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Production Management

FactoryTalk® ProductionCentre

RELEASE 10.4
DATABASE INSTALLATION GUIDE

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ALLEN-BRADLEY • ROCKWELL SOFTWARE

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Read Me First

In this chapter

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This guide describes how to set up and configure a database server to be used with the FactoryTalk® ProductionCentre (called FTPC hereafter) servers. To complete the installations and configurations, refer to your RDBMS documentation.

This guide assumes that the supporting network equipment and software are or can be installed. This guide does not provide installation instructions or requirements for related components, like Internet connections.

How to Use this Book

This guide was designed to be used with four other guides, available at the **Documentation** link on the FTPC software download web site:

- *FactoryTalk ProductionCentre Supported Platforms Guide* for the latest supported software and hardware, as well as FTPC product interoperability.
- *FactoryTalk ProductionCentre Server Installation Guide* for customers who have purchased FTPC products.

See the FTPC online knowledge base for the latest patch information, as well as troubleshooting articles.

The "Installation Checklists" on page 9 are installation workflow tables. Each step on the workflow checklist names a section and page in the book that provides instructions for performing that step, including order of operations, parameter settings, and required versions.

The text and the checklists provide cross-references to additional resources.

Organization

This book contains the following chapters and appendixes:

- **Chapter 1, "Installation Checklists"** - Provides checklists for installing and configuring MS SQL Server and Oracle software.
- **Chapter 2, "MS SQL Server Installation and Configuration"** - Describes installation and configuration tasks relating to MS SQL Server database server software.
- **Chapter 3, "Oracle Installation and Configuration,"** - Describes installation and configuration tasks relating to Oracle 11g or Oracle 12c database server software.
- **Chapter 4, "Database Server Performance"** - Provides configuration tips for improving performance.

Database Servers

The FTPC databases described in the following list may reside on a database server that houses other company databases or may have their own dedicated database server(s).

- FTPC production database is a transactional database that records and stores all data collected by FTPC.
- FTPC Operational Data Store (ODS) contains the historical data extracted from one or more production databases.

The configuration you choose is dependent on your site requirements. Work with either Rockwell Automation Technical Support or your Rockwell Automation Professional Services representative to determine the appropriate configuration. Please see the *FactoryTalk ProcutionCentre Product Overview* for more information on product architecture.

User Privileges

This document assumes that the individual performing this installation has sufficient expertise and privileges on the network and operating system (OS) to perform the required database configurations. For more information on database user permissions, refer to the appropriate database documentation.

For both the FTPC servers, you must create a database user with these minimum database privileges:

- **Oracle** users must have the following roles and privileges:
  - CONNECT and RESOURCE Roles
  - The following System Privileges:
    - ALTER PROCEDURE
    - CREATE TABLE
    - CREATE TRIGGER
    - CREATE PROCEDURE
    - CREATE VIEW
    - EXECUTE PROCEDURE
    - UNLIMITED TABLESPACE
- **MS SQL Server** users must have Public and db-owner roles.

These users and how to create them are described in Chapter 2, “MS SQL Server Installation and Configuration,” and Chapter 3, “Oracle Installation and Configuration.”

Related Documents

The following table lists other available documents that are related to the database software installation.

Table 1: Related Documents

Topic	Title	Location
Required software installation and configuration	Third-party software documentation, such as *Oracle 11g Installation Guide for Windows* or *Overview of Installing SQL Server 2008*	Vendor, such as Oracle or Microsoft, web site or manual
Complete list of Supported Software	*FactoryTalk ProductionCentre Supported Platforms Guide*	Documentation link on the FTPC software download web site
Installation issues such as: • Performance • Security • Migration • Required patches	Keyword: • Install • Performance • Security • Migrate	FTPC online knowledge base
Changes to the Production or ODS database installation	*FactoryTalk ProductionCentre Release Notes*	FTPC home page under the Help link

Chapter 1

Installation Checklists

In this chapter

- MS SQL Server Installation and Configuration 10
- Oracle Installation and Configuration 11

The following installation checklists describe the workflow for the installation of MS SQL Server and Oracle database software. For instructions on FTPC Server installation and configuration, refer to the *FactoryTalk ProductionCentre Server Installation Guide*.

Each step in the checklists includes a page reference where you will find details and instructions about that step. The tables refer to supported RDBMS and operating system pairs. Review the order and the referenced pages before you begin. Use the checklist/workflow to successfully complete a database installation.

We designed the checklists to be used with the *FactoryTalk ProductionCentre Supported Platforms Guide*. For further guidance or site requirements not discussed, contact Rockwell Automation Technical Support.

MS SQL Server Installation and Configuration

The following table provides checklists for installing MS SQL Server to be used with FTPC.

Table 1-1 MS SQL Server Checklist on Windows

Done?	Step	Page
1.	Review software and hardware requirements in the *FactoryTalk ProductionCentre Supported Platforms Guide* to verify you have the supported versions and sufficient hardware. Find the Supported List at the **Documentation** link on the FTPC software download web site.	
2.	Review the guide "User Privileges" and verify that you have sufficient permissions and privileges.	page 7
3.	"Install the Windows Operating System"	page 14
4.	"Install MS SQL Server Database Server"	page 14
5.	"Configure MS SQL Server Databases"	page 29
6.	Review Chapter 4, "Database Server Performance" for performance tips.	page 107

Oracle Installation and Configuration

The following tables provide a checklist for installing Oracle to be used with an FTPC installation.

Table 1-2 Oracle Checklist on Windows

Done?	Step	Page
1.	Review software and hardware requirements in the *FactoryTalk ProductionCentre Supported Platforms Guide* to verify you have the supported versions and sufficient hardware. Find the guide at the **Documentation** link on the FTPC software download web site.	
2.	Review the guide about "User Privileges" and verify that you have sufficient permissions and privileges.	page 7
3.	"Install the Windows Operating System"	page 42
4.	"Install Oracle"	page 42
5.	"Configure the Oracle Databases"	page 54
6.	Review Chapter 4, "Database Server Performance" for performance tips.	page 107

Chapter 2

MS SQL Server Installation and Configuration

In this chapter

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  - Configure Optional SQL Filegroups 39

This chapter describes the choices during MS SQL Server product installation required by FTPC. This document also provides requirements, but not instructions, on how to create the databases that are used by FTPC. To complete the installation and configuration, refer to the MS SQL Server documentation.

We recommend that you install the Database and Application Server software on different machines. It is possible to install any combination of the software (for example, the Database and Application Server software) on the same machine, but you will experience performance degradation.

Install the Windows Operating System

When you install the MS SQL Server software on a Windows operating system, follow the database documentation instructions. Keep the following requirements in mind:

- ❑ If you are installing SQL Server 2016 on a Windows Server 2012 R2 machine, install the following updates:
  - ❖ Windows8.1-KB2919442-x64.msu
  - ❖ Windows8.1-KB2919355-x64.msu
- ❑ You must install .NET Framework 3.5 service pack 1 before you install MS SQL Server.

> **NOTE:** SQL Server 2016 requires .NET Framework 4.6, which is already included with its installation.

- ❑ You must use NTFS. The FAT file system is not supported.
- ❑ The installation user must be a member of the Administrator group on the machine where you will install SQL Server.
- ❑ All servers and clients must be connected over the network using TCP/IP.

Install Required Patches

Refer to the *FactoryTalk ProductionCentre Supported Platforms Guide* for any required patches that must be installed with the Windows operating system. FTPC does not have any installation requirements.

Install MS SQL Server Database Server

The installation steps covered in this section allow you to install a database server that can be used with FTPC. Specific steps for configuring the FTPC databases are available in “Configure MS SQL Server Databases” on page 29.

Your databases must have enough free space to meet the needs of your applications. The amount of free space you need depends on many factors, including logging settings and the number of transactions. Consult your Implementation Professional or MPS Representative to estimate how much space you need.

You will need some database information when you connect the application, administration, and reporting servers to the database. You can use the following table to record the information as you configure your database.

Property	Server Name (machine name)	Database Name	User Name	User Password
Production Database				
Historical (ODS) Database				

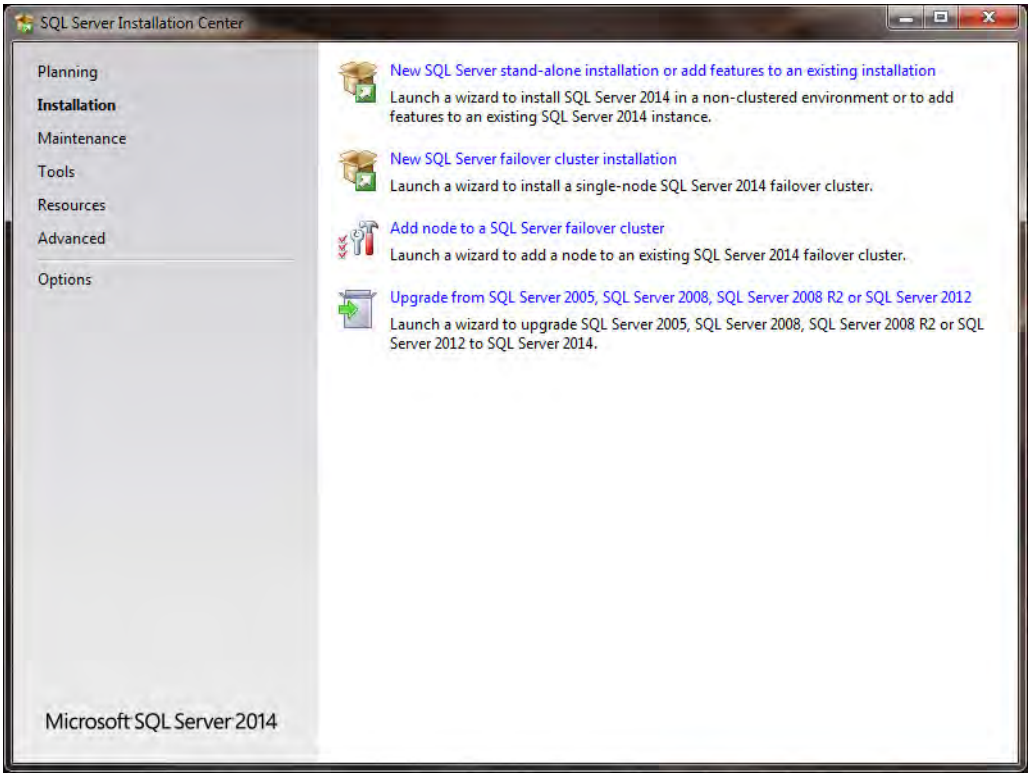
Follow the SQL Server documentation to install SQL Server. When installing, accept all default selections except those described in the following dialogs, illustrated in Figure 2-1 through Figure 2-16.

IMPORTANT: When installing SQL Server, you can either use the default TCP port (1433) or define another one. However, a port must be defined. Do not leave this property empty.

Define the Installation

Click *Installation* in the left panel. At the Installation Start dialog (Figure 2-1), click *New SQL Server stand-alone installation or add features to an existing installation* from the types of installations available to install.

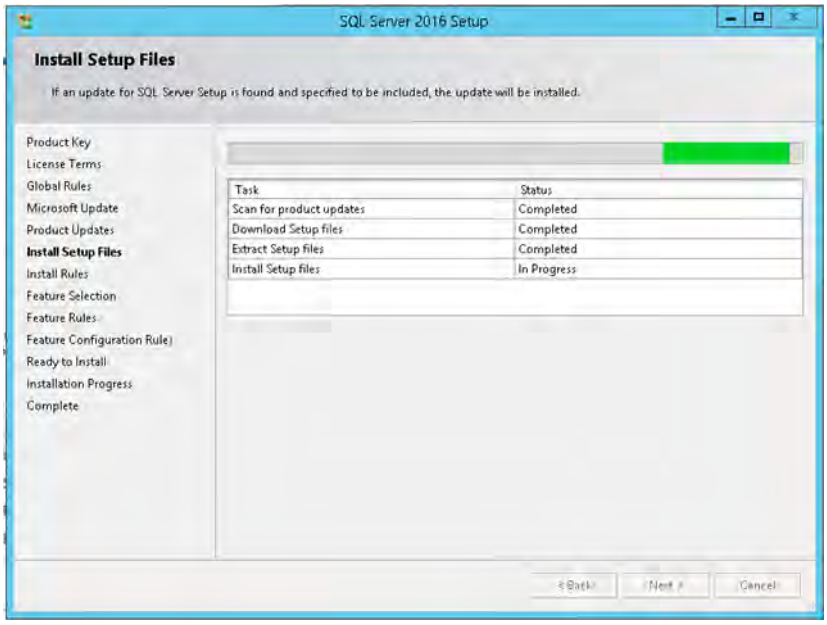
Figure 2-1: MS SQL Server Installation Type Selection



Install Setup Files

Download, extract, and install the setup files, and then click [Next].

Figure 2-2: Install Setup Files

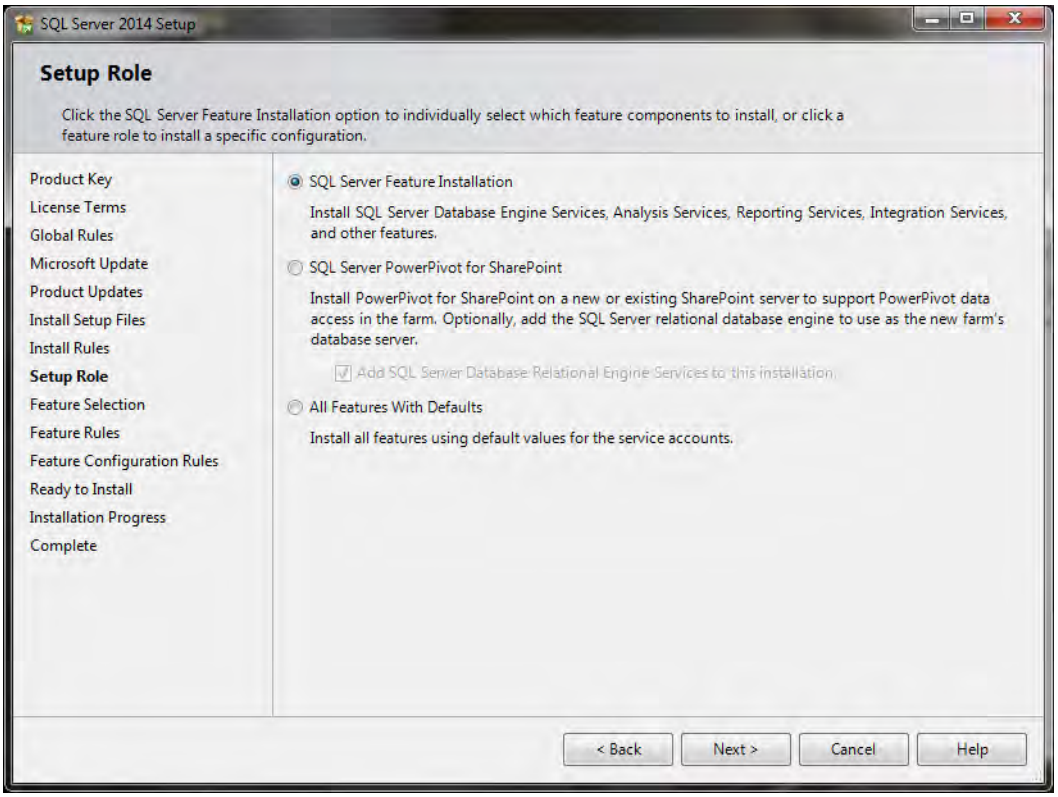


Define the Setup Role

If you are installing SQL Server 2008 or 2012, skip to "Select the Features" on page 17.

If you are installing SQL Server 2014 or 2016, at the Setup Role dialog, select *SQL Server Feature Installation* and click [Next].

Figure 2-3: Setup Role

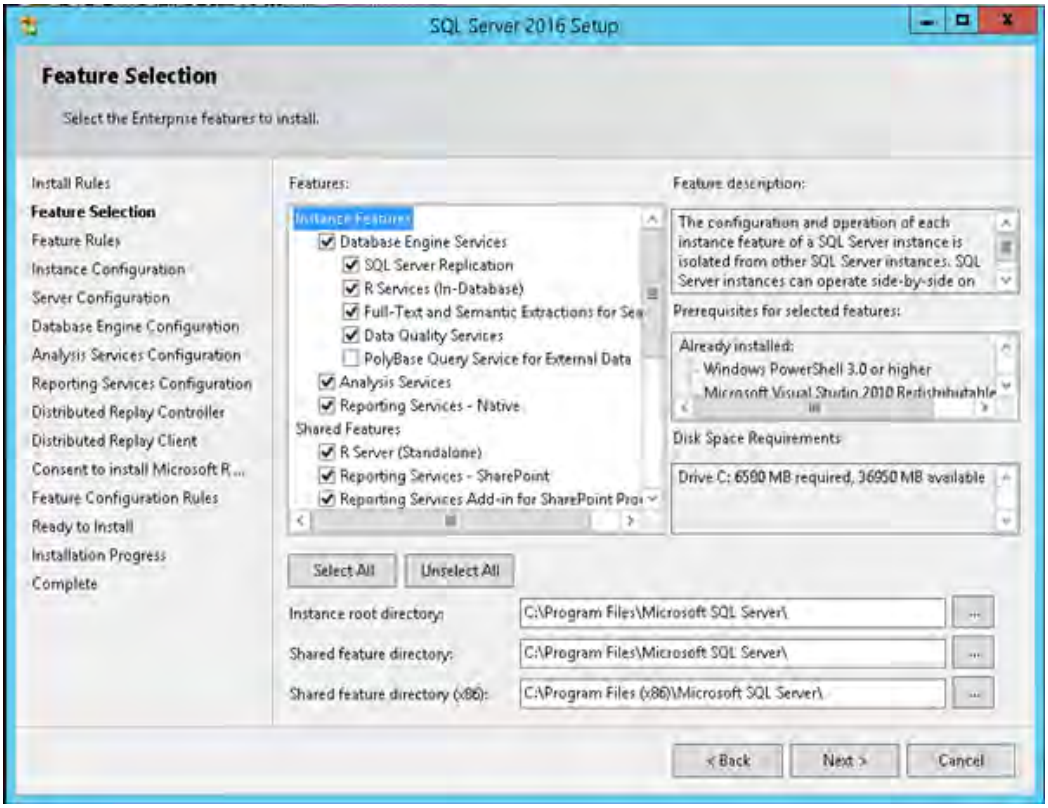


Select the Features

At the Feature Selection dialog (Figure 2-4), click at least the database engine services and database agent, and then click [Next].

If you are installing SQL Server 2016, click [Select All], but uncheck *PolyBase Query Service for External Data*.

Figure 2-4: Feature Selection

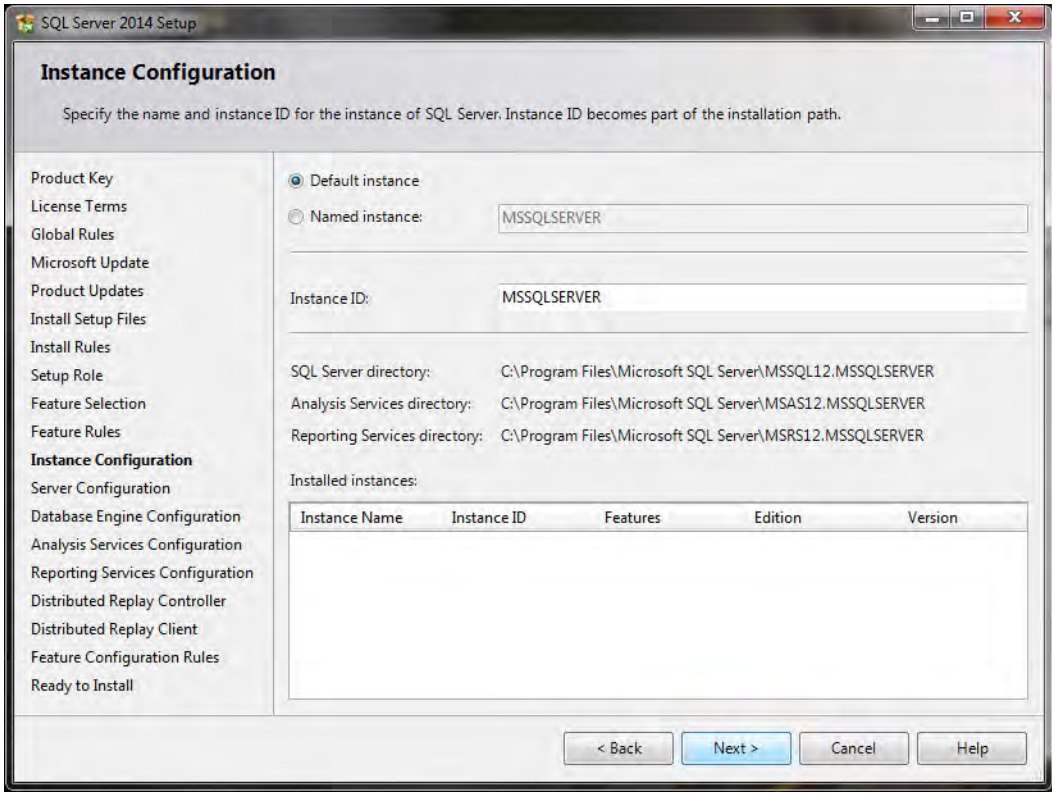


Select the Instance Name

At the Instance Configuration dialog (Figure 2-5), do one of the following:

- Select *Default instance*, then click [Next].
- Select *Named instance*, define an instance, then click [Next]. If you select this option, you must add \<***instance_name***> to the database server hostname anywhere you are required to enter the database server hostname.

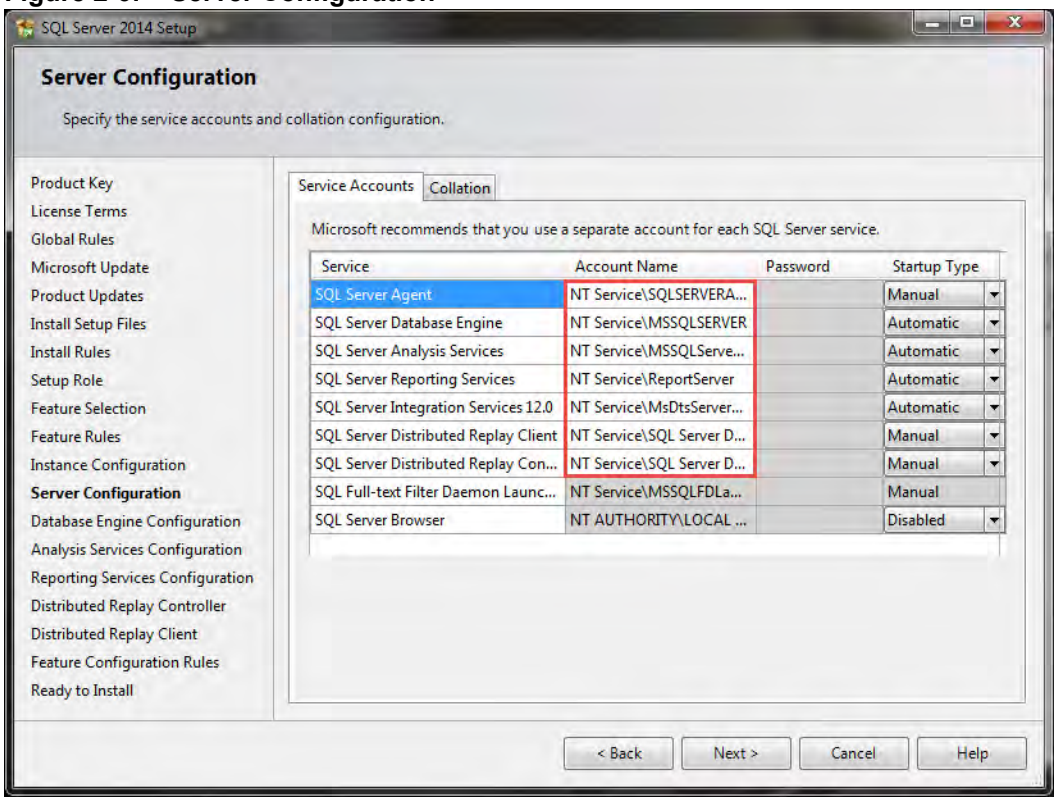
Figure 2-5: MS SQL Server Setup Selection



Specify the Server Configuration

In the Server Configuration dialog, under the Service Accounts tab (Figure 2-6), specify the account name for each SQL Server service, then click [Next].

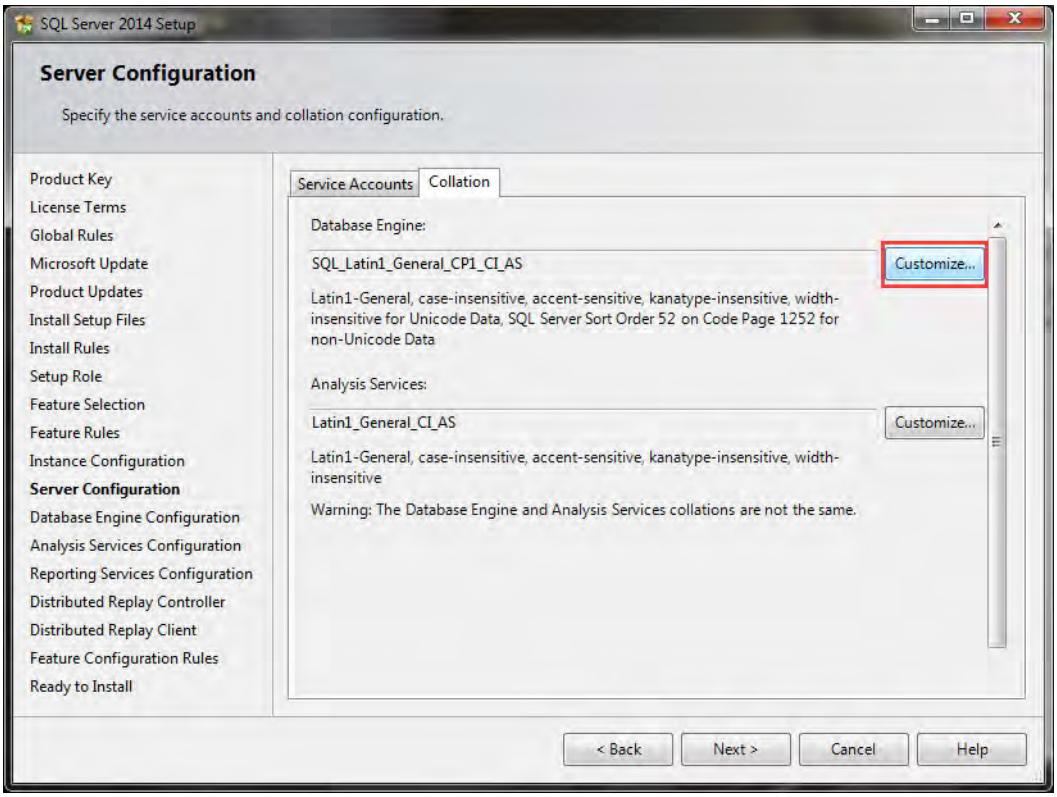
Figure 2-6: Server Configuration



Select the Collation Settings

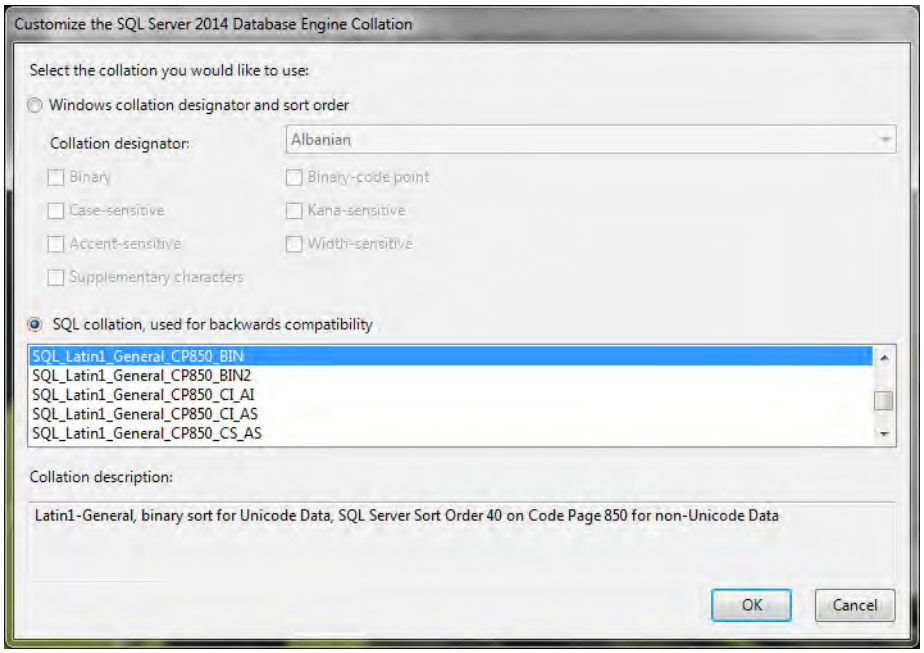
In the Server Configuration dialog, under the Collation tab (Figure 2-7), click [Customize] under the Database Engine section.

Figure 2-7: MS SQL Server Collation Settings



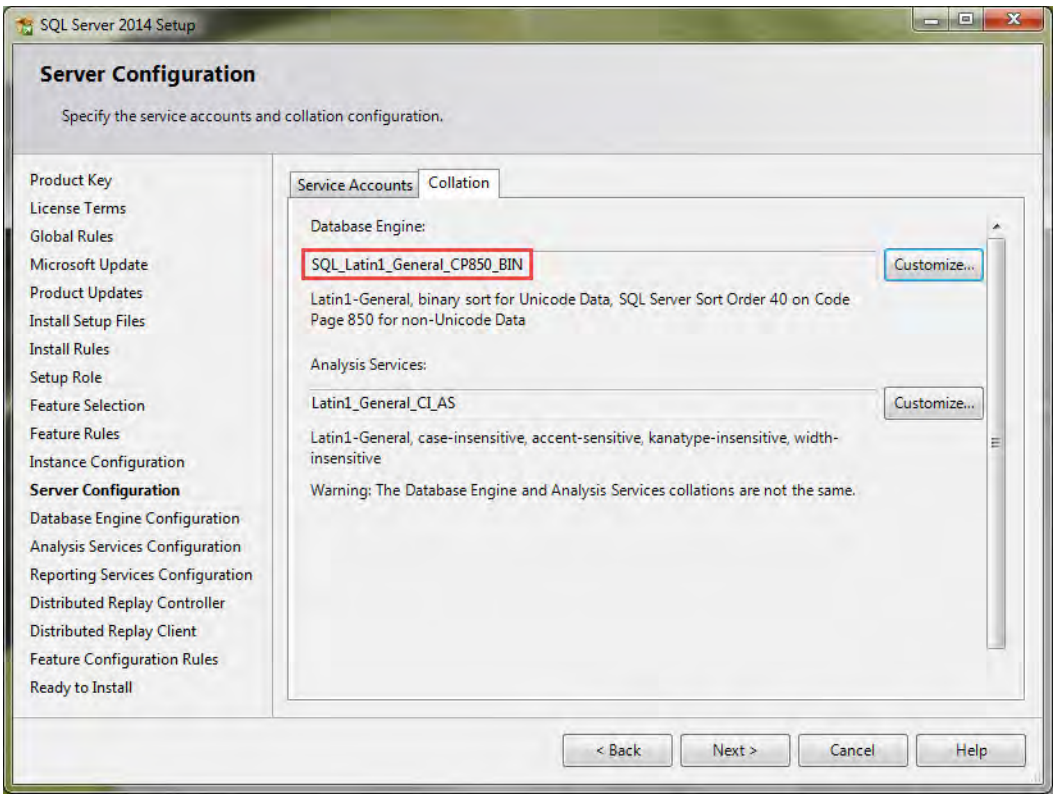
In the *Customize the SQL Server <version> Database Engine Collation* dialog, choose the *SQL collation, used for backwards compatibility* radio button (Figure 2-8), select *SQL _Latin1_General_CP850_BIN*, then click [OK].

Figure 2-8: Customize the SQL Server Database Engine Collation



You are now returned to the Server Configuration dialog. Verify that *SQL _Latin1_General_CP850_BIN* is selected under Database Engine, (Figure 2-9) then click [Next]. This provides faster searches and support of multiple languages.

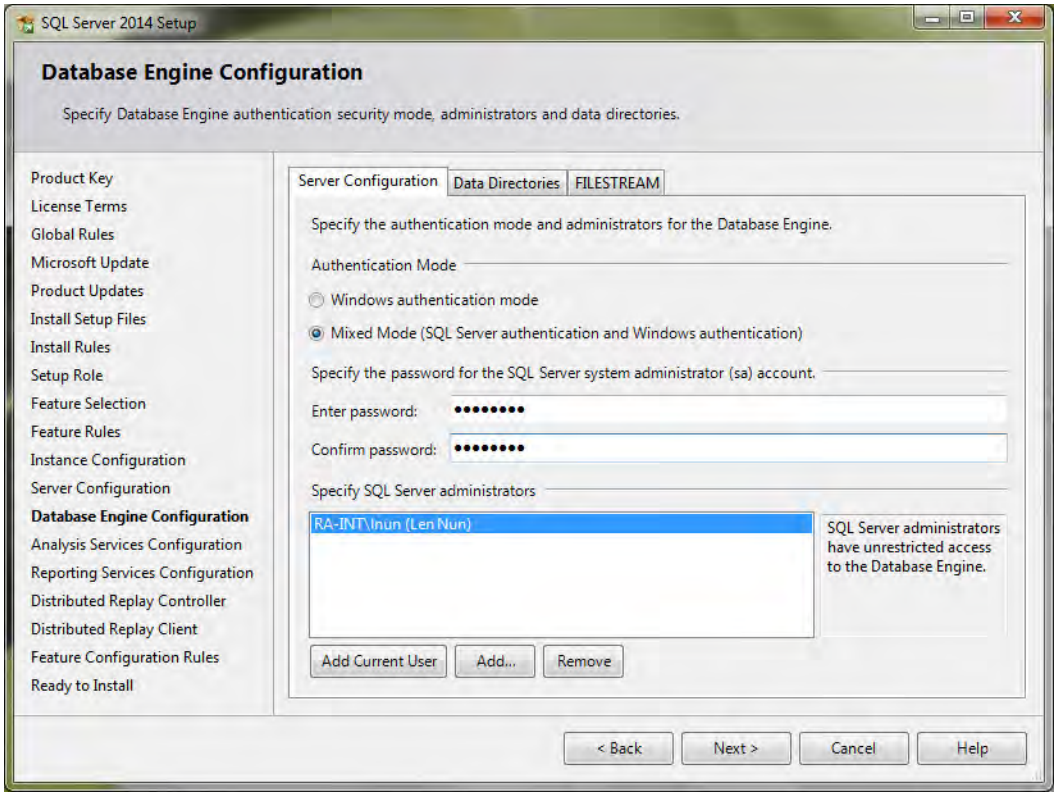
Figure 2-9: MS SQL Server Collation Settings



Select the Authentication Mode

The databases must use SQL authentication. At the Authentication Mode dialog (Figure 2-10), select *Mixed Mode* Authentication and define the password. Click [Add Current User], then click [Next].

