Database Concepts

8th Edition

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Online Appendix I

Getting Started with Web Servers, PHP, and the NetBeans IDE

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Appendix I — 10 9 8 7 6 5 4 3 2 1

Appendix Objectives

- Know how to install and manage the Microsoft IIS Web server
- Understand the file system structure used by IIS
- Know how to use the Microsoft Edge Web browser
- Know how to download and store files from Web sites
- Know how to download and install the Java Software Development Kit (JDK)
- Know how to download, install, and use the NetBeans IDE
- Know how to download, install, and use PHP
- Know how to configure and update PHP

What Is the Purpose of This Appendix?

In *Database Concepts*, we use **PHP** as our scripting language for Web page design and **NetBeans** as our **Integrated Development Environment (IDE)**.

While chapter 7 in the book cover the use of PHP to create Web pages, we necessarily omitted the details of installing and configuring PHP, Java, and NetBeans. This appendix provides coverage of these steps, with the intention of making it easier for the reader to get PHP and NetBeans up and running so that the chapter in the book can be used without interruptions to figure out how to get started with these two excellent tools.

In this appendix, we will focus on using these tools with the Microsoft Windows operating system and the Microsoft Internet Information Services (IIS) Web server. We do this for consistency with the book, which uses the same Web server environment, and to keep this appendix to a reasonable length. For users of the Linux operating system (and its variants and cousins) and the Apache Web server, the installation steps will differ, but the same general sequence will occur, while using NetBeans after installation is essentially the same regardless of operating system environment.

Which Operating System Are We Discussing?

Both Chapter 7 in *Database Concepts* and this appendix describe installations on the Windows 10 operating system. We do this because most students and other readers of this book will probably be working with their own personal computer and not with a server class computer. Therefore, we want to show you how to install these components in your own environment, not in a business environment. Further, most of you will be using a Windows operating system, and if you are using a version of Windows earlier than Windows 10, the procedures will still be about the same. Installations for Windows Server 2016 are also very similar. If you are using a version of Linux, the basic outlines are the same, but the exact details will be different.

How Do I Install a Web Server?

Although this appendix focuses on PHP and the NetBeans IDE, before you can install and use either of these tools, you must have a Web server installed and operating on your computer. The Web server for users of Microsoft operating systems (both workstation and server) is the Microsoft **Internet Information Services (IIS)** Web server (see http://www.iis.net for more information about IIS). Users of Linux (and its relatives) will use the **Apache** Web server (see http://www.apache.org for information on the Apache Foundation and specifically http://httpd.apache.org for information on the Apache Web server itself). Both of these Web servers are typically included with their respective operating systems, which simplifies obtaining a copy of the software for installation.

How Do I Set Up IIS in Windows 10?[1]

After Windows 10 is installed, there is no need to do a separate installation of IIS. We do, however, have to activate it.

Turning On Windows 10 Features—Internet Information Services:

1. Move to the Windows Desktop, then use the **Windows + X** keys to display the Windows shortcut menu, as shown in Figure I-1.
2. Click the **Control Panel** command to display the Control Panel window, as shown in Figure I-2.
3. In the Control Panel window, click the **Programs** link to display the Programs window, as shown in Figure I-3.
4. In the Programs window, click the **Turn Windows features on or off** link to display the Windows Features dialog box, as shown in Figure I-4.
5. In the Windows Features dialog box, click the **plus (+) symbol** for Internet Information Server and resize the dialog box so that it appears as shown in Figure I-5.

[1] Although we are using Microsoft Windows 10 as the Windows OS in this appendix, the same basic techniques apply to the Microsoft Windows 7 OS and Microsoft Windows 8.1 OS, with minor variations.

