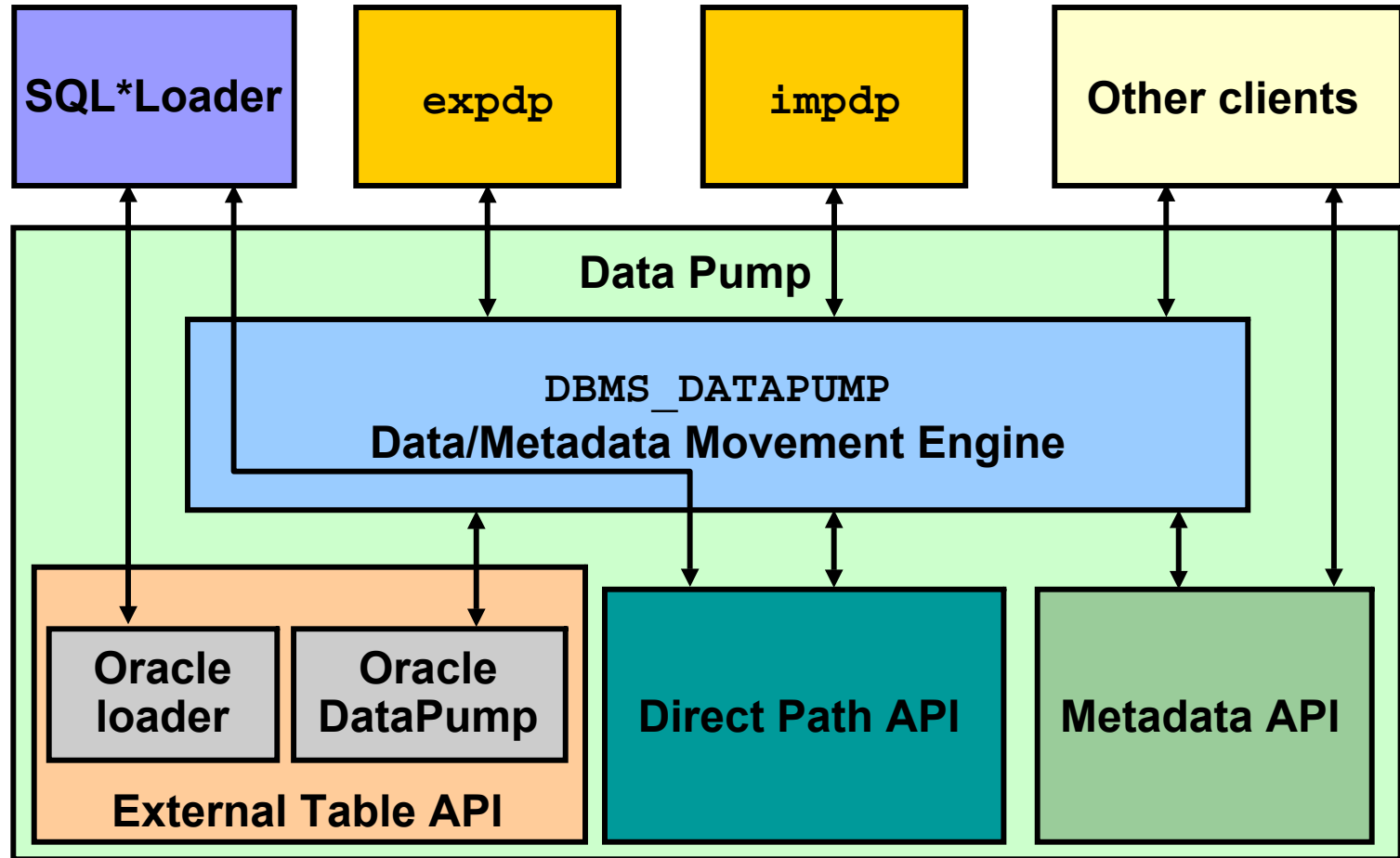
Objectives

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

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

Schema

Database Objects

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

Directory Objects

Search

Object Name

Go

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

Single



Create

Edit

View

Delete

Actions

Create Like

Go

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

Creating Directory Objects

Create Directory Object

1

Show SQLSchedule JobCancelOK

GeneralPrivileges

* NameEXTAB_LOG_DIR2

* Path/home/oracle/labs/extab2Test File System

