CHAPTER 1
Getting Started with Oracle Database 12c
It's here! Oracle Database 12c! Better yet, you are here, reading this book on Oracle Database 12c. This hopefully means that you have a keen interest in learning about all of the new features contained within Oracle Database 12c. In this book, we will cover a lot of these features, and get you excited about what's in this latest version of the Oracle Database.

This first chapter is the beginning of the Oracle Database 12c journey. In this chapter, we are going to cover getting started with Oracle Database 12c. You will find discussions on:

- Downloading and staging Oracle Database 12c
- Preparing to install Oracle Database 12c
- Installing Oracle Database 12c
- Introducing Oracle Enterprise Manager Database Express 12c

**Downloading and Staging Oracle Database 12c**

Oracle Database 12c is available through the Oracle Software Delivery Cloud (https://edelivery.oracle.com) or through the Oracle Database 12c home page (a web search for Oracle Database 12c Download should help you find it). You should create a directory on your database server and download the installation files (Zip files, usually) into that directory. Once you have downloaded the compressed images onto your computer, unzip them into the same directory using the `unzip` command.

**Tom Says**

Another great source of information on new features is the New Features Guide itself available on www.otn.oracle.com under the documentation for Oracle Database 12c. In addition, all of the documentation for the database can be found there as well. To top it all off, be sure to check out the first chapter of the documentation relevant to you to find out what’s changed in Oracle Database 12c; for example, the first chapter of the Administrators Guide is “What’s Changed in 12c for Administrators.” There are too many new features to fit in any single book; this book you are reading covers many of the most important new capabilities.
NOTE
Make sure you unzip the two Zip files into the same directory (as the installation instructions indicate) or the install will fail. It’s possible that Oracle will change the install process at some point in the future and no longer require you to unzip the files into the same directory, so review the latest read-me files to double-check.

The install image for the database itself comes in the form of two compressed (Zip) files. Additional files will be available for the Oracle Grid Infrastructure, gateways, client, web tier and other related products. This chapter addresses the installation of Oracle Database 12c only, and not the installation of the Oracle Grid Infrastructure. See Chapter 4 for information on new features associated with the Oracle Database 12c Grid Infrastructure components.

Preparing to Install Oracle Database 12c
There are a number of steps that you need to complete before you start your Oracle Database 12c software install. Many of these steps will seem very familiar to you if you have been working with the Oracle Database for a long time. Even if that’s the case, however, you should carefully consider all the following preparatory steps before you begin to install the new Oracle software:

- Review the install guides and read-me files
- Make sure your OS platform has all required updates installed
- Make sure your platform meets the minimum hardware and software requirements
- Create the required OS groups and users

Tom Says
Also, please note that raw partitions are desupported in Oracle Database 12c; you cannot use them at all in this release. Raw partitions must be migrated to ASM or a regular filesystem. See support note “Announcement of De-Support of using RAW devices in Oracle Database Version 12.1 [ID 578455.1]” for further details.
Configure the required kernel parameters
Check whether any patches are required prior to the install
Finish the pre-install steps

Let’s look at each of these items in some additional detail next.

**Review the Install Guides and Read-Me Files**

It’s always a good practice to review the installation guide a few times before you install the Oracle Database, especially if you’re dealing with a new version. The install guide provides you with a concise list of steps that you should perform as you prepare to install Oracle Database 12c. Additionally, the install media often contains read-me text files that you should review for any last-minute instructions that Oracle provides related to the install. These instructions might include prerequisites to install additional software (for example, Oracle may recommend that you download a new version of the Oracle Universal Installer (OUI) before installing the database software).

**Make Sure Your OS Platform Has All Required Updates Installed**

Review the install guide for your specific Operating System (OS) platform to ensure that you are running on a version of that OS that supports Oracle Database 12c. Additionally, check that guide along with the associated read-me files and the My Oracle Support (MOS) portal to make sure that you have installed all the OS patches and fixes that are required before installing Oracle Database 12c. MOS offers a Certification page that can assist you in determining the combinations of software and hardware that are supported by Oracle Database 12c.

**Tom Says**

This is a key point! If you are upgrading an earlier release of an Oracle install, make sure to read the Upgrade Guide (available on www.otn.oracle.com) before doing so in addition to reading the installation guide. It will be time well spent—trust me. The number one cause of failed upgrades is the failure to read the upgrade guide.
Make Sure Your Platform Meets the Minimum Requirements

Before you begin your install, make sure the platform on which you will be installing Oracle Database 12c meets the minimum hardware and software requirements. Of course, minimum requirements are just that—minimum requirements—and don’t ensure peak performance of your databases. Factors such as adding additional databases in the future, the nature of the processing that occurs in the databases, and so on will impact the total requirements of the platform with respect to disk space, memory, and CPU usage.

The general minimum server requirements vary by platform. To give you an example, some of the stated requirements for a Linux x86-64 (64 bit) install are described in the following sections.

Oracle Database 12c Software Storage Requirements

A Linux x86-64 install has the following Oracle Database 12c software storage requirements:

- Oracle Database 12c Enterprise Edition: 6.4GB
- Oracle Database 12c Standard Edition: 6.1GB
- Oracle Database 12c Standard Edition One: 6.1GB

Additional space would be required if you plan to use the fast recovery area (FRA). Diving into the factors that feed into configuring the FRA is well beyond the scope of this book. Please take a look at Oracle Database 11g RMAN Backup and Recovery by Robert Freeman (yours truly) and Matt Hart for more information on sizing the FRA. We cover backup and recovery in quite a detailed manner in that book.

The /tmp directory requires a minimum of 1GB of space. If you do not have enough space in /tmp, you need to either increase the amount of space in that file system or set the TMP or TMPDIR environment variables in the Oracle environment.