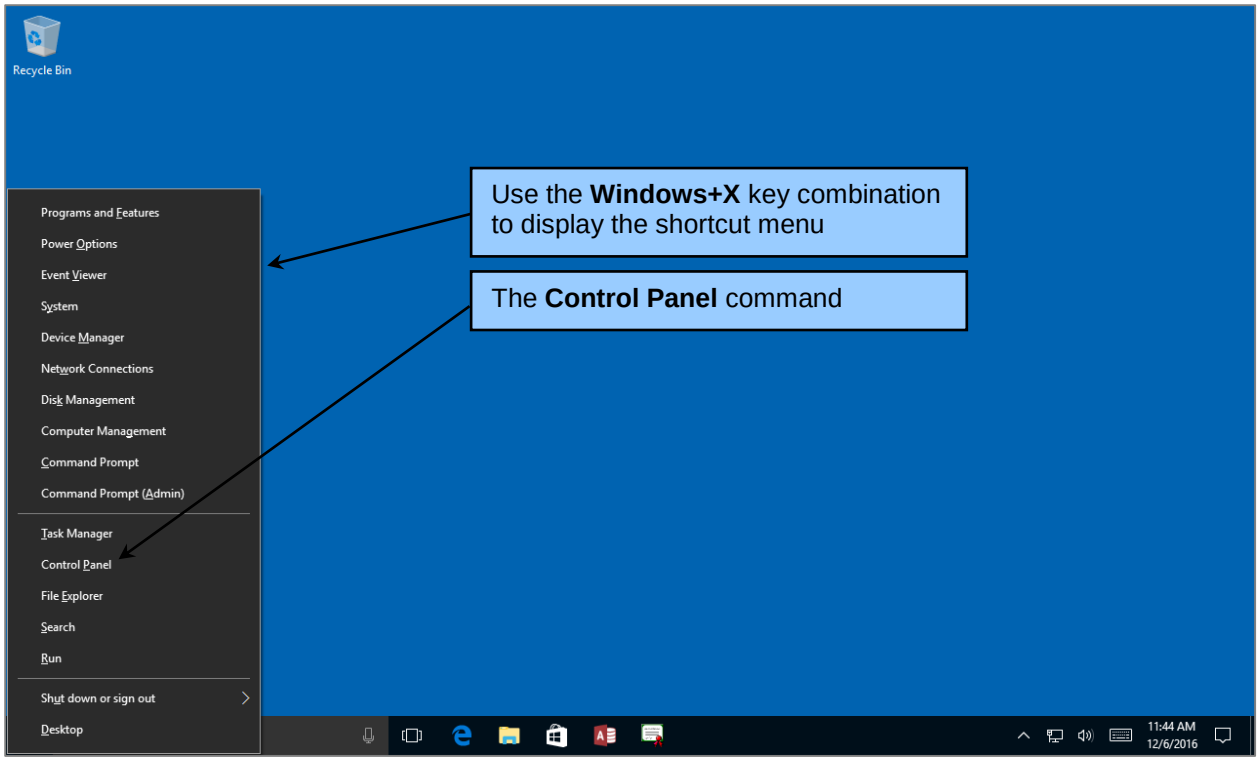


Figure I-1 — Opening Control Panel

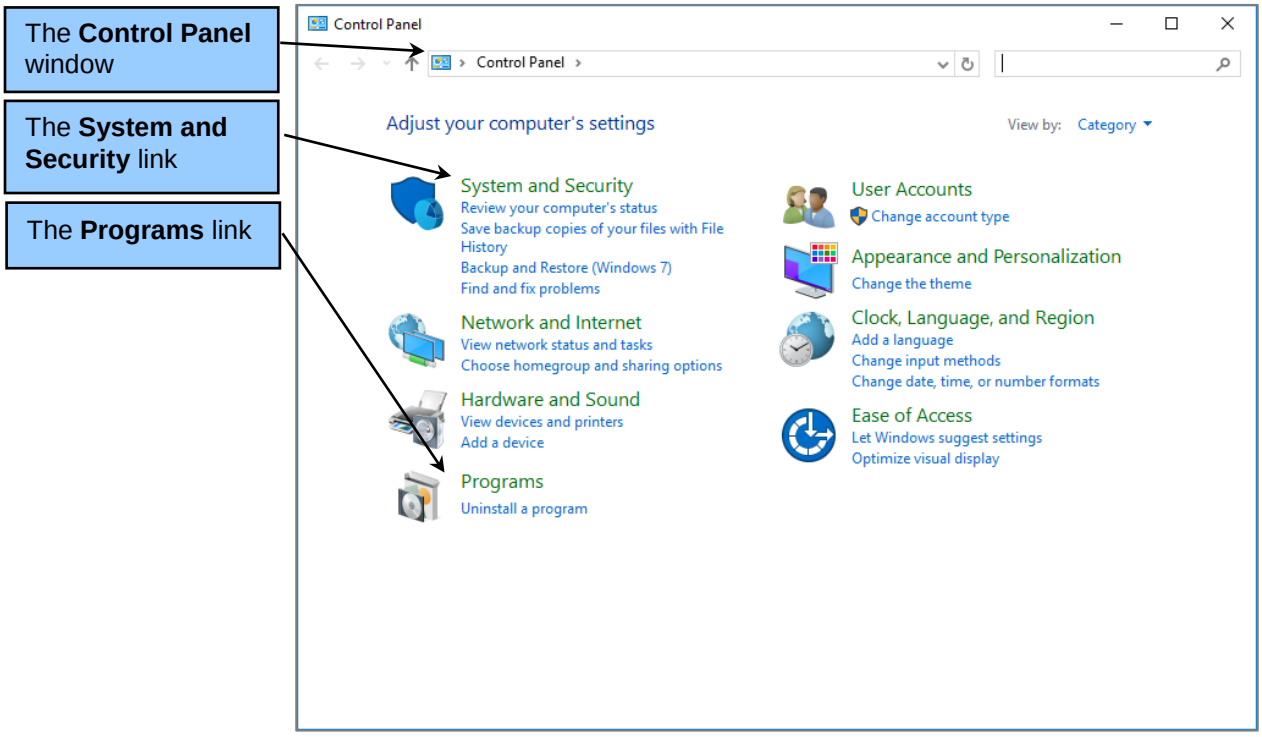


Figure I-2 — The Control Panel Window

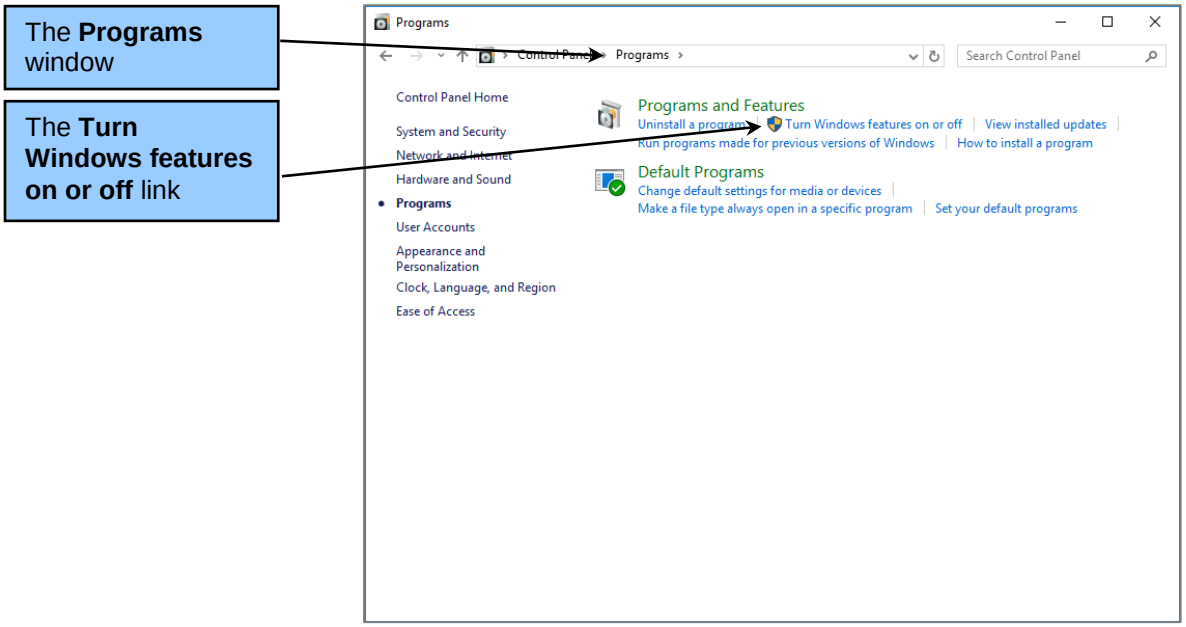


Figure I-3 — The Programs Window

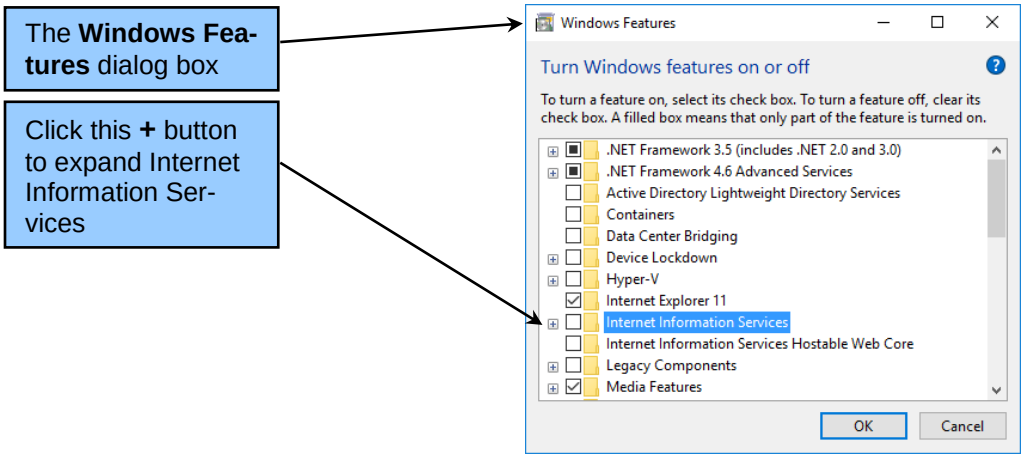


Figure I-4 — The Windows Features Dialog Box

6. In the Windows Features dialog box, expand the subsections of Internet Information Services and select the options shown in Figure I-5.
7. Click the **OK** button.
8. If any components were selected, a Microsoft Windows dialog box appears informing you that Windows is making the requested changes, and that this may take several minutes, and may require downloading files from Microsoft. When the Windows reconfiguration process is complete, click the Close button to close the dialog box and return to the Control Panel – Programs dialog box.
9. Click the **Close** button (it will turn red when selected) in the upper right corner of the Control Panel – Programs window to close the Control Panel.

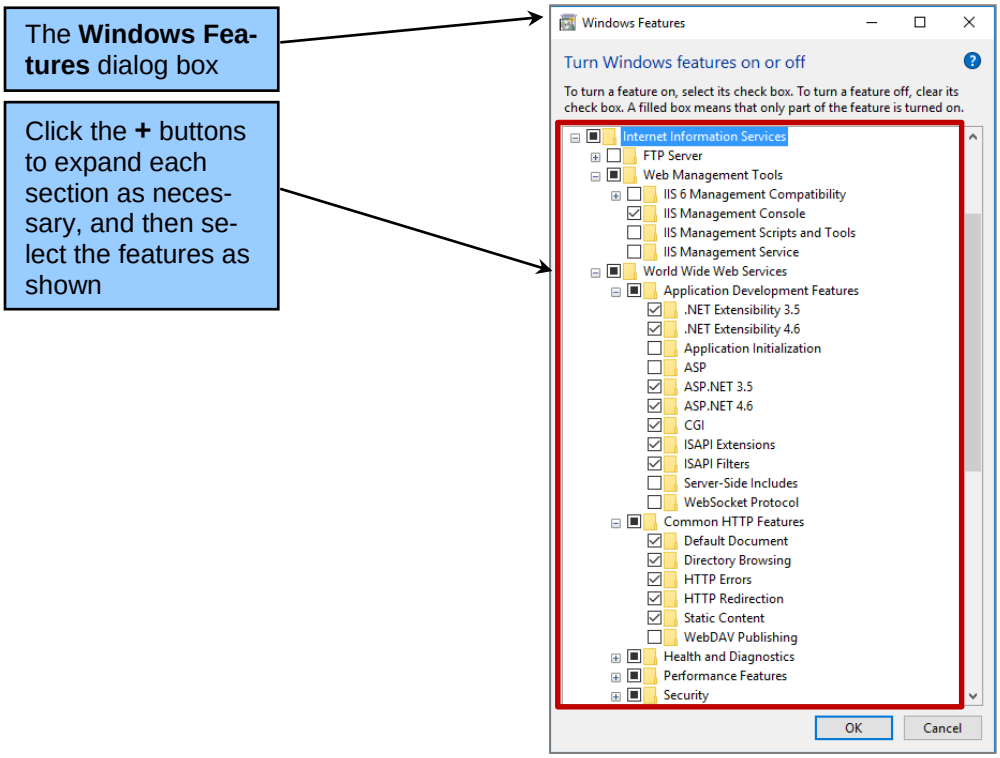


Figure I-5 — The Selected Internet Information Services Features

How Do I Manage IIS in Windows 10?

After IIS is installed, it is managed using the **Internet Information Services (IIS) Manager**. While we can always open Internet Information Services (IIS) Manager via the Windows Control Panel, we will be using the program often enough that we will find it more convenient to add an icon to the Windows task bar.

While we are doing this, we will also add an icon for the **ODBC Data Source Administrator** to the Windows task bar. The ODBC Data Source Administrator is a utility that we use in Chapter 7, and it will again be more convenient to have it on the task bar.

Adding Programs to the Microsoft Windows Start Menu:

1. Move to the Windows Desktop, the click the **Windows + X** keys to display the Windows shortcut menu.
2. Click the **Control Panel** command to display the Control Panel window.
3. In the Control Panel window, click the **System and Security** link (shown in Figure I-2) to display the System and Security window, as shown in Figure I-6.
4. In the System and Security window, click the **Administrative Tools** link to display the Administrative Tools window, as shown in Figure I-7.
5. In the Administrative Tools window, right-click the **Internet Information Services (IIS) Manager** icon to display the shortcut menu shown in Figure I-7, and then click **Pin to taskbar**.