Create Directory Object

3

Show SQLCancelOK5

GeneralPrivileges

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

Add

SelectRemove

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

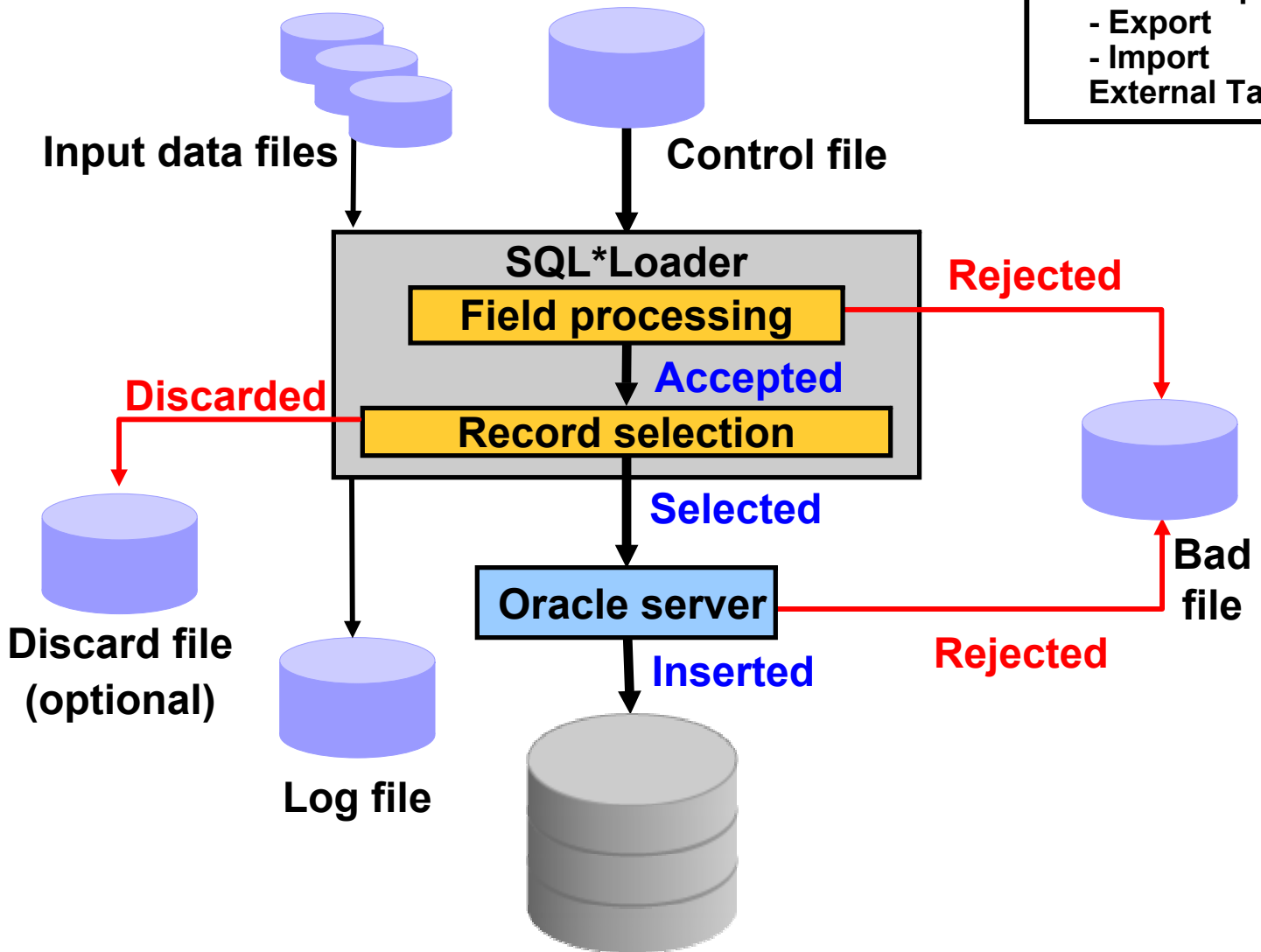
4

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

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



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**

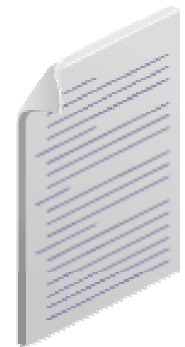
A control file is used to describe what will be loaded and how. Specify the full path and name of the control file on the database server machine.