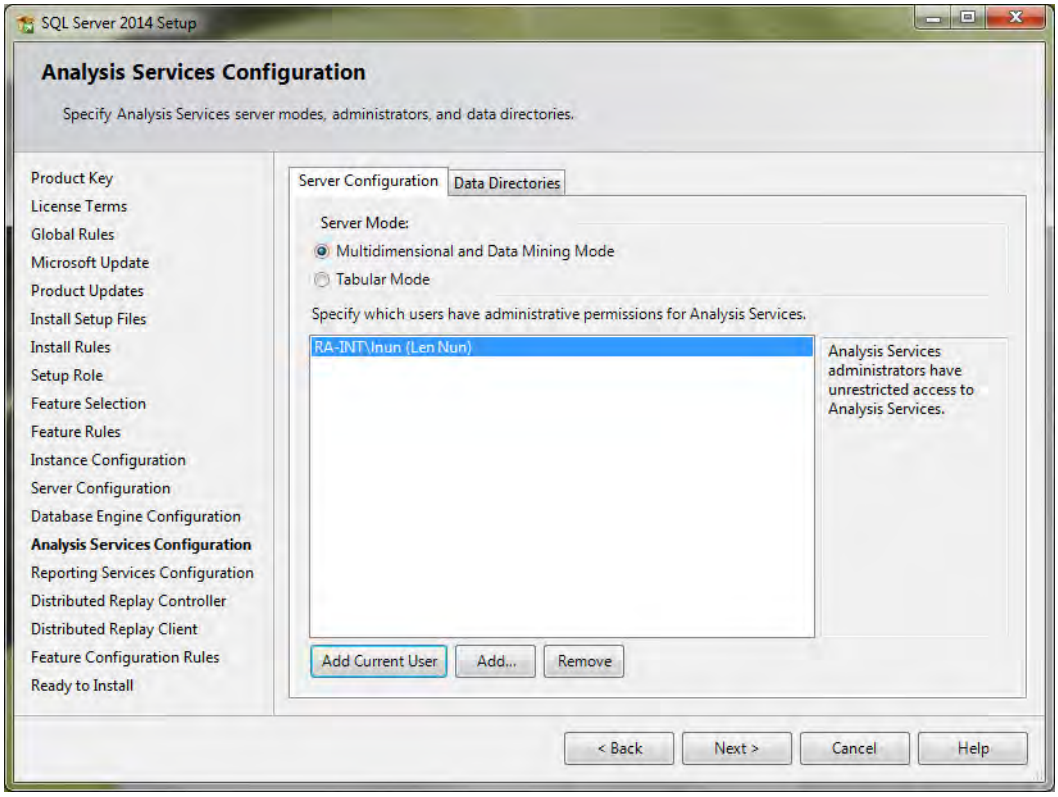
Figure 2-10: MS SQL Server Authentication Mode Selection



Specify the Analysis Services Administrator

In the *Analysis Services Configuration* dialog (Figure 2-11), under the Account Provisioning (2008 and 2012) or Server Configuration (2014 and 2016) tab, click [Add Current User], then click [Next]. This allows the current user to have unrestricted access to Analysis Services.

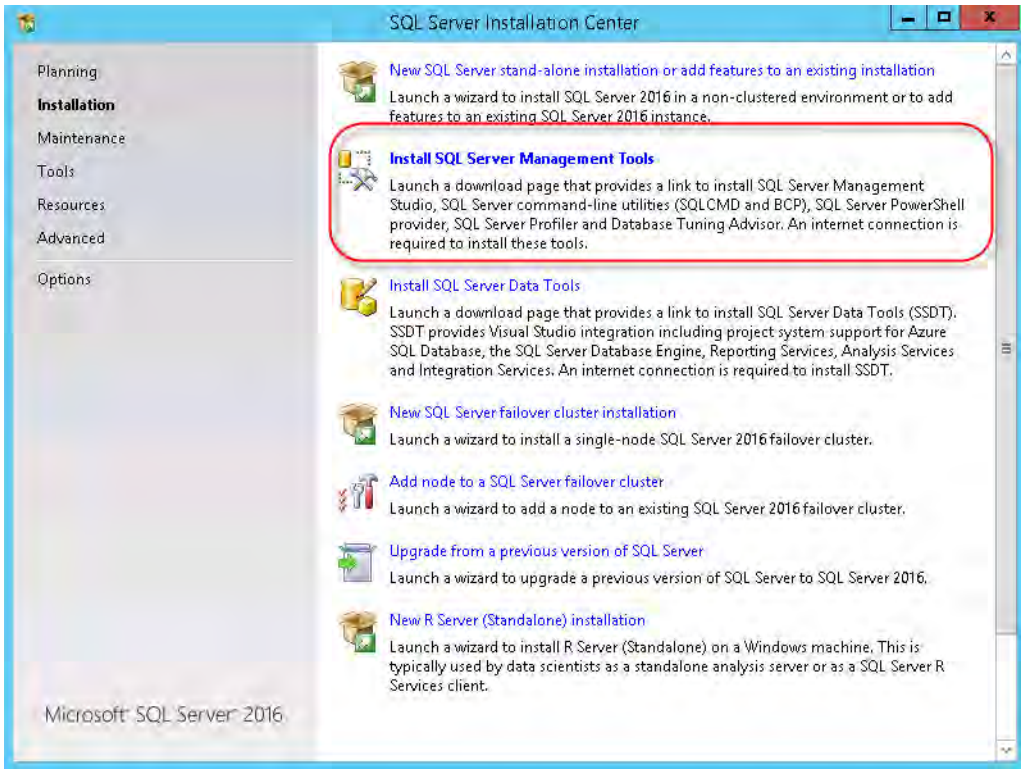
Figure 2-11: Analysis Services Configuration



Install SQL Server Management Studio (2016 Only)

After you have installed SQL Server 2016, install the SQL Server Management Studio (SSMS-Setup-ENU.exe) under **Install SQL Server Management Tools** and then restart the system.

Figure 2-12: Install SQL Server Management Tools

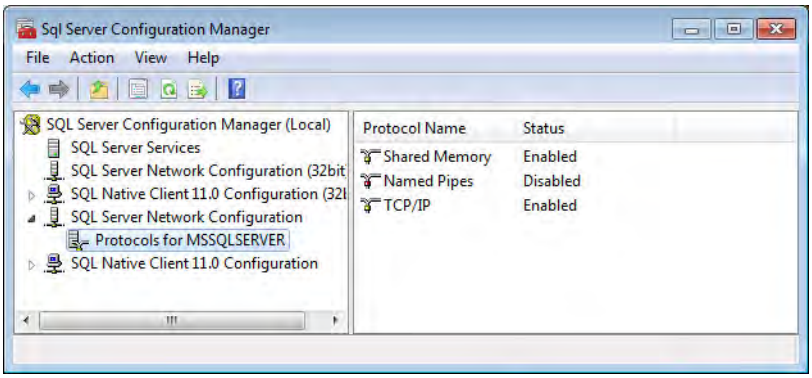


Verify the TCP/IP Status

After installing SQL Server, ensure that TCP/IP is enabled by performing the following steps.

1. Open Start > Programs > Microsoft SQL Server <*version*> > Configuration Tools > SQL Server Configuration Manager.
2. Expand SQL Server <*version*> Network Configuration if it is not already expanded. Select the server for which you want to verify that TCP/IP is enabled.
3. In the list of protocols, TCP/IP should be listed as *Enabled*.

Figure 2-13: Verify TCP/IP Status



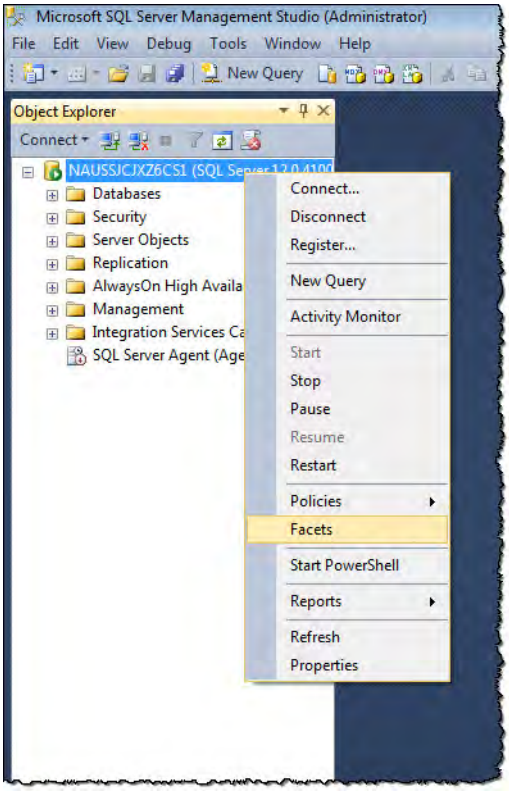
4. Close the SQL Server Configuration Manager.

Enable OLE Automation

After installing SQL Server, you must ensure that OLE Automation is enabled. It is disabled by default. To enable OLE Automation, follow the directions below.

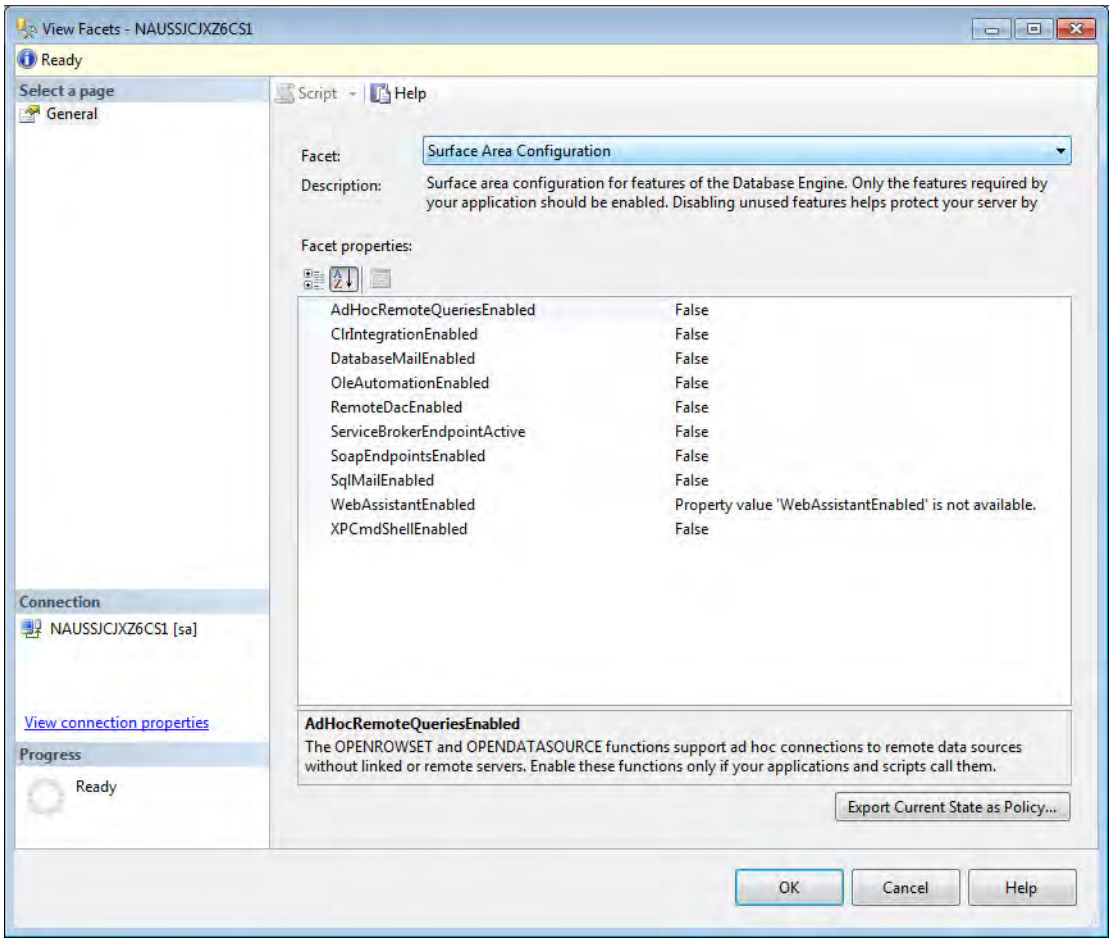
1. Go to Start > Programs > Microsoft SQL Server <*version*> > SQL Server Management Studio. Open SQL Server Managment Studio.
2. Right-click on the instance name that you would like to configure in SQL Server management Studio and select "Facets" from the context menu to open the View Facets dialog.

Figure 2-14: SQL Server Surface Area Configuration Tool



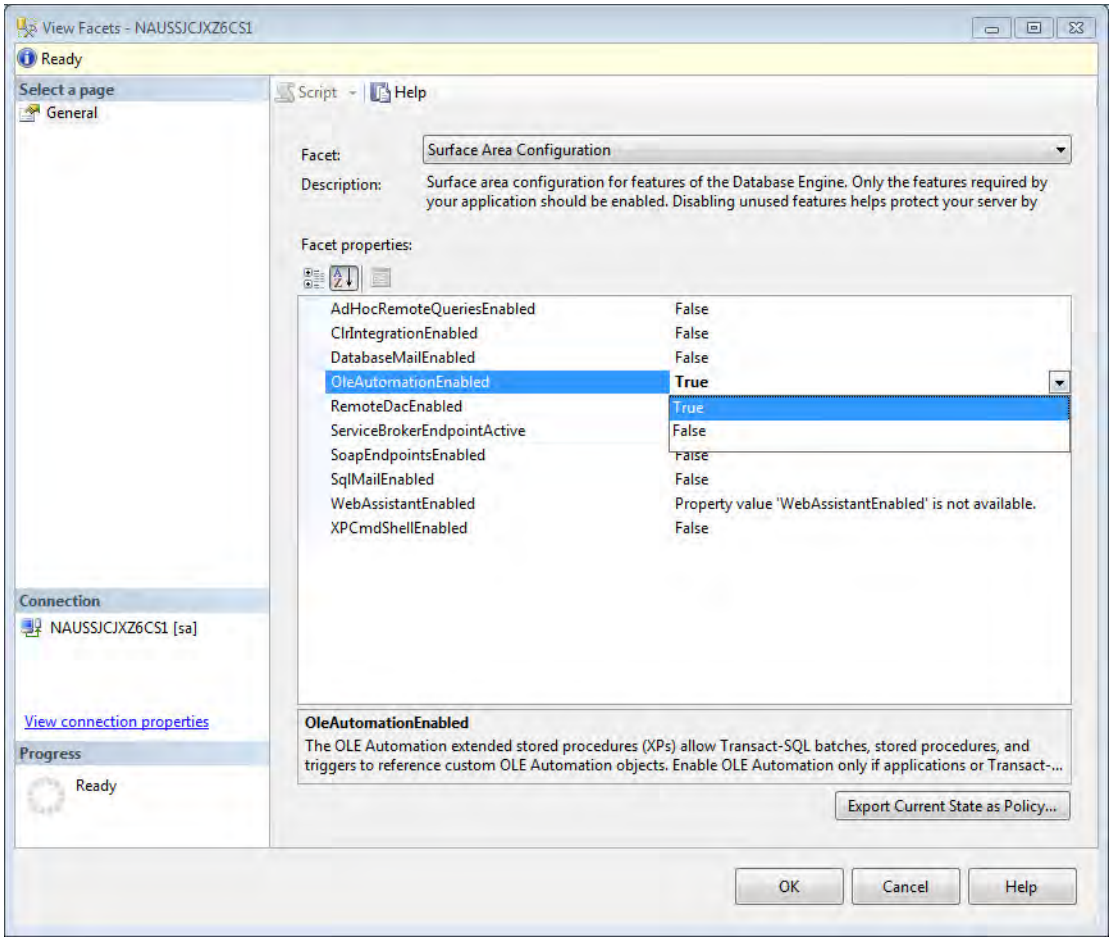
3. From the Facet drop-down menu, select *Surface Area Configuration* to display the properties exposed by that facet.

Figure 2-15: Surface Area Configuration for Features Dialog



4. Select *True* to enable the "OleAutomationEnabled" property from the Facet properties dialog.

Figure 2-16: Enable OleAutomation



5. Click [OK] to close the dialog.

Migrate the Database from MS SQL Server 2005 to MS SQL Server 2008

If you will be using MS SQL Server 2008 and have existing databases in MS SQL Server 2005, you must migrate them to MS SQL Server 2008. For information on how to migrate existing databases, please refer to Microsoft's documentation. Once you have completed the migration, verify that the compatibility level is set to 90. Depending on which application server your installation is using, you will need to perform specific tasks to upgrade the database client. Read the manual specific to your server type for details.

Install MS SQL Server Service Pack

Refer to the *FactoryTalk ProductionCentre Supported Platforms Guide* for the list of supported service packs that can be installed. FTPC has no requirements for the patch installation, so accept the default selections, except as required by your site.

To check if MS SQL Server Service Pack is already installed, follow the directions below:

1. From the Start menu, select Programs > Microsoft SQL Server <*version*> > SQL Server Management Studio.
2. Right-click the server, and then select Properties.
3. In the General page, verify the service pack from the Version field. This number corresponds to a service pack version in a matrix on the Microsoft support website. Please refer to the Microsoft site to determine if you have the correct version.

Configure MS SQL Server Databases

The following sections describe MS SQL Server configuration requirements for setting up the FTPC databases. As you configure the database, record the appropriate information in the table in the "Install MS SQL Server Database Server" on page 14.

While the sections in this chapter cover the requirements for setting up your database environment, Chapter 4, "Database Server Performance" discusses configuration settings that may be helpful, depending on your site requirements. Review that chapter for suggestions on increasing performance and optimizing your environment.

Create a Database User

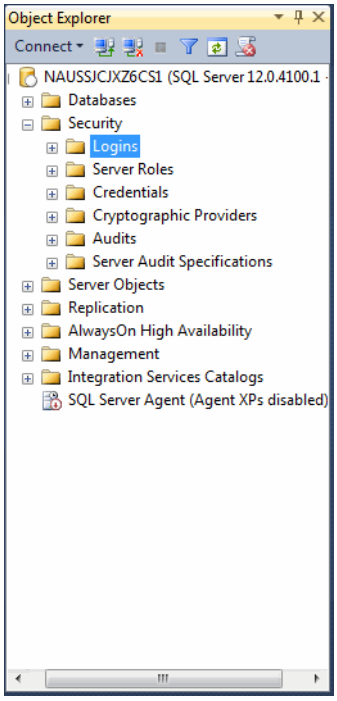
To enable the Application and Reporting servers to connect to the databases, you must configure a user with the required permissions for all five databases.

IMPORTANT: Do not create a username that starts with a number.

In SQL Server Management Studio, follow the steps below to create a new user and password with the following properties:

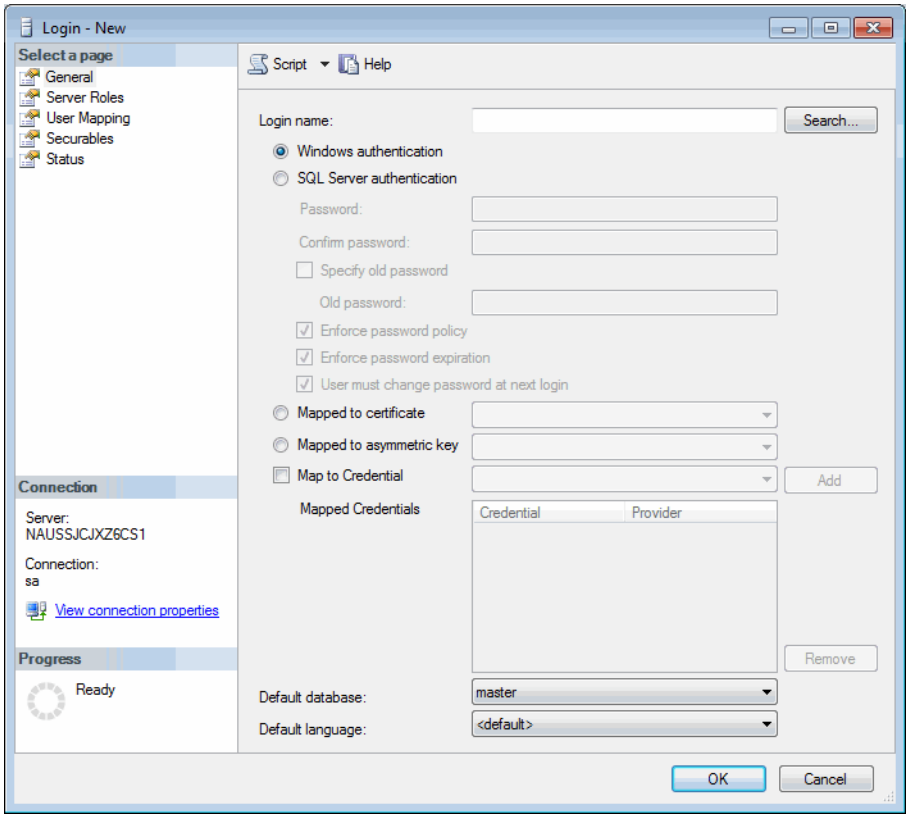
1. Open SQL Server Management Studio.
2. In the Object Explorer, expand your server. Open Security.

Figure 2-17: Microsoft SQL Server Management Studio



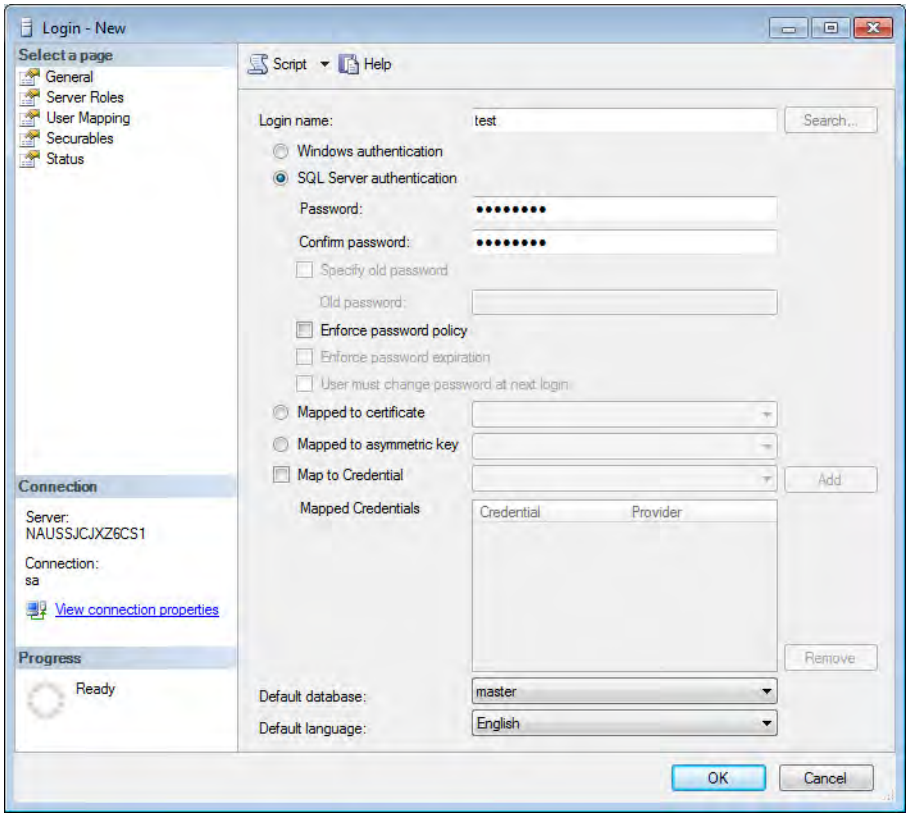
3. Right-click Logins, and select *New Login*.

Figure 2-18: General Tab



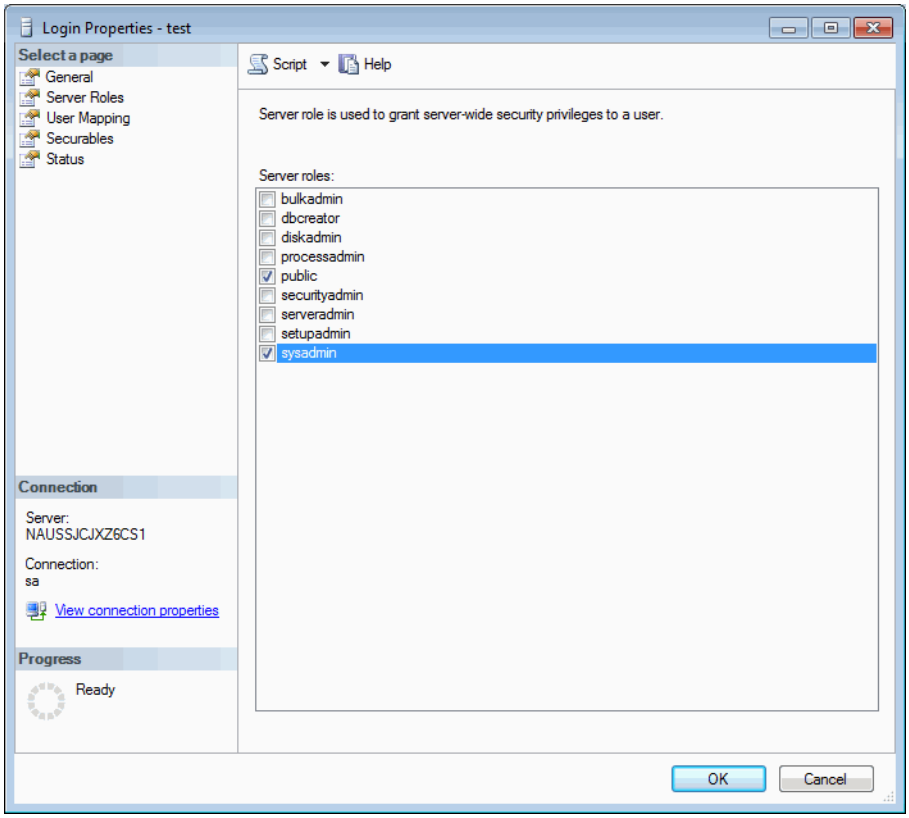
4. Enter the login name, and select *SQL Server authentication.*

Figure 2-19: Create New Login



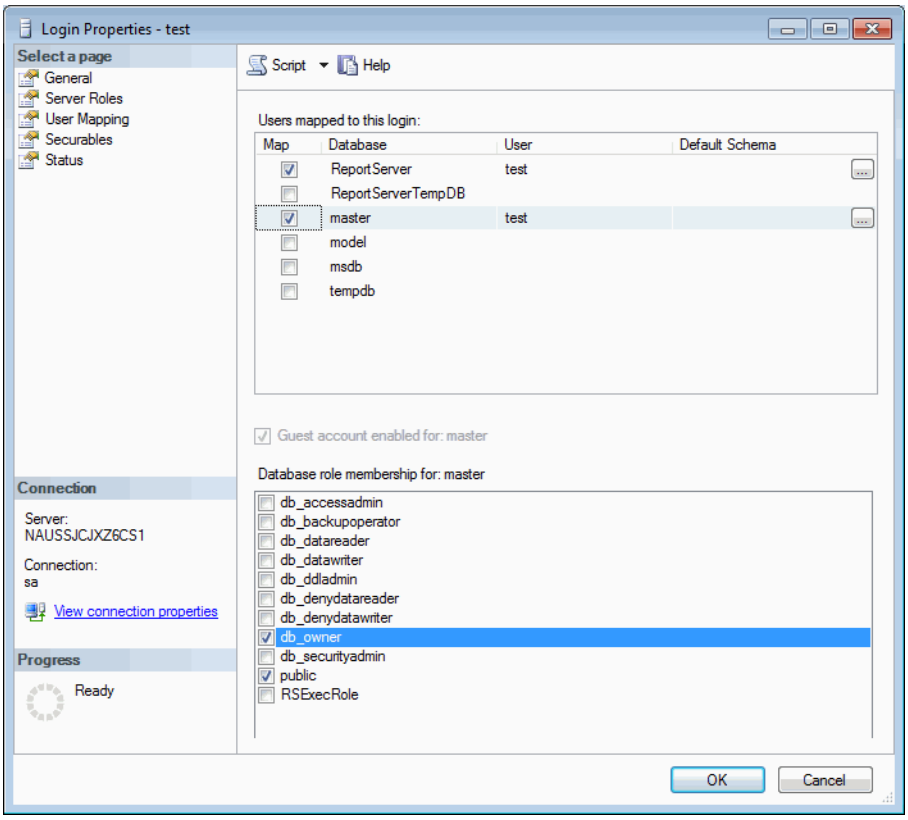
5. Enter a password, select the Default database, and click [OK].
6. Right-click the user you just created and select Properties.
7. In the Login Properties page, select the Server Roles page.
8. In the Server Roles page, set a user role of sysadmin. The database user must be a sysadmin until after the databases are initialized.

Figure 2-20: Server Roles



9. In the *User Mapping* page, select the user(s) you want mapped to this login. Migrations also require the System Administrator role. If sysadmin is removed, make sure db-owner is selected.

Figure 2-21: User Mapping

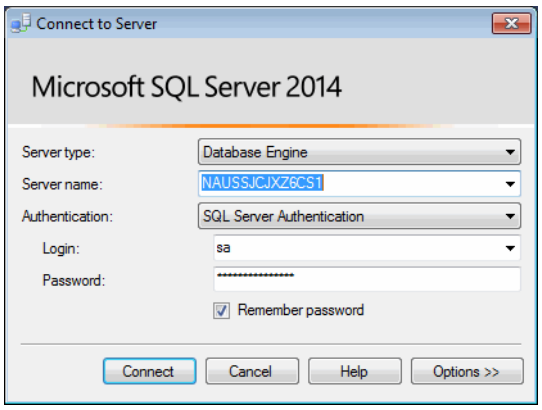


Create the FactoryTalk ProductionCentre Databases

Edit the SQL Server Registration Properties to log into SQL Server Management Studio as the user you just created. To do so, follow the steps below.

1. First select File > Disconnect Object Explorer, then select File > Connect Object Explorer.
2. Use the user and password you just created to log in to MS SQL Server Management Studio.

Figure 2-22: Connect to Server



3. Follow SQL Server procedures to create the necessary databases (either a Production database or both Production and Historical databases) with initial sizes that meet the size and growth requirements for your site, as listed in the table that follows.

IMPORTANT: Do not create a database with a name that starts with a number.

Once you determine the initial size for your database, set the database to grow automatically in increments that are appropriate for your environment.

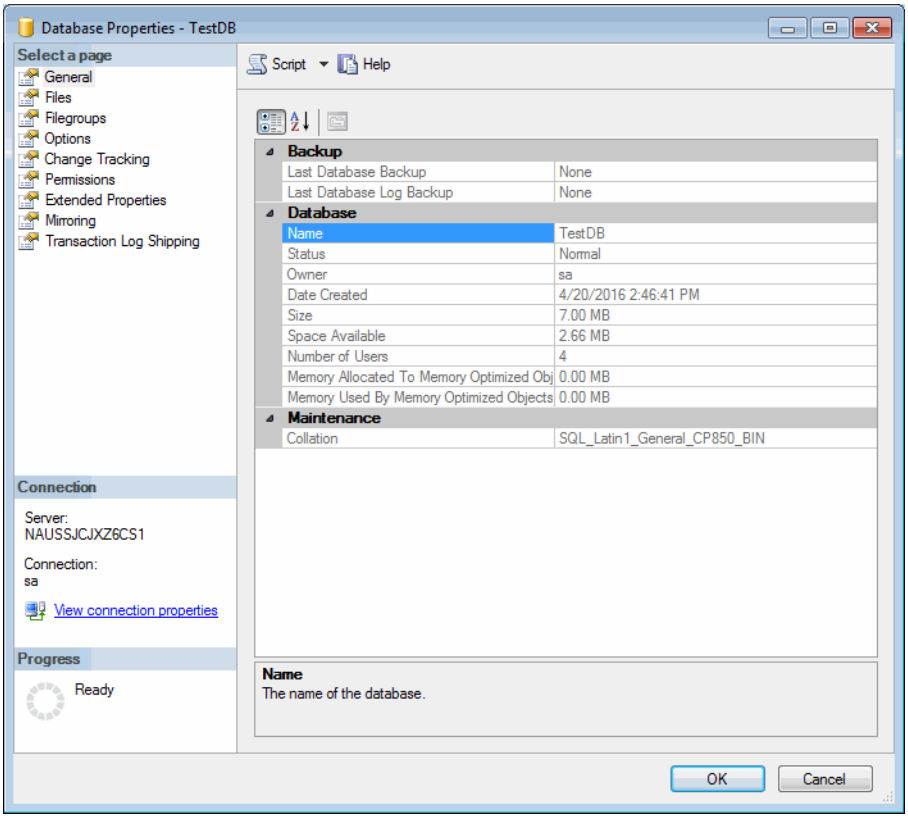
Database	Size
Production	300 MB or greater[a]
Historical (ODS)	300 MB or greater

[a]Depending on your site requirements, you may need to specify a larger size, such as 1 GB, for the database. Also, if you are using the FTPC Object Revision History feature, the database requires double the tablespace size of an application that does not use this feature.

For each of the databases you just created, follow the directions below:

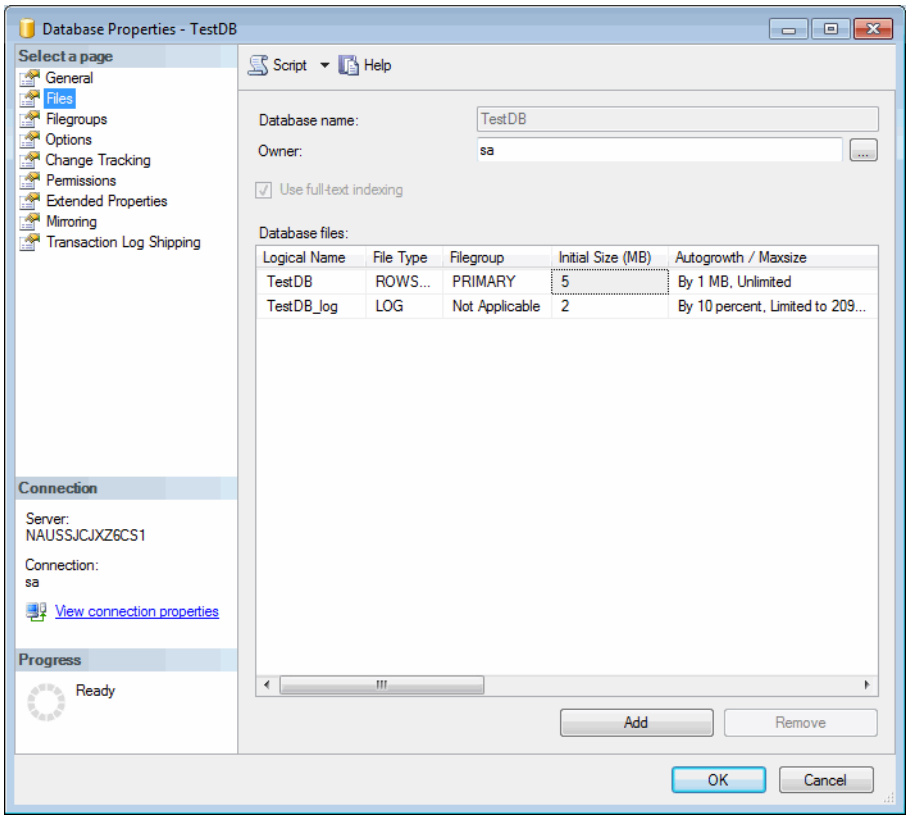
1. Right click the database and select [Properties].

Figure 2-23: Database Properties



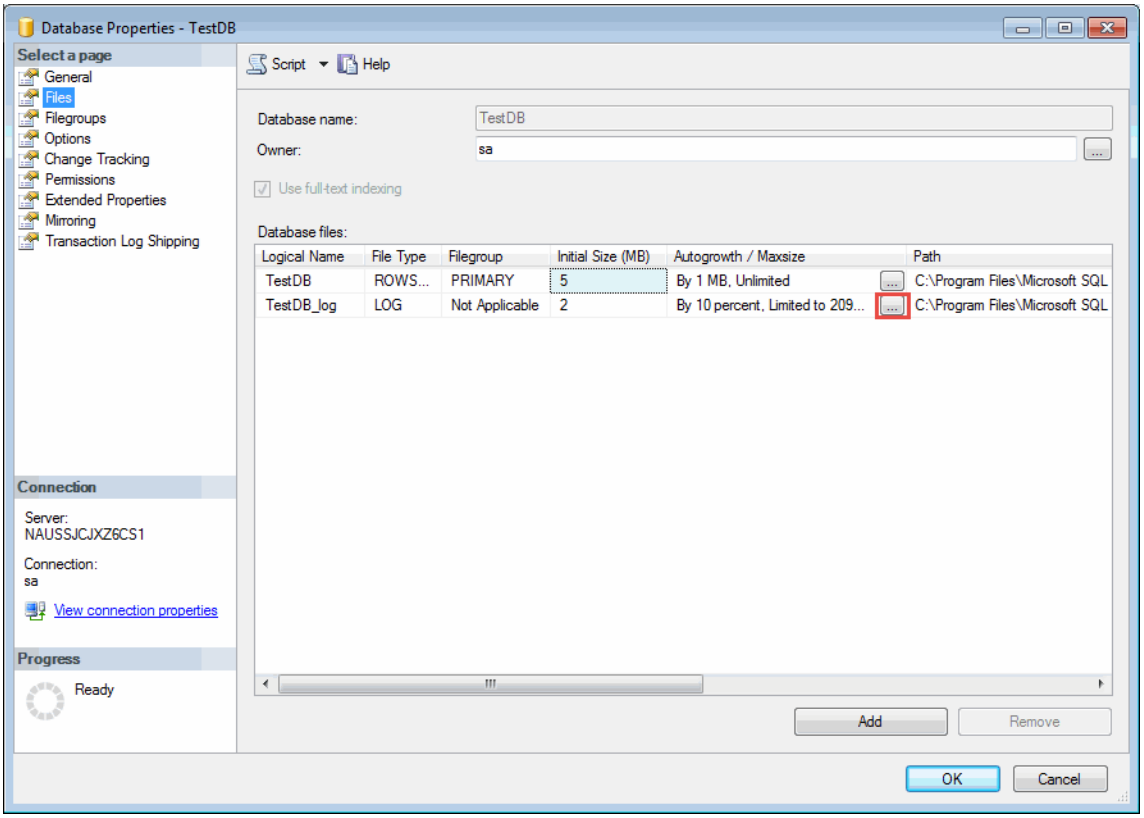
2. In the Database Properties dialog, select the Files tab.