Oracle Database 12c Memory Requirements

The Oracle memory requirements for a Linux x86-64 install are as follows:

- Minimum of 1GB (recommend 2GB of RAM or more).
- If you have between 1GB and 2GB of memory on your system, then you should allocate 1.5 times the amount of RAM for swap space.
- If you have more than 2GB of memory on your system, then you should allocate an amount of swap space equal to the amount of memory available on the system, up to 16GB.
NOTE
To reiterate, these are minimum, bare-bones requirements for database memory. Typically, you will want a great deal more memory on your system. The amount of memory that you will need is very dependent on the nature and number of the databases that you intend to run on the system. Frankly, running an Oracle Database that you expect to perform on any hardware with less than 8GB of memory is probably bordering on the insane.

Operating System Requirements
As of this writing, Oracle Database 12c supports the following Linux distributions:

- Oracle Linux 6 with the Unbreakable Enterprise kernel: 2.6.39-200.24.1.el6uek.x86_64 or later.
- Oracle Linux 6 with the Red Hat Compatible kernel: 2.6.32-71.el6.x86_64 or later.
- Oracle Linux 5 Update 6 with the Unbreakable Enterprise kernel: 2.6.32-100.0.19 or later
- Oracle Linux 5 Update 6 with the Red Hat compatible kernel: 2.6.18-238.0.0.0.1.el5 or later
- Red Hat Enterprise Linux 5 Update 6: 2.6.18-238.0.0.0.1.el5 or later
- Red Hat Enterprise Linux 5 Update 6 with the Unbreakable Enterprise Kernel: 2.6.32-100.0.19 or later
- SUSE Linux Enterprise Server 11 SP2: 3.0.13-0.27 or later

Also note that there are a number of packages that you will need to ensure are installed on your system before you can install the Oracle Database. Each version of the Operating System has a different list of packages, so we won’t list them all here.

Probably the easiest way to ensure that you have installed all the packages is to use the Oracle Database preinstall RPM that is available from ULN (linux.oracle.com). The RPM is named differently for the different operating systems in use. For example, the name is oracle-rdbms-server-12cR1-preinstall-1.0-3.el6.x86_64.rpm for Oracle Database 12c. The instructions on downloading and using this RPM are somewhat lengthy. You can find them in the Oracle Database 12c Installation Guide for Linux. There are often OS specific instructions related to the Oracle Database install, so it’s
always a really good idea to go through the install guide for your specific hardware, even if you are an Oracle old timer (like me).

After checking your install requirements, you can use a command such as `cat /etc/oracle-release`, `cat /etc/redhat-release`, or `lsb_release -id` to determine the distribution and version of Linux that is installed, making sure that everything lines up and is good to go. Here is an example of running the `/etc/oracle-release` command and the expected output:

```
[root@server12c ~]# cat /etc/oracle-release
Oracle Linux Server release 6.3
```

You will also want to determine whether the required kernel errata is installed by using the `uname -r` command, as shown here:

```
[root@server12c ~]# uname -r
2.6.39-300.26.1.el6uek.x86_64
```

In the case of my release the current install guide at the time of this writing says that I need to have release 2.6.32-100.0.19 or later, so I've got the correct server release installed. The current install guide (or updated read-me file) will contain the latest minimum release level that is required.

For Linux distributions, a number of packages must be installed. Check the current install guide for a list of these required packages. Use the `rpm` command to query the system to determine if the correct packages are installed. For example, I might want to check that the correct release for binutils (binutils-2.17.50.0.6 or later as of this writing) is installed. I can use the following command to check this information:

```
[root@server12c ~]# rpm -q binutils
binutils-2.20.51.0.2-5.34.el6.x86_64
```

Create the Required OS Groups and Users

If this is the first install on the system you are using, then you need to create the Oracle environment. The process to do this has not changed in Oracle Database 12c. You still create the Oracle inventory group (e.g., oinstall), the OSDBA group (e.g., dba), the Oracle software owner (e.g., the oracle OS account), and the OSOPER group (e.g., oper). As with earlier versions of the Oracle Database (and mentioned earlier in this chapter), there is an RPM package that you can download and install that will create the oracle OS account and groups for you. This is known as the Oracle RDBMS Pre-Install RPM. Along with creating the oracle user and required install groups, the RPM will install all required kernel packages for both the Oracle Grid Infrastructure and the Oracle Database. It will also configure the kernel parameters and resource limits to the values recommended by Oracle.
Configure the Kernel Parameters
On a new system, you need to set the OS kernel parameters (if you have not used the YUM Oracle RDBMS Pre-Install RPM). Refer to the Oracle Database 12c install guide for your specific operating system for recommended minimum values. The Oracle install guide for your operating system also provides methods to determine the current settings and reset those settings if required.

NOTE
I often find that the minimum values for the parameters recommended by Oracle quickly become insufficient for larger database installations. If you are not familiar with the operating system you are working with, you should discuss the recommended settings with an experienced OS administrator and determine if higher values are advisable.

I often find that one of the places that I run into problems is with the resource limits defined for the Oracle database owning account. Make sure that the limits for the Oracle account are set to the minimum values listed in the install guide.

Check Whether Any Patches Are Required Prior to the Install
Often, the initial release of the Oracle Database product is available on the public download sites but the updated releases are only available through Oracle’s support platform (MOS). Whether you are installing the first release of Oracle Database 12c or any release for that matter, you should check MOS and download the most current version of that version of the Oracle Database.