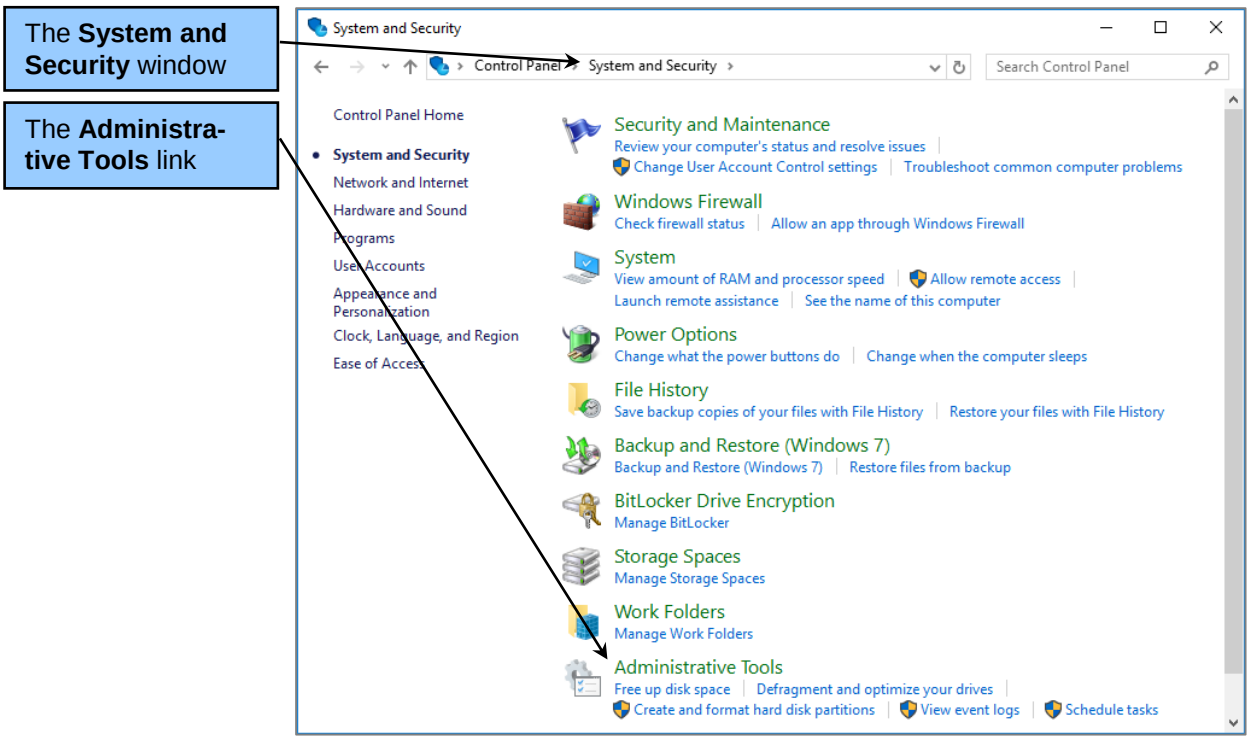


Figure I-6 — The System and Security Window

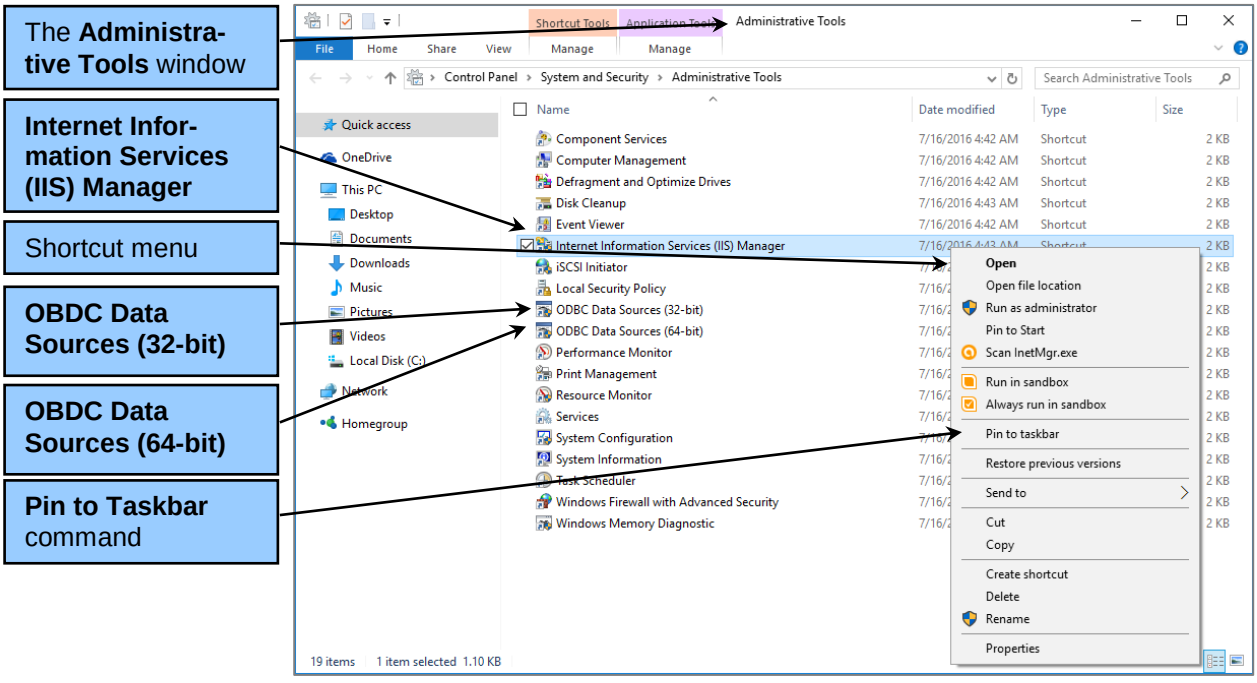


Figure I-7 — The Administrative Tools Window

6. In the Administrative Tools window, right-click the **ODBC Data Sources** icon to display the shortcut menu shown, and then click **Pin to Taskbar**. If you are running the 64-bit version of Windows 10, pin *both* the **OBDC Data Sources (32-bit)** and **ODBC Data Sources (64-bit)** to the taskbar.
7. Close the Administrative Tools window.
8. Close the Control Panel – System and Security window to close the Control Panel.

32-Bit Versus 64-Bit Programs

Microsoft Windows 10 is available only in a 64-bit version, while Microsoft Windows 8.1 and Microsoft Windows 7 are available in both 32-bit and 64-bit versions. We are running the 64-bit Windows 10 version. And therein lays a potential problem, which also applies to other Windows 64-bit operating systems such as Microsoft Server 2016.

The ODBC 64-bit Data Sources program (or, actually, a shortcut icon for the program) we have just added to the Taskbar will create *64-bit ODBC data sources* (ODBC drivers as described in Chapter 7). These will *only* work as long as *every* component in the Web application program chain (again as described in Chapter 7) is a 64-bit program. But, if *any* component is a 32-bit program, the 64-bit ODBC data source will *not* work.

In fact, when you are building the Web database applications in Chapter 7, if everything seems to be correctly done but the system still does not work, the most likely cause is a 32-bit program in the chain. To resolve your Web database application problem, create a 32-bit ODBC data source using OBDC Administrator, and then revise your Web page code to use that ODBC data source.

To resolve this problem, you will need to use the *32-bit* version of the ODBC Data Sources program. In Microsoft Windows 10, fortunately, both ODBC programs are immediately available and clearly labeled. If you are using Windows 7, the 32-bit version is located at *C:\Windows\SysWOW64\odbcad32.exe*. Locate this program in File Explorer, and then right-click it and pin it to the start menu. For Windows 10, the two ODBC program icons will appear as shown in Figure I-8.

For more information on the programs in the Windows\SysWOW64 folder, see the Wikipedia article on WoW64 at http:// en.wikipedia.org/wiki/WoW64 .

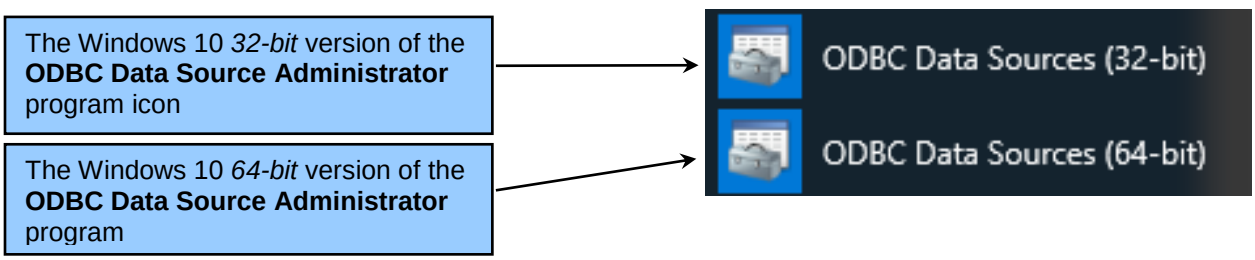


Figure I-8 — The Windows 10 32-Bit and 64-Bit Versions of the ODBC Data Source Administrator

Now we can open and use the Internet Information Services (IIS) Manager.

Opening the Internet Information Services (IIS) Manager:

1. The Windows 10 taskbar now appears similar to as shown in Figure I-9. Note that the icons for *Internet Information Services (IIS) Manager*, the *ODBC Data Sources (32-bit)*, and *ODBC Data Sources (64-bit)* are now on the taskbar.
2. Click the **Internet Information Services (IIS) Manager** menu item to open the Internet Information Services (IIS) Manager. If you are asked if you want to get started with the Microsoft Web Platform, click the No button. The Internet Information Services (IIS) Manager is displayed as shown in Figure I-10.
3. Expand the IIS tree in the Connections pane to view the settings for the Default Web Site, as shown in Figure I-11.
4. Leave the Internet Information Services (IIS) Manager open.

We can see that IIS has created a Web site named Default Web Site on our computer. But what does this mean? And just where is this Web site?