Figure 2-24: Configure Database File Properties



3. In the Files page, click the [...] button as shown in Figure 2-25 to access the dialog to modify your autogrowth settings.

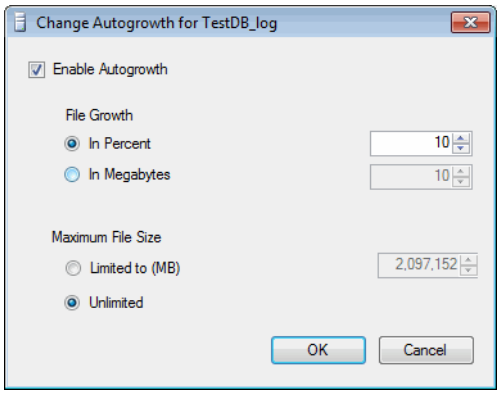
Figure 2-25: Database Properties



When the Change Autogrowth dialog appears, check the **Enable Autogrowth** checkbox and define the **File Growth** type and increment as needed by your environment.

Set the maximum file size to **Unrestricted File Growth** or **Unlimited** depending on your SQL Server version.

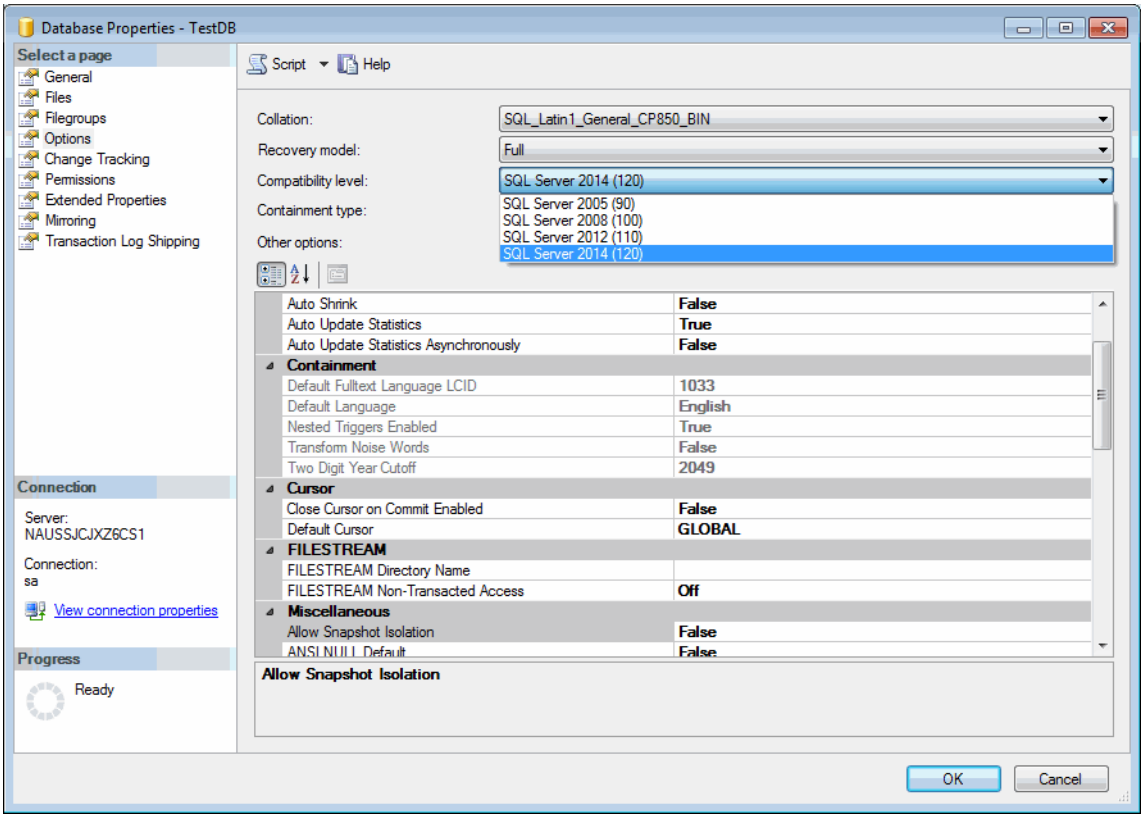
Figure 2-26: Change Autogrowth Dialog



Once you have finished setting the database properties, you must set the compatibility level. To do this, follow the directions below.

1. In the Object Explorer, locate the databases you created in the previous sections. Right-click on each database in turn and select Properties.
2. In the *Database Properties* screen under *Options*, set the Compatibility Level property to the one listed for a SQL Server version supported by FTPC.

Figure 2-27: Set the Compatibility Level



3. Click [OK] to save the configuration and close SQL Management Studio.

Enable the READ_COMMITTED_SNAPSHOT Option

Enabling the READ_COMMITTED_SNAPSHOT option increases the SQL database engine's ability to allow multiple transactions to run at the same time with a reduced chance of deadlocks. Before you enable this option, make sure that your database is not being used by any other process (for example, migration or other queries).

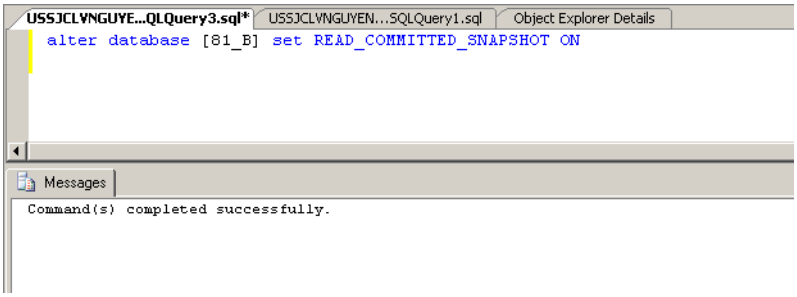
1. In the Object Explorer, locate the databases you created in the previous sections. Right-click on each database in turn, and select New Query.
2. Run the following command:

```
alter database <database_name> set READ_COMMITTED_SNAPSHOT ON
```

where <*database_name*> is the name of the database you selected. If your database name starts with a number, enclose the database name in square brackets. For example:

```
alter database [81_B] set READ_COMMITTED_SNAPSHOT ON
```

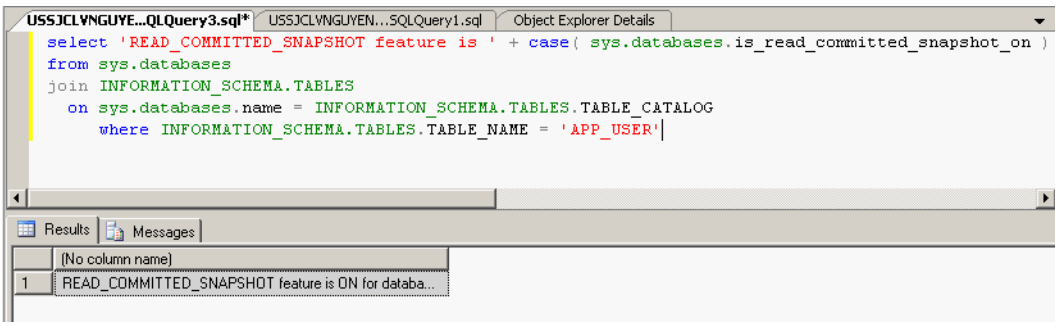
Figure 2-28: Enable the READ_COMMITTED_SNAPSHOT Option



3. To verify that the READ_COMMITTED_SNAPSHOT feature has been enabled on the current database, run the following command:

```
select 'READ_COMMITTED_SNAPSHOT feature is ' + case(
sys.databases.is_read_committed_snapshot_on ) when 1 then 'ON'
else 'OFF' end + ' for database "' +
INFORMATION_SCHEMA.TABLES.TABLE_CATALOG + '"'

from sys.databases

join INFORMATION_SCHEMA.TABLES

  on sys.databases.name =
INFORMATION_SCHEMA.TABLES.TABLE_CATALOG

     where INFORMATION_SCHEMA.TABLES.TABLE_NAME = 'APP_USER'
```

Figure 2-29: Verify the READ_COMMITTED_SNAPSHOT Option



Configure Optional SQL Filegroups

FTPC Administrator provides a database Reorganization tool that will allow you to assign logical groups of tables (e.g., fast growing, slow growing, indexes, etc.) to tablespaces that you create in the database(s) for this purpose. If you will use this feature, you can create the filegroups now, then after installation of the Administration Server, assign them to logical groups. Refer to the *FactoryTalk*

ProductionCentre Administrator User's Guide for more information about assigning tables to logical groups.

Chapter 3

Oracle Installation and Configuration

In this chapter

- **Install the Windows Operating System 42**
  - Install Required Patches 42
- **Install Oracle 42**
  - Installing the Database Software 44
- **Configure the Oracle Databases 54**
  - Configure a Listener 55
  - Create a Database 58
  - Create the Tablespaces 90
  - Create the User 97
  - Create a Local Net Service Name 104
  - Migrate a Database 104

This chapter describes the choices required by FTPC during an Oracle product installation. This document also provides requirements, but not instructions, on how to create the databases that are used by FTPC. To complete the installation and configuration, refer to your Oracle documentation.

Oracle can run on any platform supported by Oracle, but the FTPC installer must be run on a Windows machine. See the installation documentation from your software provider regarding non-Windows database installations.

Install the Windows Operating System

If you will be installing the Oracle software on a Windows operating system, follow the database documentation instructions. Keep the following requirements in mind:

- ❑ You must use NTFS. The FAT file system is not supported.
- ❑ The installation user must be a member of the Administrator group on the machine where you will install Oracle.
- ❑ All servers and clients must be connected over the network using TCP/IP.

Install Required Patches

Refer to the *FactoryTalk ProductionCentre Supported Platforms Guide* for any required patches that must be installed with the Windows operating system.

Install Oracle

IMPORTANT: An Oracle DBA should perform the Oracle Server installation and configuration.

The installation steps covered in this section apply to installations when working with FTPC. Specific steps for configuring the FTPC databases are available in “Configure the Oracle Databases” on page 54.

Your databases must have enough free space to meet the needs of your applications. The amount of free space you need depends on many factors, including logging settings and the number of transactions. Consult Rockwell Automation Customer Support to estimate how much space you need.

You must be logged in as an Administrative user. See “User Privileges” on page 7 for user privilege information.

We recommend that you install the database, application server, and reporting server software on different machines. It is possible to install any combination of

the software, such as the database and application server software, on the same machine, but you will experience performance degradation.

You will need some database information when you connect the application and reporting servers to the database. You can use the following table to record the information as you configure your database.

Table 3-1 Oracle Database Information

Properties	Production Database	Historical (ODS) Database
Server Host Name		
SID		
Listener Port		
Tablespace Name		
User Name		
User Password		
Local Net Service Name		
Note: Oracle System Identifier is also called database instance Service Name.		

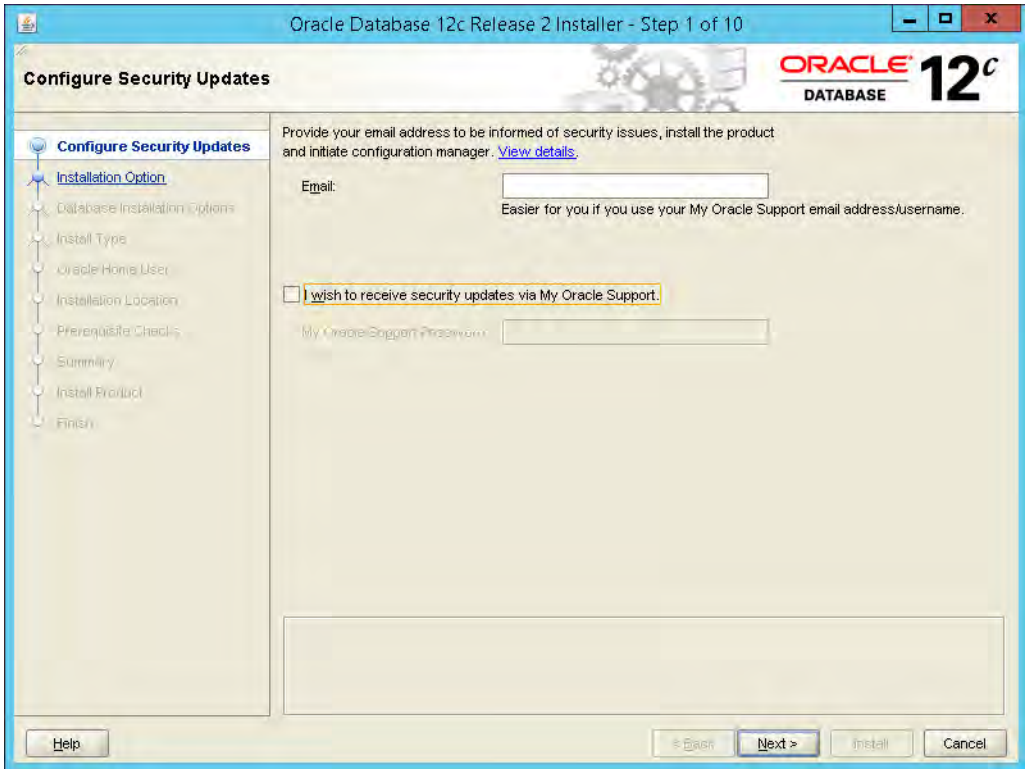
This document does **not** describe all the steps required to install Oracle. See your Oracle documentation for complete installation instructions.

Installing the Database Software

To install the Oracle database software, perform the following steps:

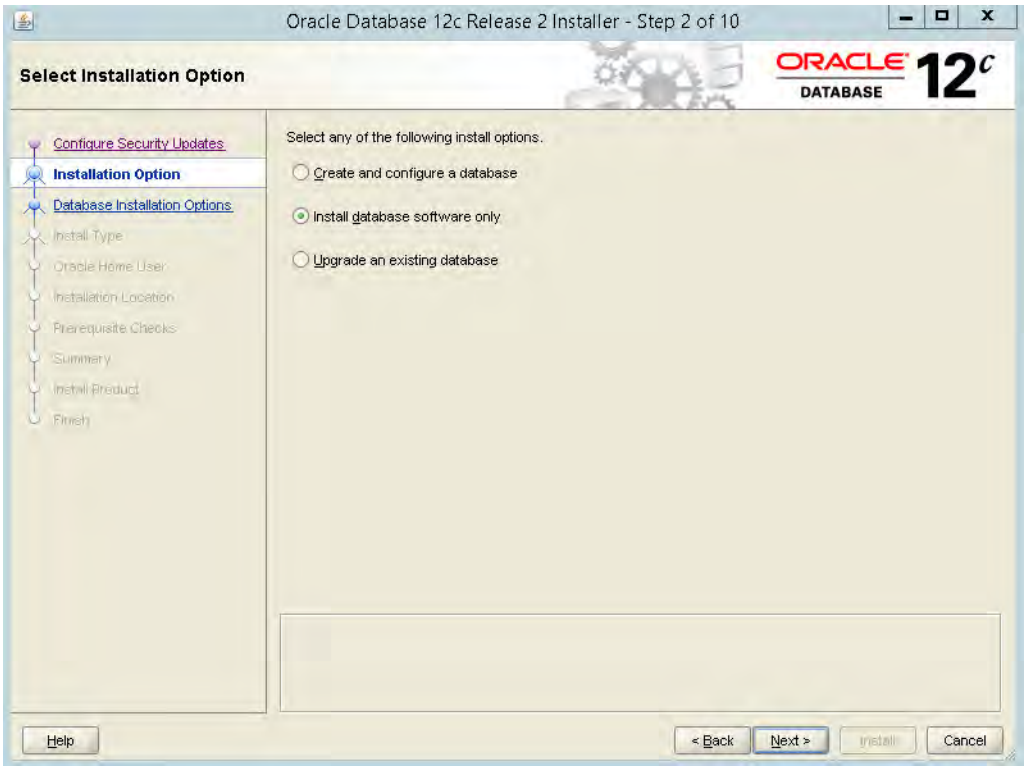
1. In the Configure Security Updates dialog, provide your email address in the space provided if you want to be informed of security issues and click [Next]. If you wish to receive security updates via My Oracle Support, click the provided checkbox and enter your Oracle support password.

Figure 3-1: Configure Security Updates



2. In the Select Installation Option dialog, select *Install database software only* and click [Next].

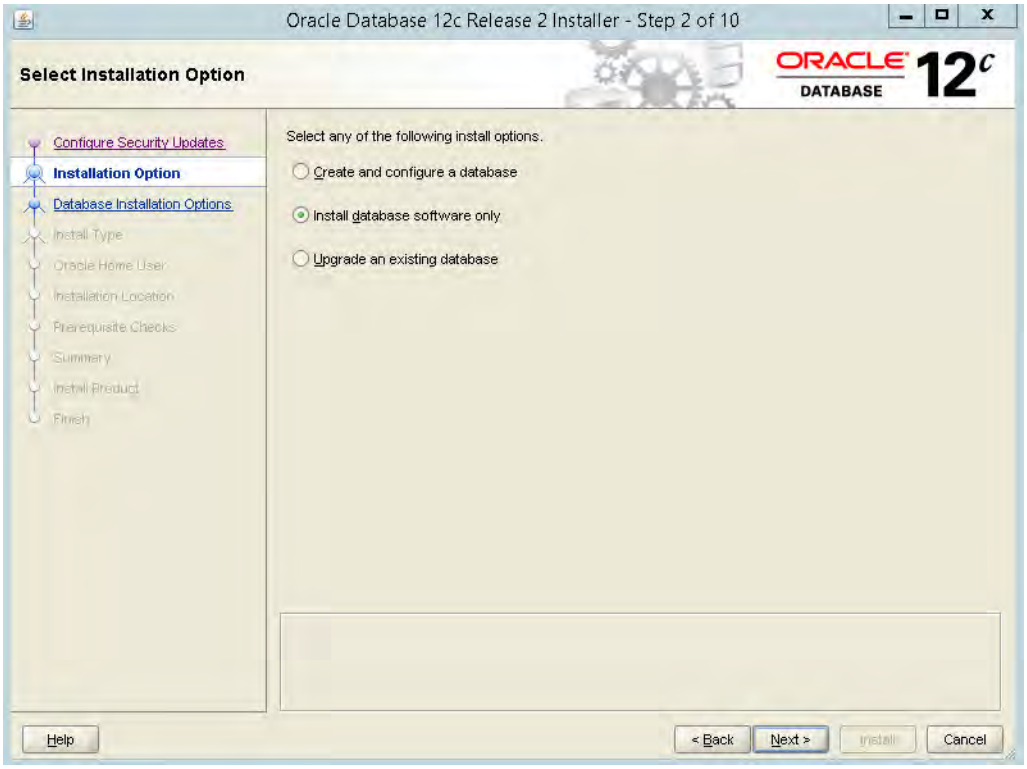
Figure 3-2: Oracle Installation Option



3. At the Grid Installation Options (11g) or Installation Options (12c) dialog, select *Single instance database installation*, then click [Next].

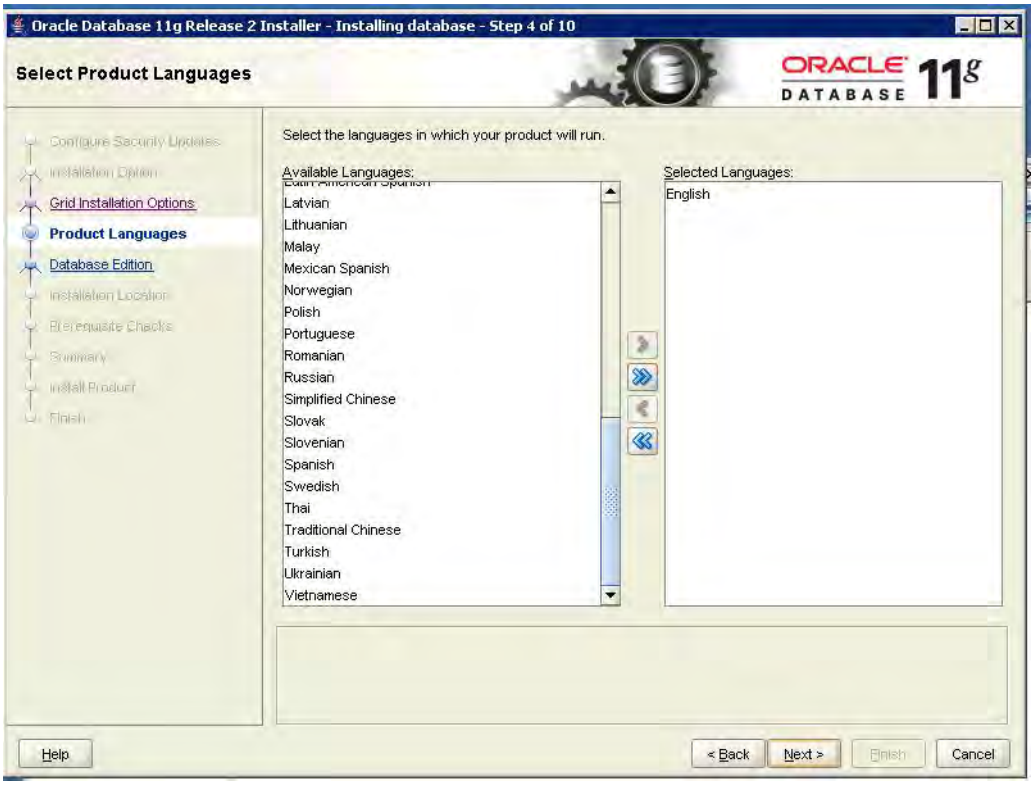
   If you are installing Oracle 11g, proceed to the next step. If you are installing Oracle 12c, proceed to step 5 on page 47.

Figure 3-3: Installation Options



4. In the Select Product Languages dialog, select the language(s) you want your product to run in, then click [Next].

Figure 3-4: Select Product Languages



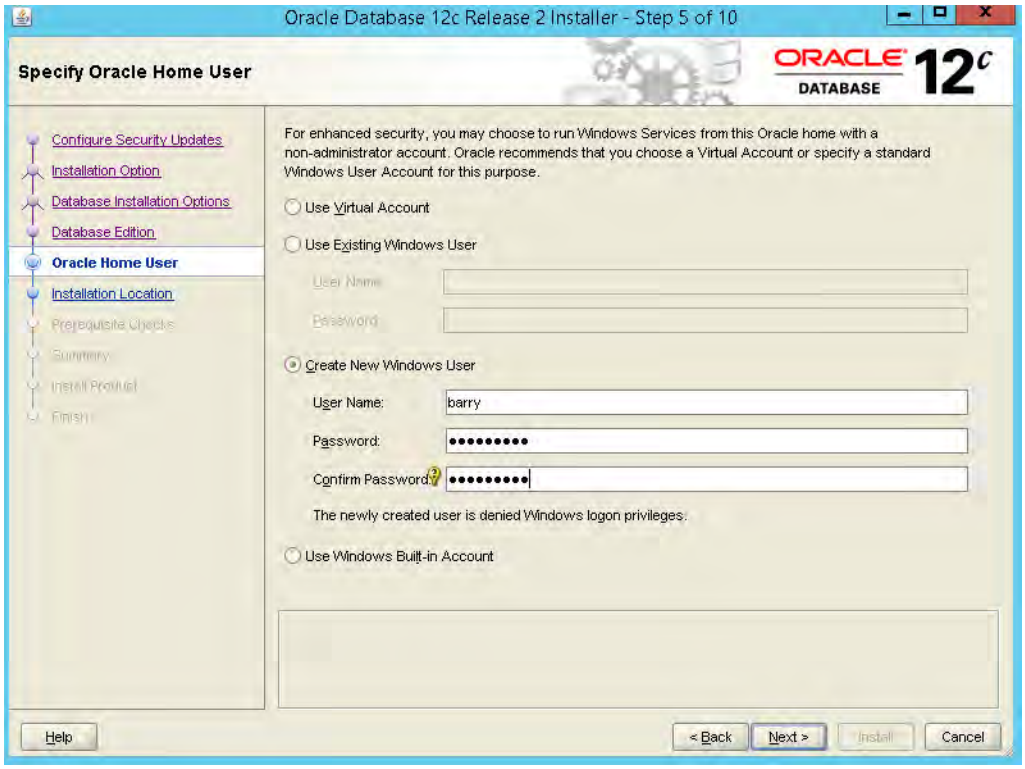
5. In the Select Database Edition dialog, choose the radio button for the database edition you wish to install and click [Next].

   If you are installing Oracle 12c, proceed to the next step. If you are installing Oracle 11g, proceed to step 7 on page 49.

Figure 3-5: Select Database Edition

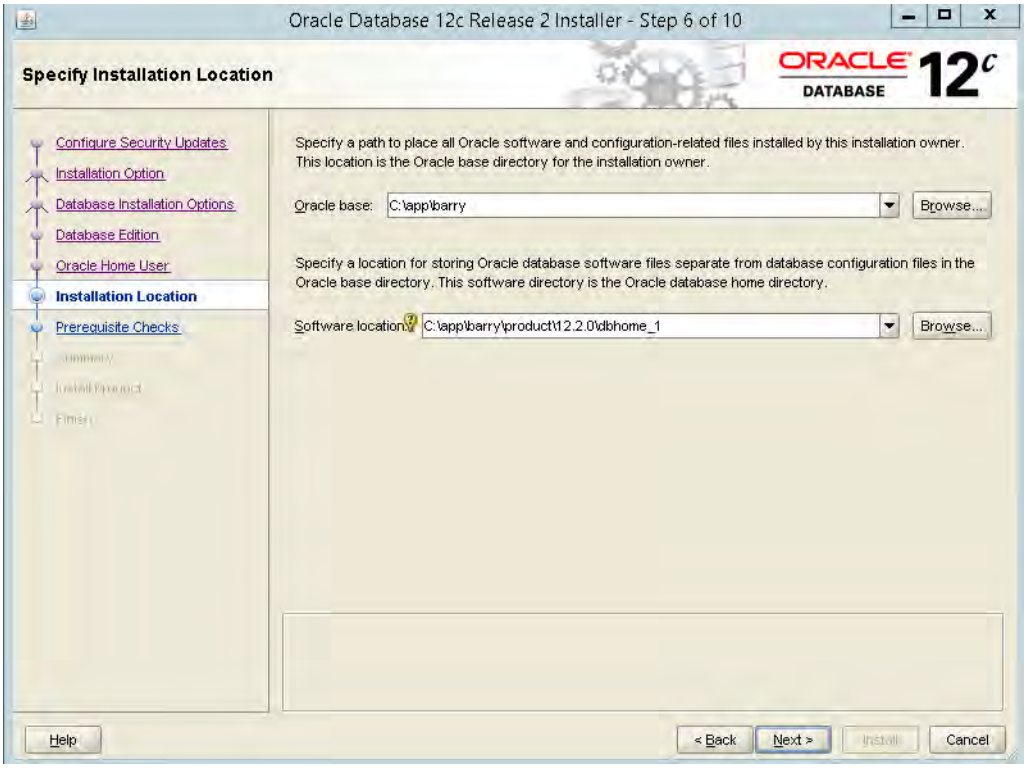
6. In the Specify Oracle Home User dialog, select whether to use an existing Windows user, create a new Windows user, or use a Windows built-in account as the Oracle Home user. If you choose to use an existing or new Windows user, then you must enter the appropriate credentials. Click [Next].

Figure 3-6: Specify Oracle Home User



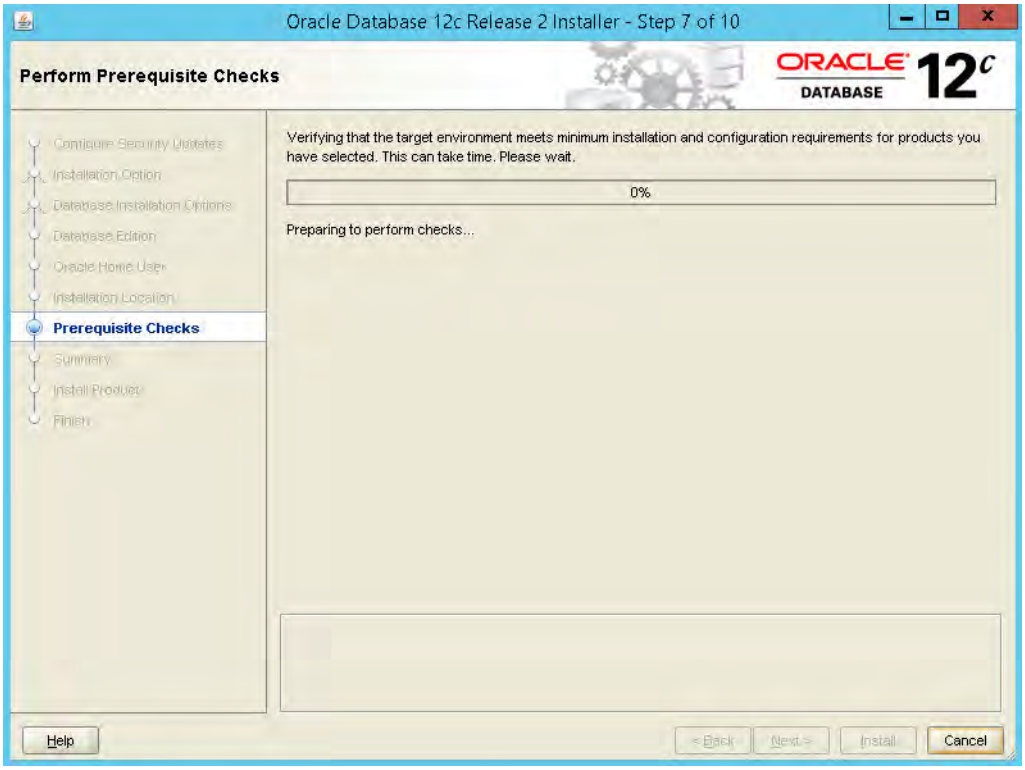
7. In the Specify Installation Location dialog, enter the directory where you want to place all Oracle software and configuration-related files, then click [Next].

Figure 3-7: Specify the Installation Location



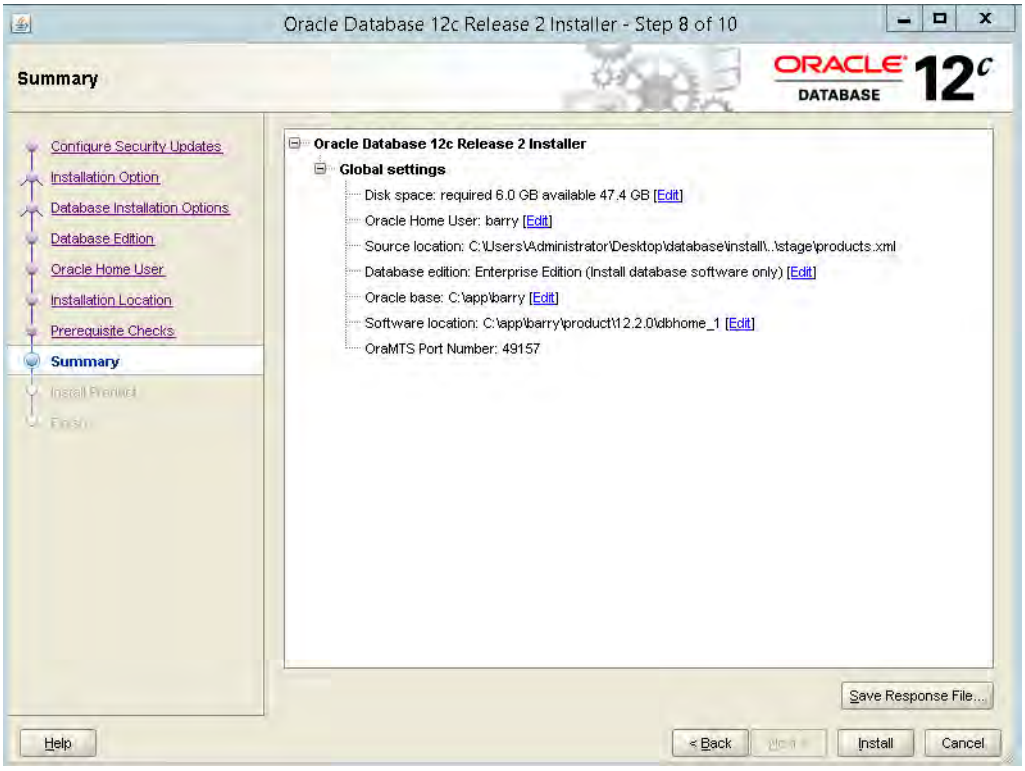
The system verifies that the target environment meets the minimum installation and configuration requirements for the products you selected. This may take several minutes to complete.

Figure 3-8: Perform Prerequisite Checks



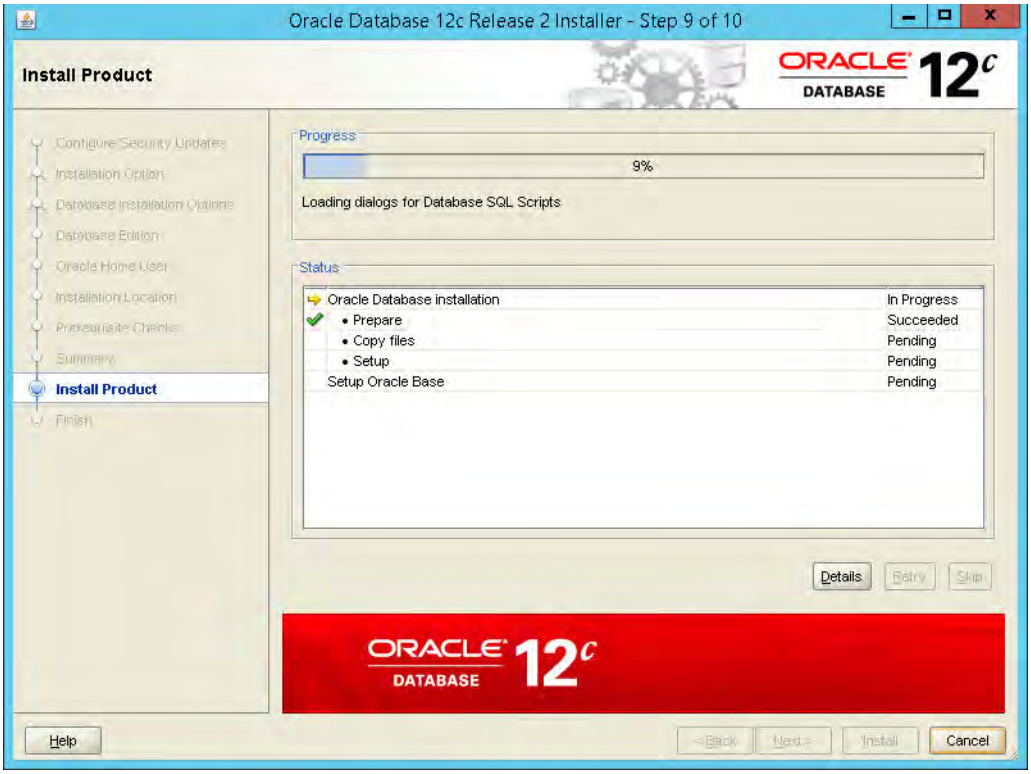
8. In the Summary dialog, click [Finish] (11g) or [Install] (12c) to complete the installation.

