



# Upgrading Your Databases to 11g: Avoiding Pitfalls and Ensuring Success Session #318

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# Qualifications

- ❖ Senior Database Analyst, Enterprise Infrastructure Services
- ❖ Provide SAP Oracle database support
- ❖ Oracle DBA – 11 years
- ❖ Information Systems Professional (I.S.P.) designation
- ❖ OCP designation – Oracle8, 8i, 9i, 10g
- ❖ Various roles – systems analyst, application developer, instructor, technical architect
- ❖ Various industries – health care, oil and gas
- ❖ Present regularly at the Calgary Oracle Users Group
- ❖ Contribute to SearchOracle.com



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# Session Objectives

❖ To ...

- gain an appreciation for developing a solid test plan prior to upgrading a database will be attained.
- gain a basic understanding of the database upgrade process.
- learn about the specific steps involved in an 11g database upgrade.



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# Session Outline

- ❖ Introduction
- ❖ Planning and Testing – Keys to Success
- ❖ Installing Oracle Database 11g
- ❖ Upgrading to 11g – DBUA versus Manual Upgrade
- ❖ Downgrading a Database
- ❖ Summary



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## What is not discussed ...

- ❖ ASM
- ❖ RAC
- ❖ Windows
- ❖ Various UNIX platforms
  - example upgrade is on Solaris SPARC



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## Why Upgrade?

- ❖ Remain on a supported database release
- ❖ Take advantage of new features
- ❖ Compatibility with operating system and hardware
- ❖ Resolve bug or other issue



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# Direct Upgrade Paths to 11g

**Table 2-1 Upgrade Paths**

Current Release	Upgrade Path
7.3.3 and lower 7.3.4 8.0.3 8.0.4 8.0.5 8.0.6 8.1.5 8.1.6 8.1.7.4 9.0.1.4	<p>Direct upgrade is <i>not</i> supported. Upgrade to an intermediate Oracle Database release before you can upgrade to Oracle Database 11g Release 1 (11.1), as follows:</p> <ul style="list-style-type: none"> <li>■ 7.3.3 (or lower) -&gt; 7.3.4 -&gt; 9.2.0.8 -&gt; 11.1</li> <li>■ 8.0.5 (or lower) -&gt; 8.0.6 -&gt; 9.2.0.8 -&gt; 11.1</li> <li>■ 8.1.7 (or lower) -&gt; 8.1.7.4 -&gt; 9.2.0.8 -&gt; 11.1</li> <li>■ 9.0.1.3 (or lower) -&gt; 9.0.1.4 -&gt; 9.2.0.8 -&gt; 11.1</li> </ul> <p>When upgrading to an intermediate Oracle Database release, follow the instructions in the intermediate release's documentation. Then, upgrade the intermediate release database to Oracle Database 11g Release 1 (11.1) using the instructions in <a href="#">Chapter 3, "Upgrading to the New Release"</a>.</p>
9.2.0.4 10.1.0.2 10.2.0.1	<p>Direct upgrade to Oracle Database 11g Release 1 (11.1) is supported from 9.2.0.4 or higher, 10.1.0.2 or higher, and 10.2.0.1 or higher. Note that Oracle Clusterware release 10.2.0.x must be at release 10.2.0.3 (or higher), before you attempt to upgrade it to Oracle Clusterware 11g release 1 (11.1). See <a href="#">"Upgrading an Oracle Real Application Clusters (Oracle RAC) Database"</a> on page 3-2.</p> <p>For release 9.2.0.3 you must first upgrade to an intermediate Oracle Database release, as follows:</p> <p>9.2.0.3 (or lower) -&gt; 9.2.0.8 -&gt; 11.1</p> <p>To upgrade to Oracle Database 11g Release 1 (11.1), follow the instructions in <a href="#">Chapter 3, "Upgrading to the New Release"</a>.</p>

**Source:** Oracle Database 11g Release 1 (11.1) Upgrade Guide, Oracle Technology Network  
([http://download.oracle.com/docs/cd/B28359\\_01/server.111/b28300/toc.htm](http://download.oracle.com/docs/cd/B28359_01/server.111/b28300/toc.htm)).



# Upgrade Methods

## ❖ Direct methods

- DBUA
- Manual upgrade – scripts

## ❖ Indirect methods

- Export/import or Data Pump
- Table copy
- Transportable tablespaces



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# Documentation

- ❖ Oracle Database 11g Release 1 (11.1) New Features Guide
- ❖ Oracle Database 11g Release 1 (11.1) Upgrade Guide
- ❖ OTN Oracle 11g home page
- ❖ Metalink
- ❖ IOUG website and Select Journal
- ❖ Oracle Database 11g books written by industry experts



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# Planning and Testing – Keys to Success



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## Project Plan: Step 1

- ❖ List of candidate databases – rank lowest to highest visibility/criticality
- ❖ Research bugs (open and resolved)
- ❖ Review 11g new features
- ❖ Develop high-level test plan
- ❖ Discuss plan with business/clients – determine dates
- ❖ Engage change management
- ❖ More detailed technical plan should flow from high-level plan



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## Project Plan: Step 2

- ❖ Detailed test plan should include:
  1. Upgrade testing
  2. Functional testing
  3. Performance testing
  4. Stress/load testing
  5. Oracle client testing



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# Project Plan: Step 3

Technical Implementation Plan  
Oracle Database Upgrade to 10.2.0.2  
February 1, 2008

Instructions: This document contains detailed instructions for upgrading a database from 9.2.0.8 to 10.2.0.2.