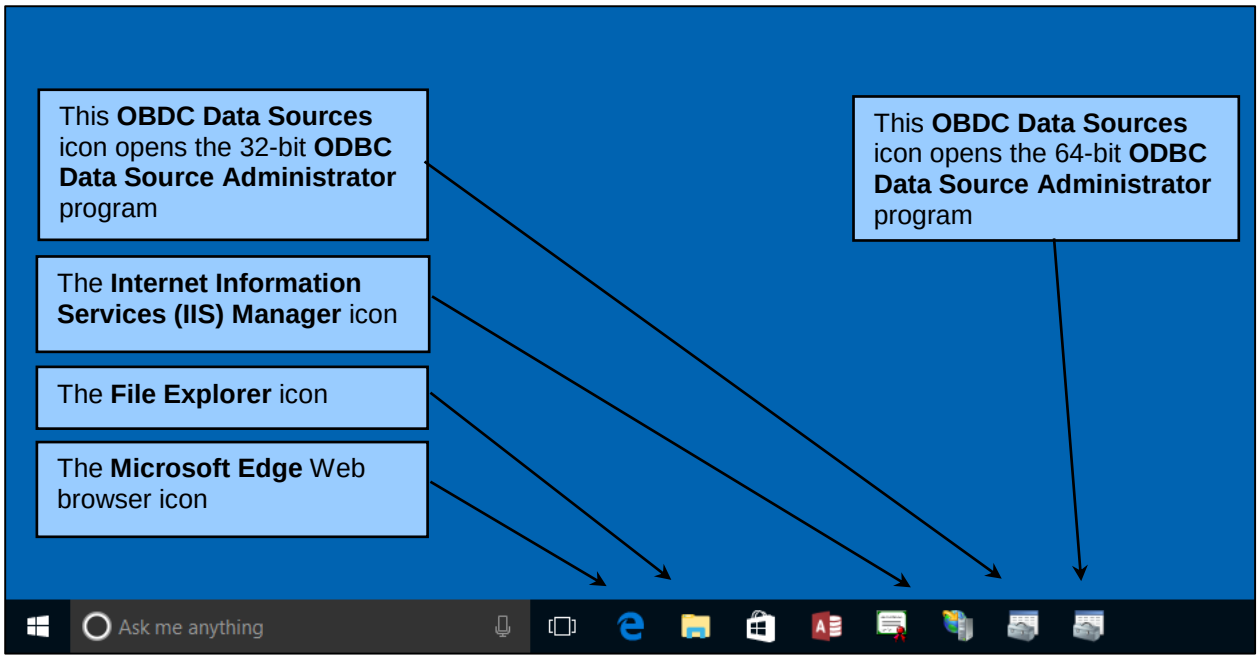


Figure I-9 — The New Program Icons on the Windows 10 taskbar

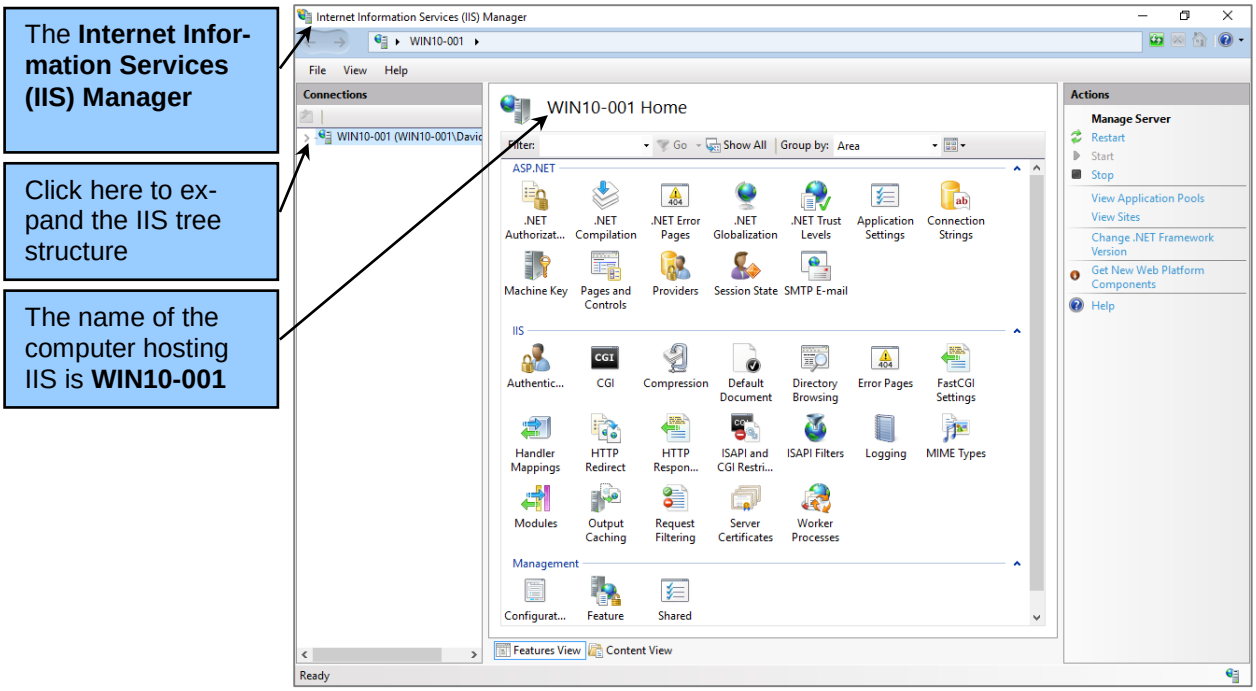


Figure I-10 — The Internet Information Services (IIS) Manager

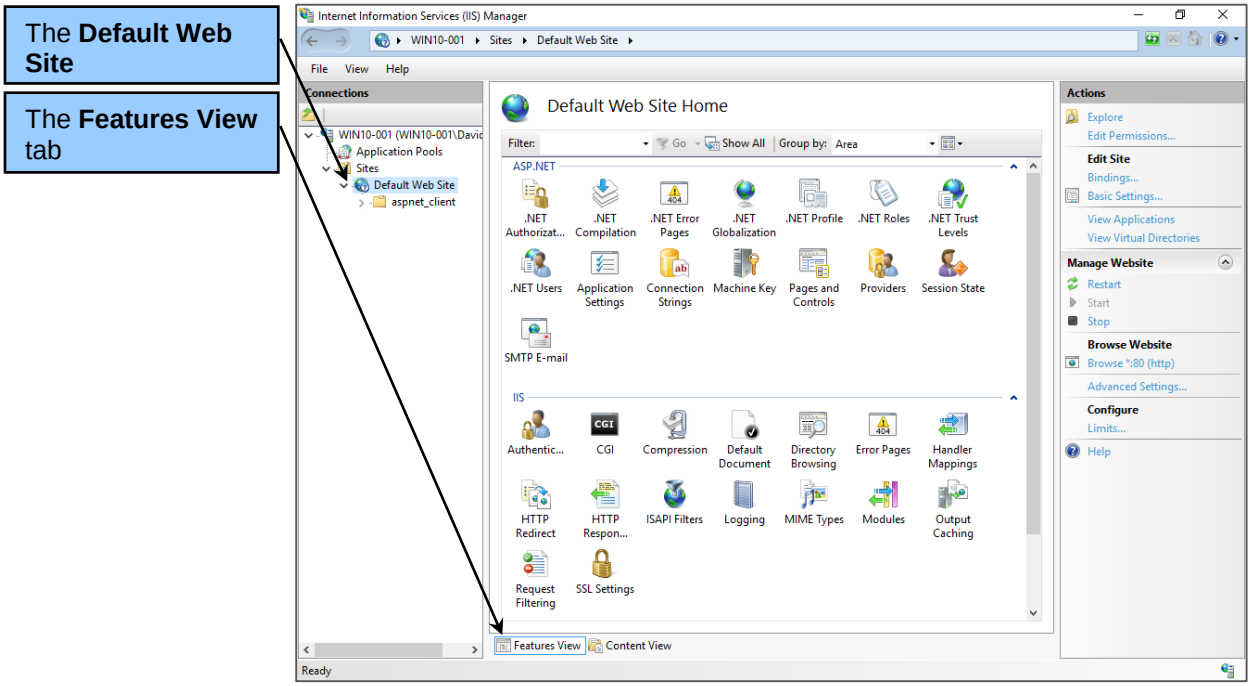


Figure I-11 — The Default Web Site

How Is a Web Site Structured?

Web sites are collections of files, and these files are stored in the file system on our computers. When IIS is installed, it creates an **inetpub folder** on the C: drive as C:\inetpub. Within the inetpub folder is the **wwwroot folder**, which is where IIS stores the most basic Web pages used by the Web server. We can see these folders using the File Explorer file management utility.

Viewing the Web Site File Structure in File Explorer:

1. To open File Explorer file system utility, you can simply click the **File Explorer** icon on the Taskbar, as shown in Figure I-9. Alternately, you can click the Windows **Start** button and find the icon for the **File Explorer** button, which is in the set of Start menu buttons immediately about the Start button.
2. Expand the C: drive structure to display the inetpub directory structure, as shown in Figure I-12.
3. Leave File Explorer open.

Note that Figure I-12 is basically the same as Figure 7-11 in Chapter 7, and at this point we are discussing the same IIS Web site structure discussed in Chapter 7. The files shown in the wwwroot folder in Figure I-12 are the default files created by IIS when it is installed. In Windows 10, the file **iisstart.htm** generates the Web page that Microsoft Edge (or any other Web browser) contacting this Web server over the Internet will display. We can also see this same structure in the Internet Information Services (IIS) Manager.

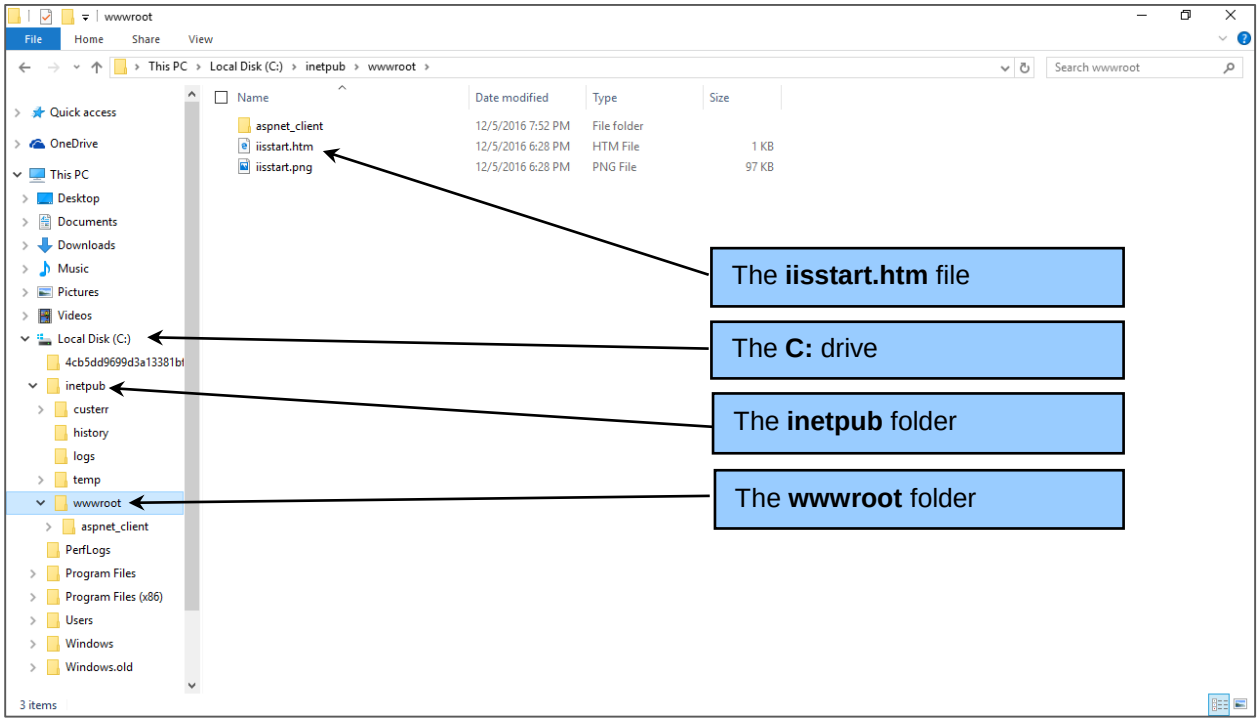


Figure I-12 — The IIS Inetpub Directory Structure and the *wwwroot* folder

Viewing the Web Site File Structure in the Internet Information Services (IIS) Manager:

1. We left the IIS Manager open, so switch to that program.
2. Click the **Content View** tab at the bottom of the utility to switch to IIS content view, as shown in Figure I-13. Then click **Default Web** site in the Connections pane.
3. Leave the IIS Manger open.