Finish the Pre-Install Steps
You are almost ready to install Oracle Database 12c. Before you can begin the install, you need to complete the following steps:

- Determine the location of the ORACLE_BASE directory. If you already have a previous version of Oracle Database installed on the system, then you should use the same ORACLE_BASE directory that is already defined. This is not required but highly recommended.
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■ Ensure that you can start an X terminal session (if installing on Linux) so that you can run the Oracle Universal Installer (OUI).
■ Unset parameters such as ORACLE_HOME, TNS_ADMIN, and the like.
■ Make sure that the PATH environment variable does not include $ORACLE_HOME/bin.

NOTE
In earlier Oracle Database versions, it was common to set ORACLE_HOME to the location of the new ORACLE_HOME before starting a new software install. It is now recommended that you set the ORACLE_BASE parameter instead. When ORACLE_BASE is set, the OUI creates an ORACLE_HOME path that is compliant with Oracle’s Optimal Flexible Architecture (OFA). It is recommended that you accept the ORACLE_HOME path that the OUI recommends.

Installing and Deinstalling Oracle Database 12c
Now that you have made sure your system is ready to install Oracle Database 12c, you are ready to install the database product. For purposes of demonstration, in this section we are installing Oracle Database 12c Enterprise Edition on Oracle Linux x86-64. We assume you have downloaded the database software and unzipped it into a directory called /u01/download/database. In this section you will

■ Prepare to start the OUI
■ Install Oracle Database 12c using the OUI
■ Deinstall Oracle Database 12c using the OUI

NOTE
Oracle Database 12c cannot be installed over an existing ORACLE_HOME location, so you will be installing it into a new ORACLE_HOME.
Prepare to Start the OUI

Before you can start the install, you first need to set up the environment so that you can run an X Windows session, and then you need to log in as the oracle user. There are many ways to run an X Windows session. In our case, we are logged directly into the server. You could use other methods, like VNC or SSH tunneling with some X Emulator. As with many things, there are a number of ways to get the job done.

In Figure 1-1, we’ve enabled X Windows (using `xhost +`), switched over to the Oracle user directory, and then changed to the `/u01/oracle/download/database/database` directory, which is where we unzipped the Oracle Database 12c install software and therefore, where we will be performing our install from.

Before performing the install, we set the ORACLE_BASE directory to `/u01/app/oracle`:

```
export ORACLE_BASE=/u01/app/oracle
```

Now we are ready to start the Oracle Universal Installer and begin the database install.

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**FIGURE 1-1.** Setting up Unix environment for install
Install Oracle Database 12c Using the OUI

To begin the install process, we start the old familiar runInstaller program:

```bash
[oracle@server12c database]$ ./runInstaller
```

This launches the Oracle Universal Installer. Oracle will go through some OUI pre-install checks, and then the OUI will appear.

During the install, the OUI presents you with several screens to enter your install information into. The Oracle Database 12c OUI interface has not changed a great deal since Oracle Database 11g Release 2 (though the install screens themselves have changed a lot), so if you have installed Oracle Database 11g Release 2 (or, frankly, even older versions) then this process should feel familiar to you.

Figure 1-2 shows the opening screen of the OUI, where you can enter your email address and your My Oracle Support password to get automated security updates. You can also choose to skip this step and move on if you prefer.

![Oracle Universal Installer Configure Security Updates screen](image-url)
If you click Next, and you did not enter an email address at the installer prompt, you will be asked to confirm that you wish to remain uninformed of critical security features. This is a rather onerous sounding message. You may, or may not, wish to enable security updates for a great many reasons. At the end of the day, you are the DBA and you understand your architecture. Since this is not a new feature, we won’t dive into best practices of this feature, and we assume you already know what to do here.

Completing the first screen, you will click Next to move to the Download Software Updates screen (see Figure 1-3), where you can enter your My Oracle Support credentials so that you can easily download and install patches and other updates from Oracle. You can enter the information requested and click Next to continue, or you can click the Skip Software Updates button and click Next to
continue. If you opt to skip software updates at this time, you can always choose to configure them at a later date. For now, we have opted to skip updates and continue. As this is not new in Oracle Database 12c, we will move on in the install process.

The Select Installation Option screen (see Figure 1-4) that appears next gives you the following three choices:

- **Create and configure a database**  Installs the Oracle Database 12c software and also creates a small Oracle database and configures the networking associated with that database.

- **Install database software only**  Installs the Oracle 12c software only. You would need to manually create a database afterward using the Oracle Database Creation Assistant.

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**FIGURE 1-4.** *OUI Select Installation Option screen*
- **Upgrade an existing database** Starts the Oracle Database Upgrade Assistant, which will give you an option to upgrade an existing database to Oracle Database 12c.

Generally, I recommend choosing the first option because it not only installs the Oracle software for you but also stands up an Oracle database at the same time. The reason I like this option is so that I can quickly test the new Oracle environment that I’ve created. Once the install is done, you can check that the database came up successfully and that the networking components work. So, in this case, we will select the first option. I also like to manually start the Database Upgrade Assistant (DBUA) if that is the tool I’m going to use to upgrade a database with (which it often isn’t). We discuss upgrading a database to Oracle Database 12c in Chapter 2 of this book.

Next, as shown in Figure 1-5, the OUI asks you which “class” of database you wish to install. The options are Desktop Class and Server Class. The main difference
is that if you choose Server Class, you get more install options. If you are new to Oracle Database, you might want to start with the Desktop Class option. Most Oracle DBAs use the Server Class option, and that is what we will select in this demonstration. Click Next to continue.

Next, the Grid Installation Options screen (see Figure 1-6) asks if you want to install a single instance database, an Oracle Real Application Clusters (RAC) database, or an Oracle RAC One Node database. In our case, we want to install a single instance database (we will cover Oracle RAC new features in Chapter 3), so we choose the first option and click Next.