Contact Information					
Name	Company	Office Phone	Cell Phone	Other Phone	Email Address
Maria Anderson		403-xxx-xxxx	403-xxx-xxxx		
Pre-Implementation Tasks					
Task	Responsible		Status	Comments	
Confirm that BW is being upgraded to 10.2.0.2.	Maria		Completed		
Ensure that Oracle 10.2.0.2 is certified on Itanium HP-UX 11.11 and 11.23.	Maria		Completed		
Determine whether there is enough disk space to install 10.2.0.2.	Maria		In process	There is currently 5 GB free in /oracle/BWQ. The 817_64 binaries could also be deleted freeing up another almost 2 GB.	
Locate Oracle installation media or download from SAP website. If installation media is only available, have the media mounted to server1.	Maria / Vito		Completed	According to Oracle's certification matrix, 10gR2 is certified on PA-RISC 11.11, 11.23 and 11.31	
Review installation documentation with respect to SAP-specific steps of installing Oracle 10.2.0.2.	Maria		In process	There is a long list of patches recommended by SAP, but not certain whether they should be installed. As well, the Oct2007 CPU patch is required. What about DST patches?	
Choose a date for installing the Oracle 10.2 software.	Maria / Lam / Lee		Completed	This is being done at the same time as the upgrade.	
Arrange for backups for both BWQ and existing <u>grain</u> inventory prior to installing the 10.2 software.	Maria / Vito		Completed	The BWQ database backup on Sunday Jan. 27 <sup>th</sup> was successful. The <u>grain</u> inventory will be TAR'd up before we start the installation of the 10.2 binaries.	
Confirm with Lam that the date of the upgrade is now to take place on Feb. 1 <sup>st</sup>	Maria		Completed	#CRQ000000062375 was backed out; change for Feb 1 <sup>st</sup> is #CRQ000000063082.	

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# Project Plan: Step 3

Technical Implementation Plan  
Oracle Database Upgrade to 10.2.0.2  
February 1, 2008

Is BWQ backed up on a regular basis? Will the upgrade change the backups or other regularly scheduled jobs?	Maria / Vito	Completed	BWQ is in <u>noarchive</u> log mode and an offline is performed on Sunday each week. <u>BRTools</u> will need to be upgraded at the same time as the database upgrade is performed.		
<b>Implementation</b>					
<b>Task</b>	<b>Responsible</b>	<b>Start Time</b>	<b>End Time</b>	<b>Status</b>	<b>Comments</b>
<u>Installing the 10.2 Oracle binaries</u>					
Ensure there is at least 500 MB in <u>/tmp</u>	Maria				There is only 300 MB in <u>/tmp</u> . Will have to define a TEMP environment variable to point to <u>/oracle/BWQ/saparch/102_install_tmpdir</u> .
<u>/oracle/stage/102_64</u> must exist and have 5 GB free	Maria				A sym link was created from <u>/oracle/stage</u> to point to <u>/oracle/BWQ/saparch</u> since there was > 60 GB available.
Copy the file OR110264.SAR from <u>/tmpcd/oradbmsdvd1.parisc</u> into <u>/oracle/stage/102_64</u> .	Maria				<u>cd /tmpcd/ oradbmsdvd1.parisc</u> <u>cp -p OR110264.SAR /oracle/stage/102_64</u>
Change ownership of this file from root to <u>orabwq.dba</u> .	Maria				
Unzip this file using the SAPCAR utility (this is SAP's proprietary TAR tool). It should create a database subdirectory under <u>/oracle/stage/102_64</u> .	Maria				<u>cd /oracle/stage/102_64</u> <u>SAPCAR -xvf OR110264.SAR</u>
Go into the database/Disk1 subdirectory under <u>/oracle/stage/102_64</u> and rename the SAP subdirectory to SAP_ORIG	Maria				<u>cd /oracle/stage/102_64/database/Disk1</u> <u>mv SAP SAP_ORIG</u>
Download the file RDBMS_SAP_64.ZIP from the SAP Support site to <u>/tmp</u> and extract it. This will create a new SAP subdirectory.	Maria				<u>cd /oracle/stage/102_64/database/Disk1</u> <u>unzip /tmp/RDBMS_SAP_64.zip</u>
Ensure the <u>/etc/orainst.loc</u> file is pointing to the correct inventory.	Maria				For some unknown reason, the <u>orainst.loc</u> file is in <u>/var/opt/oracle</u> even though this is a HP-UX server, not Solaris.



# Benefits of a Technical Implementation Plan

- ❖ Supplements change management documentation
- ❖ Audit trail for compliance requirements
- ❖ Ensures upgrades are completed the same way
- ❖ Crucial steps are not missed
- ❖ Serves as working document for next upgrade project



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# Compatibility Considerations

- ❖ Ensure COMPATIBLE parameter set appropriately
- ❖ Test thoroughly before setting COMPATIBLE to 11.0.0
- ❖ Once set to 11.0.0, cannot downgrade

*Table 5–1 The COMPATIBLE Initialization Parameter*

Oracle Database Release	Default Value	Minimum Value	Maximum Value
Oracle Database9i Release 2 (9.2)	8.1.0	8.1.0.0.0	9.2.0.n.n
Oracle Database 10g Release 1 (10.1)	10.0.0	9.2.0.0.0	10.1.0.n.n
Oracle Database 10g Release 2 (10.2)	10.2.0	9.2.0.0.0	10.2.0.n.n
Oracle Database 11g Release 1 (11.1)	11.0.0	10.0.0.0.0	11.0.0.n.n

**Source:** Oracle Database11g Release 1 (11.1) Upgrade Guide, Oracle Technology Network ([http://download.oracle.com/docs/cd/B28359\\_01/server.111/b28300/toc.htm](http://download.oracle.com/docs/cd/B28359_01/server.111/b28300/toc.htm)).



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# Prepare to Upgrade

- ❖ Impact on database management infrastructure
  - Modification to scripts
  - DIAGNOSTIC\_DEST replaces bdump, cdump, udump locations
  - Grid Control agents
  - RMAN catalog
- ❖ CONNECT role changed in 10g
- ❖ Passwords are now case-sensitive
- ❖ Passwords in database links encrypted
- ❖ Oracle 11g uses version 4 time zone files
- ❖ Deprecated/obsolete initialization parameters
- ❖ Backup strategy



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# Upgrading to Oracle Database 11g



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# Installing Oracle Database 11g

- ❖ First time install should not be on a production server
- ❖ Refer to official documentation prior to attempting an installation
- ❖ Readme document – known compatibility issues, default behaviour changes, etc.