Figure 3-9: Summary



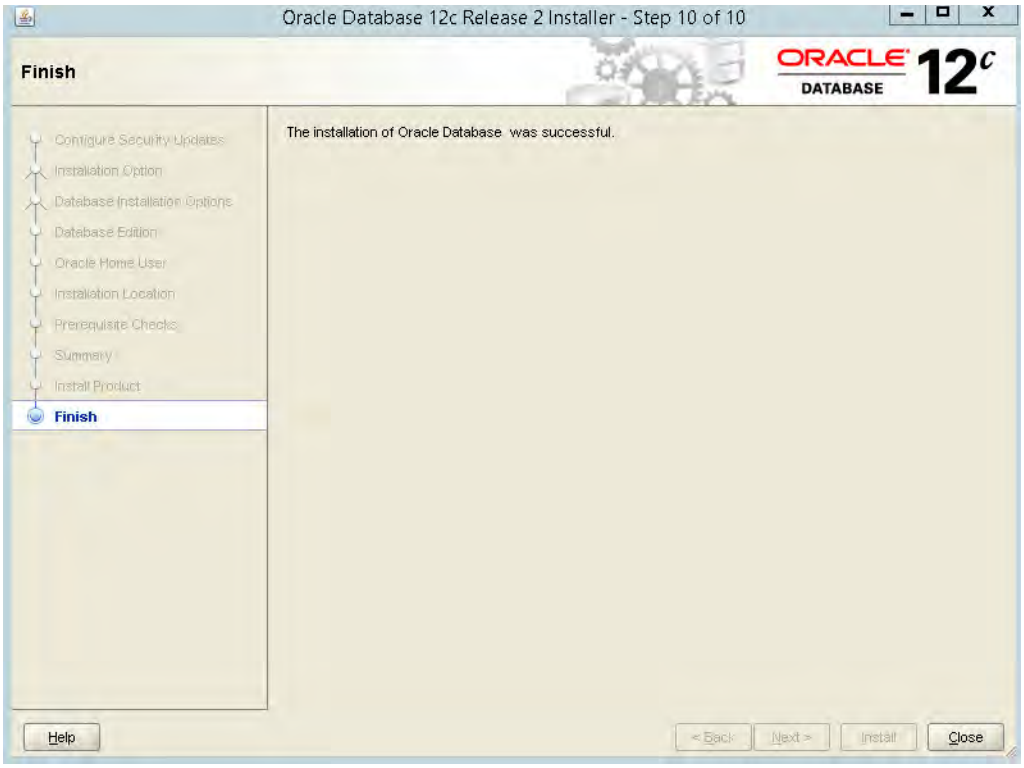
The database is installed. This may take some time to complete.

Figure 3-10: Install Product



9. If the database installation was successful, the Finish dialog appears. Click [Close] to finish the installation process.

Figure 3-11: Database Installation Complete



Configure the Oracle Databases

The following sections describe the configuration dialogs and settings required for configuring the FTPC databases. As you configure the databases, record the appropriate information in “Oracle Database Information” on page 43.

While the sections in this chapter cover the requirements for setting up your database environment, Chapter 4, “Database Server Performance” discusses configuration settings that may be helpful for optimizing your environment, depending on your site requirements. Review that chapter for suggestions on increasing performance.

The configuration steps that affect FTPC databases are described in detail in the following sections:

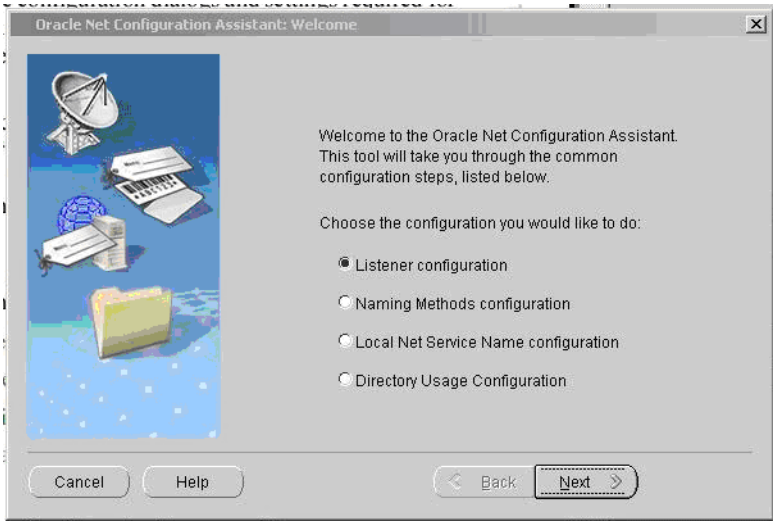
- “Configure a Listener” on page 55
- “Create a Database” on page 58
- “Create the Tablespaces” on page 90
- “Create the User” on page 97
- “Create a Local Net Service Name” on page 104

Configure a Listener

Before you create your database, you must configure a listener. To do so, run Net Configuration Assistant by navigating to Start > <*Oracle_home*> > Configuration and Migration Tools > Net Configuration Assistant where <*Oracle_home*> is the directory location you specified in step 7 on page 49.

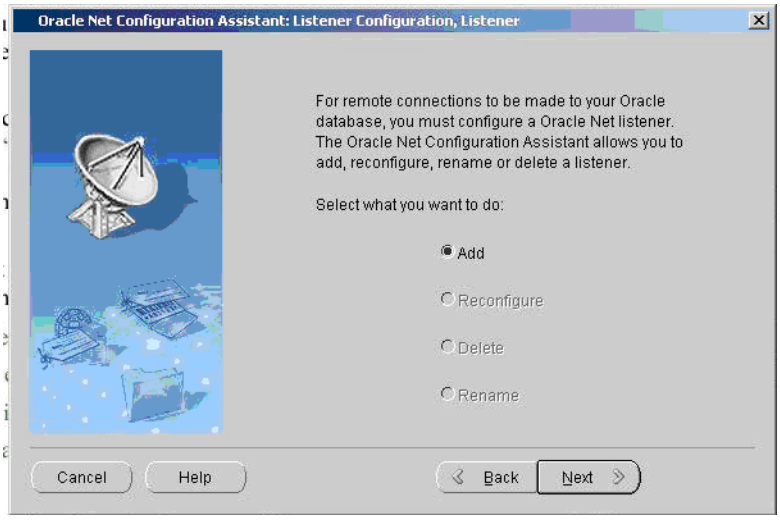
1. In the Net Configuration Assistant, choose **Listener configuration** and click [Next].

Figure 3-12: Listener Configuration Assistant Welcome



2. Select **Add** and click [Next].

Figure 3-13: Select Type of Task



3. Enter a name for your listener, and click [Next]. For Oracle 12c, you will be asked to enter credentials for the Oracle Home User account, as shown in Fig. 3-15.

Figure 3-14: Name Your Listener (Oracle 11g)

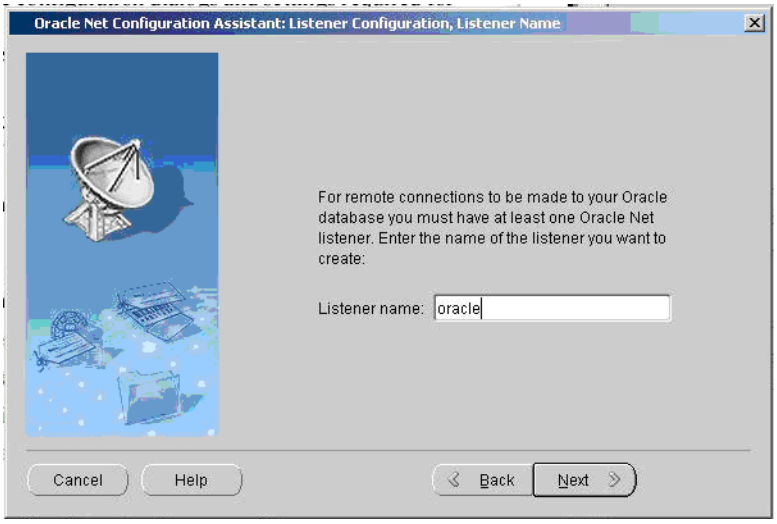
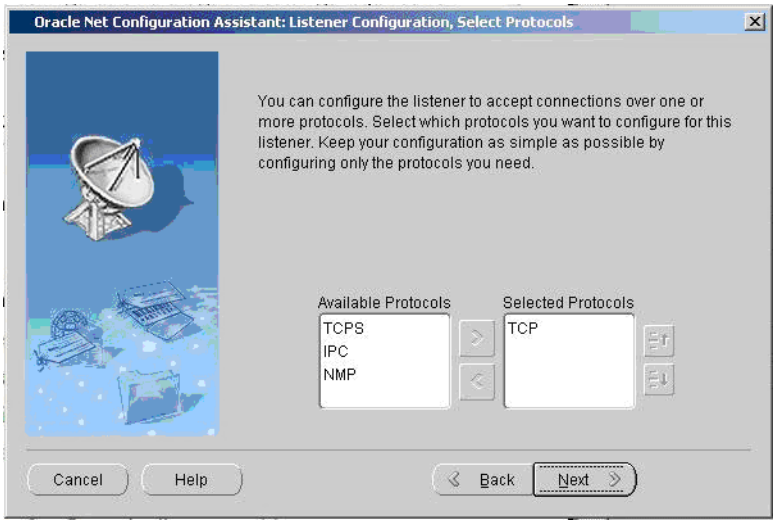


Figure 3-15: Name Your Listener (Oracle 12c)

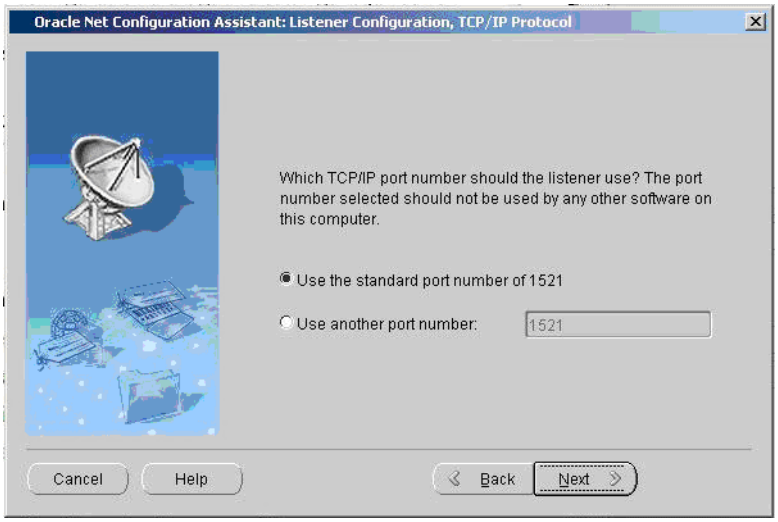
4. Click [Next] to accept the default listener protocols.

Figure 3-16: Select Listener Protocols



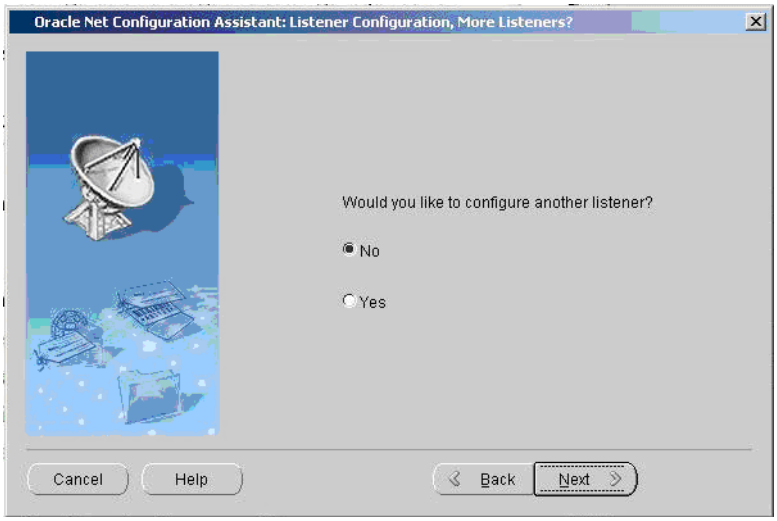
5. Click [Next] to accept the standard port number of 1521.

Figure 3-17: Listener Configuration, TCP/IP Protocol



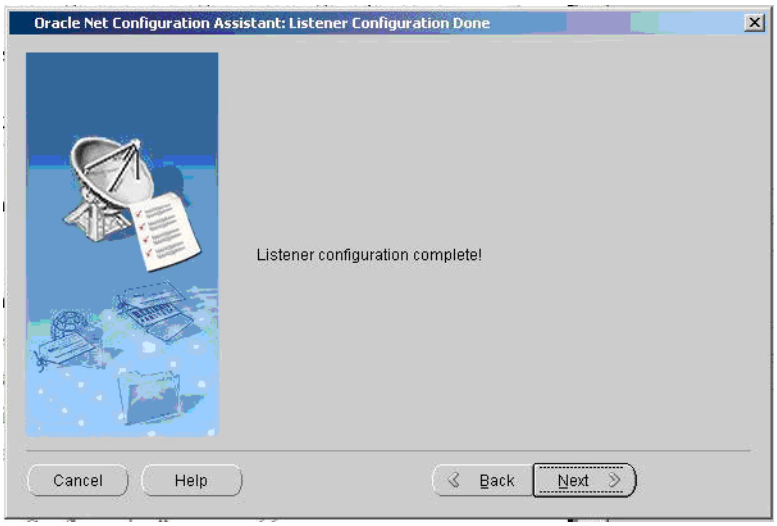
6. You have now finished configuring a listener. Select *No* to avoid configuring another listener, then click [Next].

Figure 3-18: Finish Configuring a Listener



7. Exit the Oracle Net Configuration Assistant by clicking [Cancel].

Figure 3-19: Exit the Oracle Net Configuration Assistant



Create a Database

To create a database with the Oracle 11g/12c Database Configuration Assistant (DBCA), refer to the following sections:

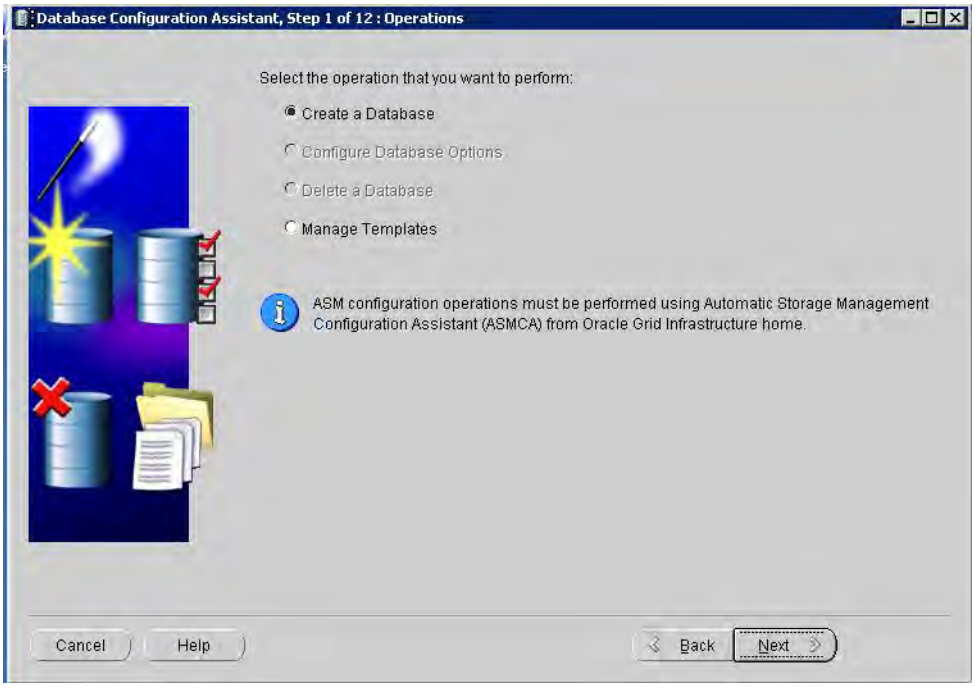
- "Create a Database on Oracle 11g" on page 58
- "Create a Database on Oracle 12c (version 12.1)" on page 67
- "Create a Database on Oracle 12c (version 12.2)" on page 75

Create a Database on Oracle 11g

To create a database using the Oracle 11g DBCA, perform the following steps:

1. Navigate to All Programs > <*Oracle_home*> > Configuration and Migration Tools > Database Configuration Assistant where <*Oracle_home*> is the directory location you specified in step 7 on page 49. Select the “Create a Database” radio button and click [Next].

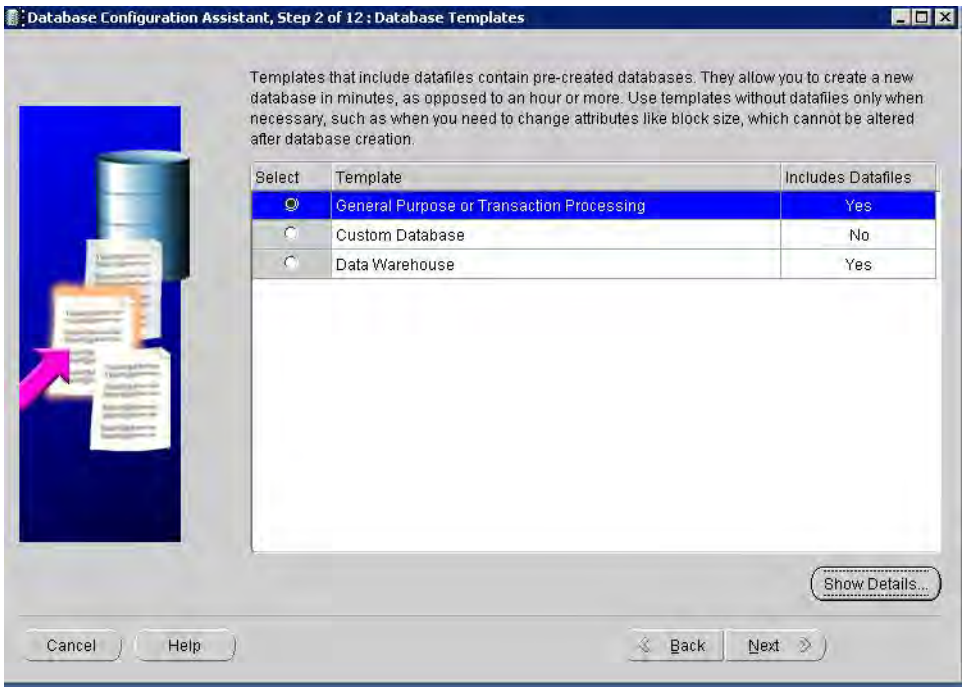
Figure 3-20: Create a Database



2. Select a database template and click [Next].

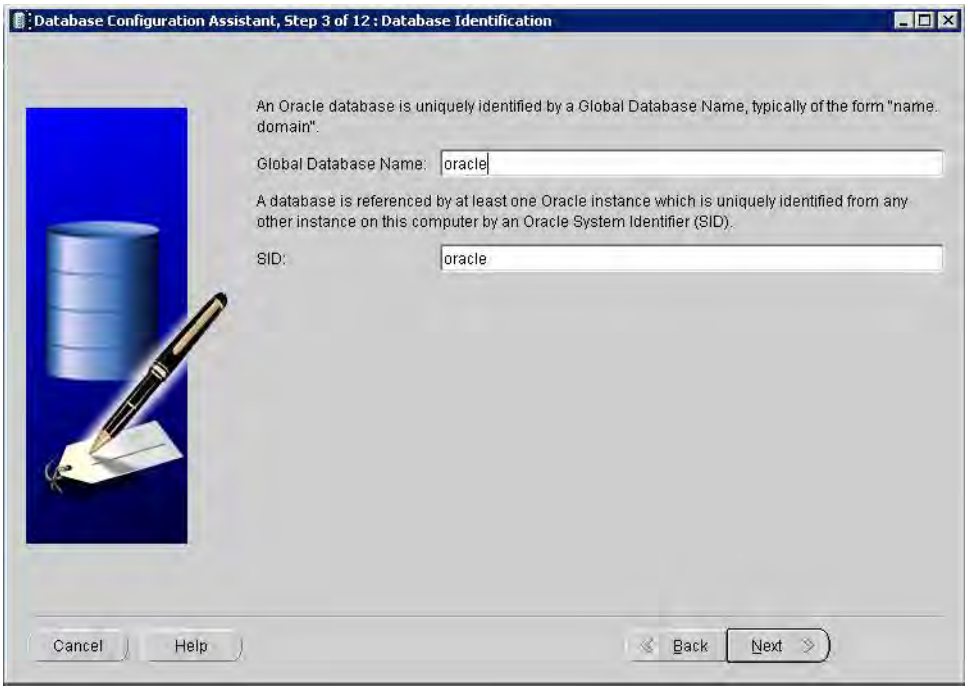
NOTE: Rockwell Automation recommends *General Purpose* or *Transaction Processing* for the Production database and *Data Warehouse* for the ODS database.

Figure 3-21: Select a Database Template



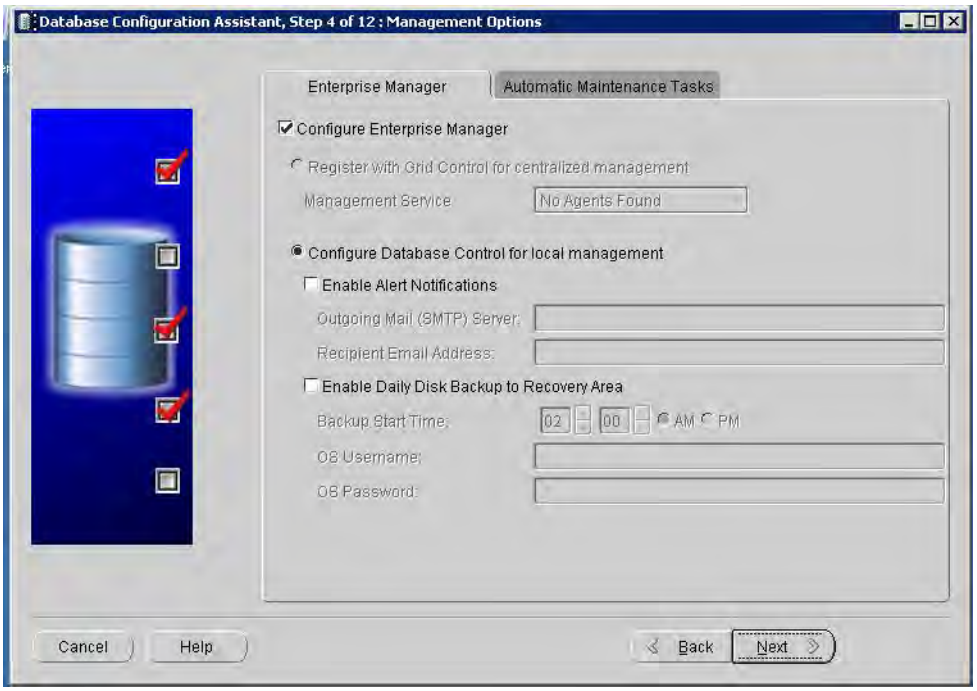
3. Enter a Global Database Name and SID, and click [Next].

Figure 3-22: Database Identification



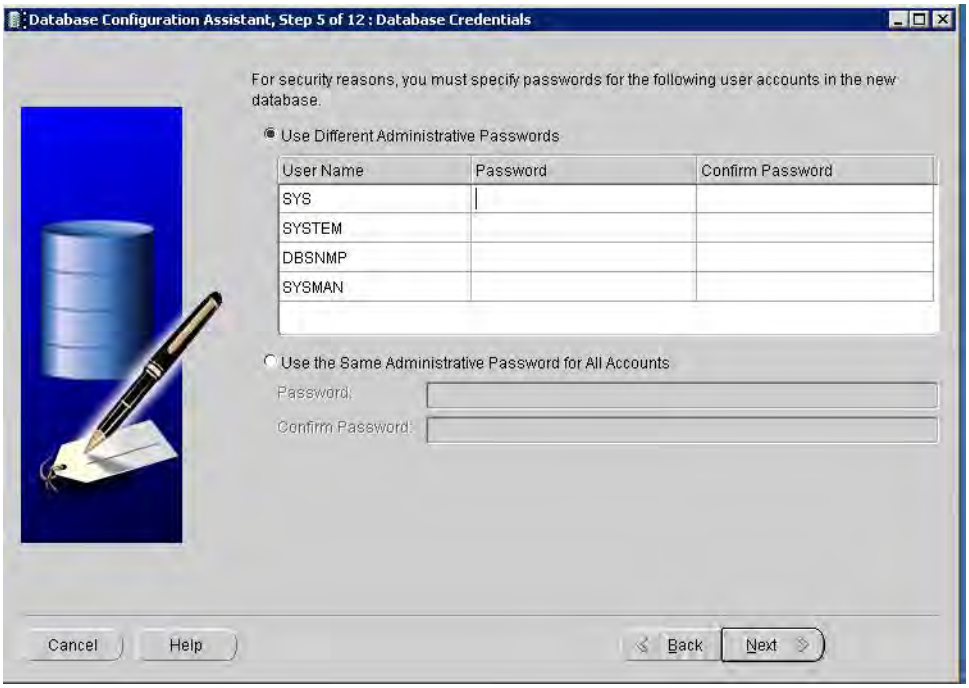
4. In Management Options, click [Next].

Figure 3-23: Management Options



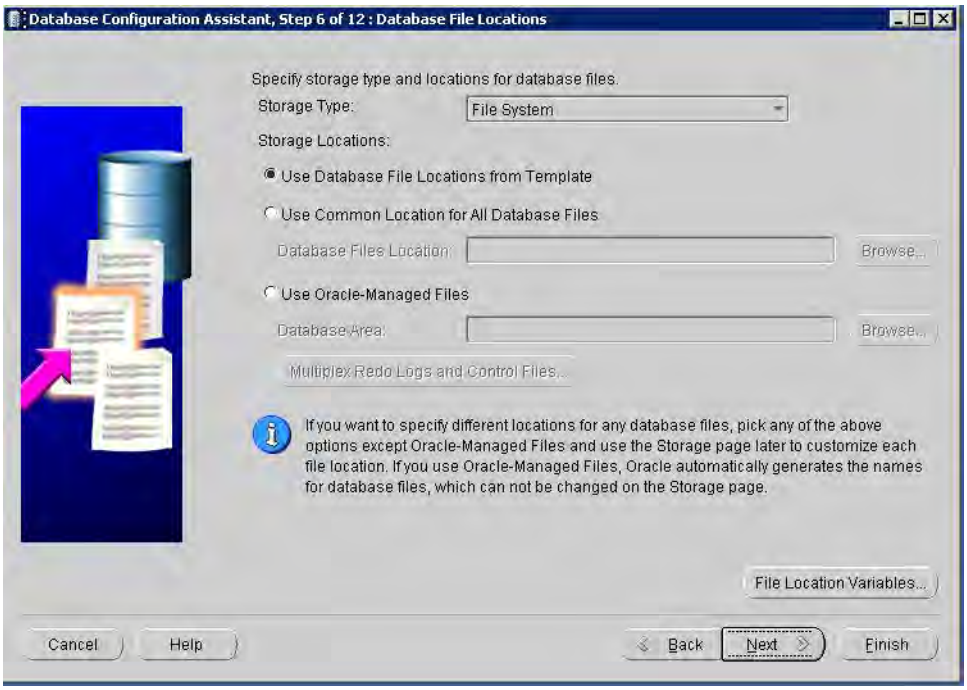
5. In the Database Credentials dialog, set your administrative passwords based on your organization's IT policy and click [Next]. Note these passwords, as you will need them for future steps.

Figure 3-24: Database Credentials



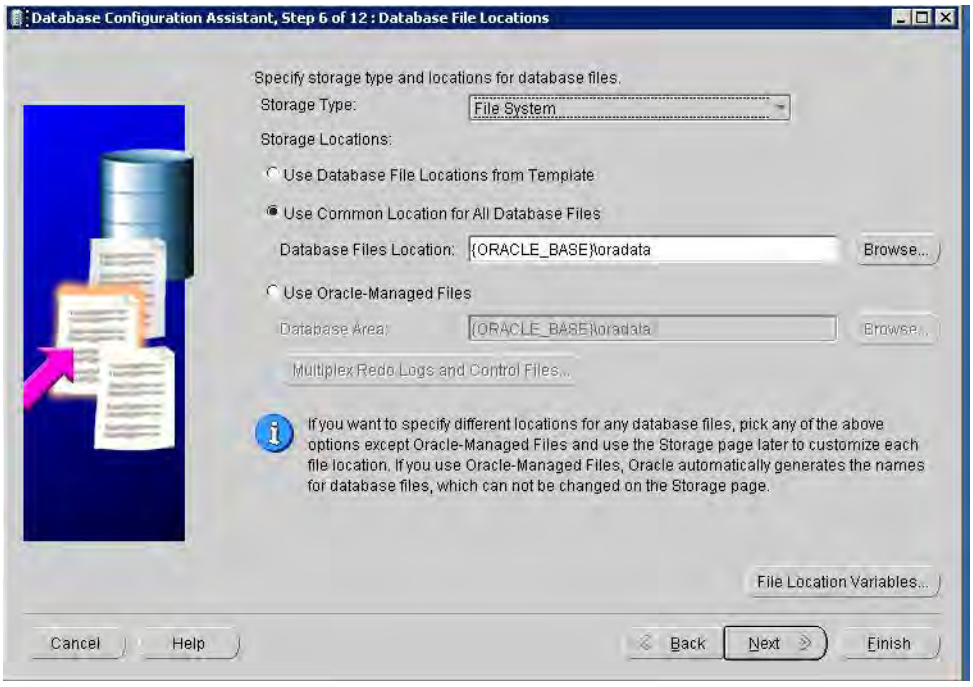
6. In the Database File Locations dialog, select the storage type you would like to use for the database and click [Next].

Figure 3-25: Storage Options



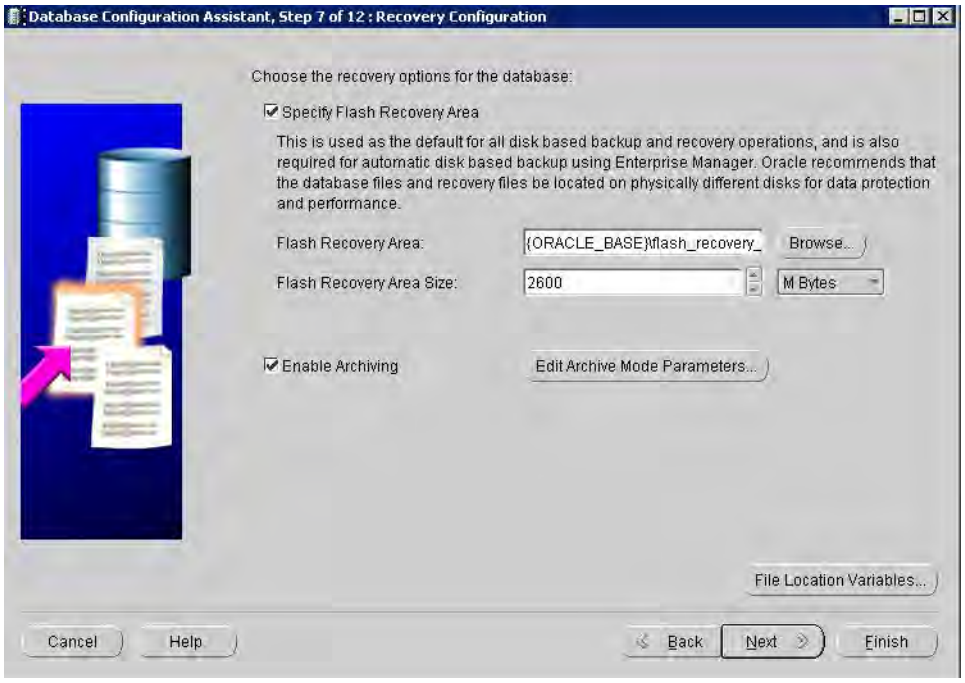
7. If you selected File System in the previous dialog, specify the location where the database files are to be created. Click [Next].

Figure 3-26: Database File Locations



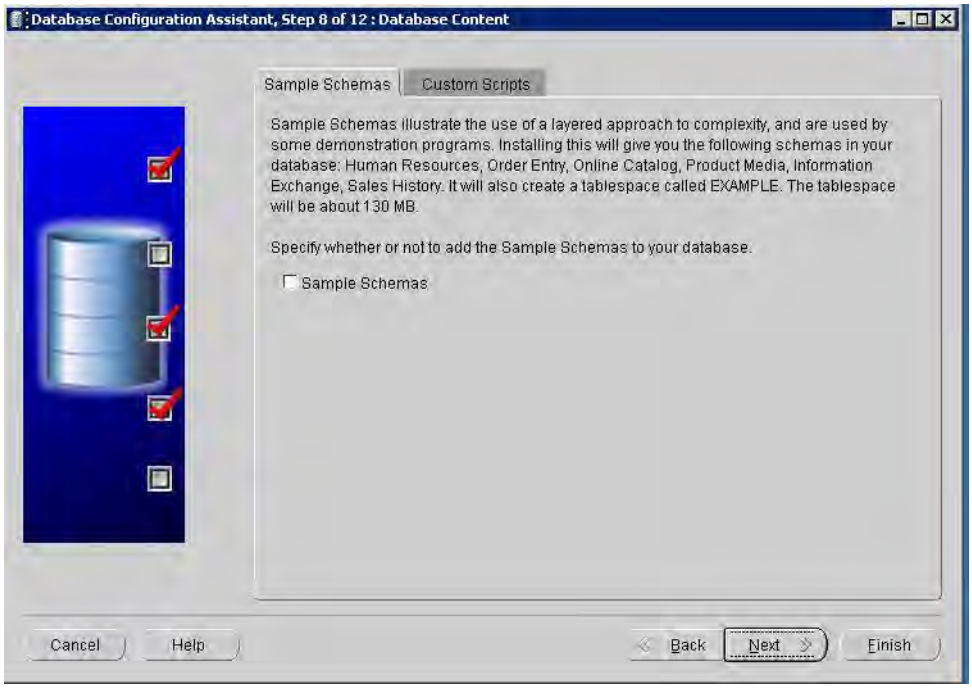
8. In the Recovery Configuration dialog, specify the recovery options you want for the database, then click [Next]. We recommend that you enable archiving.

Figure 3-27: Recovery Configuration



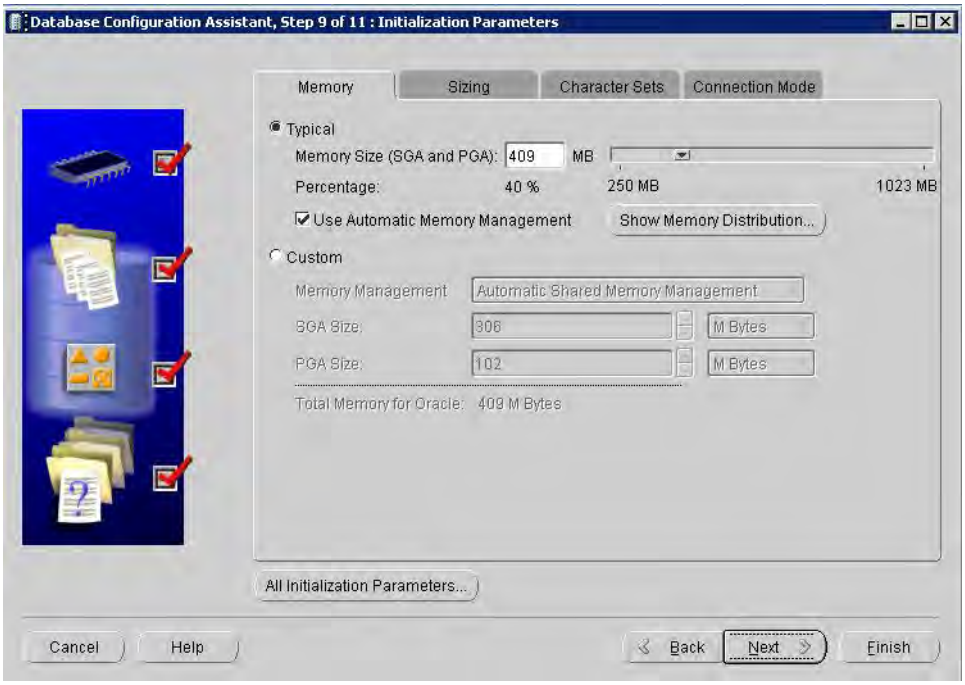
9. In the Database Content dialog, click [Next].