Figure 1-7 shows the next screen, Select Install Type, which gives you the option of performing either a typical install or a more advanced install. If this is your first time installing Oracle Database, then you may want to choose the Typical Install
option. In our case, we are going to choose the Advanced Install option. This will give us a great deal more flexibility when creating the database. Click Next after you have made your choice. One thing you will notice as you progress through the OUI and make selections is the dynamic nature of the list of steps that is presented on the left pane of the OUI. As you make your choices, the list on the left expands and contracts as required.

Next, the Select Product Languages screen, shown in Figure 1-8, provides you with the different language options that you can install. In our case, we are going to accept the default of English and click Next.
The Select Database Edition screen (see Figure 1-9) gives you options to choose which database edition you want to install. You are currently given three options (Oracle could always choose to add or remove or rename database editions at any time):

- Oracle Database 12c Enterprise Edition
- Oracle Database 12c Standard Edition
- Oracle Database 12c Standard Edition One
Select the Oracle Database 12c edition that you are licensed to install. Each version has varying levels of features and capabilities. In our case, we are going to choose to install the Enterprise Edition of Oracle Database 12c and then click Next.

Next you are presented with the Specify Installation Location screen, shown in Figure 1-10, where you define the location of the ORACLE_BASE directory. We specified the location of the ORACLE_BASE directory earlier in this chapter, in the section “Finish the Pre-Install Steps.” When you fill in the ORACLE_BASE location (that is, the Oracle Base field in the OUI), the OUI automatically completes the Software Location field below it. This directory will become the ORACLE_HOME...
directory for the software. In our case, we have accepted the default ORACLE_BASE directory (/u01/app/oracle), which we planned on using anyway. Note that the Software Location information is also prefilled using the directory $ORACLE_BASE/product/12.1.0/dbhome_1. Typically, we accept these defaults. Click Next to continue.

If you are installing the Oracle Database software into this ORACLE_BASE location on this machine for the first time, then the Create Inventory screen is displayed next, as shown in Figure 1-11. The Oracle Inventory (contained in the inventory directory) is its own small metadata repository that keeps track of which Oracle software is installed on your system, and other metadata such as where the different ORACLE_HOME directories are, any patches that have been applied, and
so forth. In our case, let’s just leave the defaults and click Next. If you have already installed Oracle into this ORACLE_BASE location then the inventory has already been created.

The Select Configuration Type screen (see Figure 1-12) gives you a couple of options with respect to the type of starter database that Oracle Database will create after it has installed the Oracle Database Software. Two options are available, General Purpose/Transaction Processing and Data Warehousing. Based on the option you choose, Oracle Database will use an existing Oracle Database Configuration Assistant (DBCA) template to create the database configuration you have chosen.

Because we are just creating a starter/test database, we are going to choose the General Purpose/Transaction Processing option. If you are an experienced DBA, you know that you’ll invest a great deal of time and thought in how you will create and
configure the database that you will actually use. For now, we just want a database that we can use for test purposes. Click the Next button to continue.

The next OUI screen is the Specify Database Identifiers screen, shown in Figure 1-13. First, this screen enables you to define the global database name and the Oracle Service Identifier (SID). Both of these default to a value of orcl, which is fine in most cases. However, if you are installing Oracle Database 12c on a system that already has a database called orcl (running on Oracle Database Version 11.2, perhaps), then you need to select a different global database name and a different SID for the database.

In our case, this is not a new install, and an orcl database already exists. Therefore we will make the name of this Oracle Database 12c database orcl12c as seen in Figure 1-13.
NOTE

In this book, we use all lowercase letters for Oracle database names (which can be up to eight characters). Case sensitivity with Oracle database names is a platform-specific feature. What’s important is that you develop and follow a set of conventions with respect to how you name your databases and the like, so that the names are consistent throughout your database. Also, make sure your naming conventions meet your platform-specific requirements.

The next option on the Specify Database Identifiers screen is related to a new feature in Oracle Database called Oracle Multitenant. Notice the Create as Container database check box. This provides the ability for you to create this new
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database as a Multitenant Container Database. I discuss Multitenant Container Databases in much more detail in Chapter 3.

The Create as Container Database check box is checked by default. For now, just to keep things simple and make sure everything installs correctly before we start exercising all of the new features in Oracle Database 12c, clear this check box and then click the Next button to continue.

On the Specify Configuration Options screen, you can configure the memory allocation, change the character sets, and specify whether you want to install the sample schemas in the database. On the Memory tab, by default, the OUI allocates 40 percent of the available physical memory to the database to be installed. Frankly, because this is a test database, that's likely more than enough memory to allocate to the database that you will create. In our case, the OUI wanted to allocate 2.5GB (2594MB) to the database. That seems excessive, so I reduced the amount of memory allocated to the database to 1GB (1024MB, which is still probably more than enough), as shown in Figure 1-14. Notice that I decided not to enable Automatic Memory Management.
Management (AMM). Again, because this is a test database, I don’t see any need to enable AMM at this point.

The Character Sets tab of the Specify Configuration Options screen seen in Figure 1-15 enables you to change the character set. Again, because this is just a test database, there is really no need to change the default character set (which can vary based on platform—the default on our Oracle Linux system is WE8MSWIN1252).

Next, click the Sample Schemas tab, shown in Figure 1-16. Many of the examples later in this book use the sample schemas, so when you create this database (or whatever database you create to experiment with Oracle Database 12c new features), you will want to have the sample schemas installed. Therefore, check the Create Database with Sample Schemas check box. Click Next to continue.