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# Oracle 11g Installation

Oracle Database 11g Installation - Select a Product to Install

### Select Installation Method

**Basic Installation**  
Perform full Oracle Database 11g installation with standard configuration options requiring minimal input. This option uses file system for storage, and a single password for all database accounts.

Oracle Base Location:  Browse...

Oracle Home Location:  Browse...

Installation Type:

UNIX DBA Group:

☐ Create Starter Database (additional 1482MB)

Global Database Name:

Database Password:  Confirm Password:

This password is used for the SYS, SYSTEM, SYSMAN, and DBSNMP accounts.

**Advanced Installation**  
Allows advanced selections such as different passwords for the SYS, SYSTEM, SYSMAN, and accounts, database character set, product languages, automated backups, custom installation alternative storage options such as Automatic Storage Management.

Help Back Next Install

Oracle Universal Installer: Product-Specific Prerequisite Checks

### Product-Specific Prerequisite Checks

The Installer verifies that your environment meets all of the minimum requirements for installing and configuring the products that you have chosen to install. You must manually verify and confirm the items that are flagged with warnings and items that require manual checks. For details about performing these checks, click the item and review the details in the box at the bottom of the window.

Check	Type	Status
Checking operating system requirements ...	Automatic	✓ Succeeded
Checking for the correct operating system update version...	Automatic	✓ Succeeded
Checking operating system package requirements ...	Automatic	✓ Succeeded

0 requirements to be verified.

Checking operating system requirements ...  
Expected result: One of 5.9,5.10  
Actual Result: 5.10

Help Installed Products... Back Next Install Cancel



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# Operating System Prerequisite Checks

Checking operating system requirements ...

Expected result: One of 5.9,5.10

Actual Result: 5.10

Check complete. The overall result of this check is: Passed

=====

Checking for the correct operating system update version...

Check complete. The overall result of this check is: Passed

=====

Checking operating system package requirements ...

Checking for SUNWbtool; found CCS tools bundled with SunOS (SUNWbtool). Passed

Checking for SUNWcsl; found Core Solaris, (Shared Libs) (SUNWcsl). Passed

Check complete. The overall result of this check is: Passed

=====

Checking kernel parameters

Expected result: BIT\_SIZE=64

Actual Result: BIT\_SIZE=64

Check complete. The overall result of this check is: Passed

=====

Checking physical memory requirements ...

Expected result: 922MB

Actual Result: 32640MB

Check complete. The overall result of this check is: Passed

=====

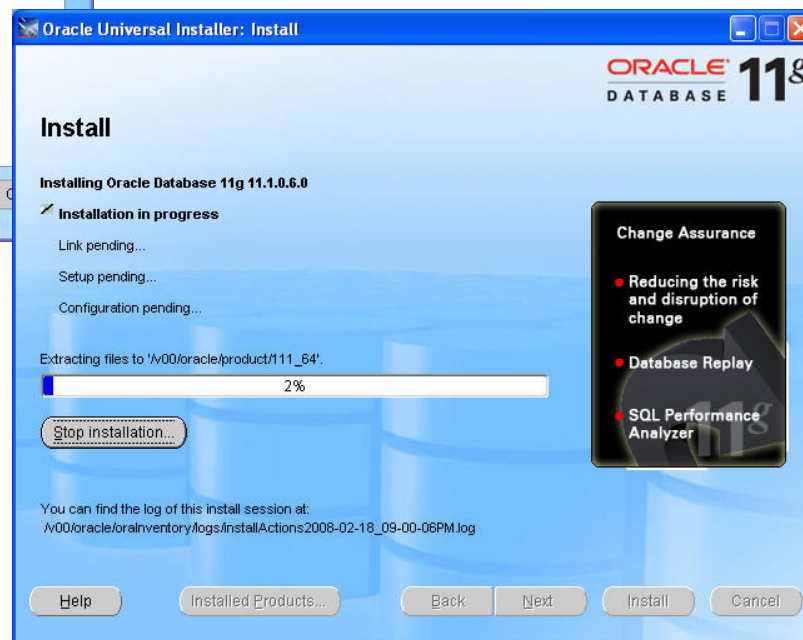
< ... snip ... >



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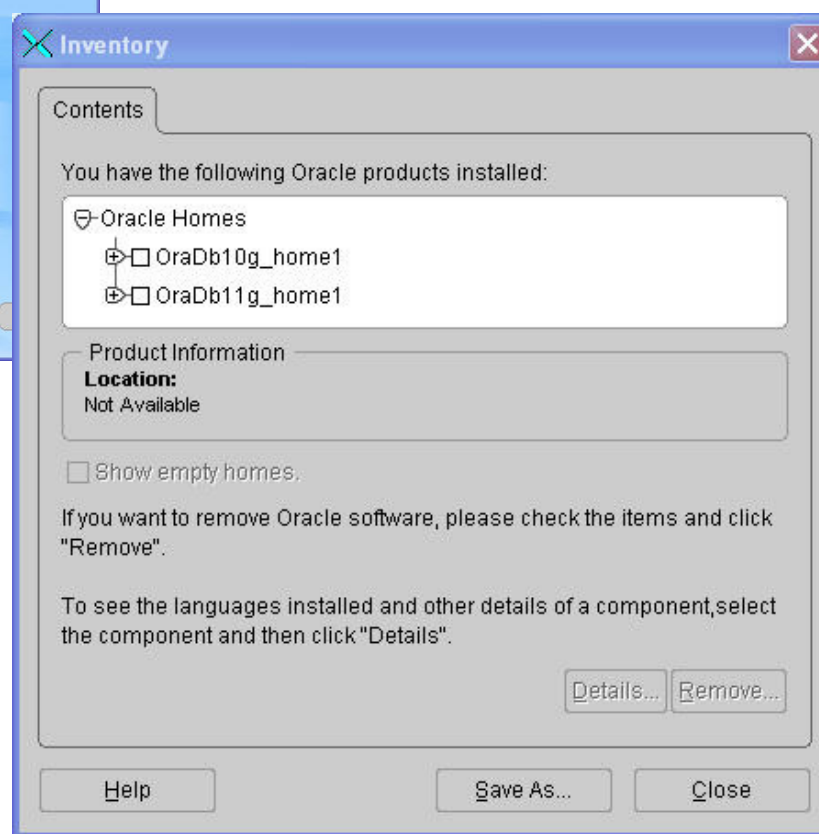
# Oracle 11g Installation