Figure 3-28: Database Content



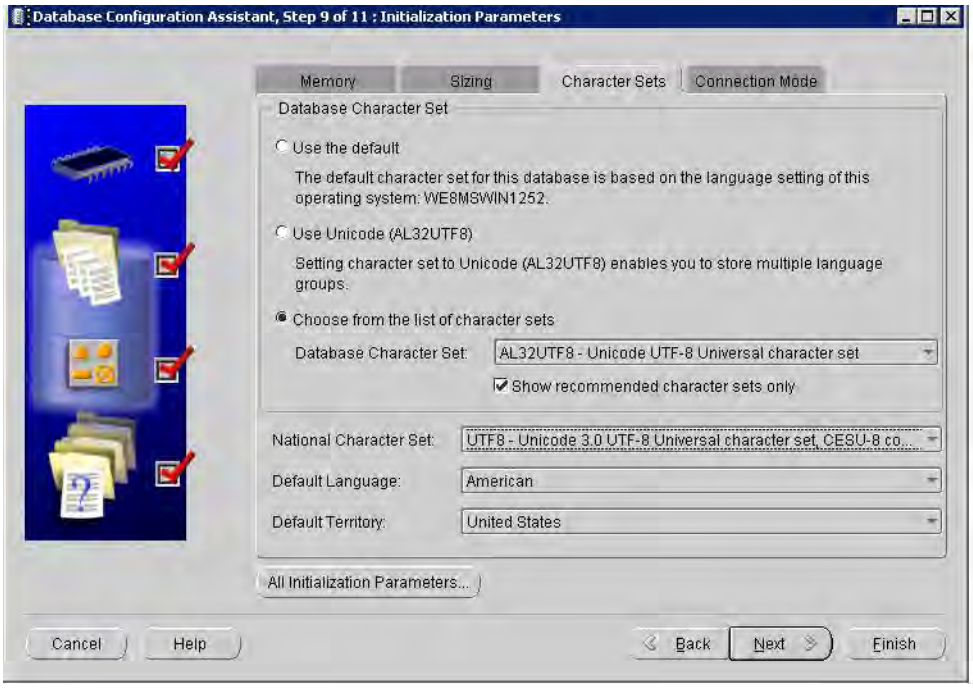
10. In the Initialization Parameters dialog, select the configuration of your choice or take the recommended settings, then choose the Character Sets tab.

Figure 3-29: Initialization Parameters



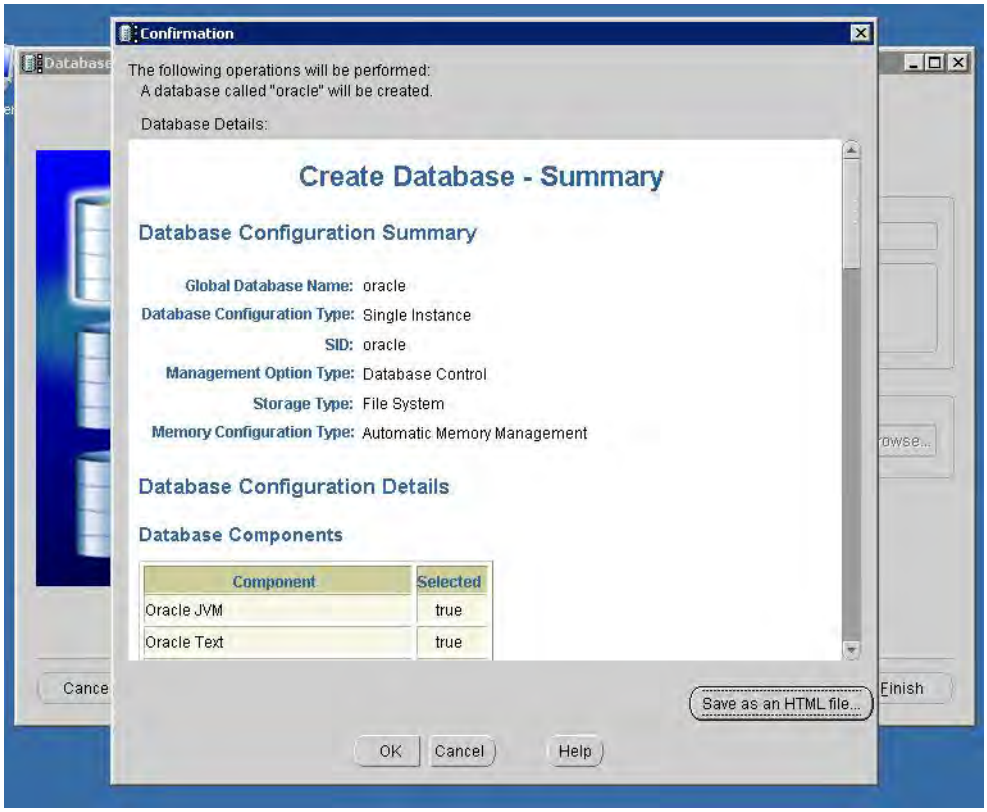
11. Select the *Choose from the list of character sets* radio button. Ensure that AL32UTF8 - Unicode UTF - 8 Universal character set is selected, that National Character Set has “UTF8 - Unicode 3.0 UTF-8 Universal character set, CESU-8 compliant” selected, then click [Finish].

Figure 3-30: Character Sets



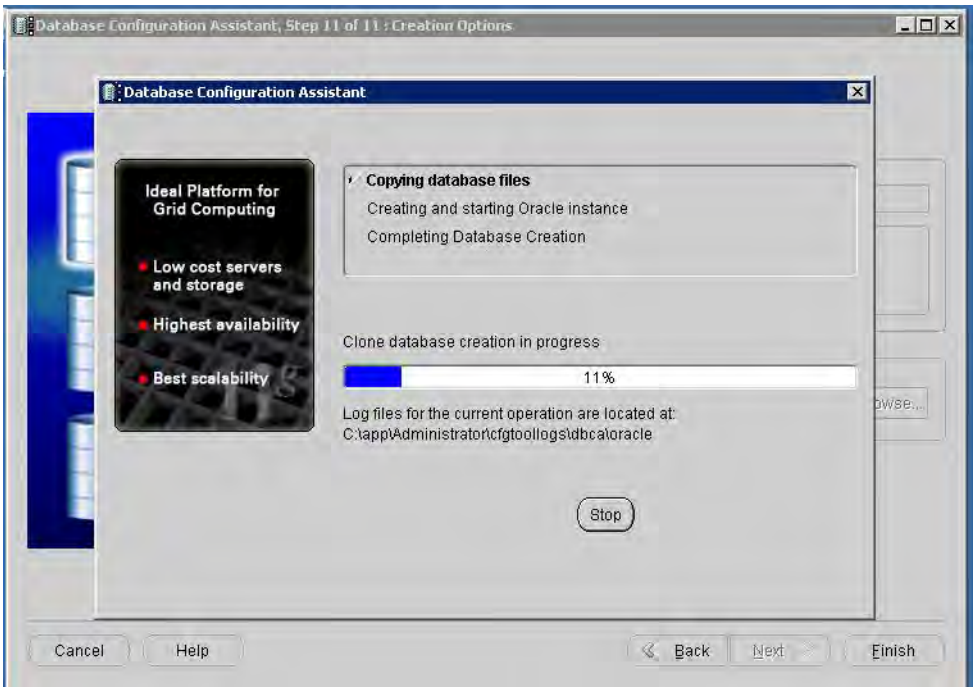
12. In the Confirmation dialog, click [OK].

Figure 3-31: Database Creation Confirmation



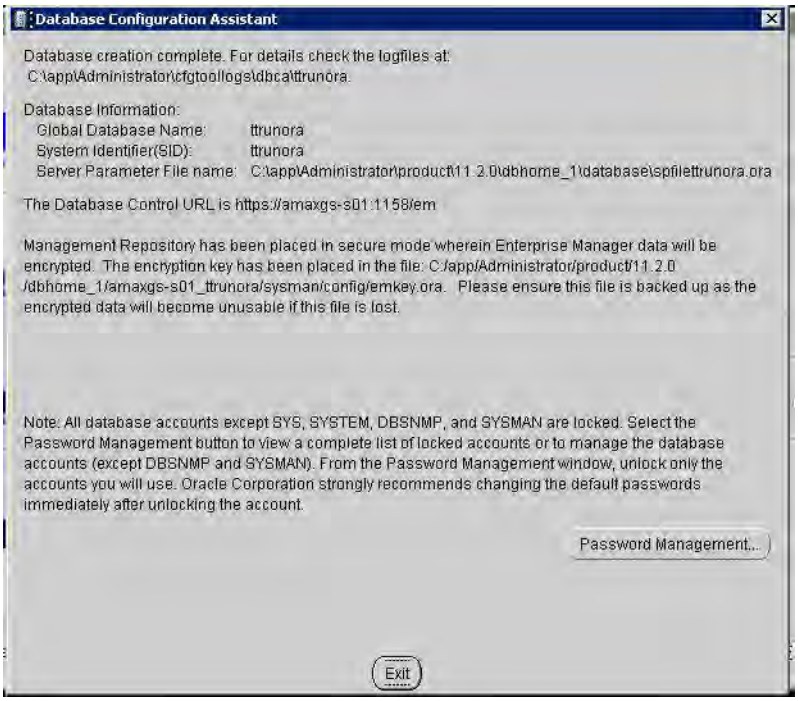
The database configuration assistant creates a database with the configuration parameters you specified.

Figure 3-32: Database Configuration Assistant



13. When the database creation is complete, the following dialog appears. Note the Database Control URL, as you will need it for future steps. Click [Exit] to exit the database configuration assistant.

Figure 3-33: Database Creation Complete

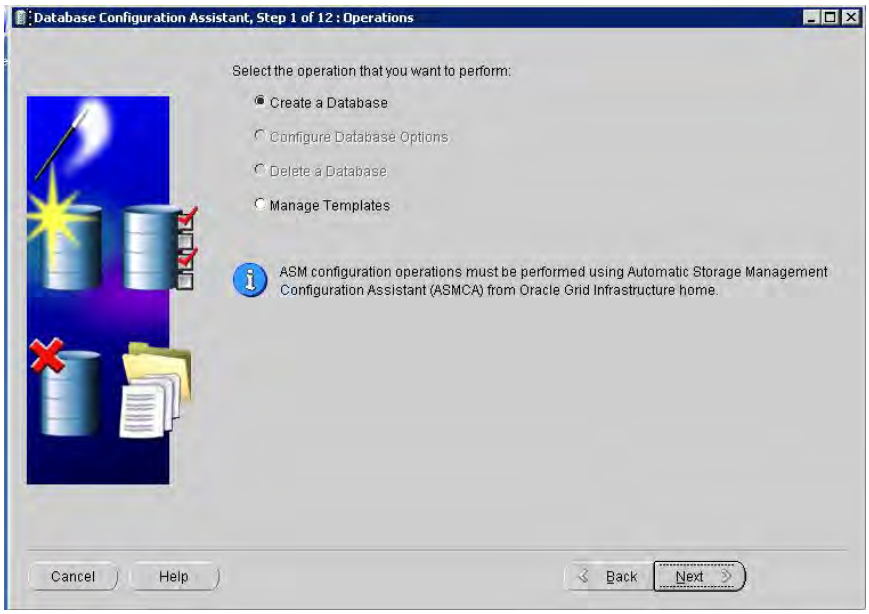


Create a Database on Oracle 12c (version 12.1)

To create a database using the Oracle 12c (version 12.1) DBCA, perform the following steps:

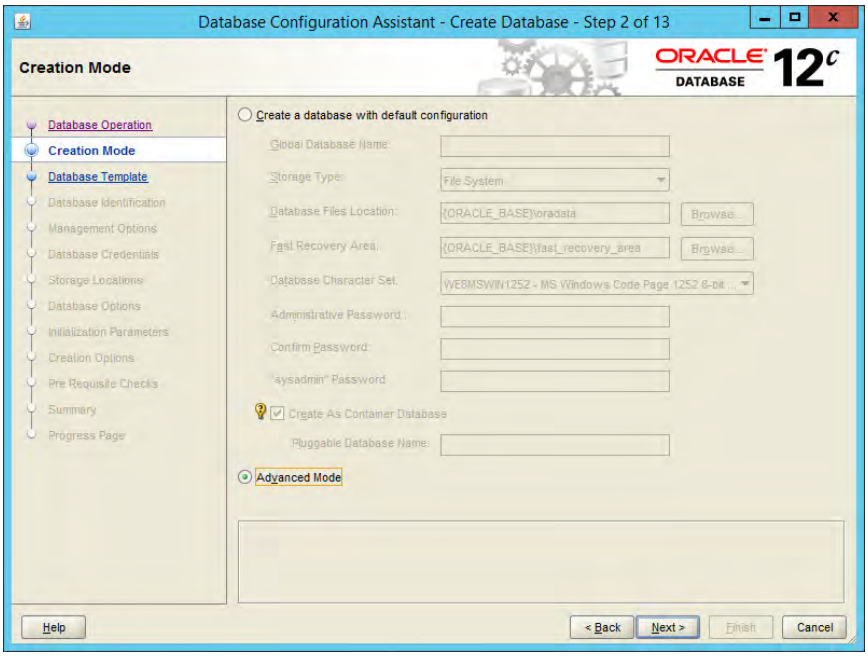
1. Navigate to All Programs > <*Oracle_home*> > Configuration and Migration Tools > Database Configuration Assistant where <*Oracle_home*> is the directory location you specified in step 7 on page 49. Select the “Create a Database” radio button and click [Next].

Figure 3-34: Create a Database



2. On the Creation Mode screen, select the “Advanced Mode” radio button located towards the bottom of the panel and click [Next].

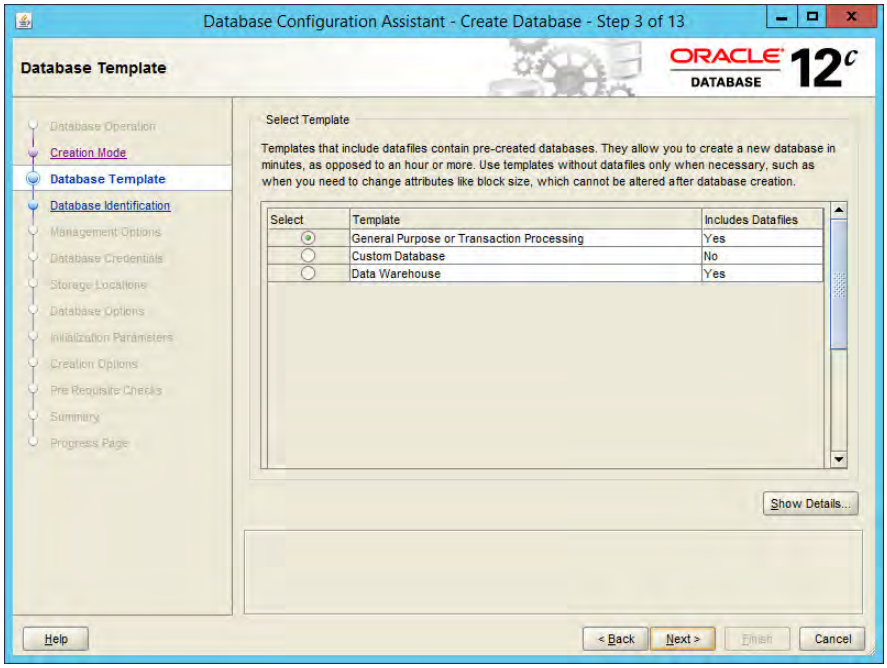
Figure 3-35: Creation Mode Screen



3. On the Database Template screen, select a database template and click [Next].

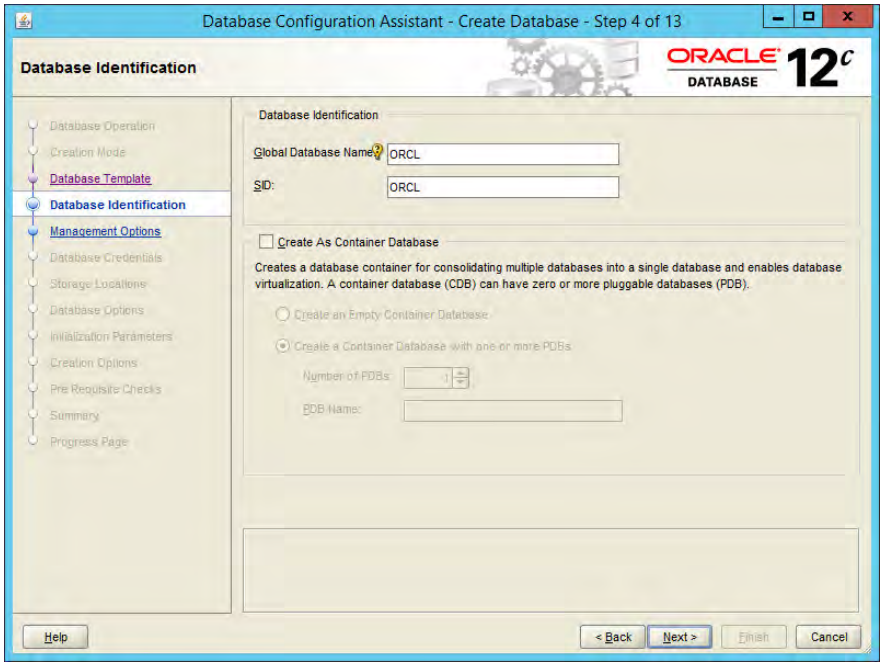
NOTE: Rockwell Automation recommends *General Purpose* or *Transaction Processing* for the Production database and *Data Warehouse* for the ODS database.

Figure 3-36: Database Template Screen



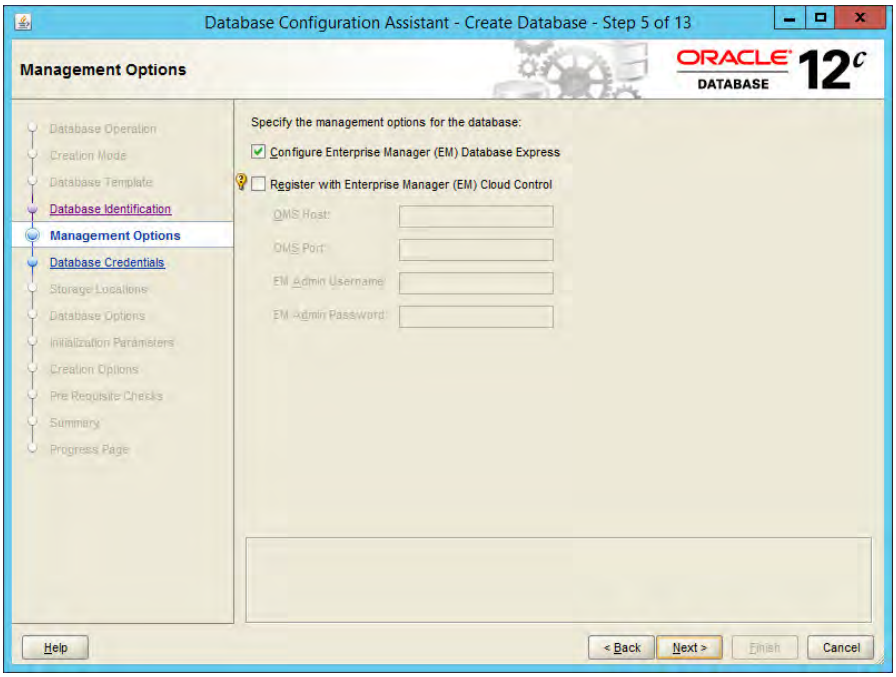
4. On the Database Identification screen, enter a Global Database Name and SID and click [Next].

Figure 3-37: Database Identification Screen



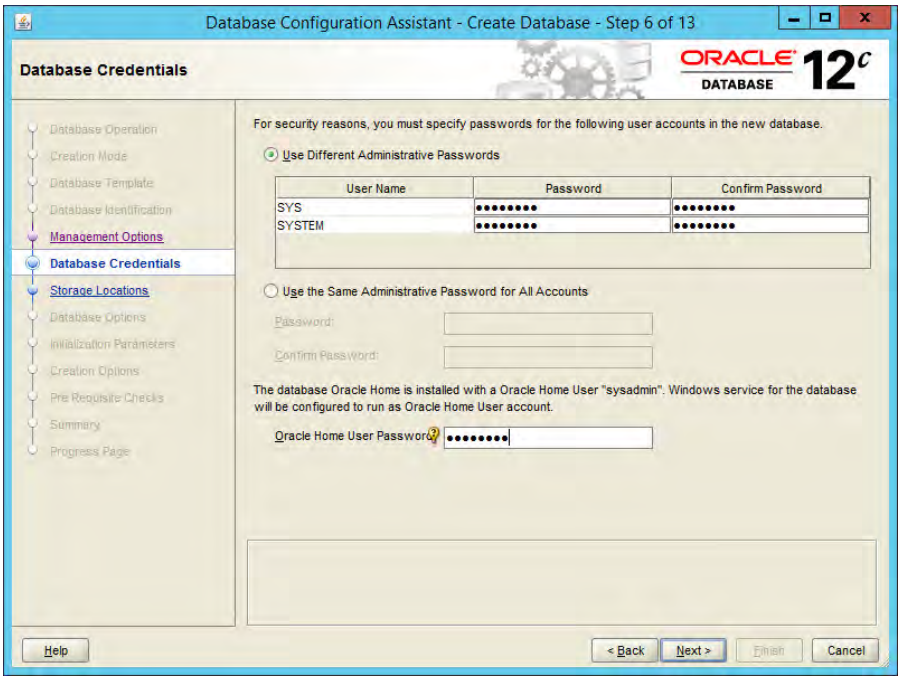
5. On the Management Options screen, click [Next].

Figure 3-38: Management Options Screen



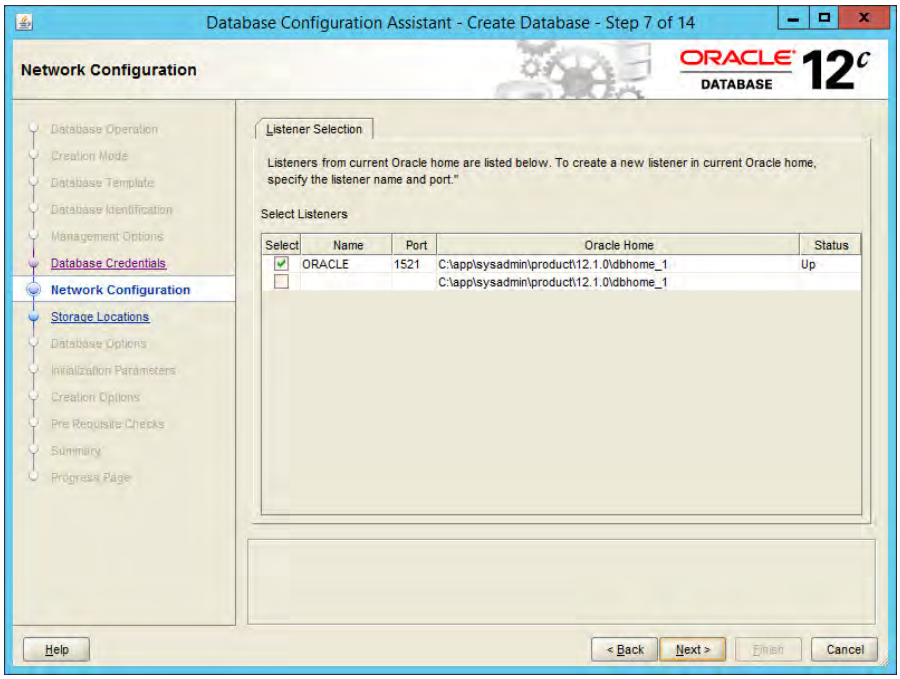
6. On the Database Credentials screen, set your administrative passwords based on your organization's IT policy. Note these passwords, as you will need them for future steps. Enter your Oracle Home User password in the lower field, and then click [Next].

Figure 3-39: Database Credentials Screen



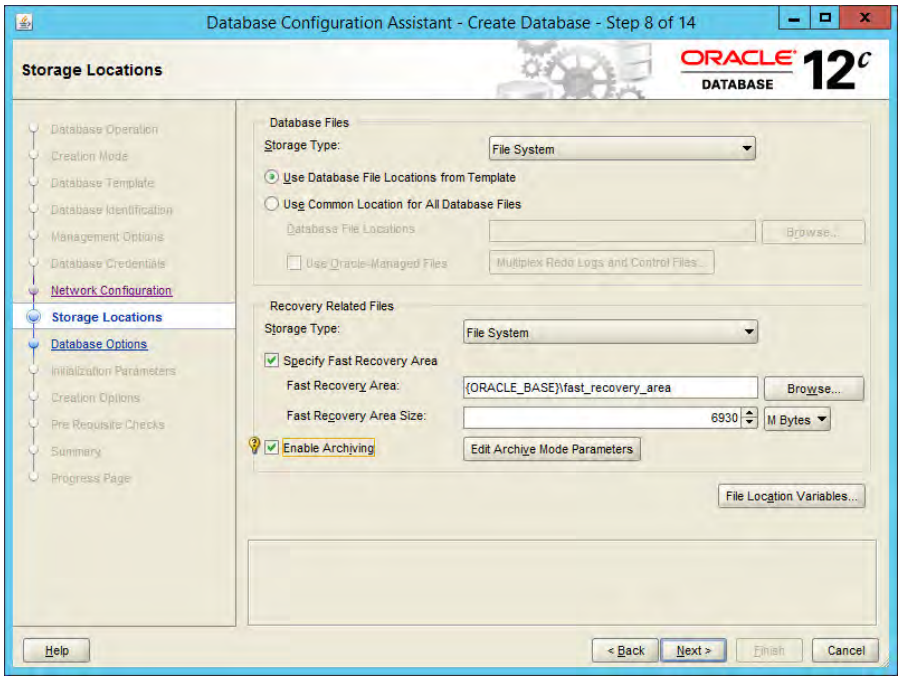
7. On the Network Configuration screen, select the listener you configured in "Configure a Listener" on page 55 and click [Next].

Figure 3-40: Network Configuration Screen



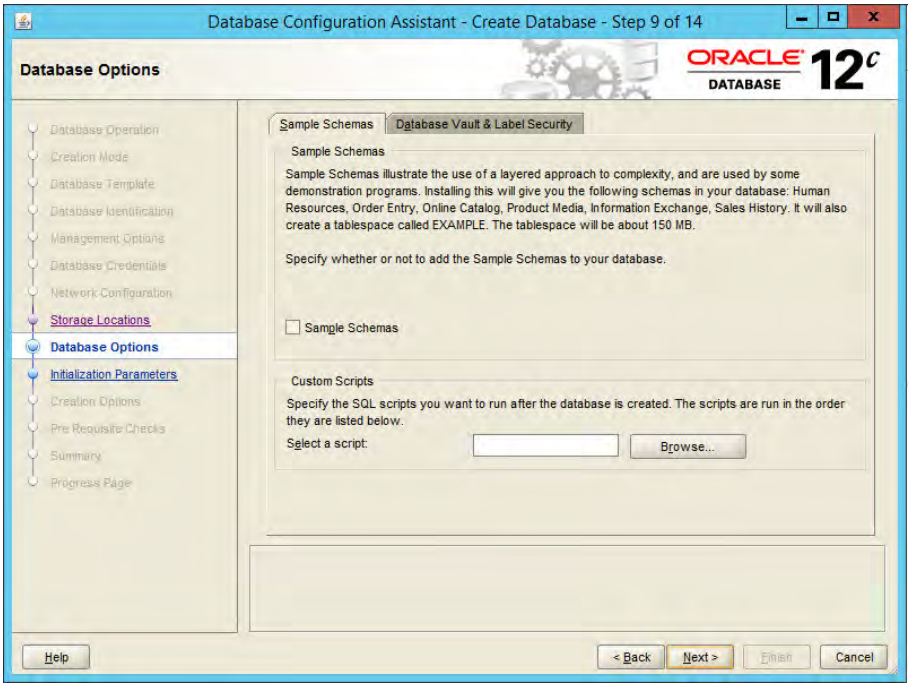
8. On the Storage Locations screen, select the storage type and recovery options you would like to use for the database. We recommend that you enable archiving. Click [Next].

Figure 3-41: Storage Locations



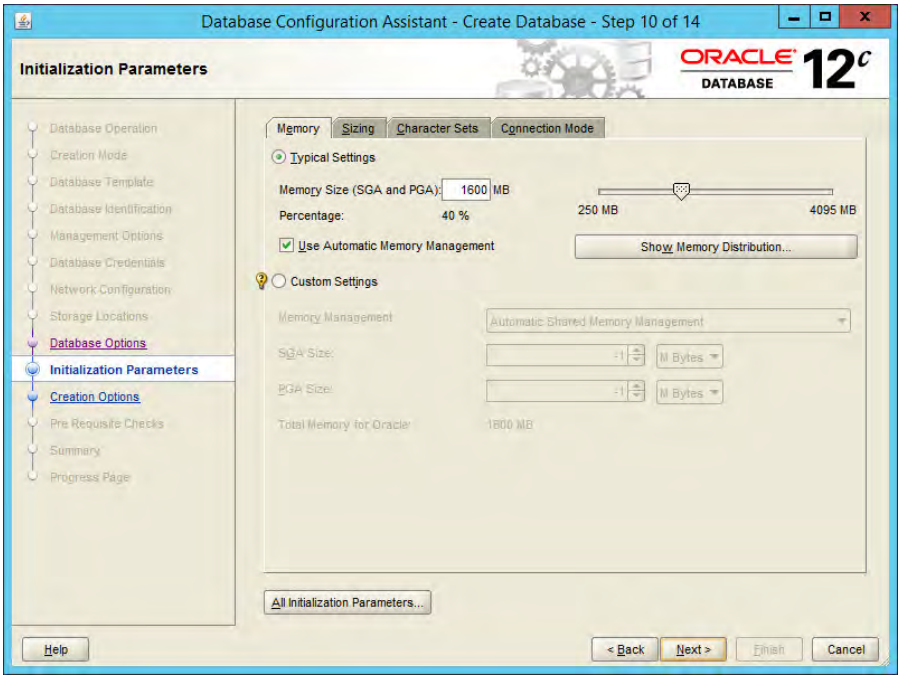
9. On the Database Options screen, click [Next].

Figure 3-42: Database Options Screen



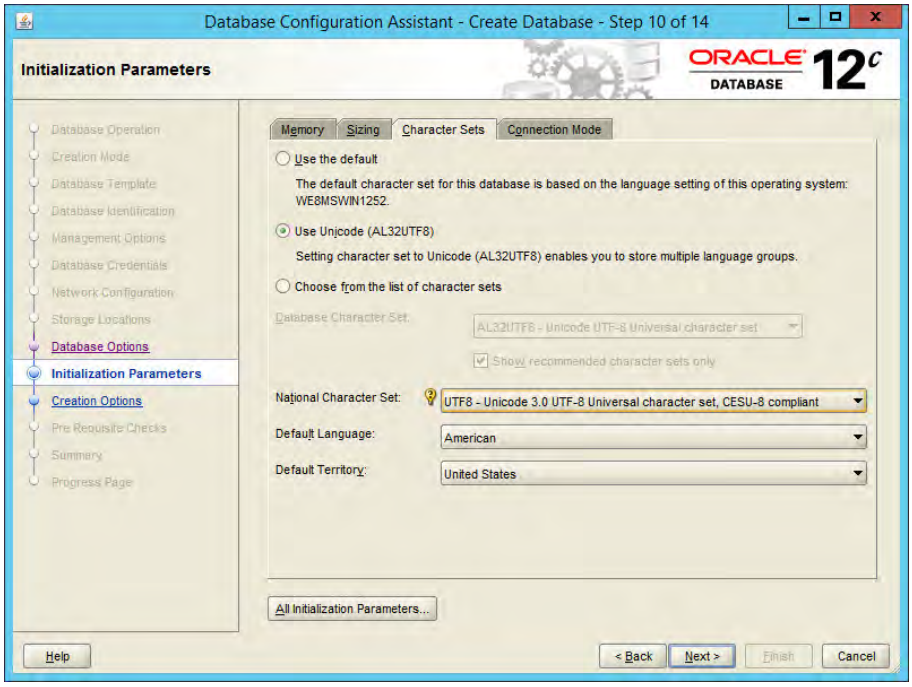
10. On the Initialization Parameters - Memory tab, select the configuration of your choice or take the recommended settings, then choose the Character Sets tab.

Figure 3-43: Initialization Parameters - Memory



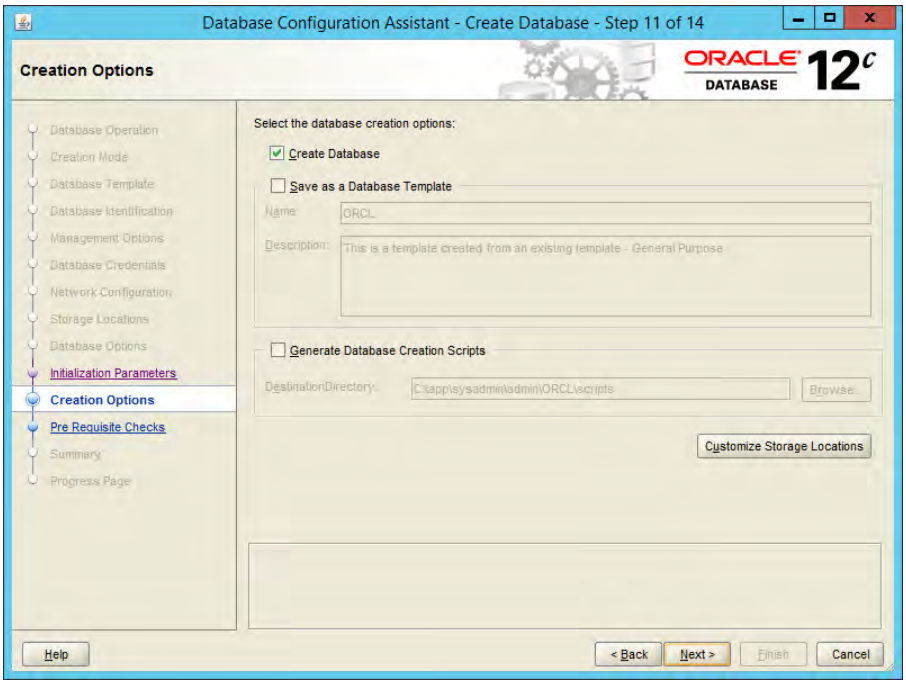
11. On the Character Sets tab, select the AL32UTF8 radio button. From the National Character Set drop-down menu, choose “UTF8 - Unicode 3.0 UTF-8 Universal character set, CESU-8 compliant”. Click [Next].

Figure 3-44: Initialization Parameters - Character Sets



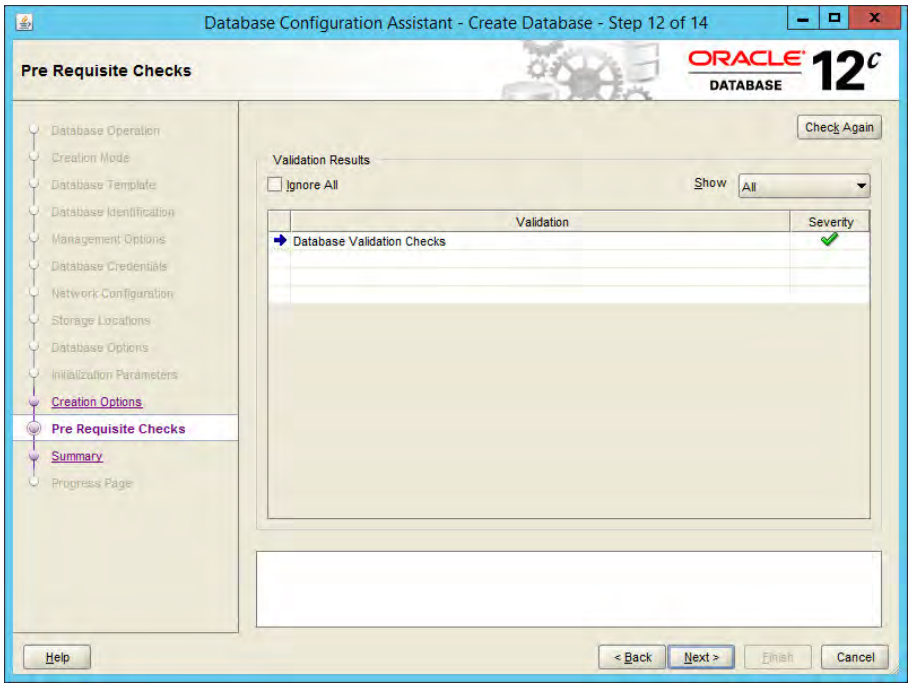
12. On the Creation Options screen, ensure “Create Database” is checked, and then click [Next].