Note that Figure I-13 is basically the same as Figure 7-11 in Chapter 7, and again shows the same IIS Web site structure discussed in Chapter 7. The files shown in the wwwroot folder in Figure I-13 are again the default files created by IIS when it is installed.

How Do I View a Web Page from the IIS Web Server?

At this point, we can test the Web server installation. To do this, we open our Web browser, type in the URL **http://localhost**, and press the Enter key. If the appropriate Web page is not displayed in your Web browser, your Web server is not installed properly.

Viewing the Web Site in Microsoft Edge:

1. Click the icon for the **Microsoft Edge** Web browser on the taskbar, as shown in Figure I-9.
2. Type in the URL http://localhost, and then press the **Enter** key.
3. The IIS 10 Web page shown in Figure I-14 is displayed. Note that this figure is basically the same as Figure 7-12 in the book.

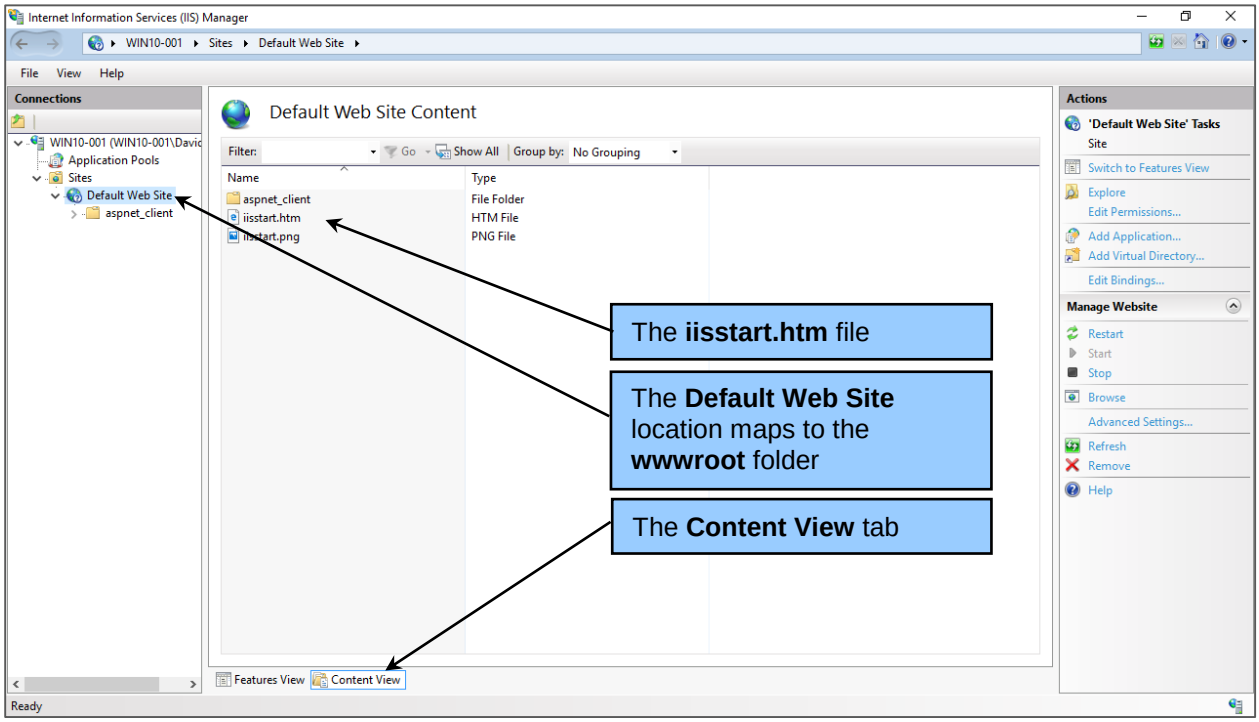


Figure I-13 — The Internet Information Services (IIS) Manager

4. Click the **Close** button to close the Microsoft Edge Web browser.
5. Close the IIS Manager.
6. Close File Explorer.

How Is Web Site Security Managed?

Folders and files in Web sites are protected by security settings on the Web server. In order to allow Web site developers to create, modify, and delete Web site folders and files, we have to grant **security permissions** to the appropriate users.

For our purposes here, these permissions need to be granted to the users of the computer that hosts the Web server. The permissions are assigned to the wwwroot folder. We can grant these permissions to folders using the File Explorer file management utility. First, however, we need to change a File Explorer setting.

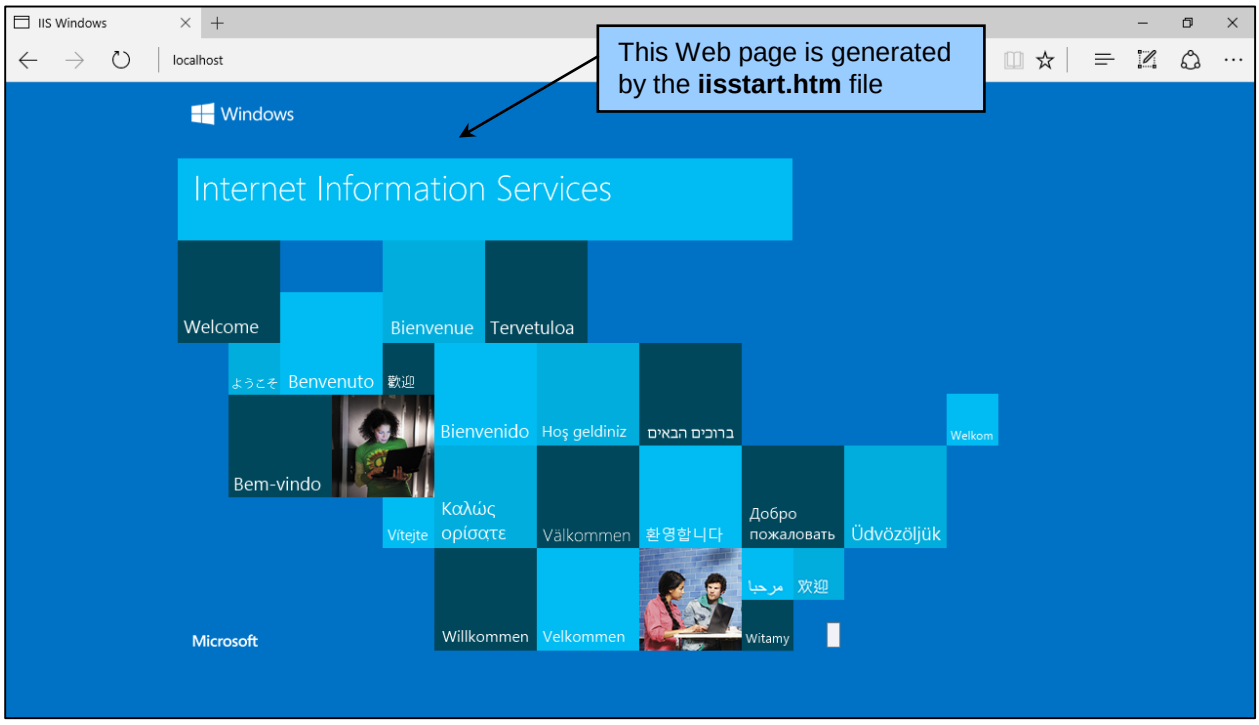


Figure I-14 — The Default IIS Web Page

Granting Web Site Security Permissions Using File Explorer:

1. Click the icon for the Microsoft **File Explorer** on the Taskbar, as shown in Figure I-9.
2. Click **Local Disk (C:)** in the object browser to select it, the click the **View** tab to open the View ribbon as shown in Figure I-15.
3. In the Layout command group, click **Details**, and then click the **Options** button to display the Folder Options dialog box.
4. In the Folder Options dialog box, click the **View** tab to display the *View* page as shown in Figure I-16. Uncheck the **Hide extensions for known file types** check box—we want to see the types of files we are working with.
5. In the *View* page, scroll to the end of the **Advanced settings** options. Uncheck the **Use Sharing Wizard (Recommended)** check box—we want complete manual control of sharing and security permissions—as shown in Figure I-17.
6. Click the **Apply to Folders** button to standardize the options for all folders. When prompted to confirm the action, click the **Yes** button.
7. Click the **OK** button to implement the setting changes and close the Folder Options dialog box.
8. Leave File Explorer open.