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# Oracle 11g Installation





## Running utlu111i.sql script

- ❖ Analyzes database and recommends changes prior to upgrading
- ❖ Copy utlu111i.sql from new \$ORACLE\_HOME/rdbms/admin to new location
- ❖ Start SQL\*Plus and log into database as SYS (or another user with SYSDBA privileges)
- ❖ Spool output and run script
- ❖ Review output and make recommended changes prior to attempting an upgrade to 11g



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# Sample utlu111i.sql output

Oracle Database 11.1 Pre-Upgrade Information Tool 02-19-2008 21:03:45

.

\*\*\*\*\*

Database:

\*\*\*\*\*

--> name: ORATEST  
--> version: 10.2.0.3.0  
--> compatible: 10.2.0.3.0  
--> blocksize: 8192  
--> platform: Solaris[tm] OE (64-bit)  
--> timezone file: V3

.

\*\*\*\*\*

Tablespaces: [make adjustments in the current environment]

\*\*\*\*\*

--> SYSTEM tablespace is adequate for the upgrade.  
.... minimum required size: 725 MB  
.... AUTOEXTEND additional space required: 245 MB  
--> UNDOTBS1 tablespace is adequate for the upgrade.  
.... minimum required size: 453 MB  
.... AUTOEXTEND additional space required: 428 MB  
--> SYSAUX tablespace is adequate for the upgrade.  
.... minimum required size: 423 MB  
.... AUTOEXTEND additional space required: 173 MB

< ... snip ... >



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# Using DBUA to Upgrade

- ❖ Preferred method to upgrade a database
- ❖ Less control over process, but also less prone to error
- ❖ On UNIX, start up the DBUA from new \$ORACLE\_HOME/bin ...

`./dbua`

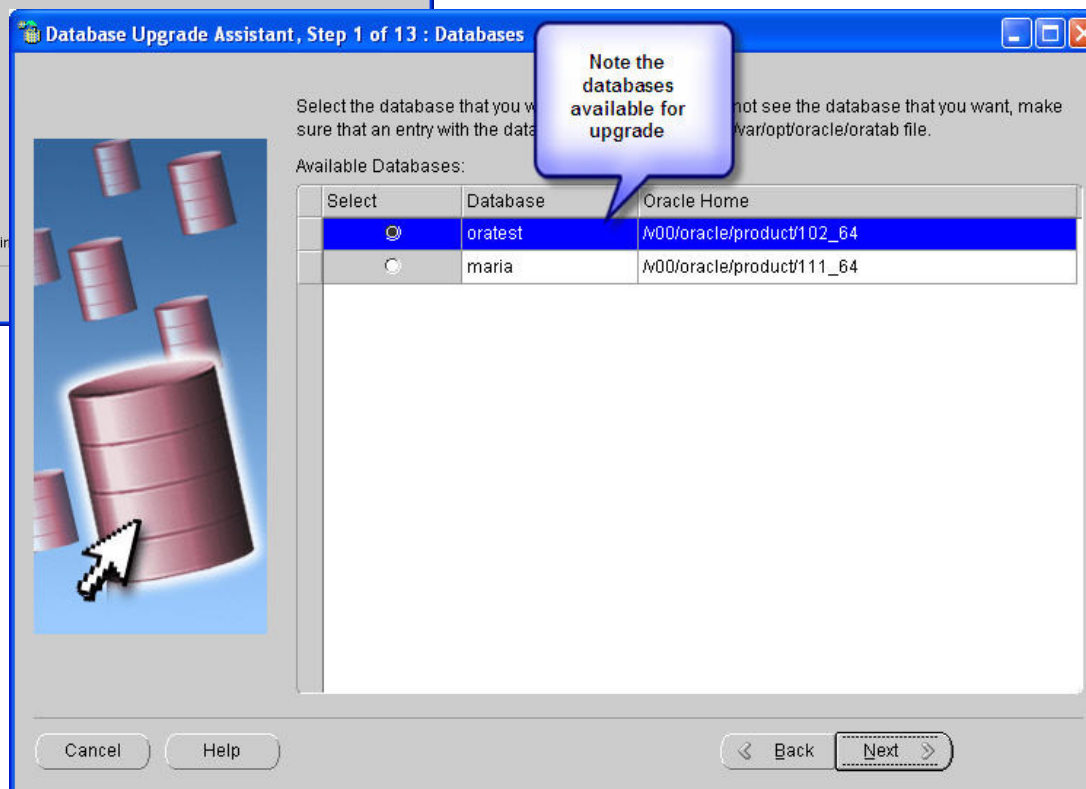
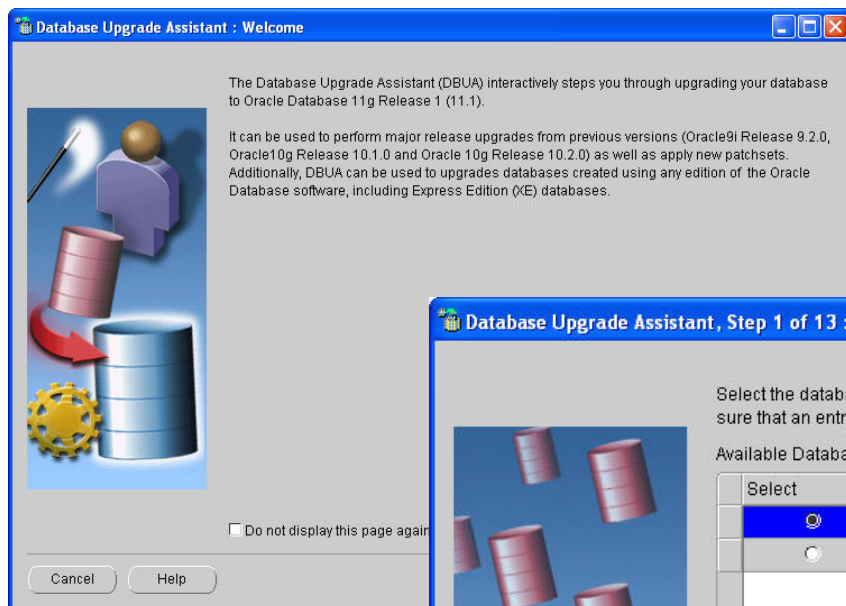
- ❖ Welcome screen will appear ...