FIGURE 1-15. Character Sets tab of the OUI Specify Configuration Options screen
Next, the OUI presents the Specify Database Storage Options screen, where you specify the location in which to store the database files that will be created for your database. The other option, Oracle Automatic Storage Management (ASM) is used if you have Oracle ASM configured. Typically, ASM would be configured if you are installing the Database on an Oracle Database RAC cluster (though RAC is not required). I discuss Grid- and RAC-related new features in Chapter 4.

In this case, as shown in Figure 1-17, we are going to leave the File System radio button selected and accept the default location listed for the database files in the Specify Database File Location text box.

Next, you will find yourself on the Specify Management Options screen. If you have some experience with installing previous versions of the Oracle Database then you will notice that the next screen is slightly different than you will have seen previously. First, you will not find an option to set up Oracle Enterprise Manager.
Database Control for the database. Oracle has discontinued Database Control and replaced it with a new product called Oracle Enterprise Manager Database Express. We will discuss the removal of Database Control and the addition of EM Database Express later in this chapter.

The Specify Management Options screen also provides you with an opportunity to connect your database with the Oracle Management Server infrastructure (that is, Oracle Enterprise Manager Cloud Control 12c). For now we will leave the screen as is and click Next to continue. Since you’re not really doing anything on this screen, I decided to save paper and not give you a screen shot.

The Recovery Options screen, shown in Figure 1-18, is where you define the location of the fast recovery area (called Recovery Area location on the screen—don’t ask me, I don’t know). Check the Enable Recovery check box, leave the File
System radio button selected, and accept the default file system as the FRA. Also
note that when you enable recovery, this will enable redo log archiving.

**NOTE**

This book is not about backup and recovery of Oracle databases, so we won’t go into the specifics of the FRA, how to manage it, RMAN backups, or anything like that in this chapter, though we will do a quick backup of our new database toward the end of this chapter. (For detailed information about backup and recovery, check out Oracle Press’s book Oracle RMAN 11g Backup and Recovery, by Robert Freeman and Matthew Hart.)
This is a good spot to mention the help options that the OUI offers as you proceed through the install process. If you want additional information about the screen you are viewing, click the Help button (in the lower-left corner). A window with helpful information specific to the install step you are currently on will appear. Figure 1-19 provides an example showing the Help Topic Window that appears when you click the Help button (which I highlighted for you just for fun!) on the Specify Recovery Options screen of the OUI.

Having selected the FRA, click Next to proceed to the Specify Schema Passwords screen, shown in Figure 1-20, which enables you to set the passwords for the SYS,
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SYSTEM, and DBSNMP schemas. You can choose to use separate passwords for each schema (considered the best practice), or you can use a common password for all the schemas. Since this is a simple test database, we will opt to use the same password for all accounts.

Note in the Messages box (at the bottom of Figure 1-20) that the OUI lets you know if your password does not meet certain complexity requirements. (To view the minimum password requirements click the help button). If you click Next, the OUI warns you that the password does not meet Oracle's recommended standards and
asks if you want to continue. If you want to change the password to comply with the
Oracle standards, click the No button and then re-enter the password. If you wish to
continue with a nonconforming password, click the Yes button. If you want more
information, then you can click the Details button and the dialog box will provide
you with more information on the warning that you have received. This is
demonstrated in Figure 1-21.

On the next screen, Privileged Operating System Groups, you can define the
various operating system groups that are associated with different privileges (such
as the OSDBA group). In our case, we will accept the default values (shown in
Figure 1-22) and click the Next button.

After you click the Next button, the OUI proceeds to run the install prerequisite
checks on the system. These checks ensure that all the required system settings are
correct prior to the install. The system checks whether the proper packages have
been installed, whether the proper kernel parameters are set, and so on.

As shown in Figure 1-23, the prerequisite checks have detected a problem with
the free space in the /tmp file system and issued a warning (as seen in the status
column). We can see at the bottom of the figure that there needs to be at least 1GB
of free space and we only have some 835MB space available.
Figure 1-23 shows that a warning was issued (as shown in the Status column). The Fixable column is marked No. If the Fixable column were marked Yes then we could prompt the OUI to generate a fix script for us to correct the problem. Many problems detected in the Perform Prerequisite Checks screen are automatically fixable. The reason this one is not is that the OUI does not know if the /tmp file system is just too small, or if we just have some big files that need to be removed. Also, it would not know which files it could safely remove to correct the condition. So we have to intervene manually to correct the problem. In this case, we could just go in, remove some big files, and click the Check Again button. The OUI would re-check the configuration and find that we had cleared enough space. At this point no error or warning message would appear.
Now, let's look at another case. In Figure 1-24, we see that the prerequisite checks have found a problem with the setting of the system memory parameter semmsi. It should be set to 250 and it appears to be set to 200.

Notice that this time, the Fixable column says Yes. This means that we can have Oracle Database help us correct the problem. If you are sure the problem is not significant, click the Ignore All check box. This prompts the OUI to ignore all the errors and warnings detected and proceed with the install as if there were no issues. However, I want to correct the problem, so I'll click the Fix & Check Again button near the top of the screen. In response, Oracle creates a script and opens a dialog box, labeled Execute Fixup Scripts (see Figure 1-25), that lists the name of the script and gives us instructions on how to proceed. In our case, we will open another
terminal window, make sure we are the root user and execute the script called runfixup.sh.