Figure 3-45: Creation Options Screen



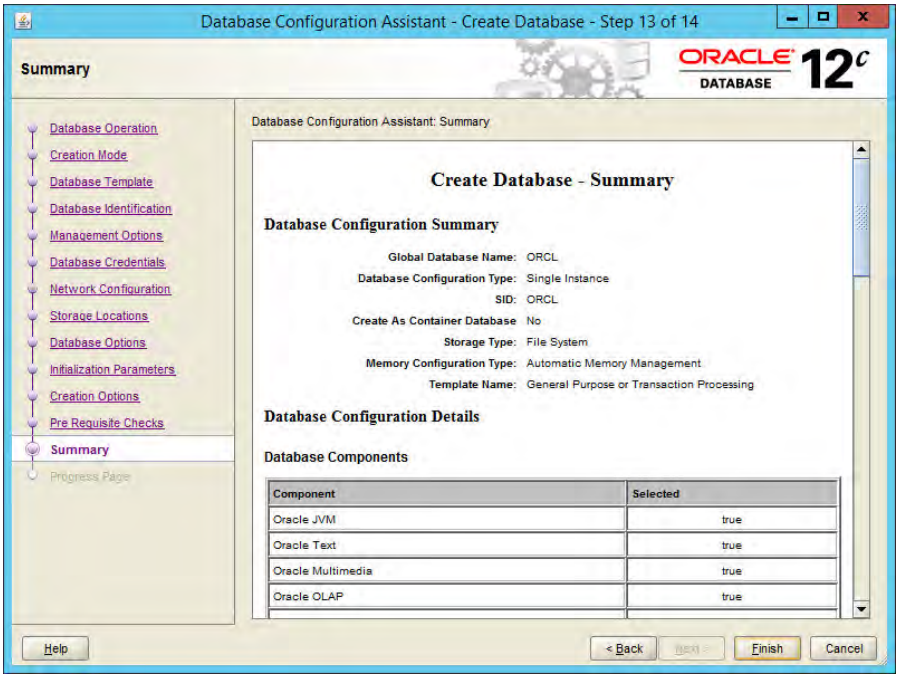
13. On the Pre-Requisite Checks screen, click [Next]. This page will list any issues with your configuration and will prevent you from continuing if they are not resolved.

Figure 3-46: Pre-Requisite Checks Screen



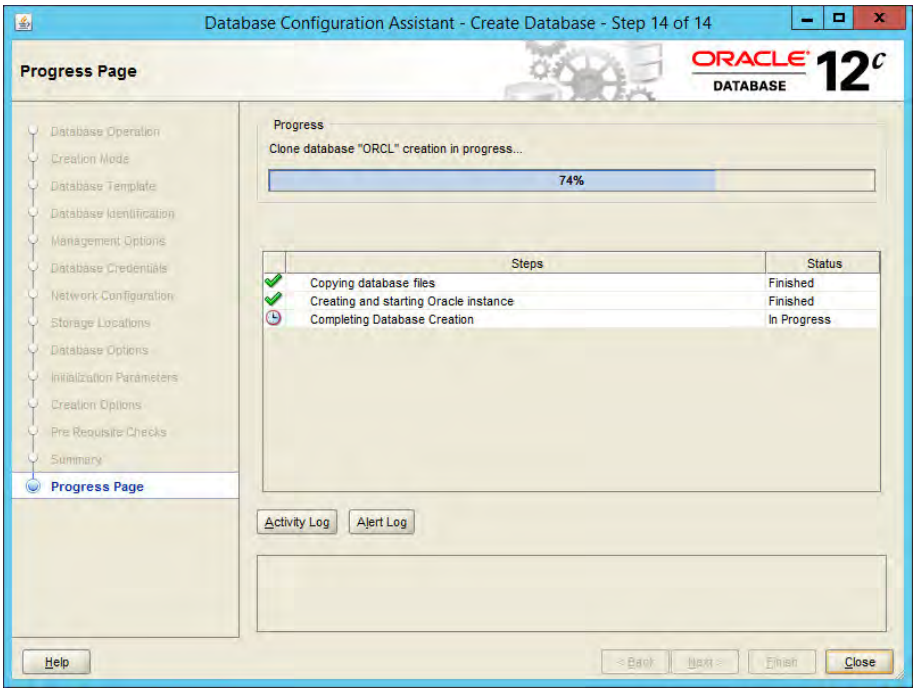
14. On the Summary Screen, click [Finish].

Figure 3-47: Summary Screen



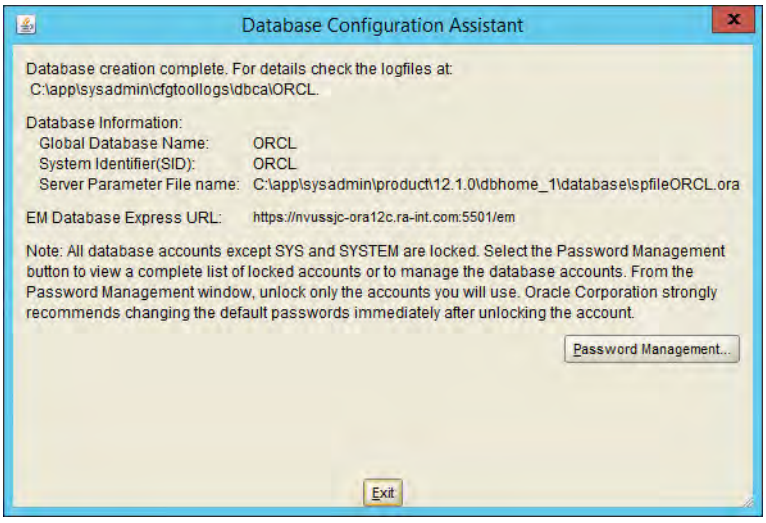
15. On the Progress page, the database configuration assistant creates a database with the configuration parameters you specified.

Figure 3-48: Progress Page



16. When the database creation is complete, the following dialog appears. Note the Database Control URL, as you will need it for future steps. Click [Exit] to exit the database configuration assistant.

Figure 3-49: Database Creation Complete

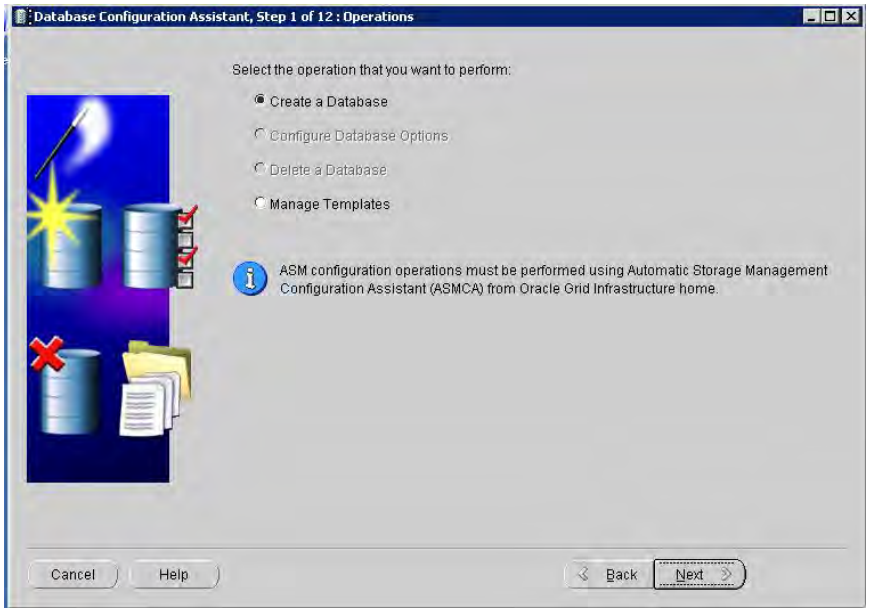


Create a Database on Oracle 12c (version 12.2)

To create a database using the Oracle 12c (version 12.2) DBCA, perform the following steps:

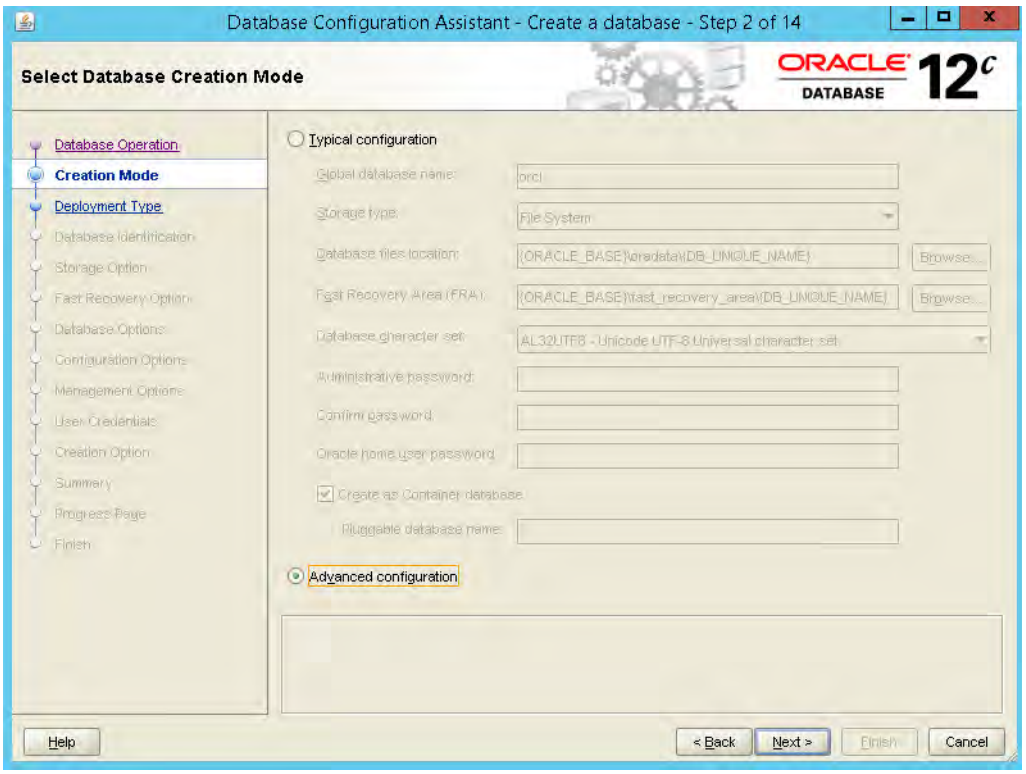
1. Navigate to All Programs > <*Oracle_home*> > Configuration and Migration Tools > Database Configuration Assistant where <*Oracle_home*> is the directory location you specified in step 7 on page 49. Select the “Create a Database” radio button and click [Next].

Figure 3-50: Create a Database



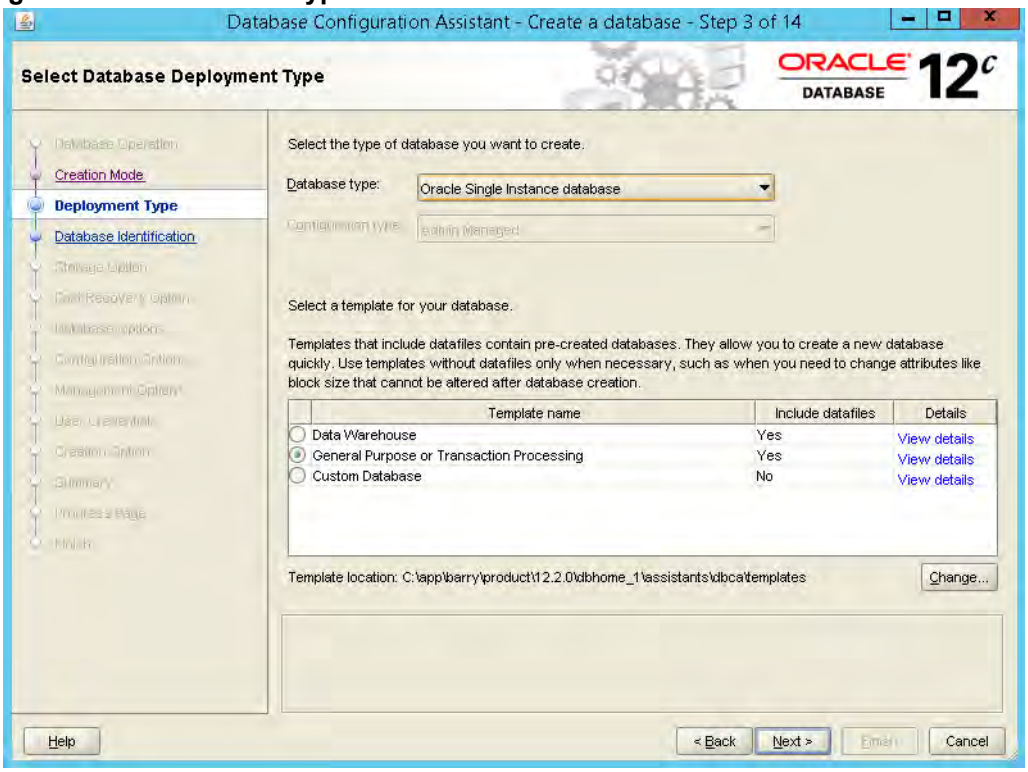
2. On the Creation Mode screen, select the “Advanced Mode” radio button located towards the bottom of the panel and click [Next].

Figure 3-51: Creation Mode Screen



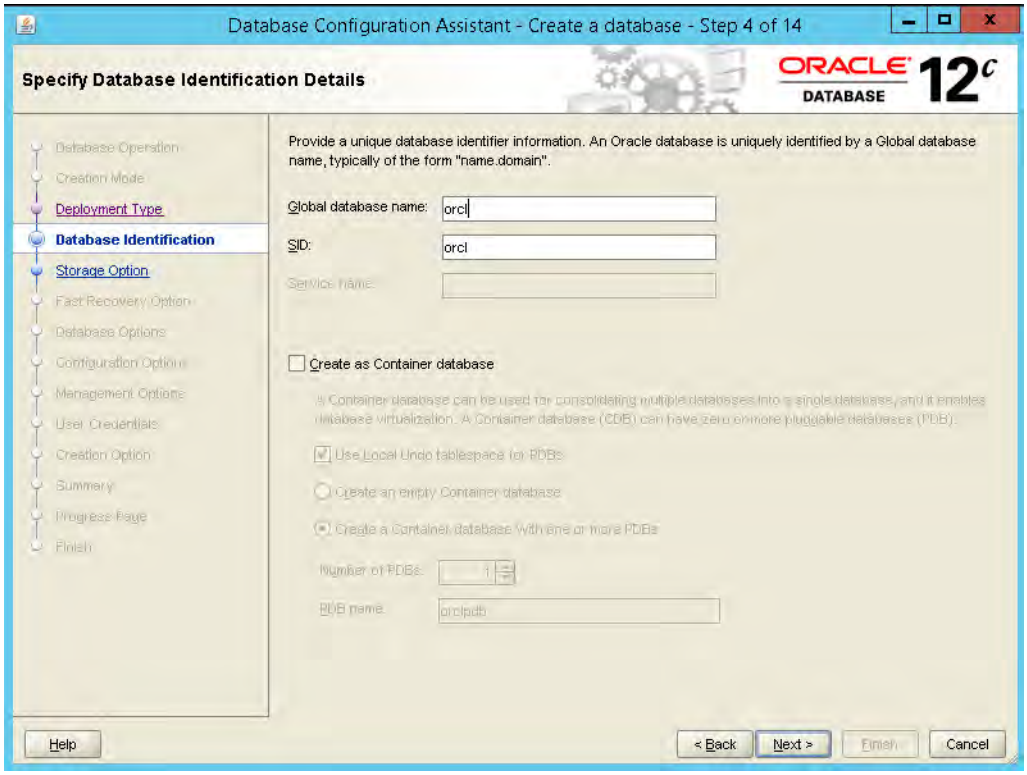
3. On the Deployment Type screen, select “Oracle Single Instance database” as the database type and select the “General Purpose or Transaction Processing” radio button and click [Next].

Figure 3-52: Database Type Screen



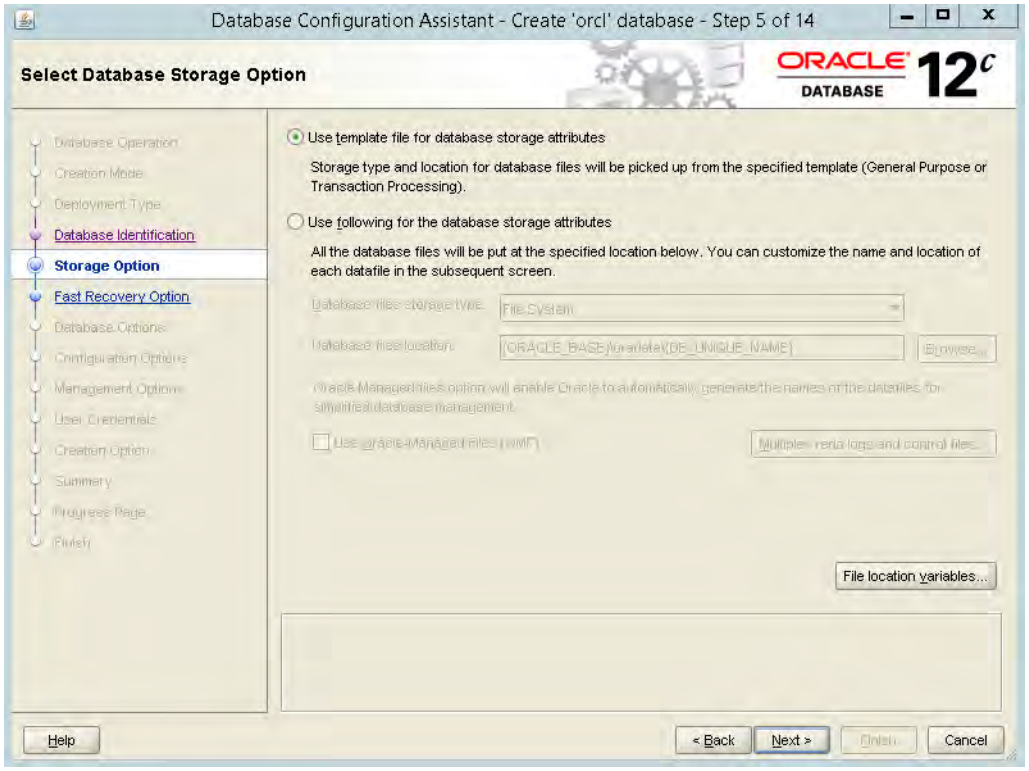
4. On the Database Identification screen, enter a Global Database Name and SID, uncheck “Create as Container database” if it is not needed, and then click [Next].

Figure 3-53: Database Identification Screen



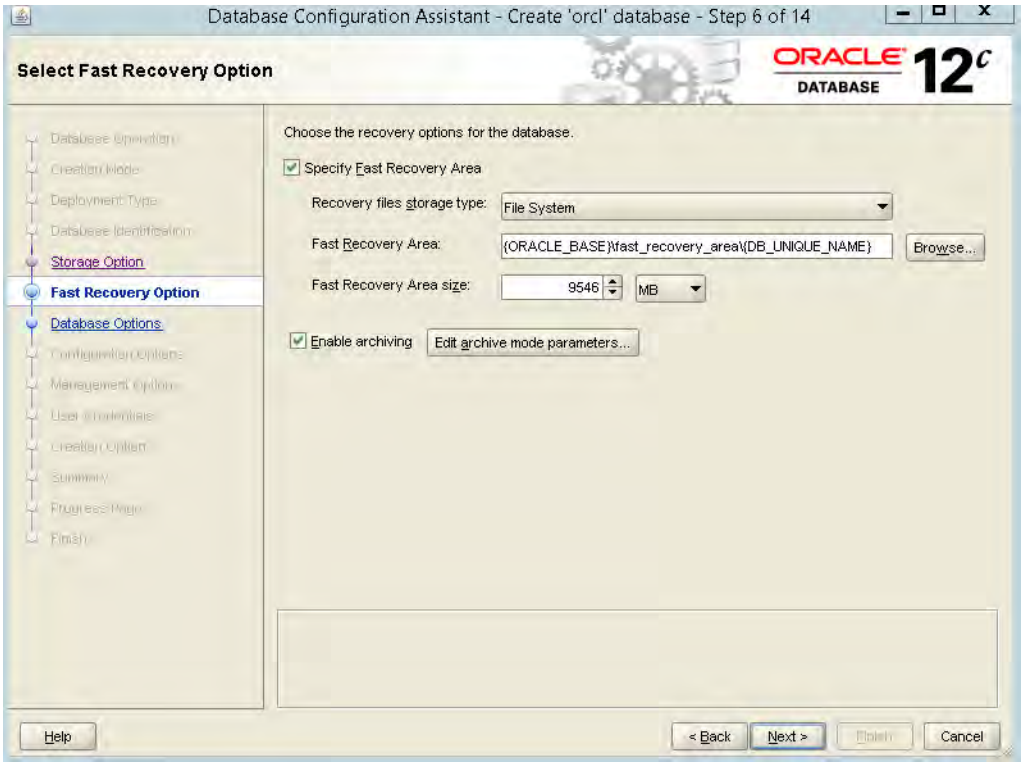
5. On the Storage Option screen, accept the default and click [Next].

Figure 3-54: Storage Option Screen



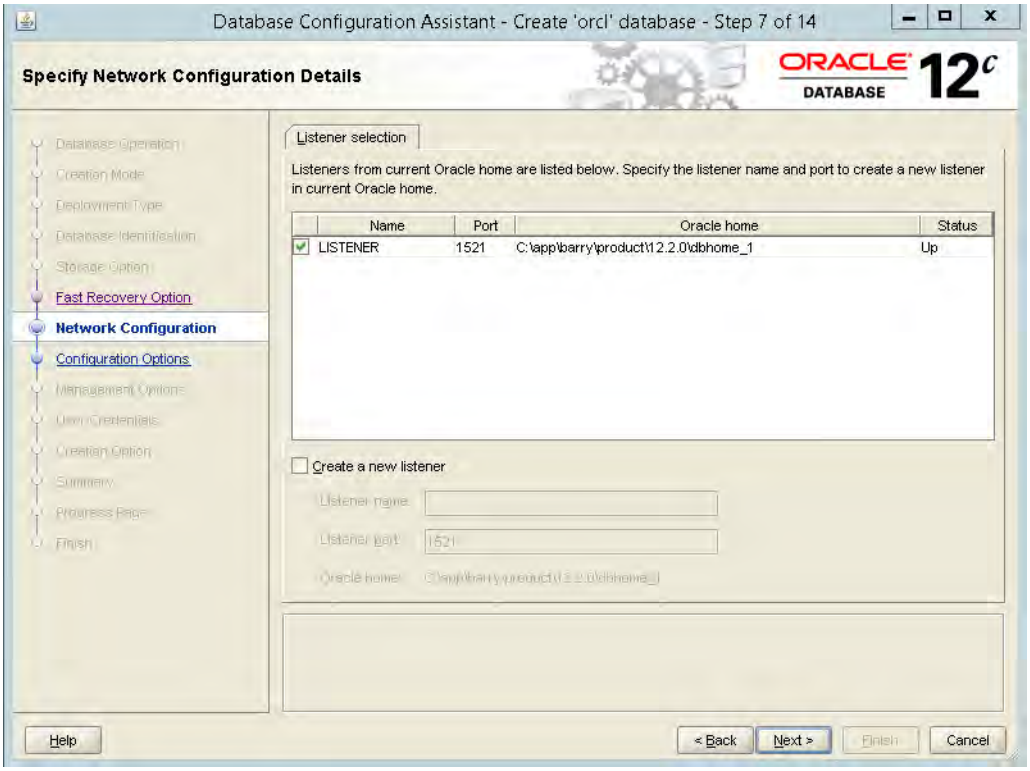
6. On the Fast Recovery Option screen, check “Specify Fast Recovery Area” and “Enable archiving.” Click [Next].

Figure 3-55: Fast Recovery Option Screen



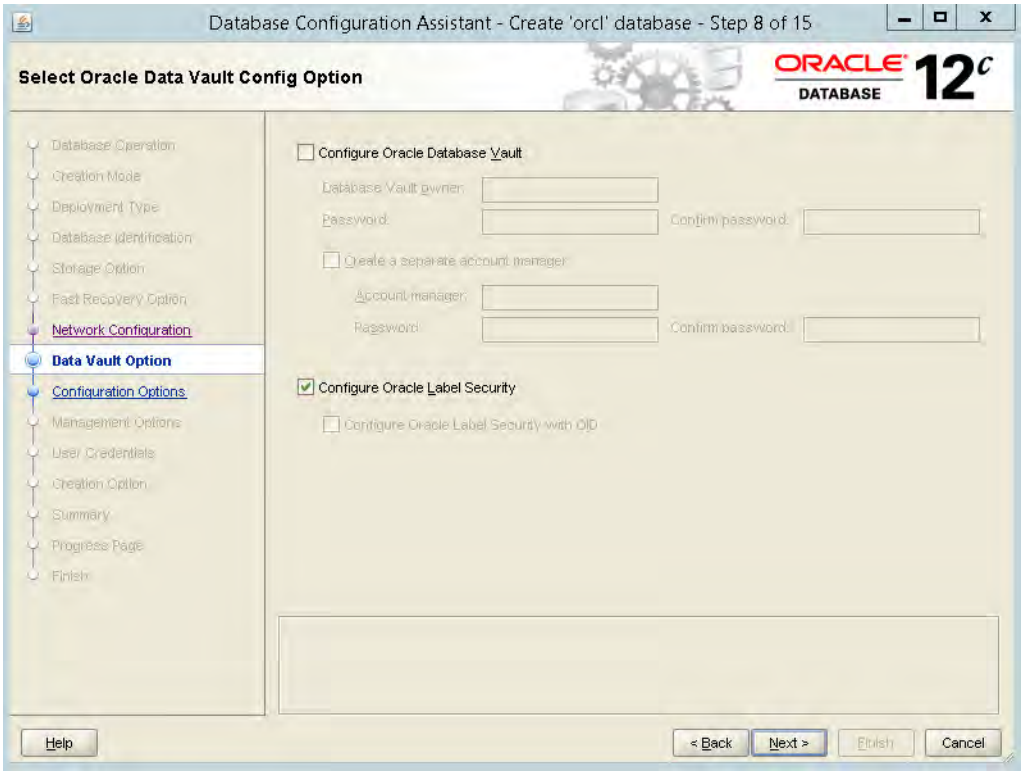
7. On the Network Configuration screen, select the listener you configured in “Configure a Listener” on page 55. Click [Next].

Figure 3-56: Network Configuration Screen



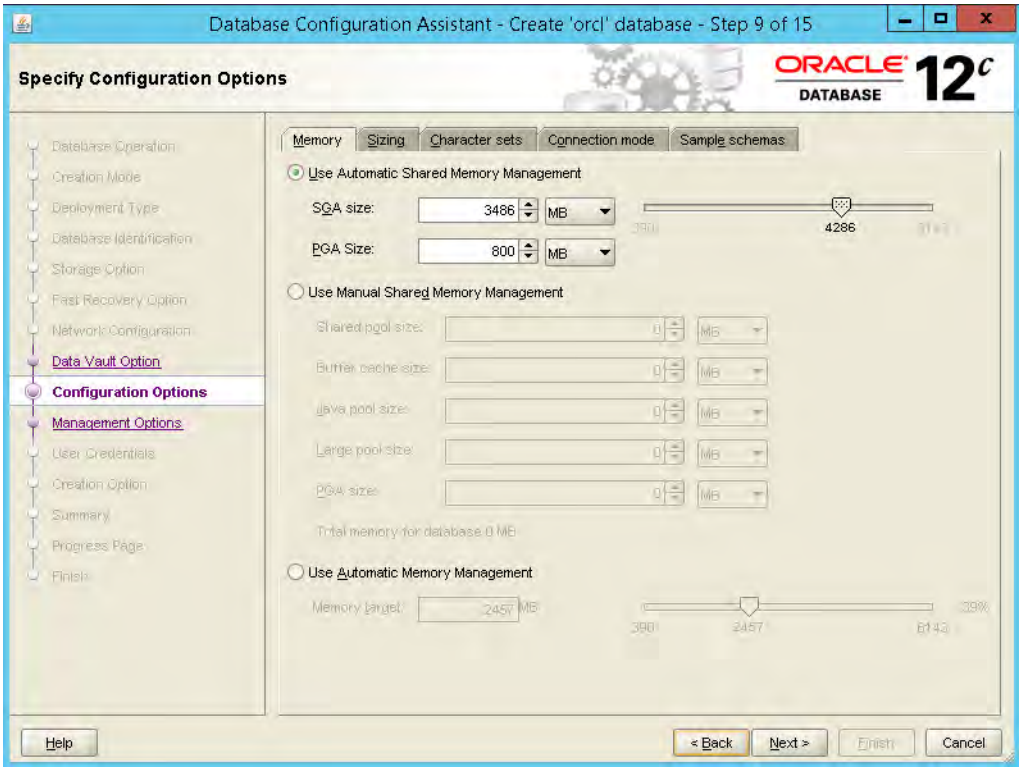
8. On the Data Vault Option screen, select “Configure Oracle Label Security.” Click [Next].

Figure 3-57: Default Vault Option Screen



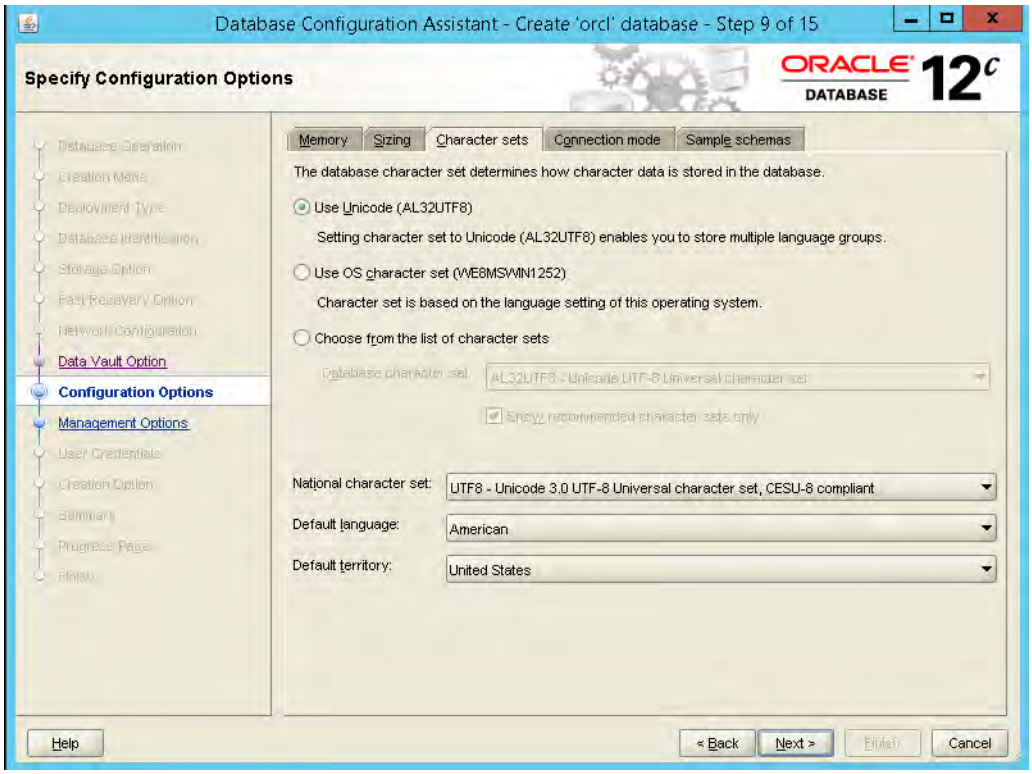
9. On the Configuration Options screen > Memory tab, select the configuration of your choice or take the recommended settings. Then choose the Character sets tab.

Figure 3-58: Configuration Options Screen - Memory Tab



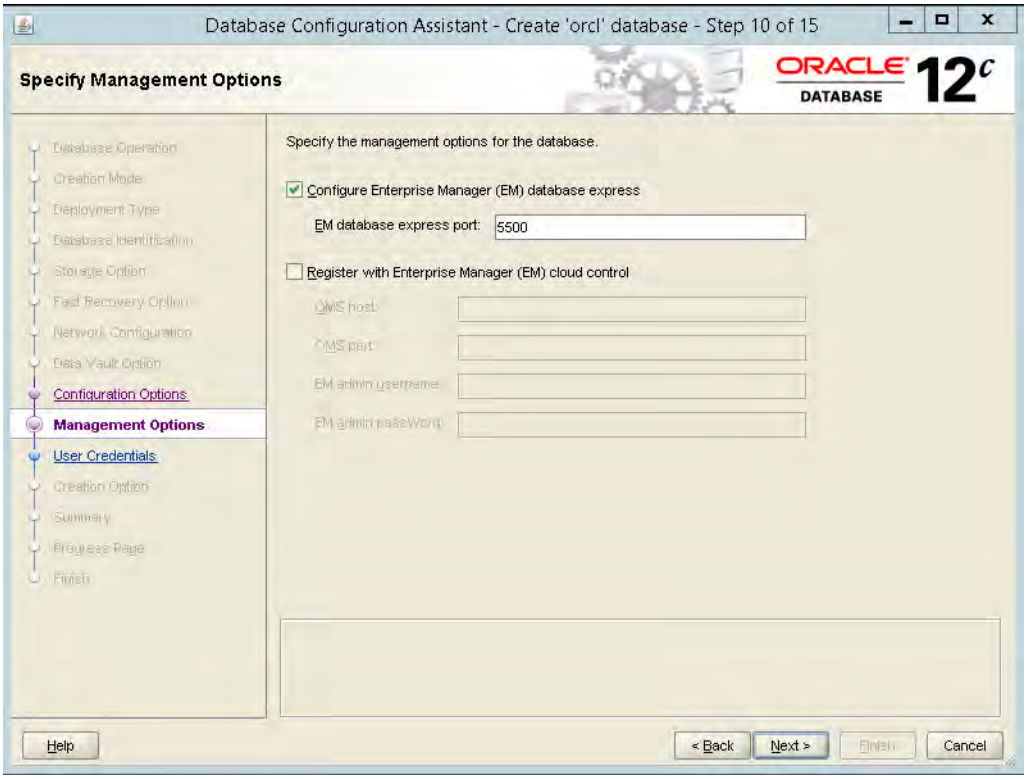
10. On the Character Sets tab, select the “Use Unicode (AL32UTF8)” radio button. From the National character set drop-down menu, choose “UTF8 - Unicode 3.0 UTF-8 Universal character set, CESU-8 compliant.” Click [Next].

Figure 3-59: Configuration Options Screen - Character sets Tab



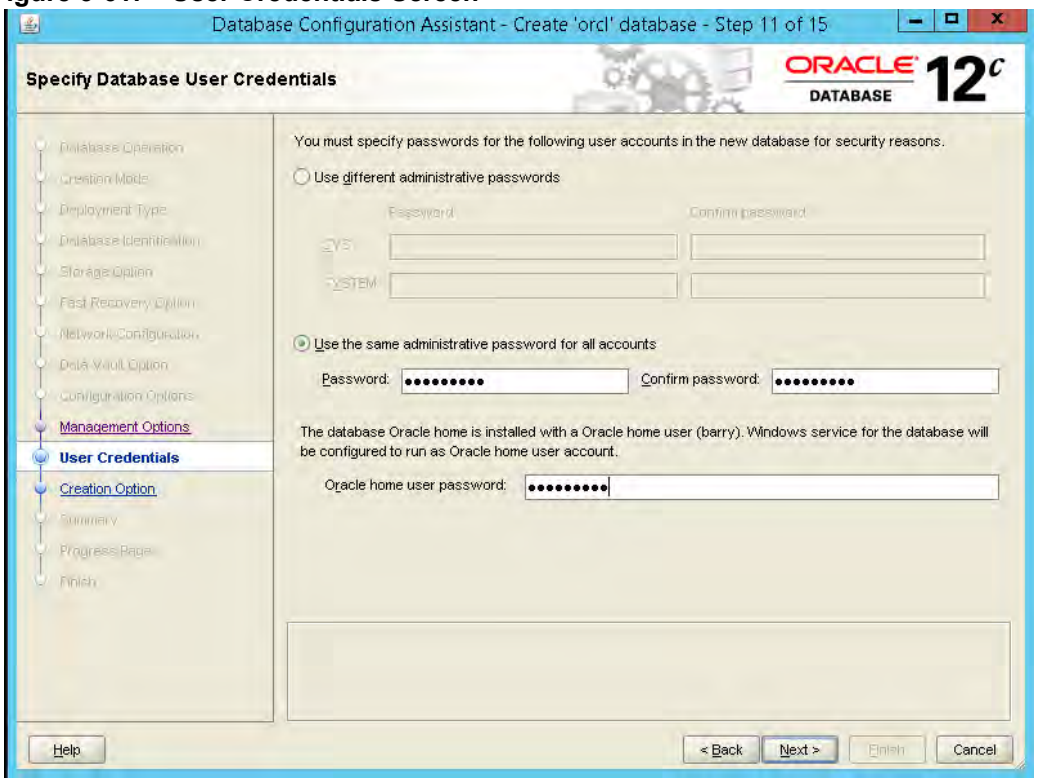
11. On the Management Options screen, check “Configure Enterprise Manager (EM) database express,” and then click [Next].