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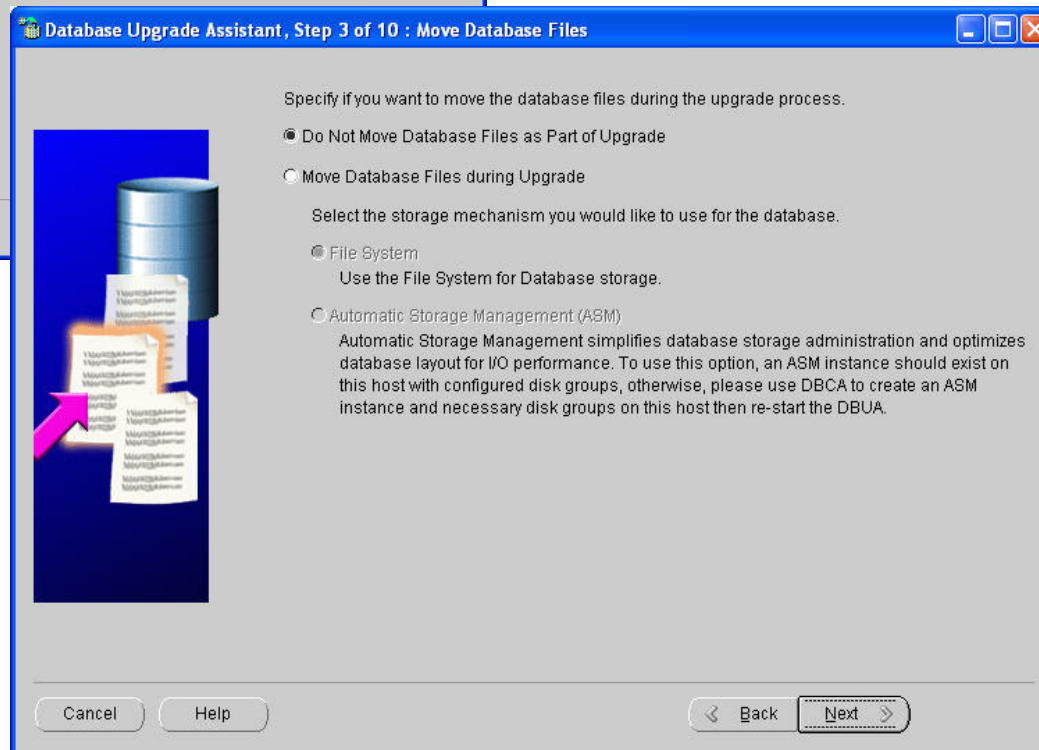
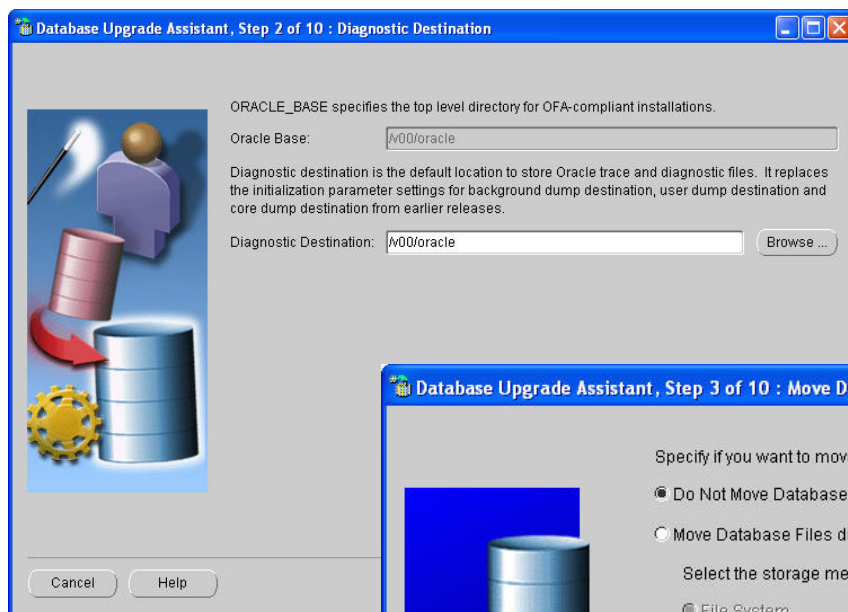
# Using DBUA to Upgrade