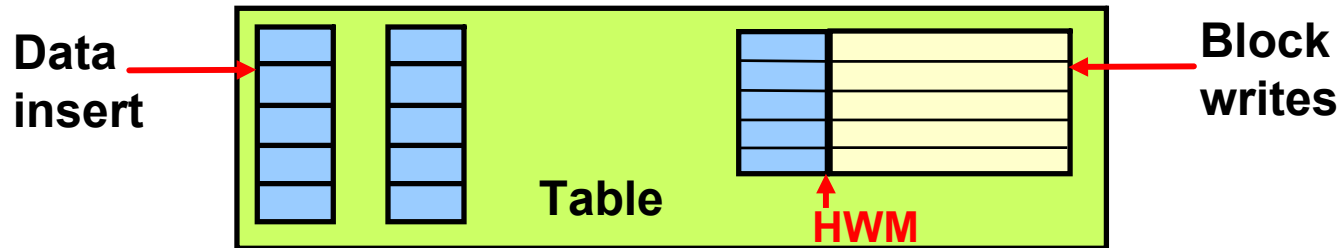
SQL*Loader Control File

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

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

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

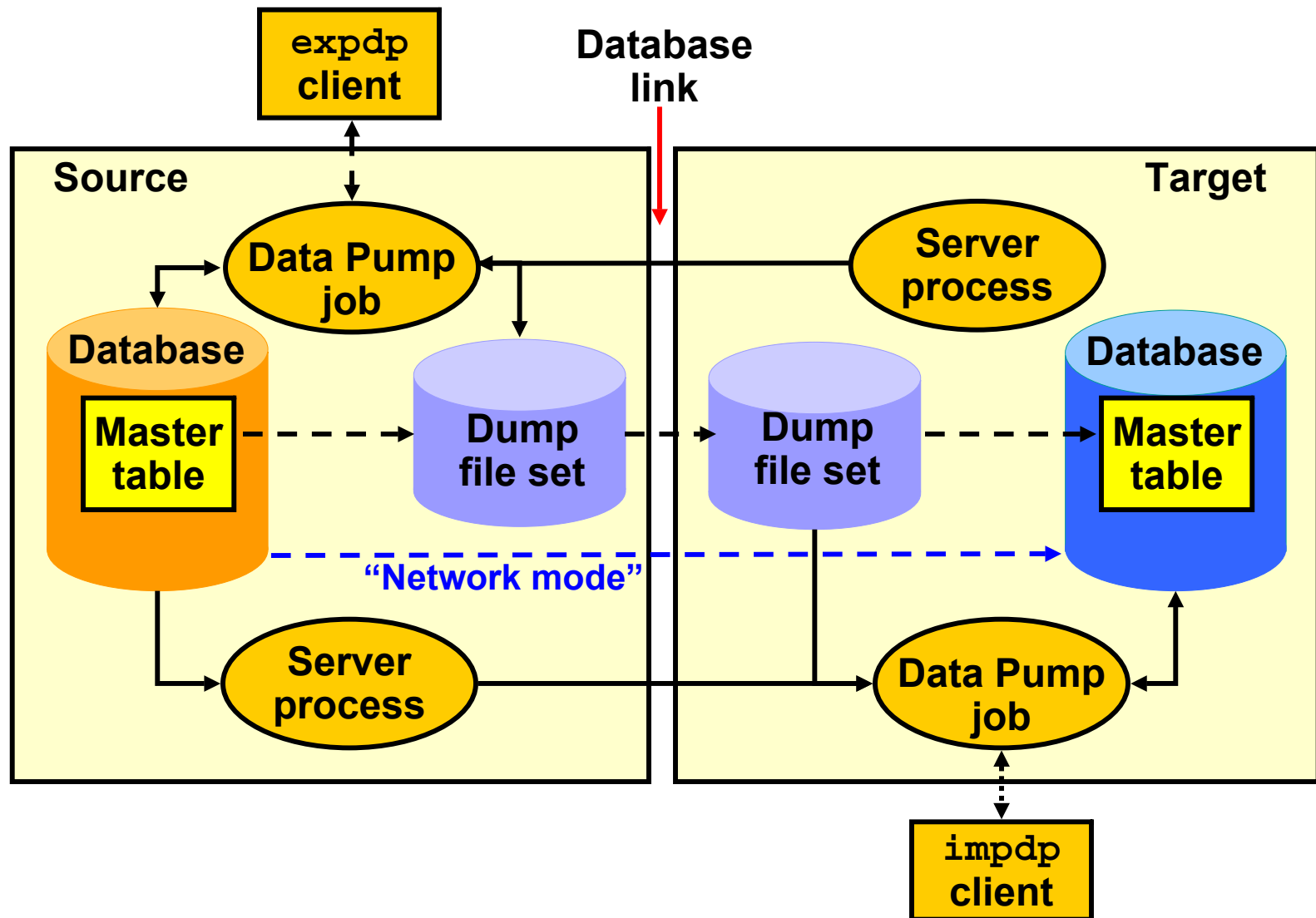
- **Is callable via DBMS_DATAPUMP**
- **Provides the following tools:**
 - expdp
 - impdp
 - Web-based interface
- **Provides data access methods:**
 - Direct path
 - External tables
- **Detaches from and reattaches to long-running jobs**
- **Restarts Data Pump jobs**



Data Pump: Benefits

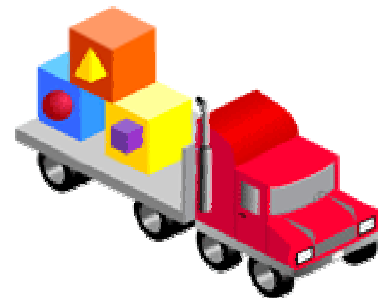
- **Fine-grained object and data selection**
- **Explicit specification of database version**
- **Parallel execution**
- **Estimation of the export job space consumption**
- **Network mode in a distributed environment**
- **Remapping capabilities during import**
- **Data sampling and metadata compression**

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

Directory Obj.
SQL*Loader
Data Pump

> - Export
- Import
External Table

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
--------	-------------	------------------------

	No items found	
--	----------------	--

Add Another Row

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 699783

☐ As the SCN which most closely matches the specified time

Date June 6, 2005



Time 12:00 AM

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
--------	------------------	------------

	No items found	
--	----------------	--

Add

ORACLE

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:

```
SAMPLE="HR" . "EMPLOYEES" : 44
```

Example to unload 30% of the entire export job (because no table name is specified):

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

Export Options: Files

Schemas

Options

Files

Schedule

Review

Export: Options

Database **orcl.oracle.com**

CancelFinishBackStep 2 of 5Next

Maximum Number of Threads in Export Job

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 **Create Directory Object**

Log File

[▶ Show Advanced Options](#)

Data Pump File Locations

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"/>	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	

Add All You can w %U' in the filename.