Here is the result of actually running the fixup script created by the OUI:

```
[root@server12c Desktop]# /tmp/CVU_12.1.0.1.0_oracle/runfixup.sh
All Fix-up operations were completed successfully.
```

After running the fixup script, click OK in the Execute Fixup Scripts dialog box. The OUI will rerun the checks. If all of the errors and warnings are not cleared, the OUI displays the screen shown in Figure 1-23 again, with any remaining errors or warnings listed. In that case, proceed to correct any additional errors or warnings as previously described.
If the problems were corrected, then you will see the OUI Summary screen, as shown in Figure 1-26. You can review the various settings and configurations that will be applied to the install. If the settings all look correct, then you are ready to install the Oracle Database software. Simply click the Install button.

If you want to reset a setting, click the Edit link next to that setting. You are taken back to the OUI screen where that setting is configured. Optionally, you can click the Back button to reverse through the configuration pages one at a time, or you can click the Cancel button to cancel the install.

NOTE
Clicking the Save Response File button allows you to save your selections as a response file that you can use later in “silent” installs.
In our case, we are ready to install Oracle Database 12c, so we click Install and, voilà, the OUI begins to install our database for us! Figure 1-25 shows an example of the OUI installing the Oracle software. You can click the Details button to see additional details of the install process. How long the OUI takes to complete the install process depends on a number of factors, including memory, disk speeds, CPU speed, system load, and so forth. Note the details box that is available to click. This will present even more detailed information on the install process if you desire.

After the OUI has installed the database software itself, but before it can create the first database, we need to perform a few manual steps as root to complete the database software install. This step is shown by the Execute Root Scripts step in the status box of the section of the OUI Install Product screen that you can see in Figure 1-27.
During this step the OUI presents you with a list of scripts that you need to run as the root owner. An example of the dialog box that indicates the script or scripts you need to run to complete the software install is shown in Figure 1-28.

As directed in the Execute Configuration Scripts dialog box (shown in Figure 1-28), we will run the `/u01/app/oracle/product/12.1.0/dbhome_2/root.sh` script as the root user. During your install you may be prompted to run more than one script as root.

To run these scripts, open a separate terminal session as root and then run each of the scripts in the order shown in the Execute Configuration scripts dialog box seen in Figure 1-28. Here is an example:

```
[root@server12c Desktop]# /u01/app/oracle/product/12.1.0/dbhome_2/root.sh
Performing root user operation for Oracle 12c
The following environment variables are set as:
ORACLE_OWNER= oracle
```
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ORACLE_HOME= /u01/app/oracle/product/12.1.0/dbhome_2
Enter the full pathname of the local bin directory: [/usr/local/bin]:
The contents of "dbhome" have not changed. No need to overwrite.
The contents of "oraenv" have not changed. No need to overwrite.
Enteries will be added to the /etc/oratab file as needed by
Database Configuration Assistant when a database is created
Finished running generic part of root script.
Now product-specific root actions will be performed.
[root@server12c Desktop]#

Once the scripts have successfully executed, click the OK button in the Execute Configuration Scripts dialog box. At this point, the OUI will indicate that the install of the Oracle Database was successful, as shown in Figure 1-26. To complete the installation, click the Close button to close the OUI.

Once the OUI has installed the Oracle Database 12c software, it will then start to create the Oracle Database and configure Oracle Database networking for you. During this install, you will notice some other new features when the Oracle Database Configuration Assistant (DBCA) starts to create that database. One nice feature of the DBCA in Oracle Database 12c is that there is a button that will open

FIGURE 1-28. OUI Execute Configuration Scripts dialog box
the alert log of the database for you, so that you can monitor the log as the database is being created. You can see the DBCA doing its thing in Figure 1-29.

Figure 1-30 provides a look at the new Alert log output screen, and the Activity Log dialog box output during the install process.

Once the OUI and the DBCA are complete, the DBCA returns information about the database that has just been created, as shown in Figure 1-31. At this point, the database should be up and running.

Let's check that the database is actually running by logging in as follows:

```
[oracle@server12c ~]$ . oraenv
ORACLE_SID = [orcl12c] ?
The Oracle base remains unchanged with value /u01/app/oracle
[oracle@server12c ~]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Sun Jul 21 00:28:08 2013
Copyright (c) 1982, 2013, Oracle. All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 - 64bit Production
```
With the Partitioning, OLAP, Advanced Analytics and Real Application Testing options
SQL> select open_mode from v$database;
OPEN_MODE
--------------
READ WRITE

Before you click the OK button on the DBCA, make sure you write down the URL for EM Database Express URL. You will want that. Then, to complete the install, simply click the OK button on the DBCA screen. This will return you to the OUI Finish screen. You can then click the Close button on the OUI Finish screen to complete the install.
Deinstall Oracle Database 12c with the OUI

A quick word about deinstalling Oracle Database 12c is in order. The way you deinstall the database software has changed in Oracle Database 12c. The deinstall tool that you used to use is now deprecated and you now deinstall the database using the OUI interface. To do this, you first will start the installer from an Oracle Database 12c ORACLE_HOME. Figure 1-32 shows you the Welcome screen of the OUI. Notice that it looks different than the OUI Welcome screen that you started from the Oracle Database install media.

To remove an Oracle Database ORACLE_HOME, you select the Deinstall Product button that you see on the right side of the OUI Welcome screen. When you select this button, the OUI Inventory screen will appear as seen in Figure 1-33. Select the ORACLE_HOME that you wish to deinstall, and click the Remove button as seen in Figure 1-33.

The OUI will present you with a confirmation screen, making sure you really want to remove the ORACLE_HOME. If you do, just click the Yes button and the OUI will remove the Oracle software in the selected ORACLE_HOME. When the deinstall is complete, the OUI will return to the OUI Inventory screen, allowing you to remove another ORACLE_HOME if you wish.
NOTE

If an ORACLE_HOME has a dependent HOME location (as indicated by the + sign by the ORACLE_HOME name), then you need to remove that dependent object first, and then you can remove the remaining ORACLE_HOME.