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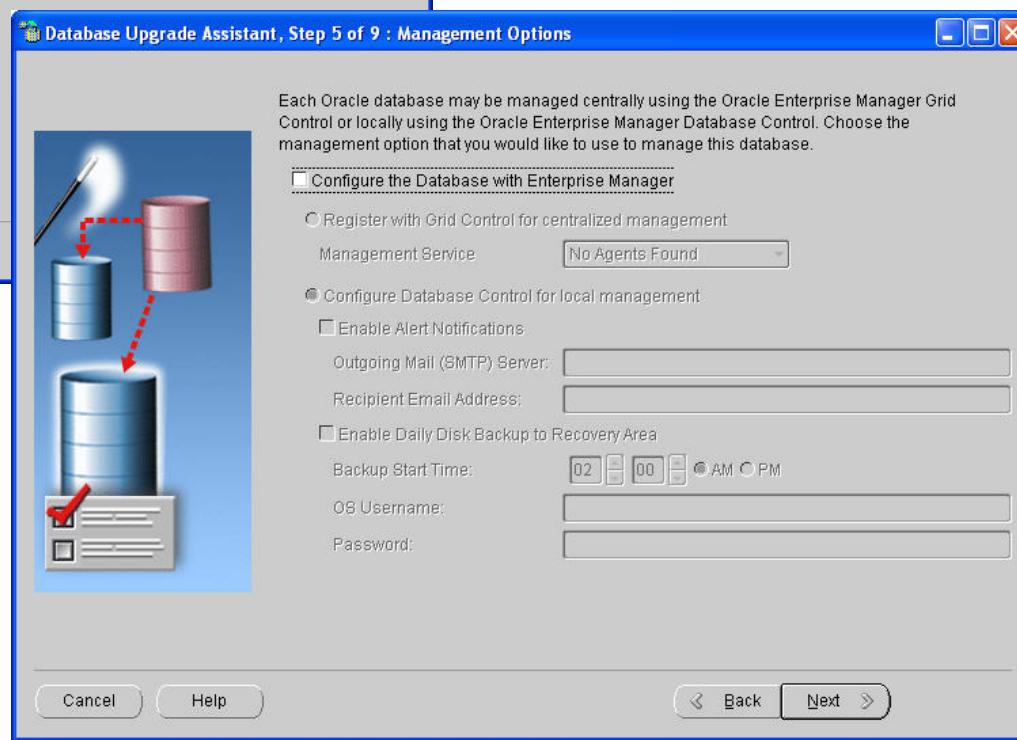
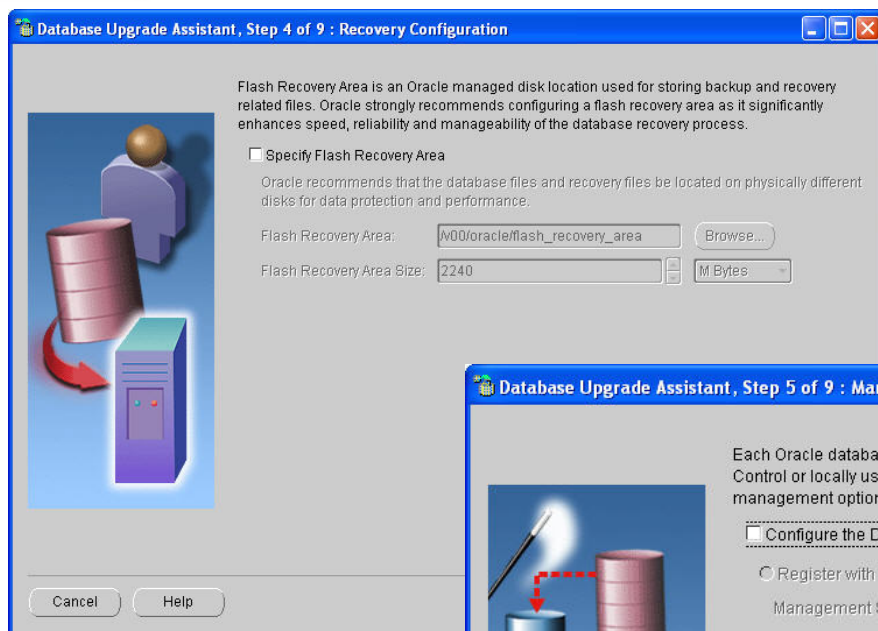
# Using DBUA to Upgrade