Directory Object Cancel Finish Back Step 2 of 4 Next

Copyright Database | Setup | Preferences | Help | Logout

The order of precedence of file locations:

- **Per-file directory**
- **The DIRECTORY parameter**
- **The DATA_PUMP_DIR environment variable**
- **DATA_PUMP_DIR directory object**

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

Description

Job Schedule

Start


☒ Immediately

☐ Later

Date


Time

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

▼ Hide PL/SQL

Export PL/SQL

```
declare
  h1 NUMBER;
begin
  begin
    h1 := dbms_datapump.open (operation => 'EXPORT', job_mode => 'FULL', job_name => 'hrexpl', 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**

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
--------	------------------	-----------



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 **oracle**

* Password *********

☐ Save as Preferred Credential

ORACLE

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

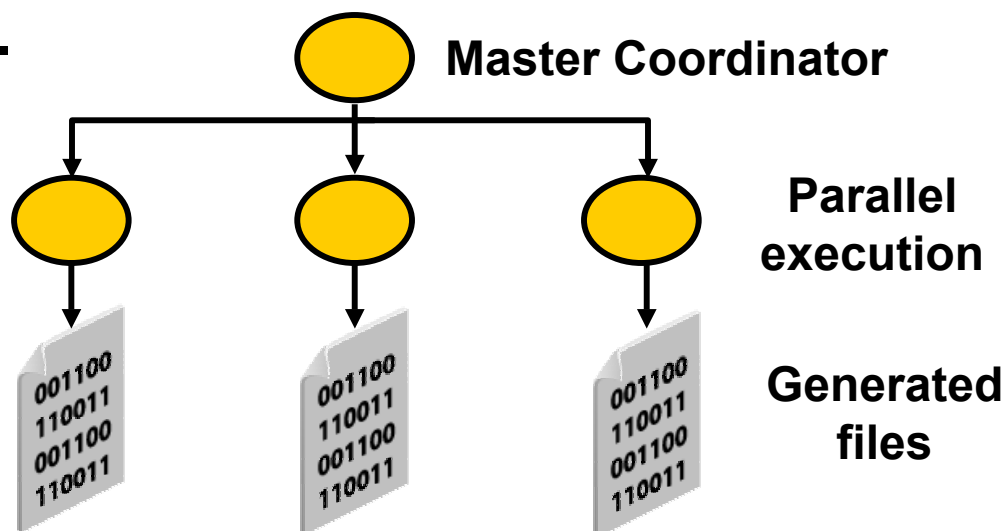
Using TRANSFORM, you can also :

- **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

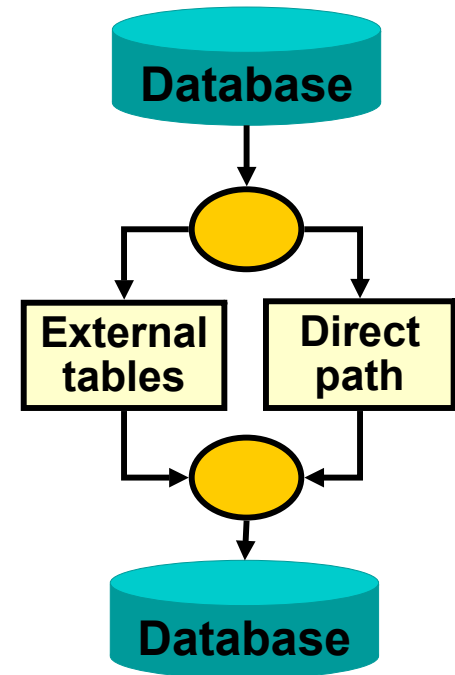