Figure 3-60: Management Options Screen



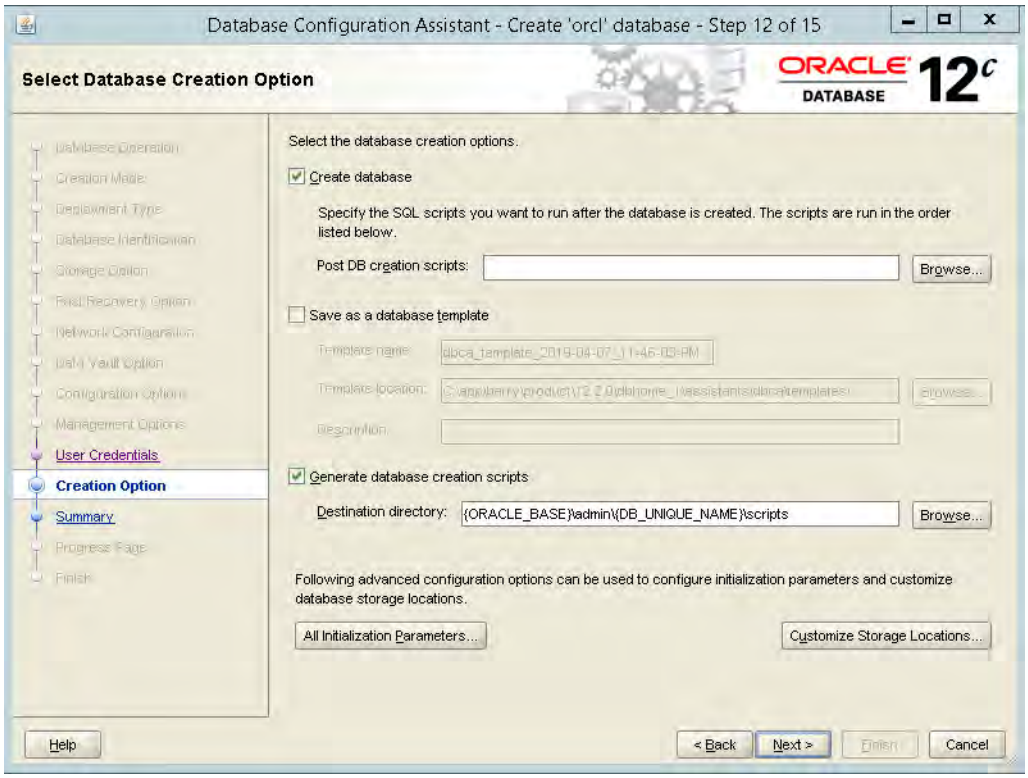
12. On the User Credentials screen, select the “Use the same administrative password for all accounts” radio button. Enter your Oracle Home User password in the lower field, and then click [Next].

Figure 3-61: User Credentials Screen



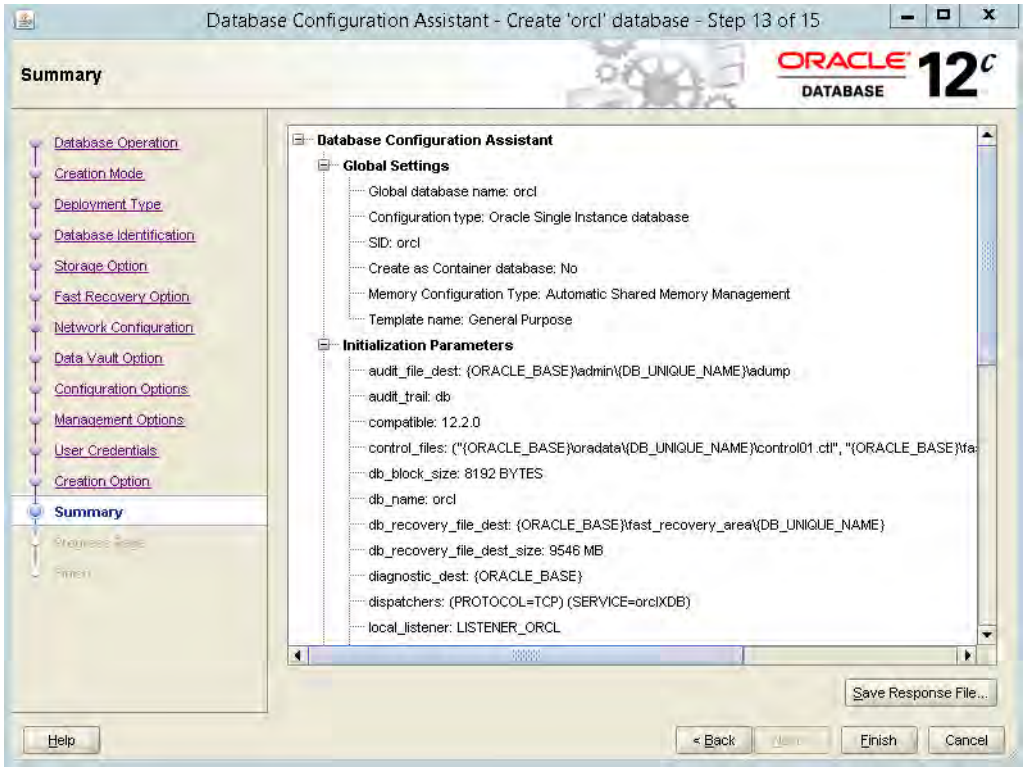
13. On the Creation Option screen, check “Create database” and “Generate database creation scripts.” Click [Next].

Figure 3-62: Creation Option Screen



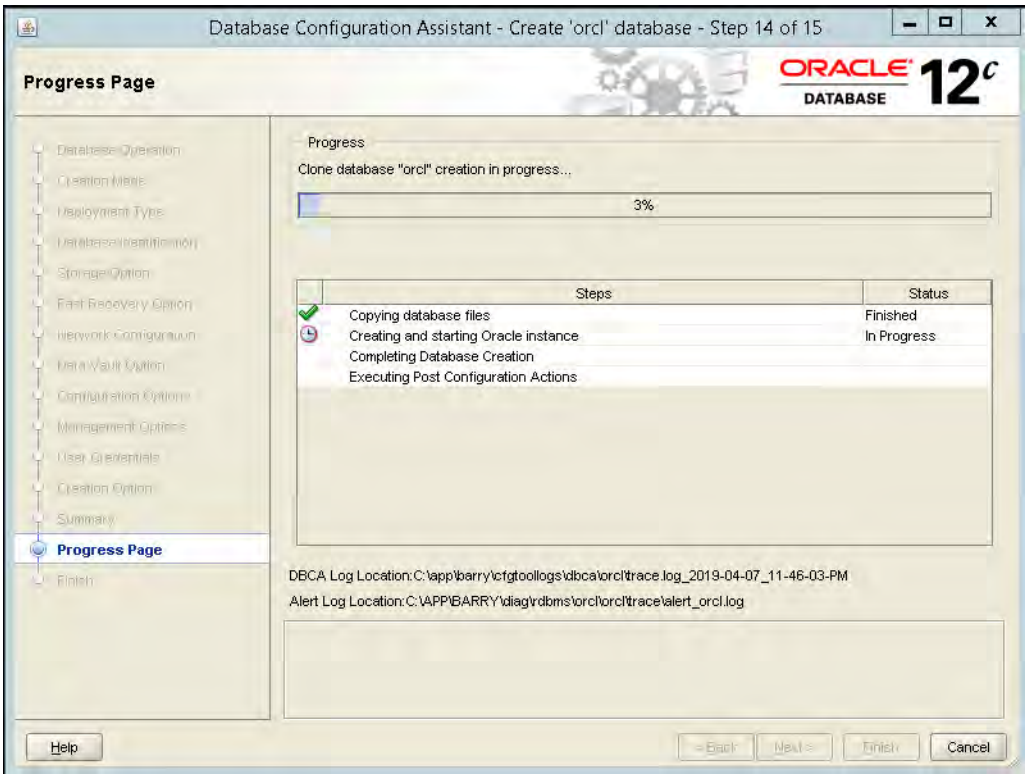
14. On the Summary Screen, click [Finish].

Figure 3-63: Summary Screen



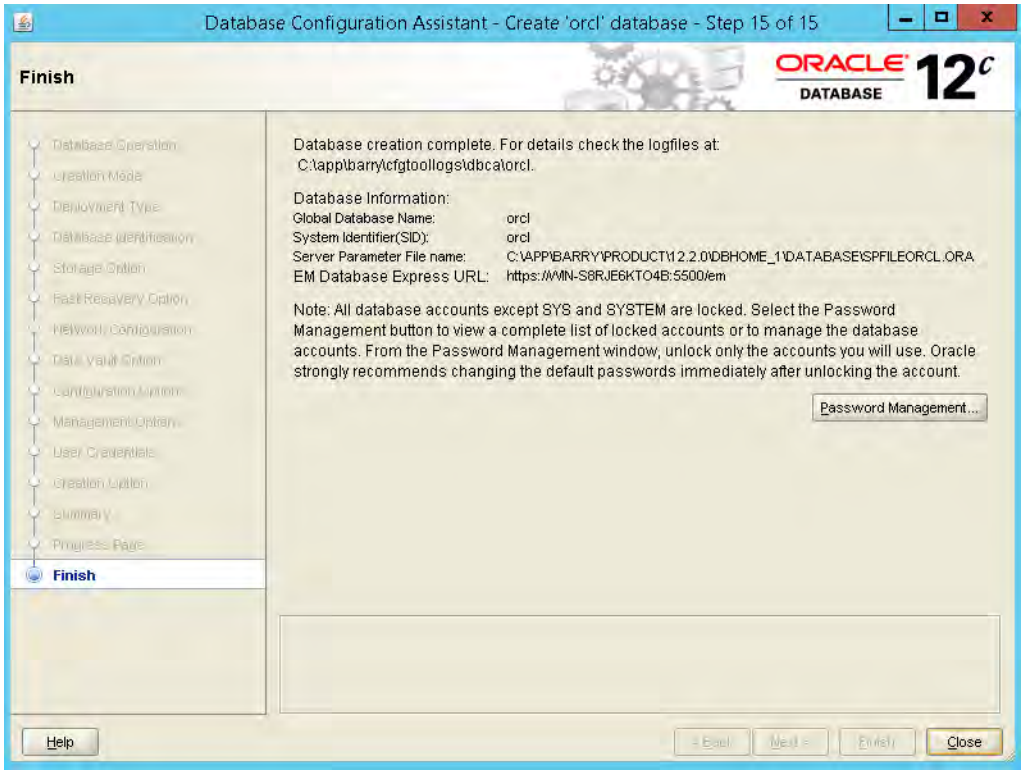
15. On the Progress page, the database configuration assistant creates a database with the configuration parameters you specified.

Figure 3-64: Progress Page



16. When the database creation is complete, the following dialog appears. Click [Exit] to exit the database configuration assistant.

Figure 3-65: Database Creation Complete



Create the Tablespaces

To create the tablespaces in the database you just created, refer to the following sections:

- “Create the Tablespaces on Oracle 11g” on page 90
- “Create the Tablespaces on Oracle 12c” on page 94

Create the Tablespaces on Oracle 11g

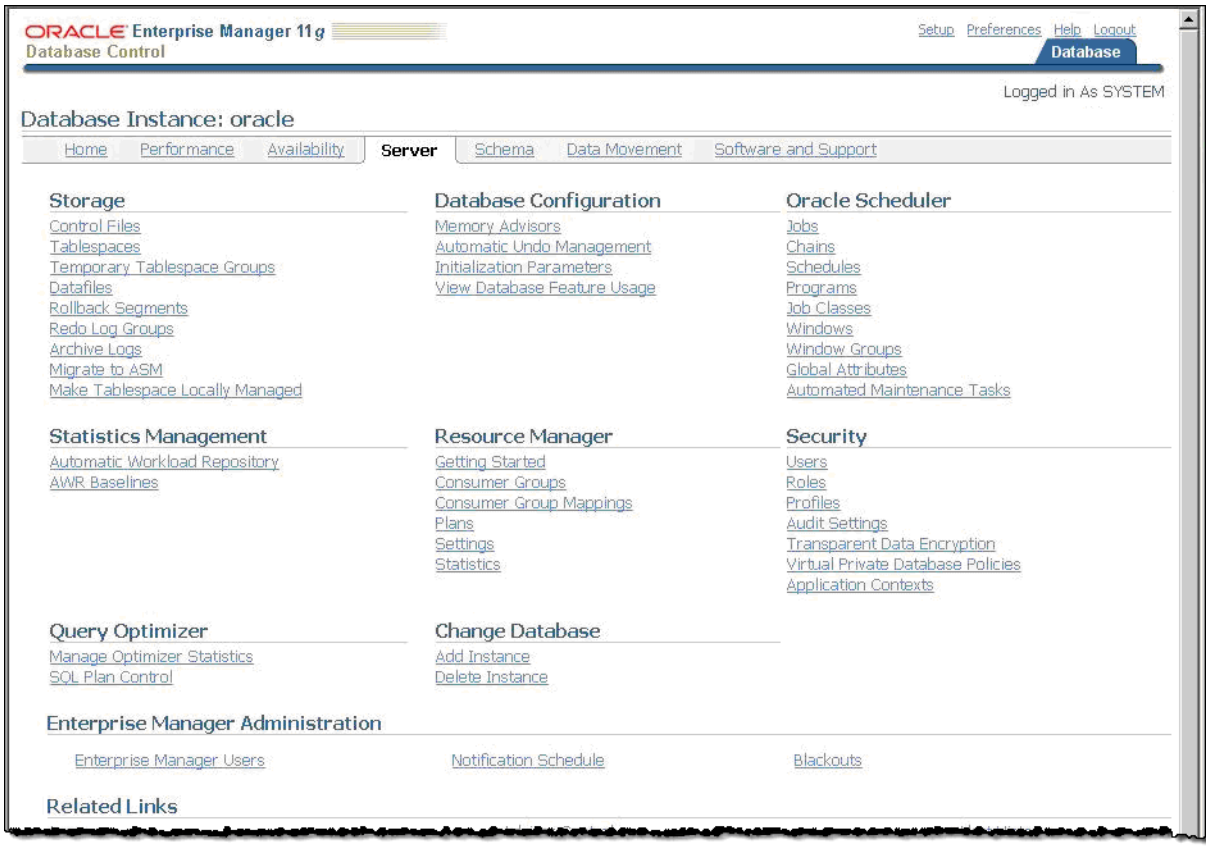
To create the tablespaces on Oracle 11g, perform the following steps:

1. In a web browser, enter the Database Control URL you noted earlier and log on as SYSTEM with the corresponding password.

Figure 3-66: Database Control Login Page

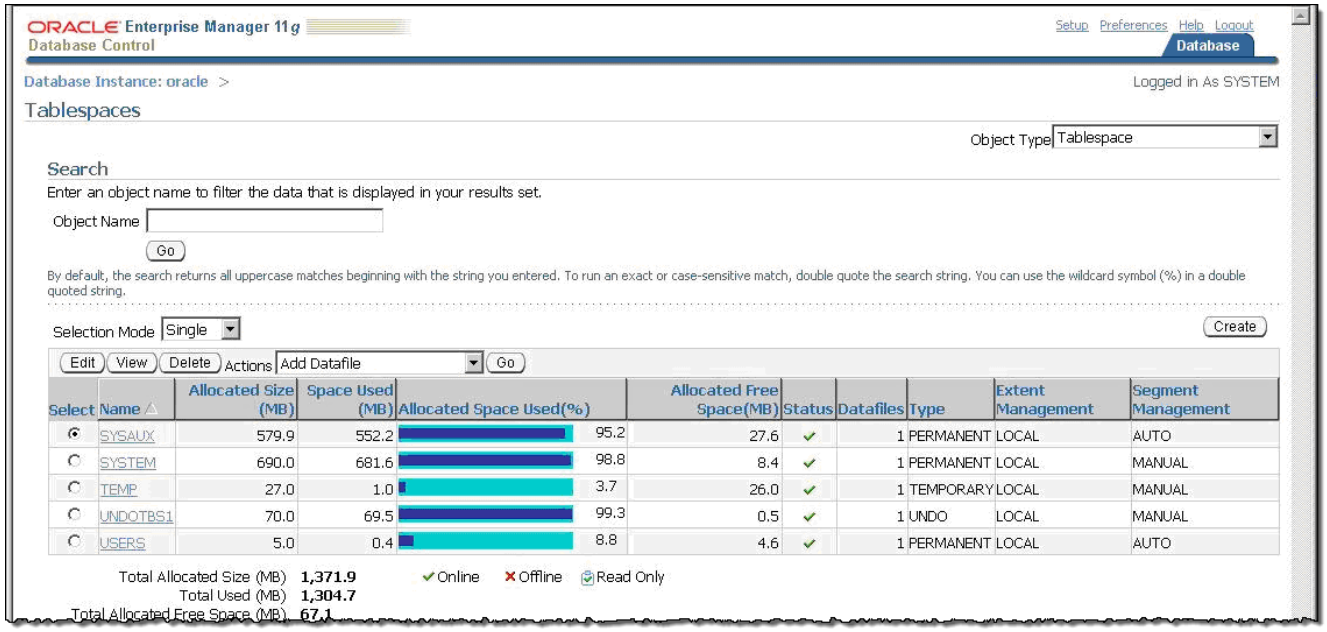
2. Select the Server tab and then, under the Storage heading, select *Tablespaces*.

Figure 3-67: Server Tab



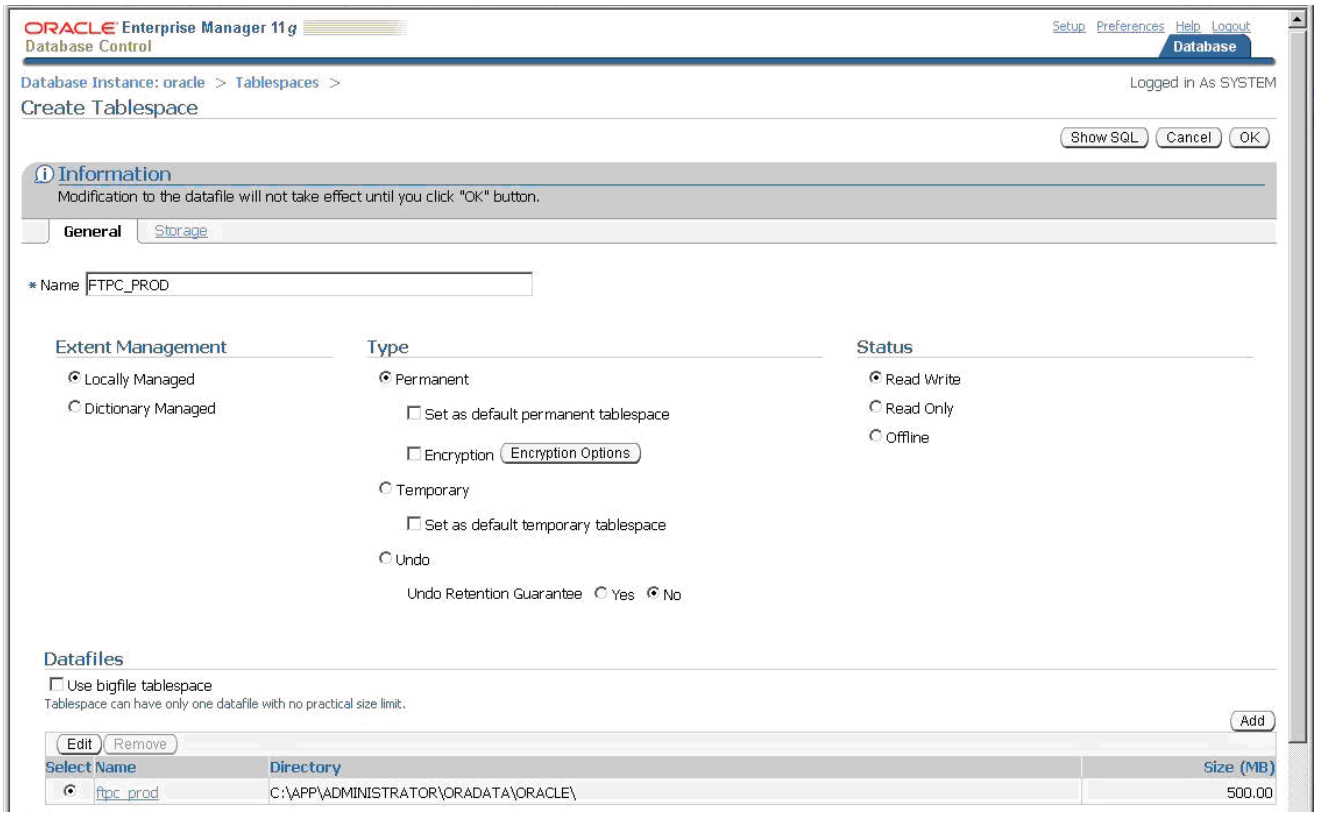
3. On the Tablespaces screen, click [Create].

Figure 3-68: Create a Tablespace



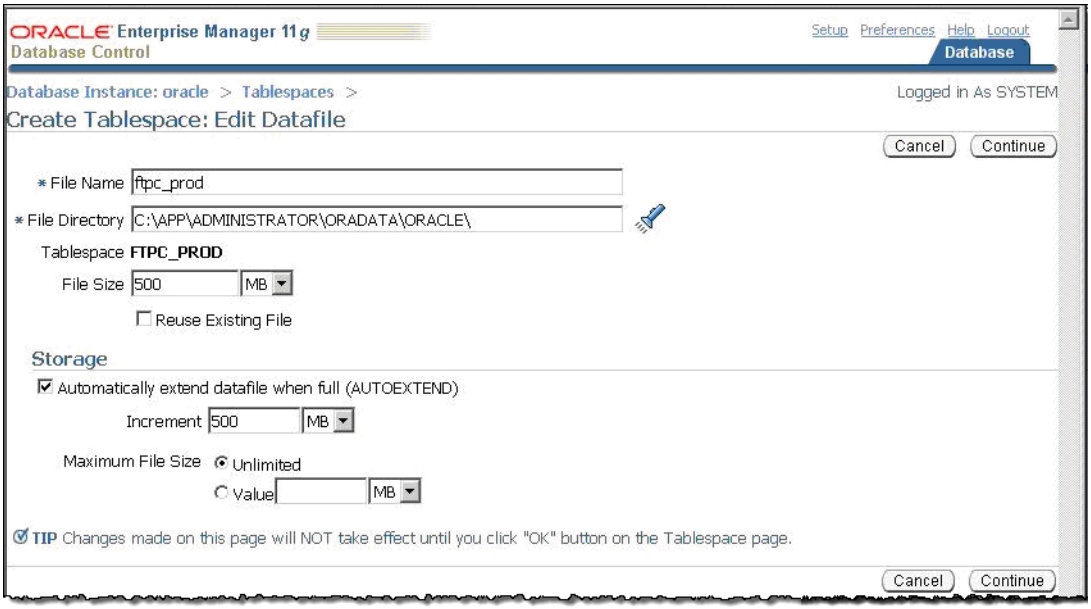
4. Give the tablespace a name and click [Add] to add one or more files.

Figure 3-69: Give the Tablespace a Name



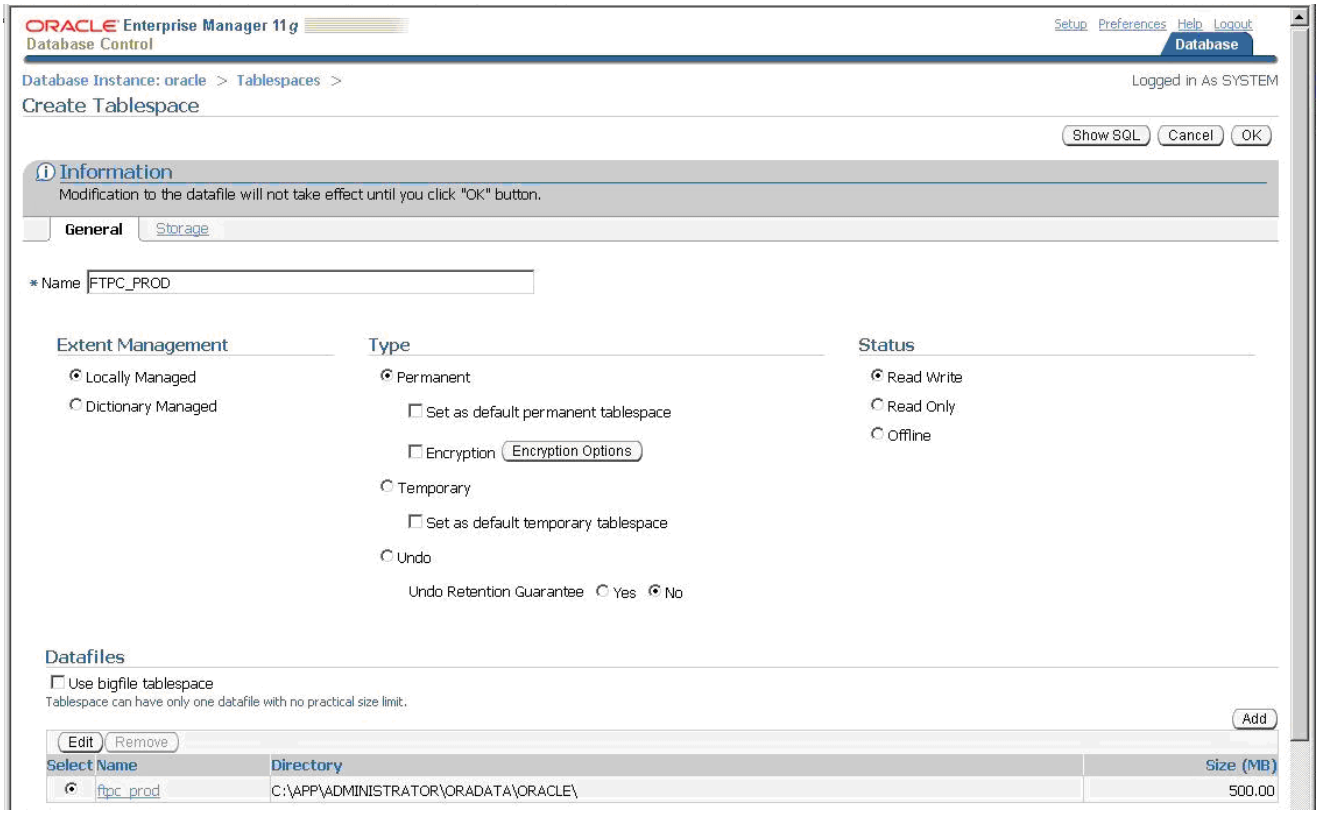
5. Specify the details for the file. Your values will depend on the needs of your particular application. We recommend setting the initial size and increment size as large as possible. Click [Continue].

Figure 3-70: Specify Your Tablespace's Details



6. Click [OK] to create the tablespace. This may take a while, depending on the size of the file.

Figure 3-71: Start Tablespace Creation



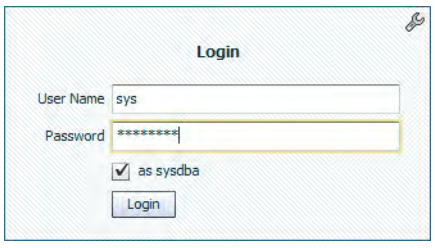
7. When the tablespace creation is finished, click *Database Instance:oracle* at the top left corner. You have now finished creating your tablespace.

Create the Tablespaces on Oracle 12c

To create the tablespaces on Oracle 12c, perform the following steps:

1. In a web browser, enter the Database Control URL you noted earlier. At the login prompt, enter sys as the username and its corresponding password. Check the “as sysdba” checkbox and then click [Login].

Figure 3-72: Database Control Login Page

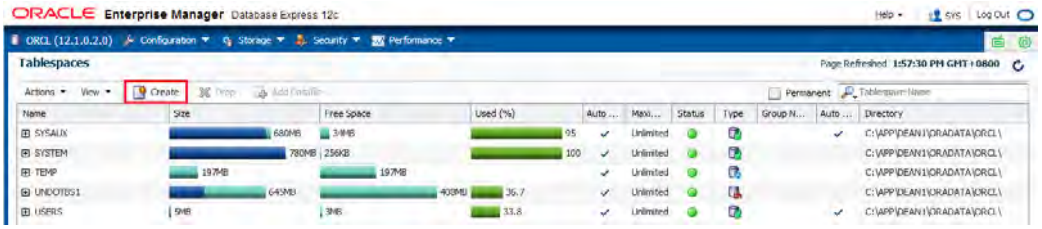


2. Expand the *Storage* drop-down menu and select *Tablespaces*.

Figure 3-73: Storage Drop-Down Menu

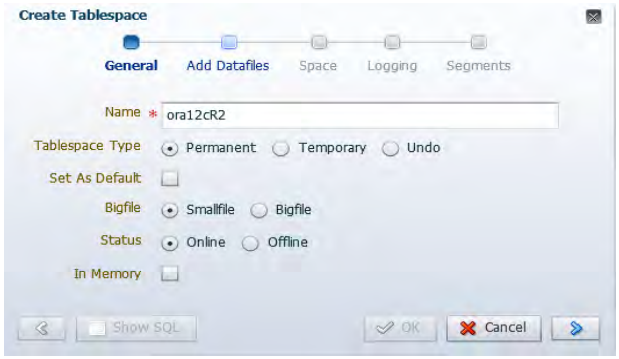
3. On the Tablespaces screen, click the [Create] button to bring up the Create Tablespaces dialog.

Figure 3-74: Create Tablespace



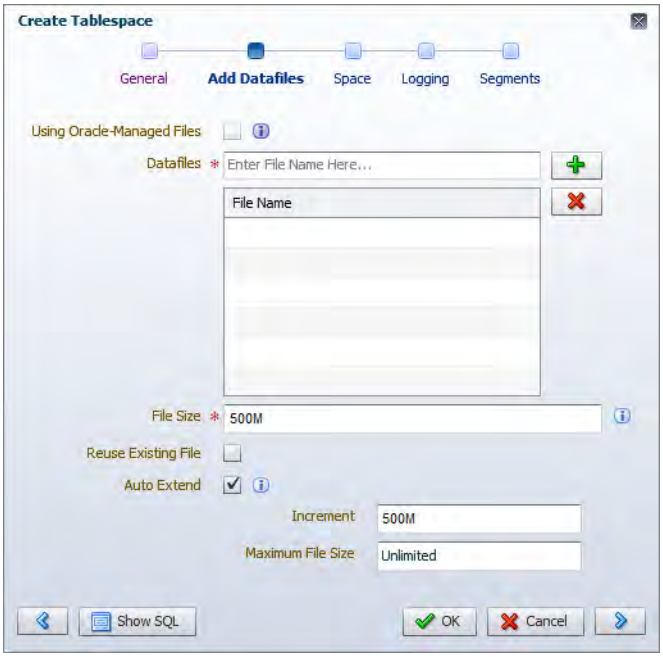
4. On the Create Tablespaces dialog's General tab, input your settings for this tablespace. Click the [>] and [<] arrow buttons to switch to a different settings page.

Figure 3-75: Create Tablespaces - General



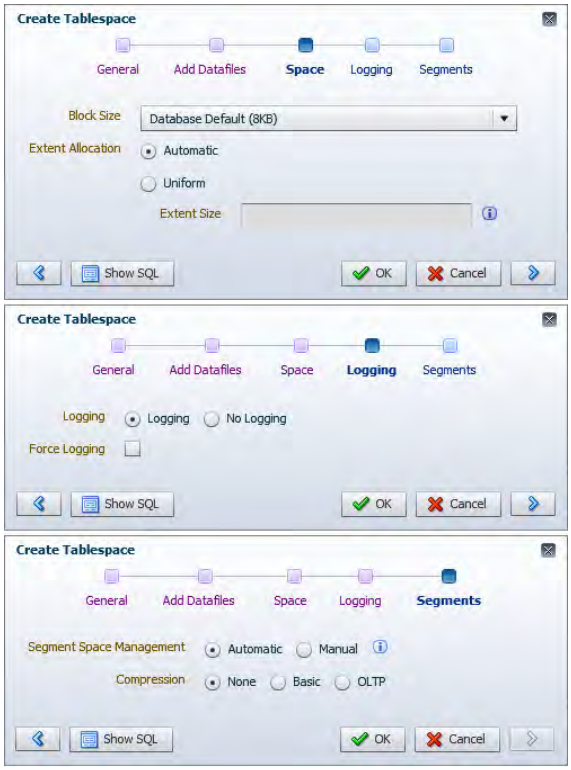
5. On the Add Datafiles tab, click the [+] button to add files. Specify the details for the file. Your values will depend on the needs of your particular application. We recommend setting both the file size and increment size to 500 MB.

Figure 3-76: Create Tablespaces - Add Datafiles



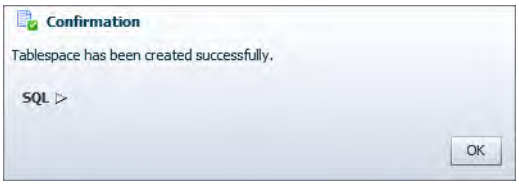
6. We recommend using the default settings on the Space, Logging, and Segments tabs. Once you have finished configuring the settings, click [OK] to create the tablespace. For more information on each setting, please refer to the official Oracle 12c documentation.

Figure 3-77: Create Tablespaces - Space, Logging, Segments



7. Click [OK] on the confirmation dialog.

Figure 3-78: Tablespaces Confirmation Dialog



Consider the following information when you set up your tablespaces. When you export a snapshot from one database to another, you can ease the process by using identical tablespace names. For example, when you export your Production database snapshot to your development database, the process is easier if both databases are named MyProduction. FTPC Administrator provides a database reorganization tool that allows you to assign logical groups of tables (e.g., fast growing, slow growing, indexes, etc.) to tablespaces that you create in the database(s) for this purpose. You can create the tablespaces now, and then after installation, assign them to logical groups. Refer to the *FactoryTalk ProductionCentre Administrator User's Guide* for more information.

Create the User

To create the user in the database you just created, refer to the following sections:

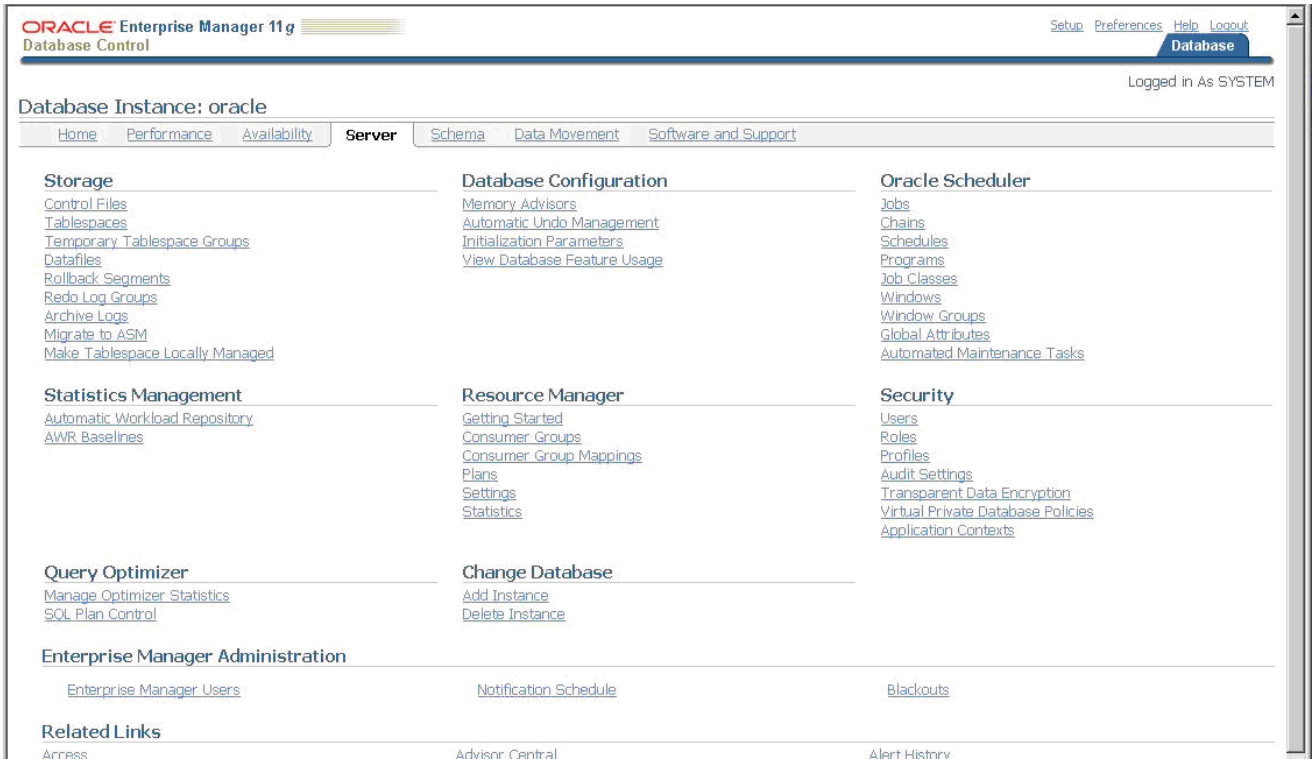
- "Create the User on Oracle 11g" on page 97
- "Create the User on Oracle 12c" on page 102

Create the User on Oracle 11g

To create the user on Oracle 11g, perform the following steps:

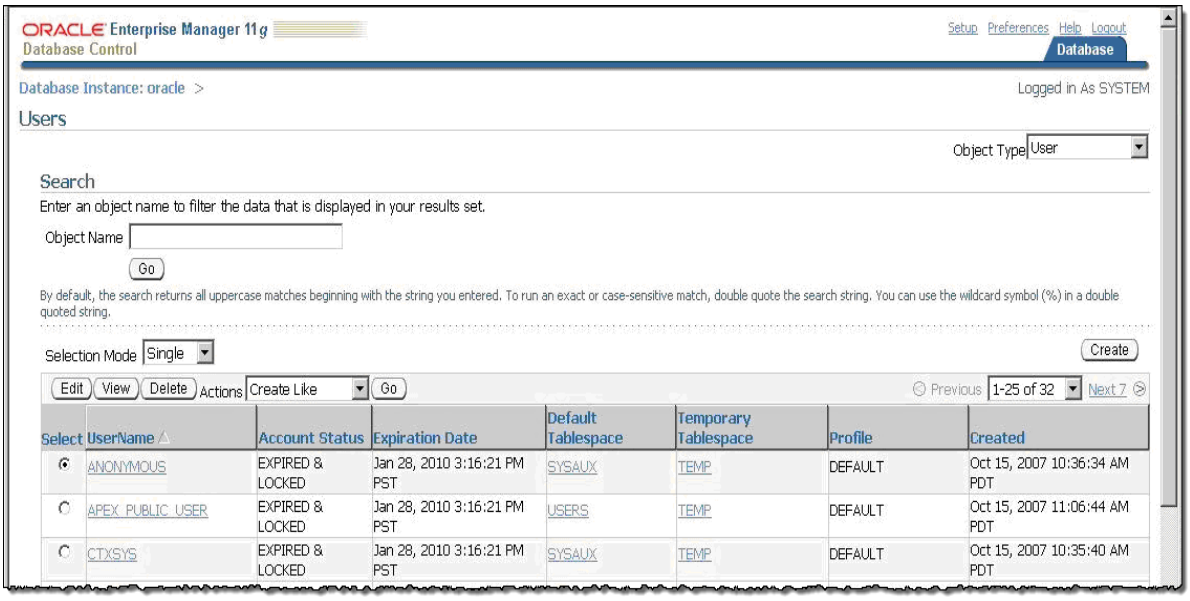
1. From the Server tab, under the Security heading, click *Users*.