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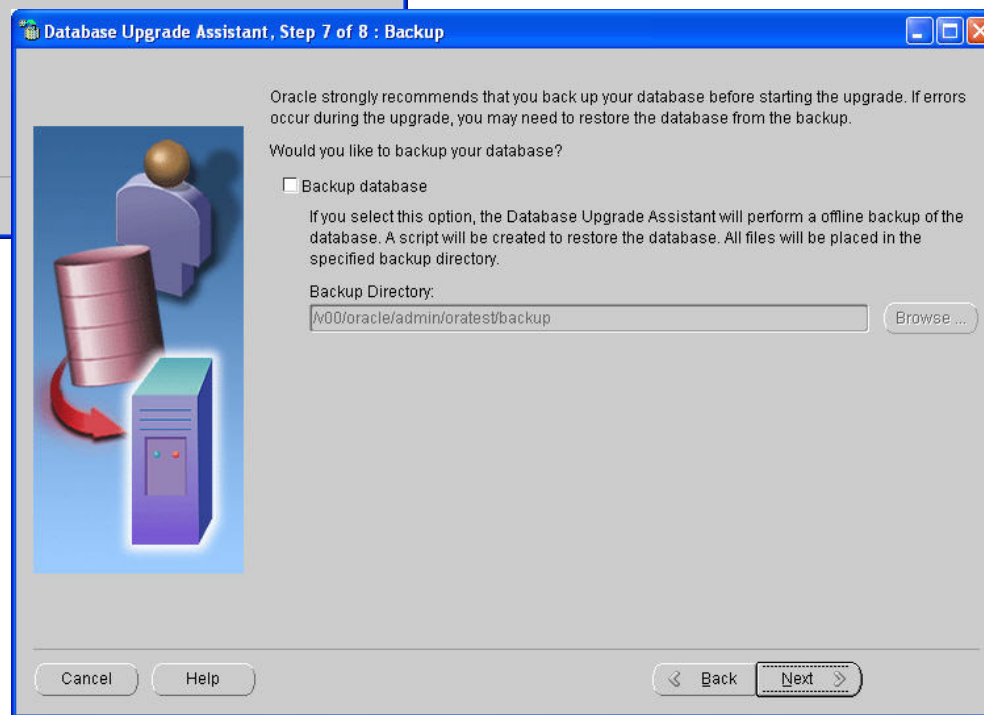
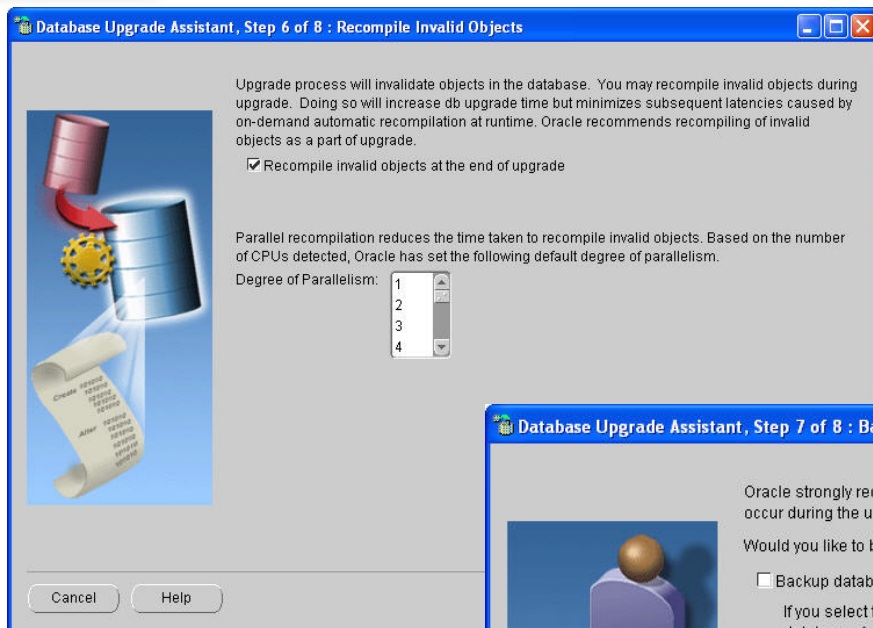
# Using DBUA to Upgrade



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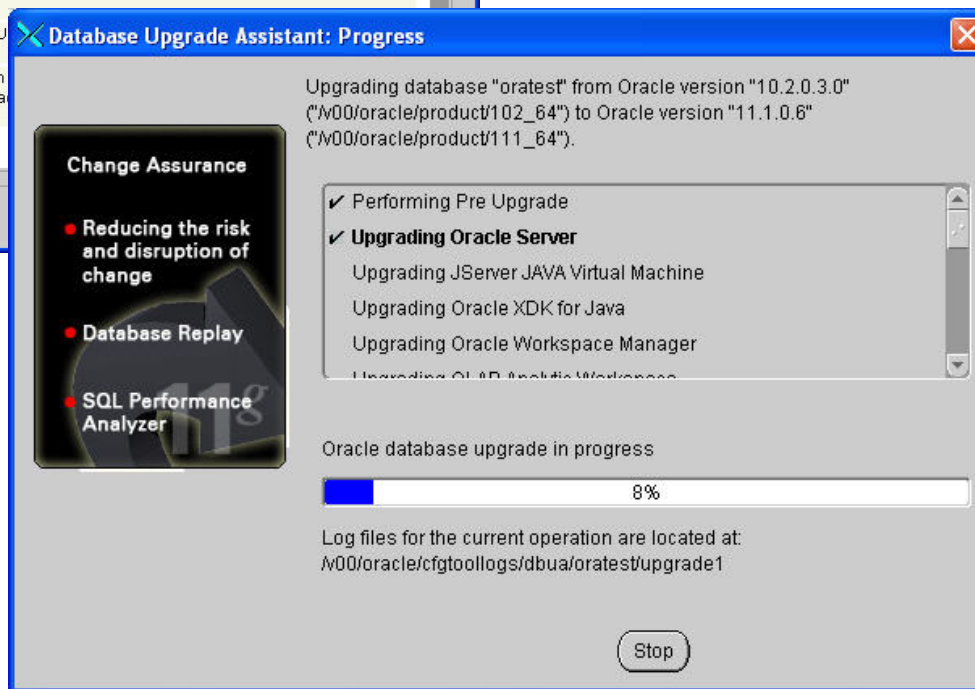
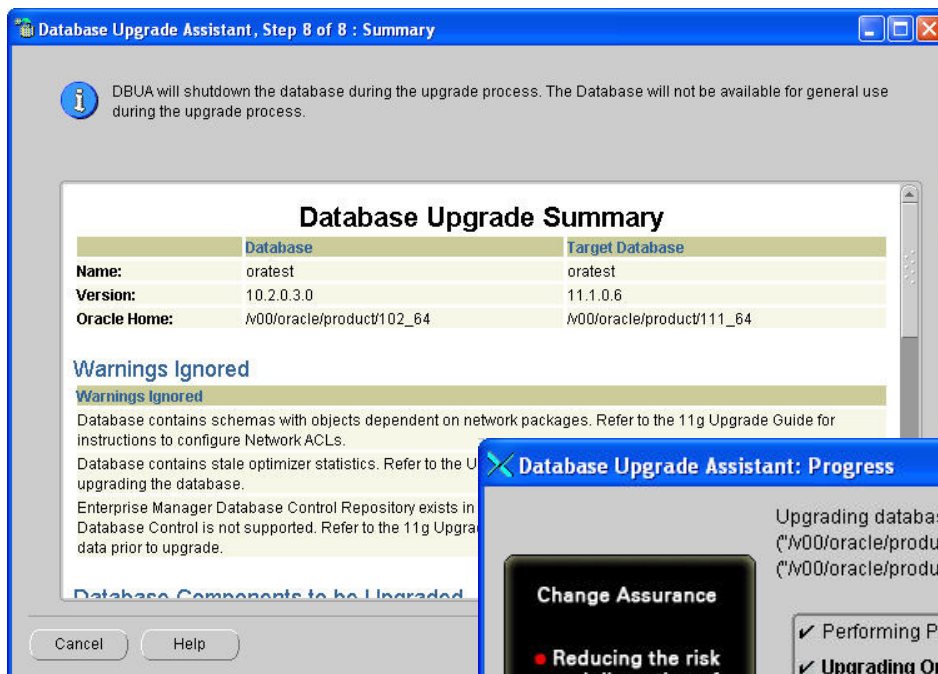
# Using DBUA to Upgrade