- **Performance of Data Pump can be affected by:**
 - `DISK_ASYNC_IO=TRUE`
 - `DB_BLOCK_CHECKING=FALSE`
 - `DB_BLOCK_CHECKSUM=FALSE`
- **The following should be set high to allow for maximum parallelism:**
 - `PROCESSES`
 - `SESSIONS`
 - `PARALLEL_MAX_SERVERS`
- **The following should be sized generously:**
 - `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

The image shows two overlapping screenshots from the Oracle Enterprise Manager 10g Database Control interface. The left screenshot shows the 'Administration' tab with a sidebar menu. A red box highlights the 'Monitor Export and Import Jobs' link under the 'Data Movement' section. A red arrow points from this link to the right screenshot. The right screenshot shows the 'Export and Import Jobs' page, which is titled 'Export and Import Jobs' and includes a table of data pump jobs.

Database Instance: EDRSR14P1_01

Home Performance Administration Maintenance

The Administration tab displays links that allow you to administer the database. It also 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.

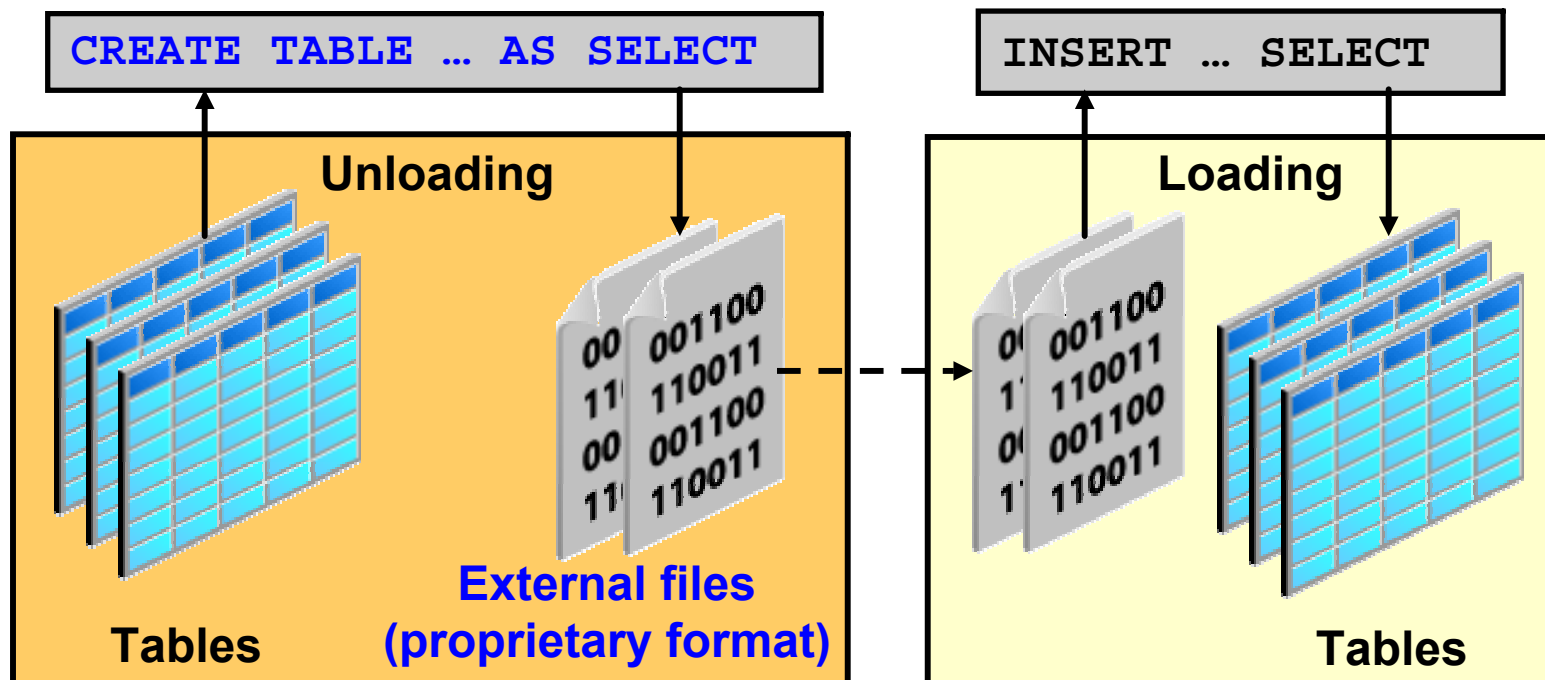
Data Pump Job	Owner	Job Status
NEW 1	SYSTEM	DEFINING