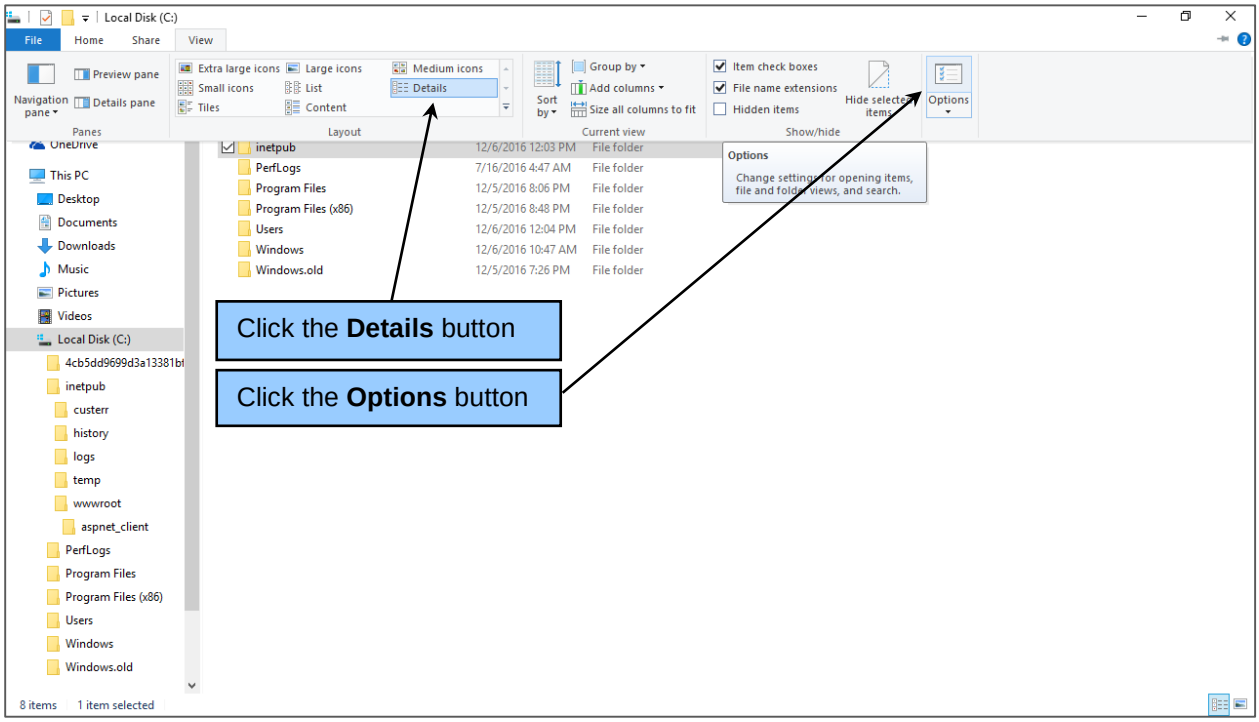


Figure I-15 — The Folder and Search Options Command

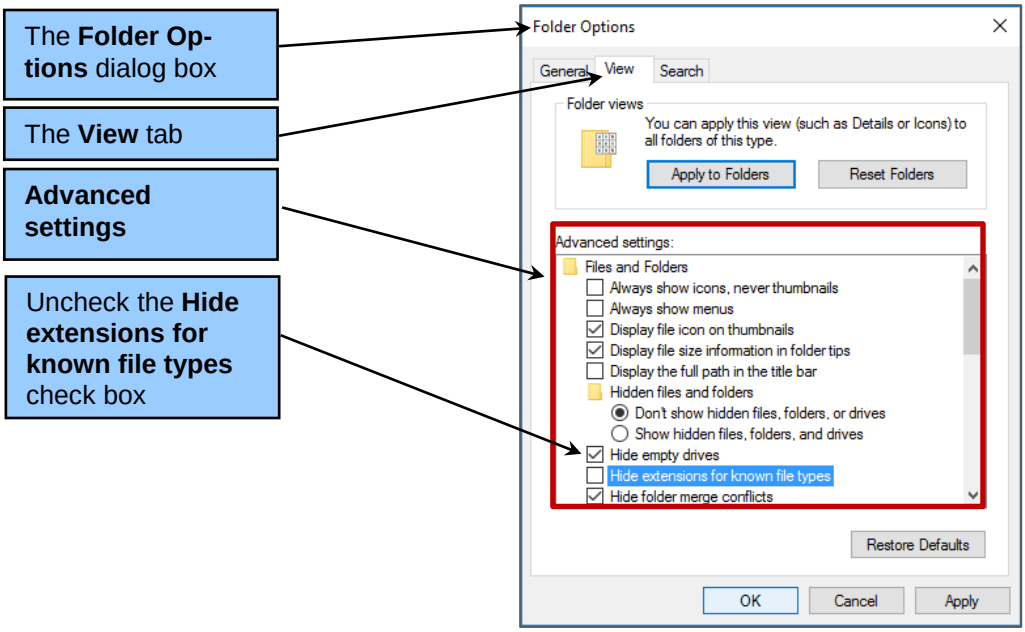


Figure I-16 — The View Page in the Folder Options Dialog Box

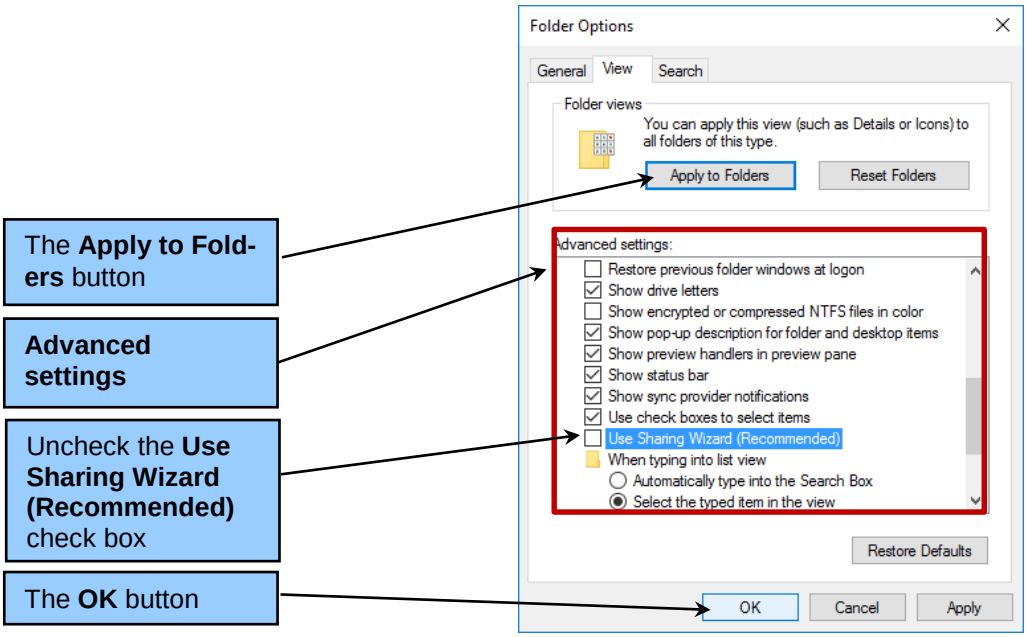


Figure I-17 — The Use Sharing Wizard (Recommended) Setting

Granting Web Site Security Permissions Using File Explorer

1. File Explorer should still be open. If not, open File Explorer.
2. In the Navigation page on the left, expand the C: Drive structure to display the **C:\inetpub\wwwroot** folder.

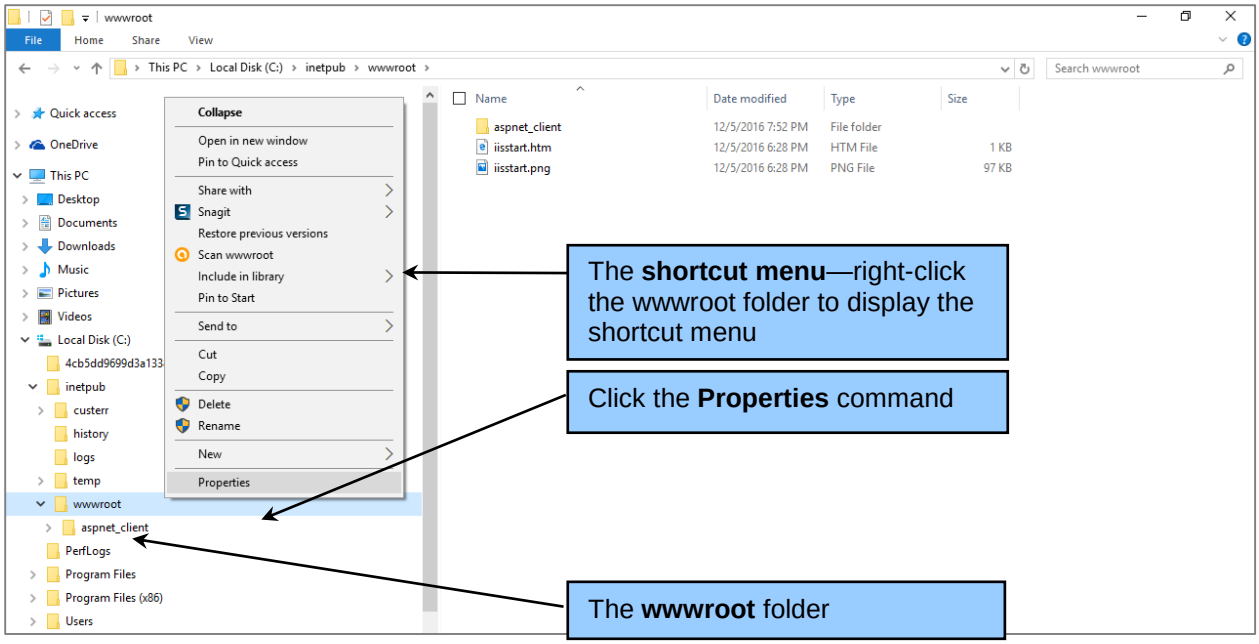


Figure I-18 — The Properties Command

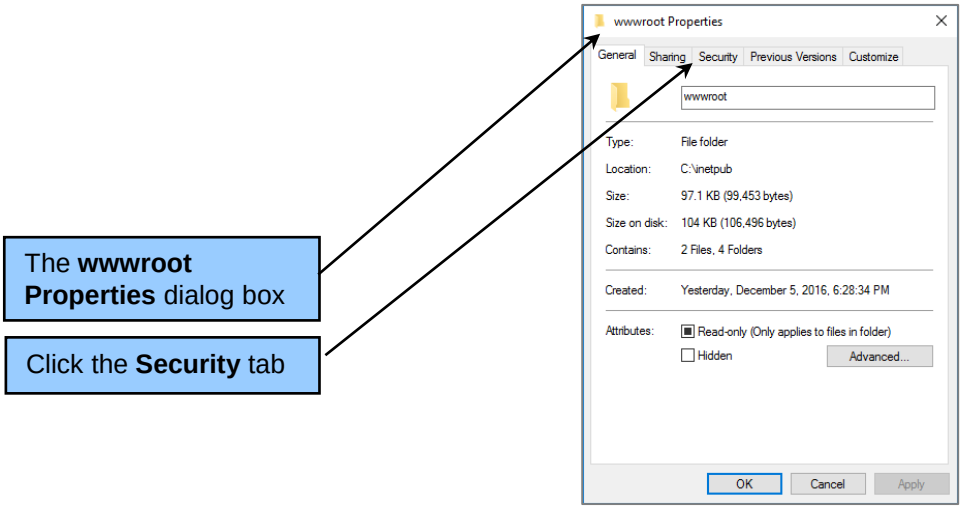


Figure I-19 — The wwwroot Properties Dialog Box

3. Right-click the **wwwroot** folder to display the shortcut menu as shown in Figure I-18.
4. In the shortcut menu, click **Properties** to display the wwwroot Properties dialog box, as shown in Figure I-19.
5. In the wwwroot Properties dialog box, click the **Security** tab to display the *Security* page.
6. On the *Security* page, scroll through the list of **Group or user names** until you can see the Users group, and then click the **Users** group to select it. The Permissions for the Users group are displayed as shown in Figure I-20.