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# Using DBUA to Upgrade



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# Post-upgrade Tasks

- ❖ Modify environment variables to reference new \$ORACLE\_HOME ...
  - ORACLE\_HOME
  - PATH
  - LD\_LIBRARY\_PATH
  - SHLIB\_PATH
- ❖ Modify listener.ora and start listener from 11g \$ORACLE\_HOME
- ❖ Reset user passwords to take advantage of case sensitivity
- ❖ Never start/stop the database with the old software!



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# Manual Database Upgrade

- ❖ Backup the database.
- ❖ Copy init.ora and password file from old \$ORACLE\_HOME/dbs to new \$ORACLE\_HOME/dbs.
- ❖ Remove deprecated and obsolete parameters. Set COMPATIBLE parameter.
- ❖ Convert rollback segments to automatic UNDO. Create a SYSAUX tablespace if not already there.
- ❖ Shut down the database; modify oratab.
- ❖ Modify environment variables to point to new \$ORACLE\_HOME. Navigate to \$ORACLE\_HOME/rdbms/admin.
- ❖ Log into SQL\*Plus, start the database with the 'upgrade' option ...

```
sqlplus /nolog  
connect / as sysdba  
startup upgrade;
```



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# Manual Database Upgrade

- ❖ Run catupgrd.sql from the new \$ORACLE\_HOME/rdbms/admin. Spool the output.
- ❖ The catupgrd.sql script should shut down the database as a last step. If not, shut down the database and restart it.
- ❖ Create spfile from the pfile used to start the database.
- ❖ Run the utlu111s.sql script. All components should be VALID.
- ❖ Run the catuppst.sql and utlrp.sql to perform post-upgrade tasks and recompile invalid objects.



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# Sample output from utlu111s.sql

```
SQL> @utlu111s.sql
```

```
.  
Oracle Database 11.1 Post-Upgrade Status Tool          02-23-2008 15:38:35  
.  
Component                                         Status      Version  HH:MM:SS  
.  
Oracle Server                                     VALID      11.1.0.6.0  01:15:32  
JServer JAVA Virtual Machine                     VALID      11.1.0.6.0  00:34:01  
.  
Oracle Workspace Manager                         VALID      11.1.0.6.0  00:03:36  
.  
OLAP Analytic Workspace                          VALID      11.1.0.6.0  00:02:41  
.  
OLAP Catalog                                    VALID      11.1.0.6.0  00:02:58  
.  
Oracle OLAP API                                  VALID      11.1.0.6.0  00:01:11  
.  
Oracle Enterprise Manager                       VALID      11.1.0.6.0  00:41:45  
.  
Oracle XDK                                       VALID      11.1.0.6.0  00:02:05  
.  
Oracle Text                                     VALID      11.1.0.6.0  00:02:50  
.  
Oracle XML Database                             VALID      11.1.0.6.0  00:13:25  
.  
< ... snip ... >
```



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# Downgrading an Oracle 11g Database



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# Criteria for Database Downgrade

- ❖ Can only downgrade to the release upgraded from
  - E.g., if database was upgraded from 10.1, can downgrade to 10.1 but not 10.2
- ❖ COMPATIBLE parameter must not have been set to 11.0.0
- ❖ If previous release was 10.1, then must be at 10.1.0.5
- ❖ If previous release was 10.2, then must be 10.2.0.3



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# Downgrading a Database

- ❖ Shut down the database and listener. Navigate to \$ORACLE\_HOME/rdbms/admin.
- ❖ Start up the database with the 'downgrade' option ...
- ❖ Run the catdwgrd.sql. Spool the output.

```
sqlplus /nolog  
connect / as sysdba  
startup downgrade;  
@catdwgrd.sql
```

- ❖ Shut down the database. Copy init.ora and password files back to previous \$ORACLE\_HOME/dbs.
- ❖ Modify environment variables to point to previous \$ORACLE\_HOME.



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# Downgrading a Database

- ❖ Navigate to `$ORACLE_HOME/rdbms/admin`.
- ❖ Restart the database from the previous `$ORACLE_HOME` with the upgrade option.
- ❖ Run the `catrelod.sql` and spool the output.

```
sqlplus /nolog
connect / as sysdba
startup upgrade;
@catrelod.sql
```
- ❖ Shut down and restart the database.
- ❖ Recompile any invalid objects with the `utlrp.sql` script.
- ❖ If in doubt, restore and recover the database.



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# Summary



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# Keys to a Successful Upgrade

- ❖ Initiate database upgrade projects – don't wait to be pulled into an upgrade project by your business users or clients
- ❖ Research the new features of the release you wish to upgrade, as well as bugs/issues.
- ❖ Work closely with business users and application support teams to define test plan.
- ❖ Utilize a Technical Implementation Plan (TIP) or something similar to manage and document technical details.
- ❖ Time spent planning and testing is never wasted!



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# Questions?



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# Thank you!

Reminder ... please complete a speaker evaluation form!

Contact information ...

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