OK

External Table Population

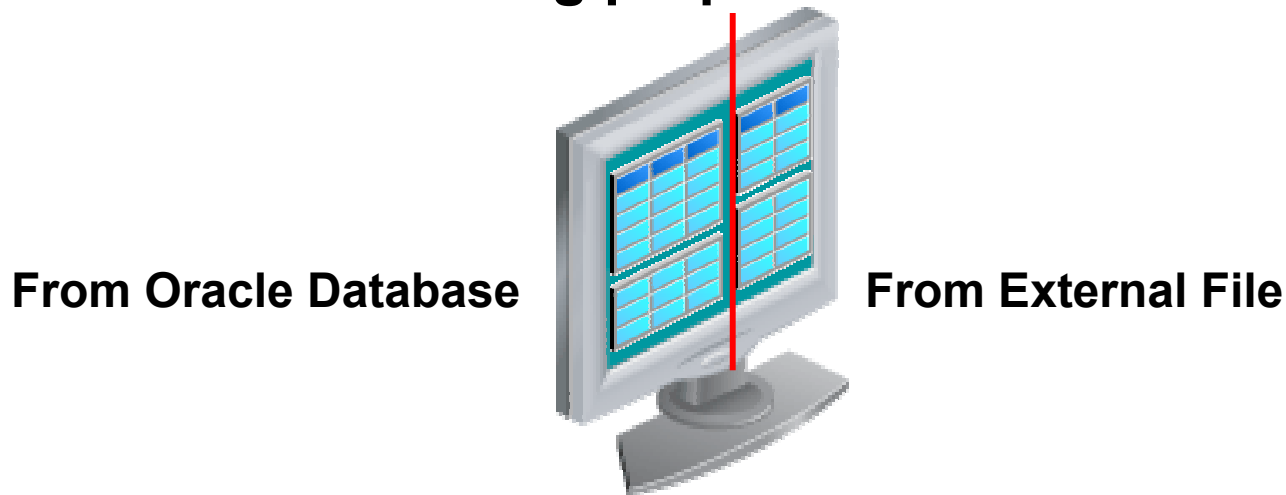
Directory Obj.
SQL*Loader
Data Pump
- Export
- Import
> [External Table](#)

- 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

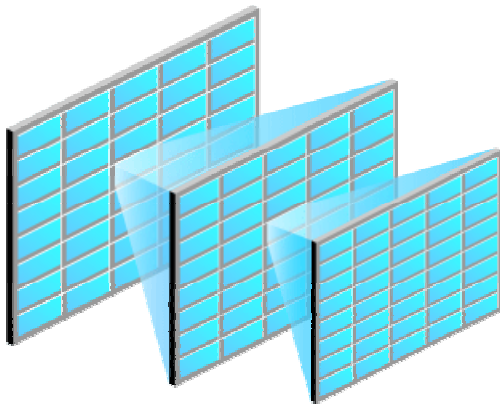
```
CREATE TABLE extab_employees
      (employee_id      NUMBER(4),
       first_name        VARCHAR2(20),
       last_name         VARCHAR2(25),
       hire_date         DATE)

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;
```

Data Dictionary

View information about external tables in:

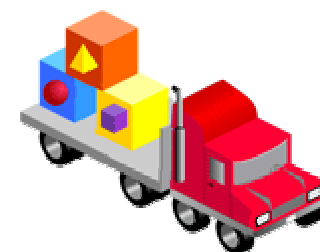
- [DBA | ALL | USER] _EXTERNAL_TABLES
- [DBA | ALL | USER] _EXTERNAL_LOCATIONS
- [DBA | ALL | USER] _TABLES, and others



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**



Practice Overview: Moving Data

This practice covers the following topics:

- **Using the Data Pump Export Wizard to select database objects to be exported**
- **Monitoring a Data Pump Export job**
- **Using the Data Pump Import Wizard to import tables in your database**
- **Using the Load Data Wizard to load data into your database**
- **Loading data by using the command line**