Note that, as of this writing, the OUI does not clean up the databases that are running under that ORACLE_HOME. In fact, the remaining instances are terminated, pretty abruptly, since the software that was running them will have disappeared all of a sudden. So, in the best of worlds, you should either remove the databases under the ORACLE_HOME directory you are removing first, or you should move them to run under a different ORACLE_HOME before you execute the delete operation.
The Death of Database Control and Birth of Database Express

If you looked closely at the output from the DBCA shown in Figure 1-31, you might have noticed something different if you are a veteran Oracle Database installer. Instead of receiving a URL for Database Control, as in the past, you are given a URL for EM Database Express. This refers to Oracle Enterprise Manager Database Express, a lightweight replacement to Database Control. You might have missed it, but Oracle announced in My Oracle Support document 1484775.1 that Database Control will no longer be supported after Oracle Database 11g Release 2.

Database Express is still web based, but it has a much smaller footprint and is easier to manage than Database Control. That’s the good news. The bad news is that Database Express does not have nearly the same functionality that Database Control had. And, no, there isn’t a copy of Database Control left over for you to use—it’s gone, history, just plain not there. If you aren’t convinced, just look for the old emca or emctl commands that were used to manage Database Control.
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Database Express Prerequisites

Before you can start Database Express, the following must be true:

- The database that you want to manage with Database Express is up and running (you can't start or stop the database with Database Express).
- The listener is running and is servicing the database you want to manage with Database Express.
- You know the name of the server that the database is on.
- You know the port number that Database Express is listening on. By default, the port number on the first Database Express database created on a database server is 5500. You can determine the correct port number for a specific database by making a call to the `dbms_xdb_config.gethttpport()` package in the database, as shown in this example:

  ```sql
  SQL> select dbms_xdb_config.gethttpport() from dual;
  DBMS_XDB_CONFIG.GETHTTPPORT()
  -----------------------------
  5500
  ```

  You can also change the port for a given database using the procedure `dbms_xdb_config.sethttpport`, as seen here:

  ```sql
  sql> exec dbms_xdb_config.sethttpport(5500);
  ```


Accessing Database Express

Now it's time to open your web browser and type in the EM Database Express URL (which you received in the Database Configuration Assistant screen shown earlier in Figure 1-26). If you forgot it, the format of the URL is as follows: `https://server_name:port_number/em`. In the case of the server we're using, the URL is `https://server12c:5501/em`. After you type the URL and press ENTER, you should see the Database Home screen, described next.

Navigating Database Express

Figure 1-34 provides an example of the Database Home screen for Oracle EM Database Express 12c.
NOTE

The loss of Database Control and the impacts to your database operations should be seriously considered when doing your Oracle database upgrade planning. It is possible that you have configured notifications, jobs, and other types of administrative and monitoring functions in Database Control that will no longer be available when you upgrade to Oracle Database 12c.

As you can see, the look and feel of Database Express is much different from that of Database Control and is a bit more like Enterprise Manager Cloud Control 12c. The Database Home screen provides a single place from which you can review and monitor the database. It provides the following database-related information:

- Basic database status information
- Summary performance information
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- Resource information, including host CPU, active sessions, memory utilization, and storage
- Database incidents that occurred in the last 24 hours
- SQL monitoring information
- Information on running jobs

As you move your cursor over the various graphs, bubbles will appear with additional information. You can click some of the buttons in the regions and drill down for additional information. For example, in the SQL Monitor region you will see SQL statements that Oracle is actively monitoring. You can click the status button of a given SQL statement to see more details about that SQL statement, including its execution plan, time and wait statistics, and IO statistics.

Although Database Express has rather limited functionality compared to Database Control, it still has a great deal of functionality to assist both junior and senior DBAs. Some of the major functionality is accessible from the following drop-down menus at the top of the Database Home screen:

- Configuration
- Storage
- Security
- Performance

Each of these drop-down menus has several options. Let’s finish up this chapter by looking at some of that functionality in additional detail.

NOTE
Database Express represents a single management interface for an individual database (or individual instance if you are running a RAC install). Database Express is much more limited than Database Control. If you are managing a few or a bunch of databases, we strongly recommend that you implement Oracle Database 12c Cloud Control in your enterprise, if you haven’t already done so. It really is the way to manage Oracle databases in the enterprise.
Configuration
Configuration, the leftmost drop-down menu in Database Express, enables you to manage the following:

- **Database Installation Parameters**  This page allows you to view and manage the various parameter settings of the database.

- **Database Memory Settings**  This page provides information about the various memory areas used by your Oracle database. For example, the page displays the current memory settings, the SGA and PGA advisor, top sessions by PGA, and other memory-related items. The page also provides an option to configure memory allocations. By clicking this option, you can modify the database memory settings (dynamic or static) as required.

- **Database Feature Usage**  Often, DBAs will ask, “Which features in the database are we actually using?” When licensing time comes around, sometimes it’s hard to tell which products you are using and which you are not. The Database Feature Usage screen provides the information you need to determine which features are currently in use, the number of times that each feature has been detected as having been used, and other information with respect to the usage of the features in the database.

- **Current Database Properties**  This page displays the current Oracle Database properties, which impact the entire database. While initialization parameters are specific to a database instance (which is significant in RAC installations), properties describe behaviors and settings of the database as a whole. Examples include the global database name, various NLS database settings, and other global database settings.

Storage
The Storage drop-down menu enables you to look at a number of storage-related database items. These include the following:

- **Tablespaces**  This page provides a list of each tablespace assigned to the database (including those with temporary datafiles, such as temporary tablespaces). It includes information regarding how much space is allocated to the tablespace, how much free space is in the tablespace, and how much of the tablespace is currently in use.