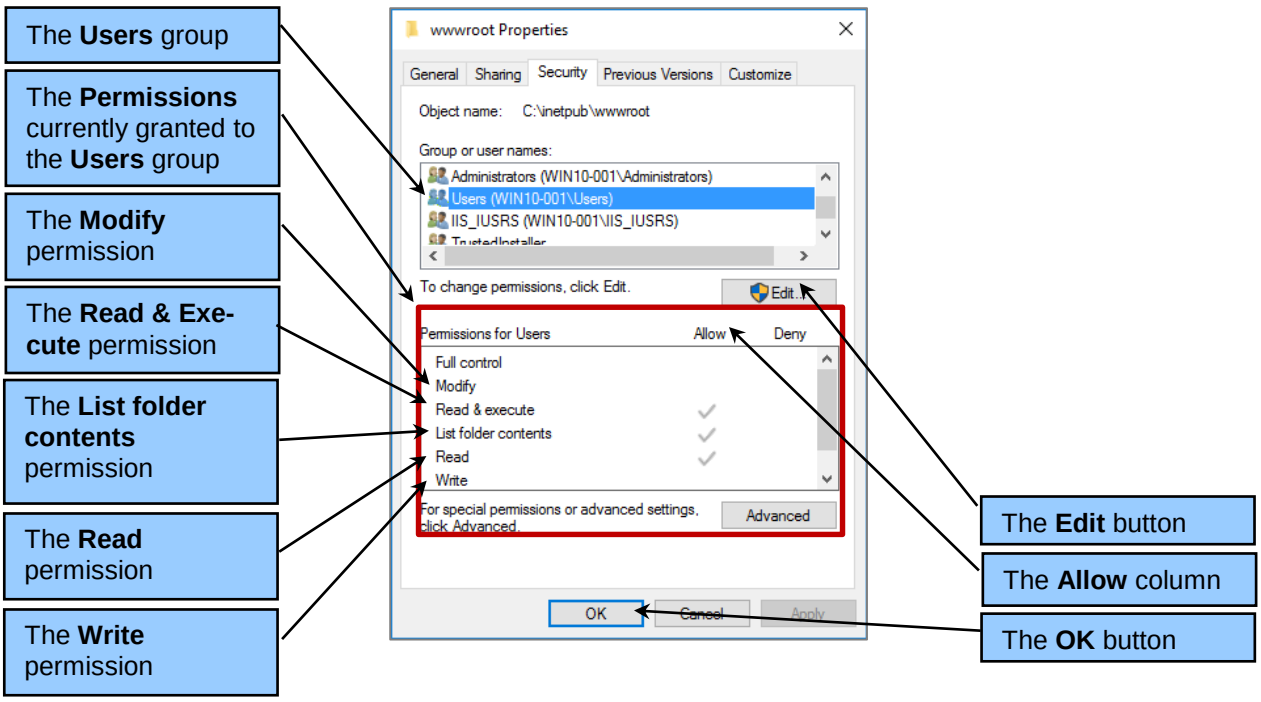


Figure I-20 — The Users Group Permissions

7. Note that the Users group currently has permissions to (1) see the wwwroot folder and the folders and files in it [the *List folder contents* permission], (2) read the files [the *Read* permission], and (3) run any program files in the folder [the *Read & Execute* permission].
8. Note that the Users group currently does **not** have permissions to (1) create new files in the wwwroot folder [the *Write* permission], (2) change the data in the files in the folder [again, the *Write* permission], or (3) delete files in the folder [the *Modify* permission]. We need to grant these permissions to the Users group.

   - NOTE: This example uses the Windows 10 operating system. In other versions of the Windows operating system, the Write and Modify permissions may already be granted. If so, having confirmed that the Users group has the necessary permissions, go directly to step 13.

9. In the wwwroot Properties dialog box, click the **Edit** button to display the Permissions for wwwroot dialog box.
10. In the Permissions for wwwroot dialog box, click the **Users** group to select it, and scroll through the Permissions for Users until you can see both the Modify and Write permissions, as shown in Figure I-21.
11. In the Permissions for wwwroot dialog box, check both (1) the **Write** check box in the Allow column and (2) the **Modify** check box in the Allow column (note that checking the Modify check box will also grant the Write permission). The Permissions for wwwroot dialog box now appears as shown in Figure I-22.
12. In the Permissions for wwwroot dialog box, click the **OK** button to close the dialog box.

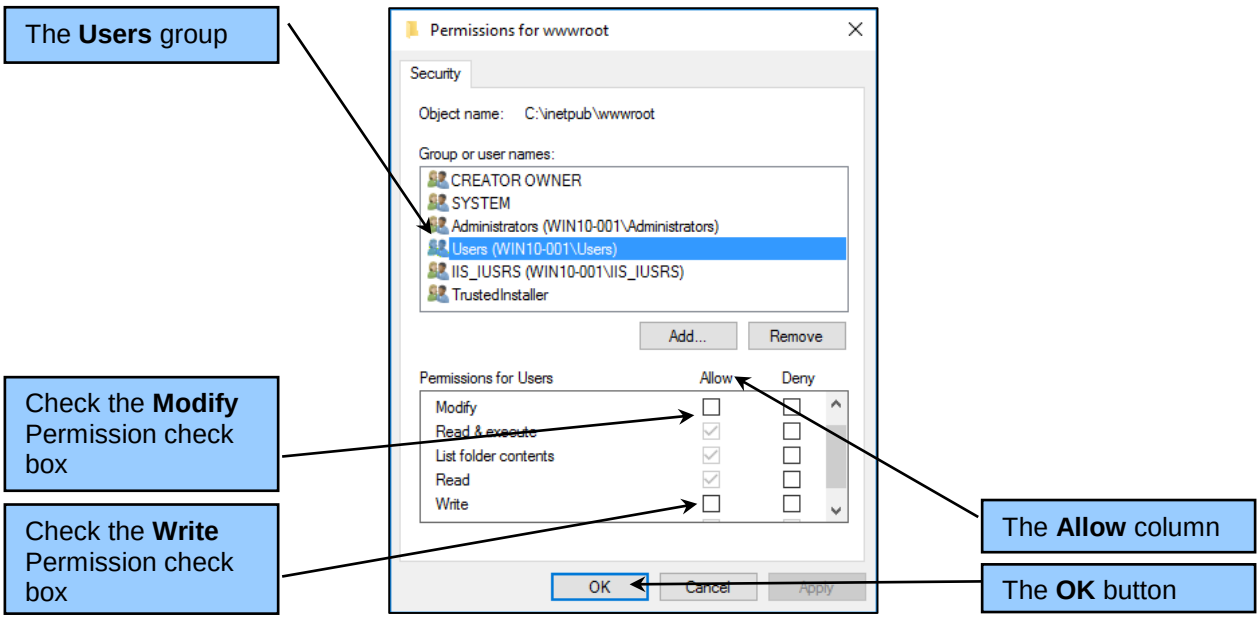


Figure I-21 — Editing the Users Group Permissions

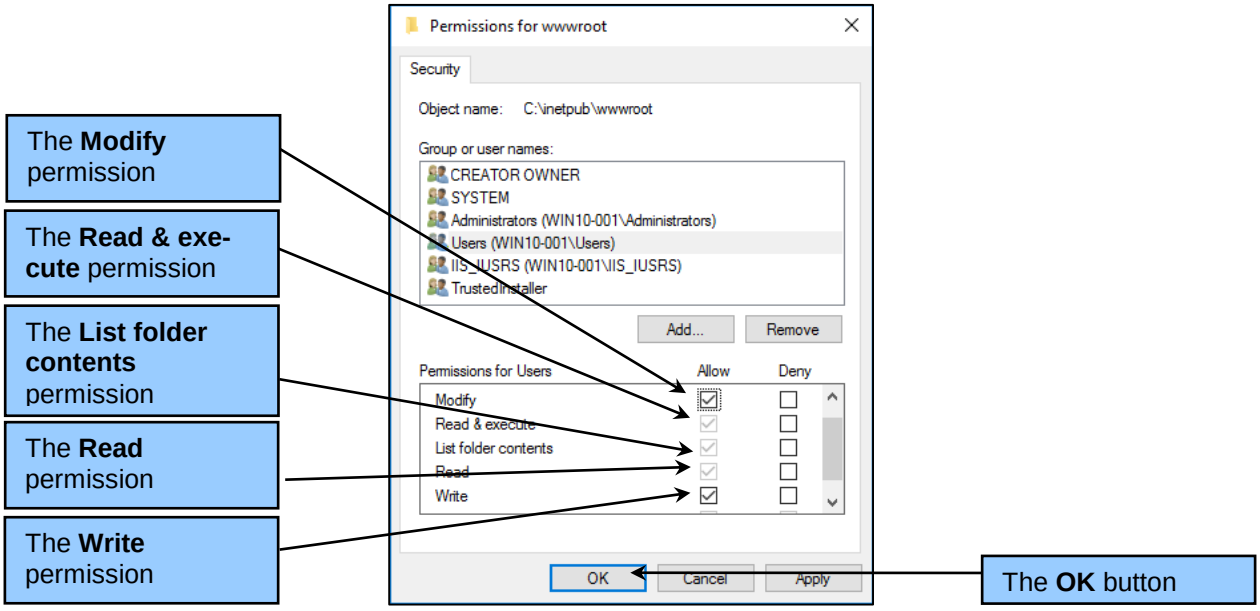


Figure I-22 — The Final Users Group Permissions

14. In the wwwroot Properties dialog box, click the **OK** button to close the dialog box.
15. Close File Explorer.

We now know that the Web server has been correctly installed and that it is displaying Web pages correctly. Now we are ready to install and test PHP and the NetBeans IDE. We will install the NetBeans IDE first, and then we'll use it to help test our installation of PHP. But first, we have to deal with Java!