Figure 3-79: Create User


ORACLE Enterprise Manager 11g
Database Control
Setup Preferences Help Logout
Database
Logged in As SYSTEM
Database Instance: oracle
Home Performance Availability Server Schema Data Movement Software and Support
Storage
Control Files
Tablespaces
Temporary Tablespace Groups
Datafiles
Rollback Segments
Redo Log Groups
Archive Logs
Migrate to ASM
Make Tablespace Locally Managed
Database Configuration
Memory Advisors
Automatic Undo Management
Initialization Parameters
View Database Feature Usage
Oracle Scheduler
Jobs
Chains
Schedules
Programs
Job Classes
Windows
Window Groups
Global Attributes
Automated Maintenance Tasks
Statistics Management
Automatic Workload Repository
AWR Baselines
Resource Manager
Getting Started
Consumer Groups
Consumer Group Mappings
Plans
Settings
Statistics
Security
Users
Roles
Profiles
Audit Settings
Transparent Data Encryption
Virtual Private Database Policies
Application Contexts
Query Optimizer
Manage Optimizer Statistics
SQL Plan Control
Change Database
Add Instance
Delete Instance
Enterprise Manager Administration
Enterprise Manager Users
Notification Schedule
Blackouts
Related Links
Access
Advisor Central
Alert History

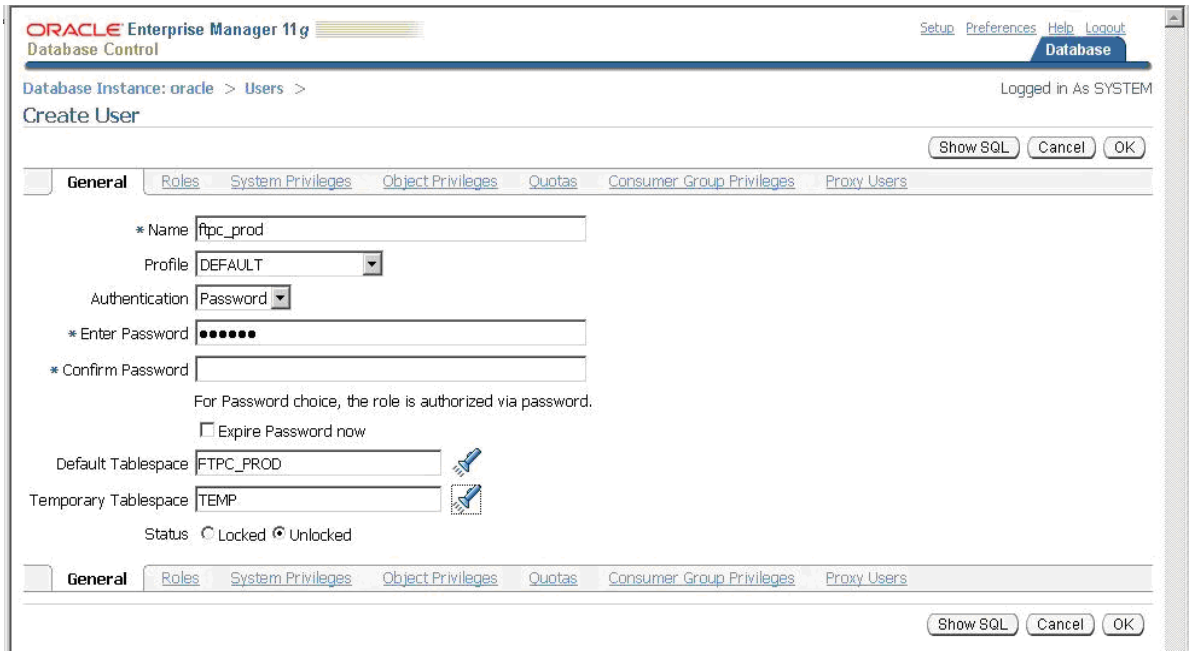
2. Click [Create].

Figure 3-80: Create New User



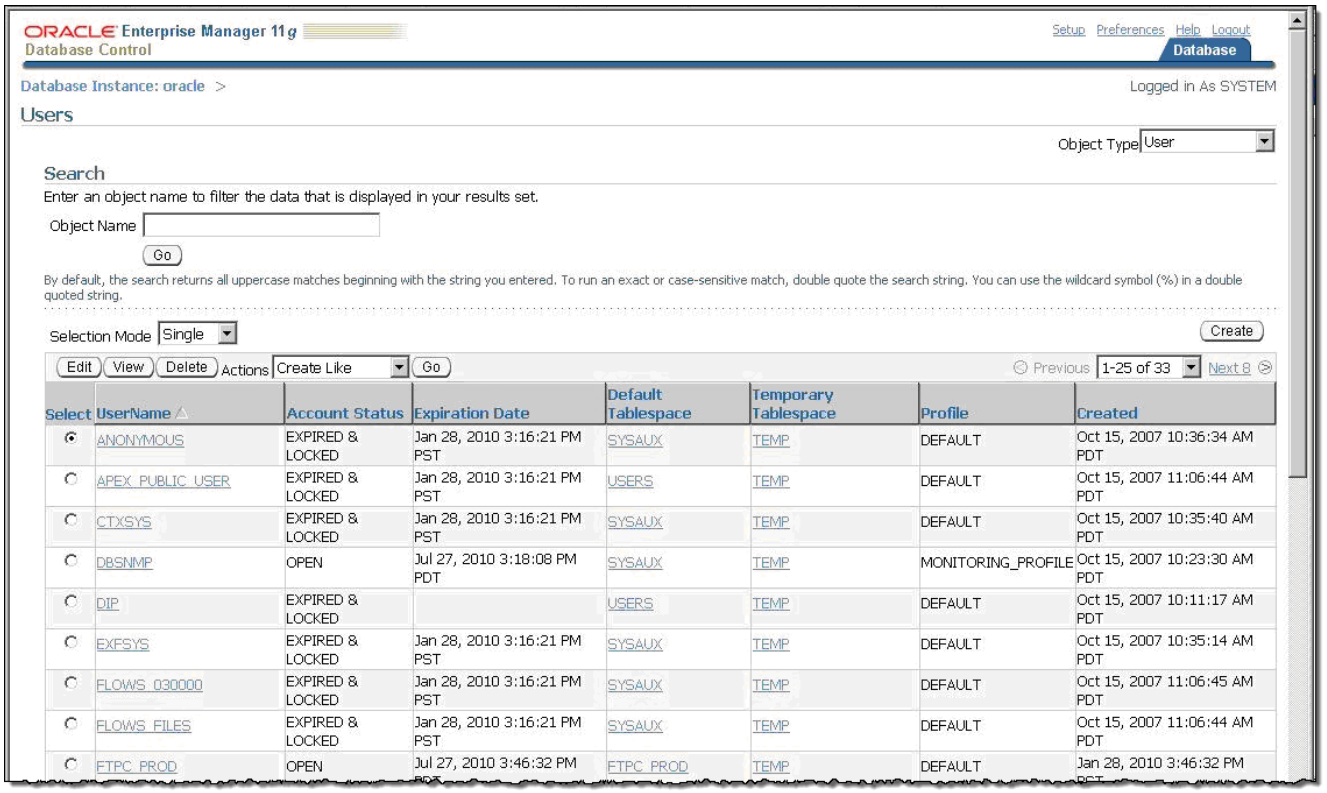
3. In the Create User screen, under the General tab, enter the following information and click [OK].
   - Name: Enter a name for the user.
   - Enter Password: Enter a password for the user.
   - Confirm password: Confirm the password.
   - Default Tablespace: Set this value to the tablespace you just created.
   - Temporary Tablespace: You can accept TEMP, the default temporary tablespace, or choose another tablespace.

Figure 3-81: Enter User Information



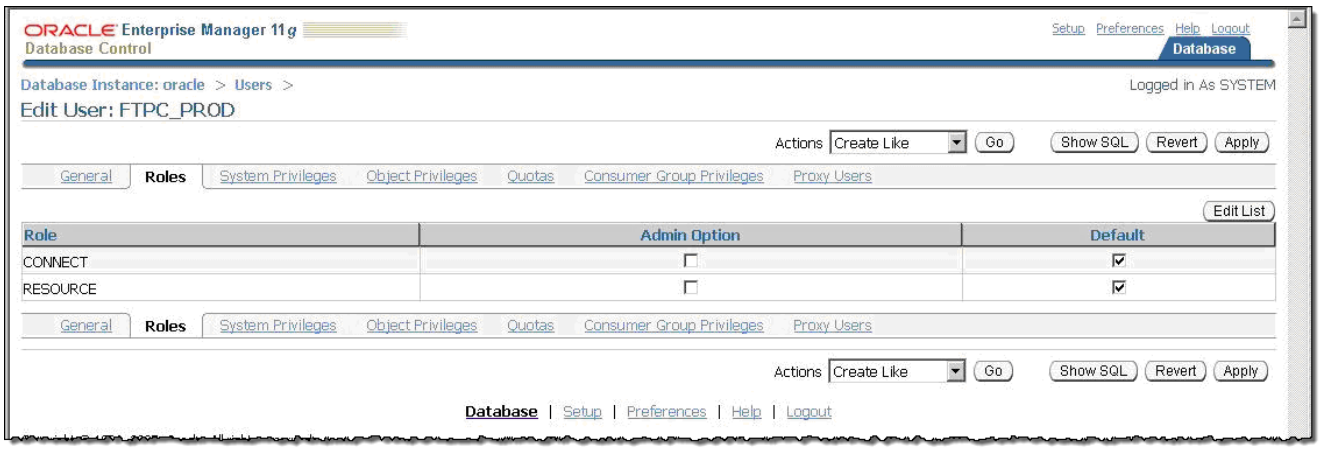
4. From the User List, select the user you just created and click [Edit].

Figure 3-82: User List



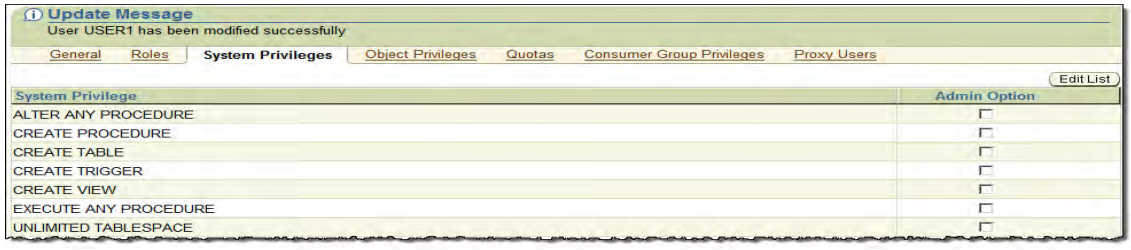
5. Select the Roles tab. Click [Edit List] and add 'resource' so that both Connect and Resource are listed. Click [Apply].

Figure 3-83: Configure Roles



6. Select the System Privileges tab. Click [Edit List], make sure the following privileges are on the list, then click [Apply].
   - ALTER PROCEDURE
   - CREATE INDEX
   - CREATE PROCEDURE
   - CREATE TABLE
   - CREATE TRIGGER
   - CREATE VIEW
   - EXECUTE PROCEDURE
   - UNLIMITED TABLESPACE

Figure 3-84: Set System Privileges



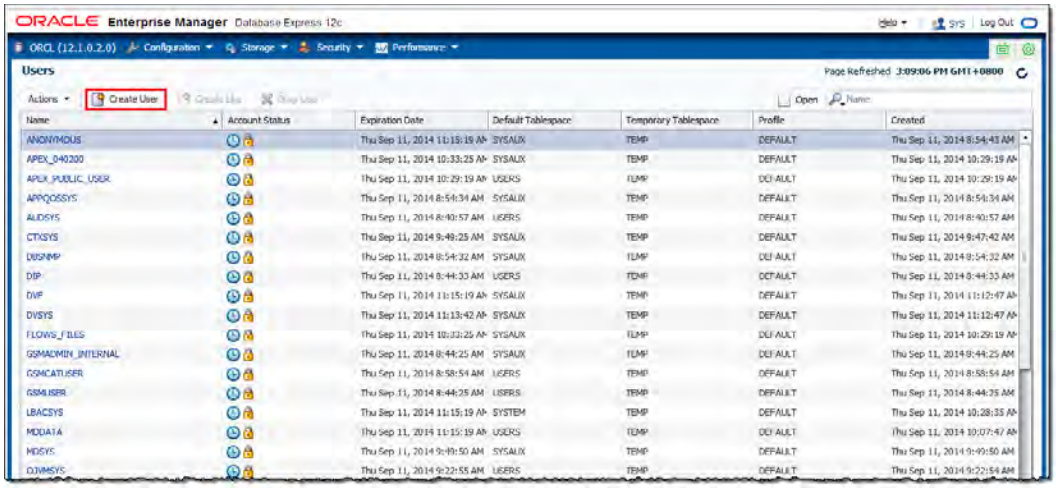
You have now finished creating your user.

Create the User on Oracle 12c

To create the user on Oracle 12c, perform the following steps:

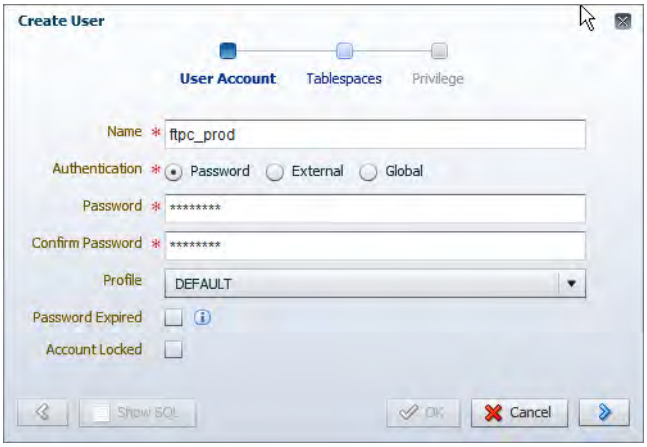
1. Expand the *Security* drop-down menu and select *Users*. Then, click [Create User].

Figure 3-85: Create User



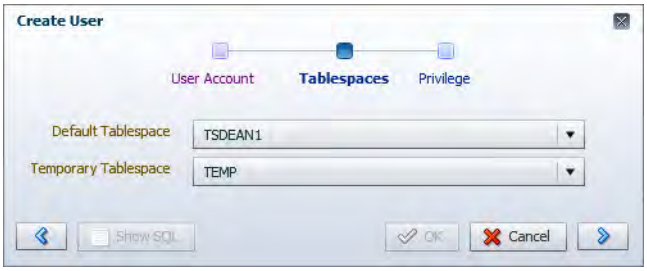
2. On the Create User dialog's User Account tab, input your settings for the new user. Click the [>] and [<] arrow buttons to switch to a different settings page.
    - **Name**: Enter a name for the user.
    - **Authentication**: Select Password.
    - **Enter Password**: Enter a password for the user.
    - **Confirm password**: Confirm the password.
    - **Profile**: Select DEFAULT.
    - **Password Expired**: Check this box if you want to force the user to change the password upon logging in for the first time.
    - **Account Locked**: Check this box to lock the user account, preventing users from logging in with it.

Figure 3-86: Create User - User Account



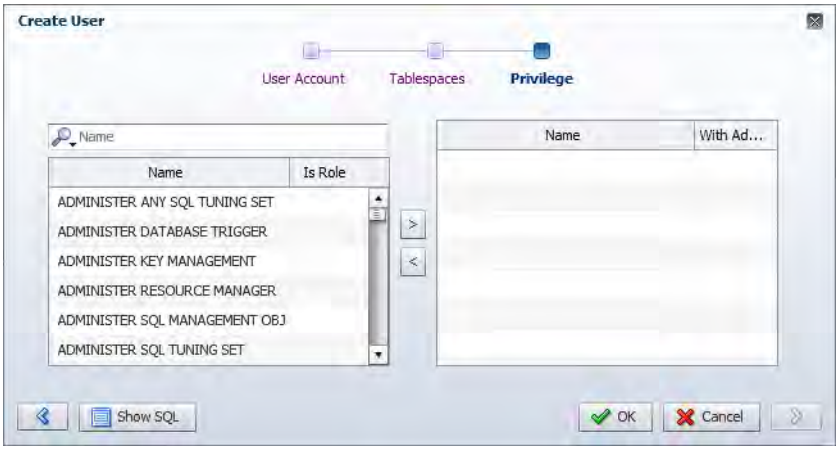
3. On the Tablespaces tab, you can configure the default and temporary tablespace for the user.
   - Default Tablespace: Set this value to the tablespace you just created.
   - Temporary Tablespace: You can accept TEMP, the default temporary tablespace, or choose another tablespace.

Figure 3-87: Create User - Tablespaces



4. On the Privilege tab, you can add or remove privileges to the user. Add the following privileges, then click [OK] to create the user.
   - ALTER ANY PROCEDURE
   - CONNECT
   - CREATE ANY INDEX
   - CREATE PROCEDURE
   - CREATE TABLE
   - CREATE TRIGGER
   - CREATE VIEW
   - EXECUTE ANY PROCEDURE
   - RESOURCE
   - UNLIMITED TABLESPACE

Figure 3-88: Create User - Privilege



You have now finished creating your user.

Create a Local Net Service Name

You will need a local net service name for the application and reporting servers to connect to the database. You can follow your conventions for the name. Record the Local Net Service name in Table 3-1 on page 43 for your reference.

Migrate a Database

If you are migrating to 10.3 or higher from a pre-10.3 release, please note the following:

- **Pre-10.3**: used the DATE data type.
- **10.3 and higher**: uses the TIMESTAMP(3) data type.

Due to this change, millisecond values are supported.

After migrating to this release, use the following to repair views that were made invalid by the migration:

```
alter view <VIEW_NAME> compile
/
```

For any views that are not repaired by the method listed above, re-create the view. For example, review any places where you are using the system function SYSDATE as it will probably need to be replaced with SYSTIMESTAMP.

If the user-defined view includes any use of TO_CHAR, please modify the format string in order to expose the millisecond values. For example, a format string of YYYY-MM-DD HH24:MI:SS should be changed to YYYY-MM-DD HH24:MI:SS.FF3. Adding .FF3 gives the fractional seconds in milliseconds.

Please see your Oracle documentation for more details.

Chapter 4

Database Server Performance

In this chapter

- **Assessing Hardware Requirements 108**
  - Scaling 108
  - RAID 108
  - Maximizing Database Resources 109
- **Monitoring Database Resources 111**
  - Indexing 112
  - Configuring Separate Databases 112
- **Configuring Microsoft SQL Server RDBMS 112**
  - Analyzing Statistics 112
  - Setting SQL Server Priority 113
  - Setting the Parallelism Parameter 113
  - Using NOLOCK 113
- **Configuring Oracle RDBMS 114**
  - Analyzing Statistics 114
  - Preventing Errors Caused by Network Problems 114
  - Using Oracle Cost-Based Optimizer 115

This chapter provides guidelines that apply to database server installations and can help optimize performance of installations within the described cases. Many sections refer to FTPC knowledge base, where you will find details and technical information.

Assessing Hardware Requirements

Rockwell Automation has performed various benchmark tests to reach the recommended minimum hardware requirements, based on basic FTPC transactions. Review the *FactoryTalk ProductionCentre Supported Platforms Guide* for these requirements when you assess your site requirements. The following sections discuss additional hardware options that may improve performance.

Scaling

Planning ahead for the database is very important. Since the database is the repository of all the information, it is not possible to balance the load, so as the load increases, the only options are increasing efficiency or increasing capacity.

If the load of the machine is beyond capacity, you can try to make the server more efficient. If the size or complexity of the query response overloads the CPU, indexing, optimizing queries, or purging the database to make it smaller will help alleviate complexity and length of existing queries. If the problem is I/O bound, upgrading the drive subsystem may help.

The next options are to upgrade to a more powerful machine or place the databases on different machines. Both solutions require downtime. If there is a lot of contention on the database and the slowdown is not due to overloading the CPUs, getting a more powerful machine may not improve performance. Contention may be resolved by making sure each database, such as the ODS and Production databases, is on a separate machine. Splitting the databases will take some of the pressure off the machines.

See the FTPC knowledge base article 103 for additional information.

RAID

We recommend that the more active database servers, like the Production database server, have a RAID 1 for the operating system, which is mirrored. In addition separate the data files and transaction log files onto two additional volumes. Ideally, these two extra volumes are RAID 1+0, although that is not a requirement.

We recommend that in situations where performance of the database does not impact production, such as with the historical (ODS) database servers, you use a RAID 5.

Depending on the application, different RAID configurations and stripe sizes are more efficient. For example, RAID 5 has less disk space overhead, but is slower than mirroring. Mirroring requires 100% overhead, but is much faster. Also, large stripe sizes allow large files to be written quickly, but waste disk space when writing small files. Make sure that you understand the different readings from your monitoring, then work with your System Administrator to accurately and efficiently identify the source of any problems.

See the FTPC knowledge base article 319 for additional information.

Maximizing Database Resources

Especially if you have a large, high-volume database server, we recommend putting the temp database, the log files, and the data files onto three separate drive volumes to maximize the resources. If only two drive volumes are available, separate the temp database and log files from the data files. If more drive volumes are available, then we recommend that you use FTPC Administrator's *Reorganize* feature to separate data from indexes.

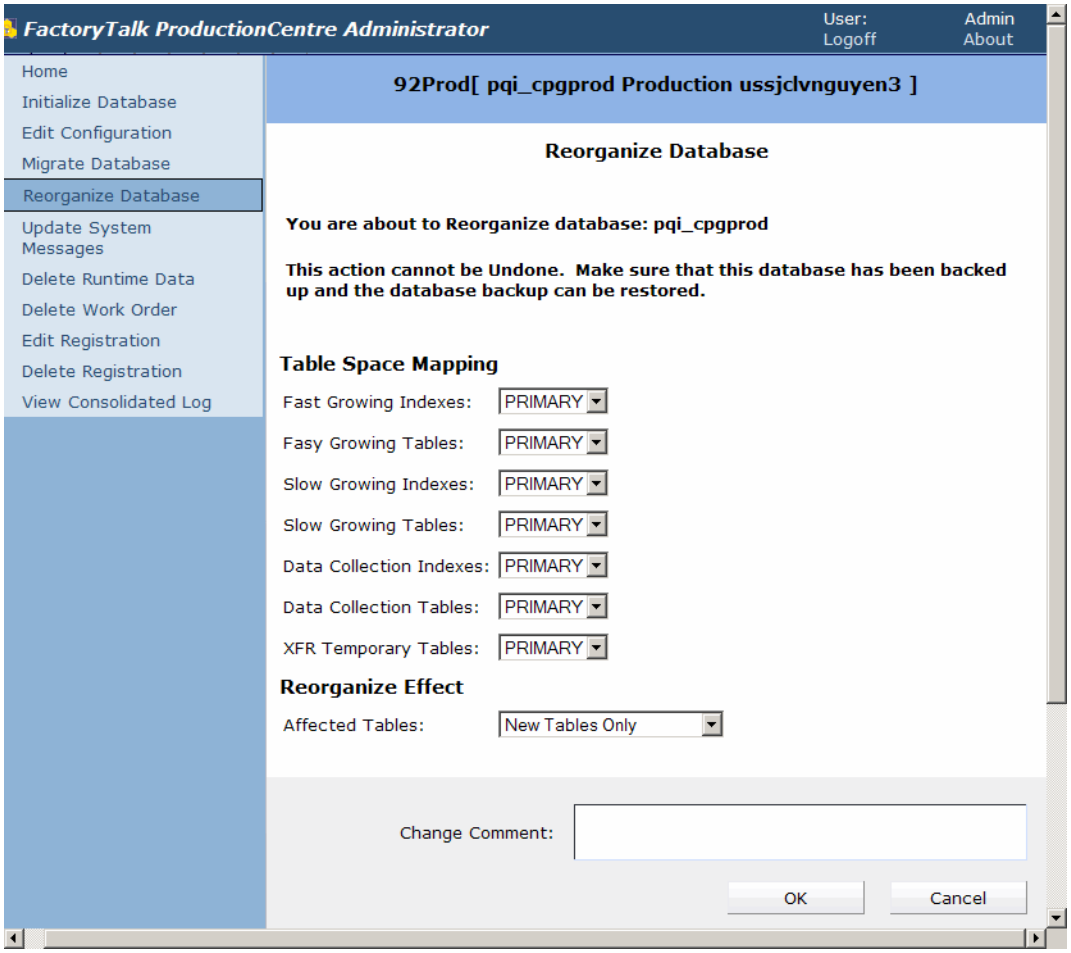
Physical separation of the three different types of files SQL uses (temp, log, and data) can minimize traffic congestion.

For more information, see SQL Server books online.

Using the Reorganize Feature

By using the FTPC Administrator table reorganization utility with the tablespaces, you can define the extent size to work with table growth speed. You can use this wizard during initialization or later, after installation and configuration. Figure 4-1 shows the mapping of the tablespaces to the table and index groups.

Figure 4-1: Table and Index Mapping Screen



Separate each function to correspond to the table and index groups shown in Figure 4-1. For example, place the indexes on their own volume, separate from the logs and data, then assign the Fast and Slow growing indexes to that volume.

FTPC supports automatic allocation for tablespace storage and autoextend on the datafiles.

Table 4-1 compares the settings for slow- and fast-growing indexes and tables.

Table 4-1 Default Storage Clause

Table Type	Settings
Slow-growing indexes and tables	Initial = 16KB Next = 64KB Minextents = 1 Maxextents = unlimited PCTincrease = 0
Fast-growing indexes and tables	Initial = 64KB Next = 512KB Minextents = 1 Maxextents = unlimited PCTincrease = 0

Here is an example scenario:

You know that your unit table will rapidly produce quantities of data and will grow fast, while your route table will generate far less data and can grow slowly. Here is how you can use that information when you configure your database installation.

1. When you create the tablespaces for your Production database, create one named Fast-growing with the recommended growth settings from Table 4-1.
2. Create an additional tablespace named Slow-growing with the settings from Table 4-1.
3. After installing FTPC and connecting to the Production database, open the Reorganize Database link.
4. The Reorganize Database page enables you to group your tables and indexes as fast- or slow-growing, as shown in Fig. 4-1.
   - Select your Fast-growing table in the Fast Growing Tables list.
   - Select your Slow-growing table in the Slow Growing Tables list.

   You can designate which tablespace houses the fast- or slow-growing tables, but FTPC (middleware) decides which tables are fast- or slow-growing.
5. Click [Next] to complete the wizard.

   The wizard enables you to re-map your indexes.
6. Click [Next] through the screens to complete the wizard and commit the changes.

Monitoring Database Resources

We recommend that you monitor database deadlocks. Deadlocks may indicate that too many resources are accessing your database at the same time. If this is the case, work with your Database Administrator to characterize the problem and try

to balance database requests. Some examples of problems and solutions if this occurs are:

- If reports are being run frequently, it might help to reduce the frequency with which they are run.
- If deadlocks occur during a time of high system load, change the time of day that non-critical reports are run to a period of lower system load.

Indexing

Indexing your databases makes selects faster, but may slow down inserts, deletes, and updates. Using this principle, index appropriately, but do not index everything. For example, avoid indexing *date* data types, but do index *integer* data types. The following scenario illustrates using a filter and an indexed attribute:

> If you use a UnitFilter to filter on uda_0 = 'supplier part number', then you should have an index on uda_0 or the filter will have to scan the whole table.

Configuring Separate Databases

FTPC installations do not require separation of the various databases but supports the configuration when appropriate for the anticipated load.

FTPC supports the following configurations:

- Separate database server machines for production and historical (ODS).
- Separate databases on a single server. When using this configuration, it is recommended that the physical layout of the Production and ODS databases be configured in such a way that minimizes the disk I/O contention between the two databases. It is also recommended that the two databases share as few resources as possible (i.e., memory, CPUs, disks, etc.). Please contact Rockwell Software Technical Support for more information and recommendations.

Configuring Microsoft SQL Server RDBMS

The following sections describe areas that can be modified to improve database performance.

Analyzing Statistics

Database statistics enable the database to create efficient plans for responding to queries. Microsoft SQL Server updates statistics dynamically.

The *Auto create statistics* and *Auto update statistics* default settings collect statistics. We recommend using these services for all databases.

IMPORTANT: Statistics that contain a space in their name are not supported. If a statistic name contains a space, then migration will fail.

Unlike Oracle, where you must run a scheduled task to update statistics, SQL Server will estimate statistics as it goes. There are times where manually updating statistics becomes necessary, for example, to update statistics after a large purge of the database.

We recommend that database statistics be updated periodically to avoid deadlocks in the databases that rely on the auto create/update statistics.

See the FTPC knowledge base article 391 for additional information.

Setting SQL Server Priority

When you configure your SQL Server databases, we recommend that you **do not** select *Boost SQL Server Priority*. This setting may cause erratic behavior.

Setting the Parallelism Parameter

For your Production database, which uses Online Transactional Processing (OLTP), we recommend you set the parallelism parameter to a value of 1. This setting minimizes performance loss by preventing any one query from allocating resources from all available processors.

The default setting, *use all available processors*, instructs SQL server to allocate more resources to larger queries. This could make the Production databases available to large reporting queries that will consume large amounts of resources. This may cause stations on the factory floor to slow down because the setting ignores the importance of the smaller shop floor queries when there is a large reporting query.

If your other databases, such as ODS, are on different servers and have no effect on production, the default setting works well.

Using NOLOCK

When using SQL statements with getArrayDatafrom...() methods or with ODBC directly you can use the NOLOCK option, which requests that SQL Server ignore locks on tables and records and read directly from the tables. The NOLOCK only applies to the single statement, so you do not need to alter the entire connection's isolation level. This option is only available with *select* statements.

Refer to Microsoft documentation on "NOLOCK" for additional information.

The getArrayDatafrom...() method connects to retrieve the query from the database, and disconnects once it has retrieved the record set. Additional information on this method may be found in the Process Designer API Help.

See the FTPC knowledge base article 92 for more information.

Configuring Oracle RDBMS

The following instructions should only be performed by an experienced Oracle Database Administrator. If you have detailed questions about the Oracle parameters described, contact Oracle Technical Support. If you have questions about the information presented here, contact Rockwell Automation Customer Support.

Analyzing Statistics

Because Oracle does not automatically collect statistics, as MS SQL does, one way to automate frequent statistic collection is to run a scripted service. Please see your Oracle database documentation for instructions on setting up an automatic database job.

IMPORTANT: Statistics that contain a space in their name are not supported. If a statistic name contains a space, then migration will fail.

For information about using statistics for cost-based planning, refer to "Using Oracle Cost-Based Optimizer" on page 115.

Set the Cursor_Sharing Parameter

The cursor_sharing instance parameter can reduce parse time for certain applications by sharing compiled statements when different applications use the same statements.

For best results, set the cursor_sharing parameter to SIMILAR. Oracle treats the parameter as follows:

- If multiple applications are using identical compiled statements, the parameter acts like the FORCE parameter, which shares the compiled statements between those applications that use the statements.
- If multiple applications are using similar but not identical statements, the cursor_sharing parameter uses variables to still share the compiled statements.

Refer to the Oracle documentation for more information about the cursor_sharing parameter.

Preventing Errors Caused by Network Problems

Network problems or normal network timeouts can cause certain Oracle errors. There are several different methods of preventing the errors, described below.

- Configure the Oracle Listener to listen at multiple ports. Use an Oracle utility, such as Oracle Net Configuration Assistant, to do this or change 'listener.ora' to have an additional port. For example:

```
LISTENER =
    (DESCRIPTION_LIST =
    (DESCRIPTION = (ADDRESS = (PROTOCOL = TCP)(HOST =
    qanimo)(PORT = 1521)))
    (DESCRIPTION = (ADDRESS = (PROTOCOL = TCP)(HOST =
    qanimo)(PORT = 1523)))
    )
```

- If configuring the listener to have additional ports does not prevent the problem, try the following suggested by Oracle:
  - Create a PROTOCOL.ORA in <*oracle_home*>/network/admin on the server side. Add one line: TCP.NODELAY=YES, then stop and restart the listener. This will turn on persistent tcp buffer flushing. Be aware this can create some additional network traffic, but should not cause significant problems.
  - Edit SQLNET.ORA, usually located in <*oracle_home*>/network/admin. Either remove the sqlnet.expire_time or set it to some value like 30 (the units for this value are minutes), then stop and restart the listener for the change to take effect. This will either turn off dead connection detection (DCD) or will increase the time to 30 minutes before the connection can be marked for deletion. Sometimes the performance monitor will mark connections as idle even though they are waiting for data. To work around the problem, either set the value high enough that most queries will return before that time has passed or do not use DCD.
  - Edit SQLNET.ORA, usually located in <*oracle_home*>/network/admin. Add the line BREAK_POLL_SKIP and set to any numeric value (the units of this value are seconds), then stop and restart the listener. The higher the value the less frequently BREAK_POLL_SKIP is checked. Again, this is a server-side setting.
  - Edit SQLNET.ORA, usually located in <*oracle_home*>/network/admin. Add the line DISABLE_OOB=ON, then stop and restart the listener. Again, this is a server side parameter. This will disable out-of-band breaks.

Using Oracle Cost-Based Optimizer

For best performance, use Oracle's cost-based optimizer facility for FTPC, rather than rule-based. If there are no statistics, the optimizer defaults to rule-based analysis, which may result in poor performance. For information about obtaining statistics, refer to "Analyzing Statistics" on page 114.

The available modes are:

- **rule**: the optimizer uses a rule-based approach, regardless of the presence of statistics.
- **cost-based modes**:
  - **all_rows**: the optimizer uses a cost-based approach, regardless of the presence of statistics and optimizes with a goal of minimum resource use to complete the entire statement. This option is good for untuned, high-volume batch systems. This is the default and the recommended mode.
  - **first_rows_*n***: the optimizer uses a cost-based approach, regardless of the presence of statistics. This option is good for applications that routinely display partial results to users, such as paging data to a user in a web application.
  - **first_rows**: the optimizer uses a mix of costs and heuristics (set by Oracle) to find a best plan for fast delivery of the first few rows. This option is good for untuned systems that process a lot of single transactions.

See your Oracle documentation for more information about optimizer mode.

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