  On the Tablespaces page, you can also create or remove tablespaces, add datafiles to existing tablespaces, and drill down in a given tablespace and look at its individual datafiles.
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- **Undo Management**  This page provides an overview of undo-related database statistics. Information presented includes the Undo Advisor, undo space usage, undo generation rate, and general information related to database undo.

- **Redo Log Groups**  This page provides information about the online redo logs in the database (instance). It displays all the available online redo logs, and shows you which one is the current online redo log, the log sequence number, and the location of the current online redo log file.

  The Redo Log Groups page also lets you create and drop new online redo log groups and files, force a checkpoint, and switch logfiles.

- **Archive Logs**  This page provides information about each online redo log that has been archived.

- **Control Files**  This page provides information about the database control files, including number, location, and name.

**Security**

The Security drop-down menu enables you to manage the following basic database security functions:

- **Users**  This page provides a list of all the users in the database and a variety of other information, including whether the account is locked, when it was created, the default user and temporary tablespaces, and when the account expires. Clicking the name of an individual user opens a page called User View, which provides a lot of details about the individual user, including their roles, system, and object grants.

  The Users page also enables you to create or drop users; create a user like another user (for example, if you have a user named Robert, you can create a user named Carrie that is just like the Robert user account); manage privileges and roles; and manage grants to database objects.

- **Roles**  This page enables you to manage database roles. You can see all the roles that currently exist in the database, create new roles, and delete existing roles. You can also look at specific roles and see the privileges assigned to those roles.

- **Profiles**  This page enables you to see all profiles defined in the database. It also lets you create or remove profiles in the database.
Performance
The Performance drop-down menu is perhaps the handiest of the four menus in Database Express. From the Performance menu, you can access

- The Performance Hub
- The SQL Tuning Advisor

Performance Hub The Performance Hub provides a real-time look at database performance. It also enables you to go back in time, somewhat, and see what past performance looked like. Figure 1-35 provides an example of what the Performance Hub looks like.

Figure 1-35 shows quite a bit of information about our database. The top graph indicates that a peak in user activity occurred shortly after 1:30 a.m. (which is when we ran a backup). Below the graph, the Summary tab is selected, which provides a general overview of the performance of the system. The Host: Runnable Processes pane shows that we are not using very much CPU. The Memory: Host pane shows how much memory was allocated to the database and how much is allocated to

---

**FIGURE 1-35.** Oracle EM Database Express Performance Hub with Summary tab selected
specific areas (such as the SGA and PGA). You can also check the Show Host Memory check box to see how much memory the database has allocated relative to the total amount of memory allocated to the database server itself. The other two panes include information about active sessions and IO-related information.

Unfortunately, the Performance Hub Summary tab offers no real drill-down capabilities. So, for example, if you see a spike in performance, you usually can’t click that spike and drill down into additional information. Other views, such as the Activity view, do provide drill-down capabilities.

So, if you click the Activity view, a graph located in the middle of the page provides wait-related information by default. The drop-down box above the graph provides a number of alternative views that you can select. You can choose to look at such information as top sessions, resource consumption, and other metrics that can help you to not only tune your database but also respond to database performance issues.

The bottom of the Activity tab shows the SQL that is executing on the system and shows the different user sessions that are running in the database. The SQL and user sessions are sorted based on what is being displayed in the upper graph. For example, as shown in Figure 1-36, if you choose to have the upper graph show SQL statements by top-level SQL ID, you can then view below the graph the individual SQL statements and user sessions sorted by the top-level SQL ID you have selected.

**FIGURE 1-36.** Oracle EM Database Express Performance Hub with Activity tab selected
SQL Tuning Advisor  The SQL Tuning Advisor provides a window into Oracle's SQL Tuning Advisor (STA). The STA runs automatically during the maintenance window. Also, if you wish, you can run the STA manually from the Performance Hub (with the Activity tab selected) if you find a SQL statement that is performing poorly. Simply pick the SQL statement(s) you want to have analyzed and then click the button to schedule the STA in Figure 1-36 we mentioned earlier. You can then view the results by clicking the SQL Tuning Advisor tab. Automated runs will be displayed on the Automatic tab, and your manual runs will be displayed when you click the Manual tab.

Database Express has a lot of functionality, and we have just scratched the surface in this chapter. Frankly, covering all of its functionality could probably take up its own book. While it is now missing some of the functionality that you might have gotten used to with Database Control, it's much lighter weight and the performance for what it does do is exceptional. We have given you a good introduction to the tool, but the best way to really understand Database Express is to actually use it.

End of Line
We have started our journey to exploring Oracle Database 12c new features by installing the product and creating a starter database. Quite the first step! In each chapter, we will wrap up the chapter with a section I call “End of Line.” If you read Oracle Database 11g New Features, you will know that “end of line” is a quote from the first Tron movie, indicating that the MPC has completed its communication. In true geek style, I am borrowing the line as it sounds so much more fun than using “summary” or “chapter conclusion.”

There is nothing boring about Oracle Database 12c. This version of the Oracle Database has perhaps some of the biggest changes and new features of any of the Oracle major releases in some time, if ever. You might have glimpsed some of that in this chapter as you installed Oracle Database. In the next chapter, you will see even more as we cover migrating and upgrading to Oracle Database 12c from previous versions of the Oracle database.

Then in the chapters that follow Chapter 2, we will really get things into high gear talking about new features like there is no tomorrow. By the time you are done reading this book, you will feel beyond excited to start playing with all the things that the Oracle developers have given you in Oracle Database 12c. So, head on to Chapter 2 and let's continue our quest for Oracle Database 12c knowledge!