What Is Java?

Java is a programming language, and NetBeans is written in Java. For more information, see the Wikipedia article on Java.

Java programs require that you install a **Java Virtual Machine (JVM)** on your computer in order to run them, and since NetBeans is a Java program, you will have to install a JVM on your computer before you can install and run NetBeans. The easiest way to do this is by installing the Oracle **Java Runtime Environment (JRE)** or the **Java Software Development Kit (JDK)** for your operating system.

What Is the NetBeans IDE?

While a simple text editor such as Notepad is fine for simple Web pages, as soon as we start creating more complex pages, we will move to an **integrated development environment (IDE)**. An IDE gives you the most robust and user-friendly means of creating and maintaining your Web pages. If you're working with Microsoft products, you'll likely use Microsoft Visual Studio (or the freely downloadable Visual Studio Community edition, available at http://www.visualstudio.com/en-us/products/visual-studio-express-vs.aspx). If you're working with JavaScript or Java, you might prefer the Eclipse IDE (downloadable at http://eclipse.org/). In this book, we will use the **NetBeans IDE**. NetBeans provides a framework that can be modified by add-in modules for many purposes.

How Do I Install the Java Development Kit (JDK) and the NetBeans IDE?

The easiest way to install Java is to install it at the same time you install the NetBeans IDE. In fact, they are available for download as a package from the Oracle Web site at http://www.oracle.com/technetwork/java/javase/downloads/jdk-netbeans-jsp-142931.html. As of this writing, which is being done later than Chapter 7, the associated JDK is JDK 8 Update 111, and although Chapter 7 shows NetBeans 8.1, in this appendix we will download and install NetBeans 8.2.

We will do this, but note that if you are using a 64-bit operating system, you should install *both* the 32-bit and 64-bit versions of the JRE.

Installing the Java JRE:

1. Open **Microsoft Edge** (or the Web browser that you use).
2. Type in the URL http://www.oracle.com/technetwork/java/javase/downloads/jdk-netbeans-jsp-142931.html and then press the **Enter** button. The JDK 8u111 with NetBeans 8.2 Web page is displayed as shown in Figure I-23.
3. Click the **Accept License Agreement** button, then click the **download link** for your operating system.
4. At this point, a message box appears asking what you want to do with the file. Click the **Save** button.

5. As shown in Figure I-24, after the file is downloaded, a message box is displayed asking if you want to run (install) or open the folder where the file was saved.
6. In this case, it is easier and faster to install the Java JRE at this point, so click the **Run** button.
7. Windows displays a User Account Control dialog box as shown in Figure I-25, asking if you want to allow the program to make changes to your computer. Click the **Yes** button.
8. The *Java SE Development Kit and NetBeans IDE Installer* dialog box is displayed, as shown in Figure I-26. Click the **Next** button.
9. The *Java SE Developer Kit Installation* page is displayed, as shown in Figure I-27. Click the Next button.
10. The *NetBeans Installation* page is displayed, as shown in Figure I-28. This page determines the installation location for the IDE. Use the default, and click the **Next** button.
11. The *NetBeans Summary* page is displayed, as shown in Figure I-29. This page determines the installation location for the NetBeans IDE. Use the default, and click the **Install** button.
12. The installation may take several minutes, so be patient!

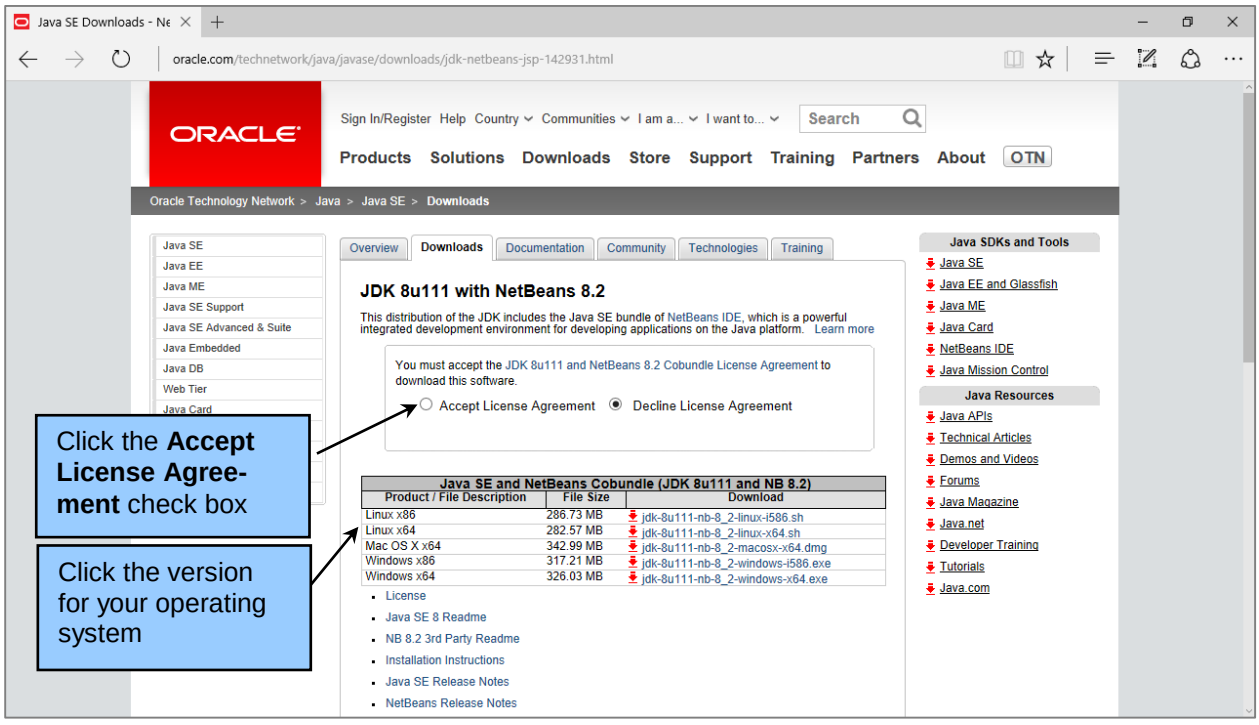


Figure I-23 — The Java JDK 8u111 with NetBeans 8.2 Web Page

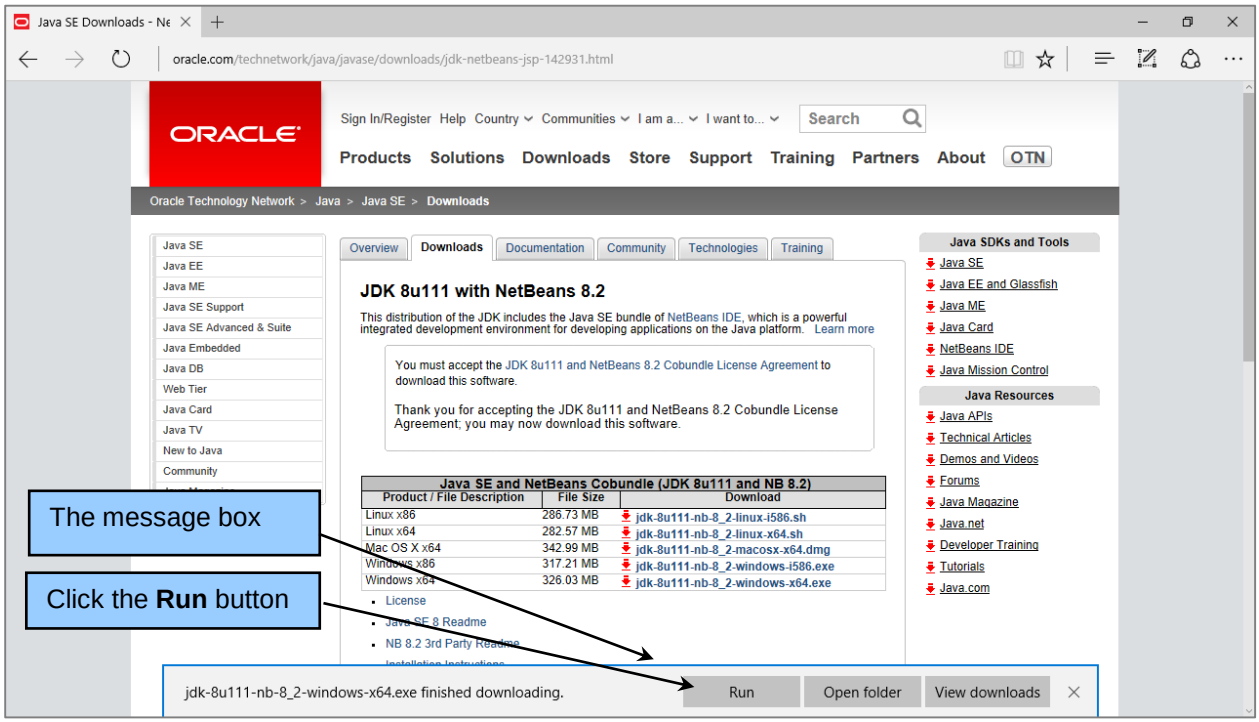


Figure I-24 — The Do You Want to Run or Save {*FileName*}? Message Box

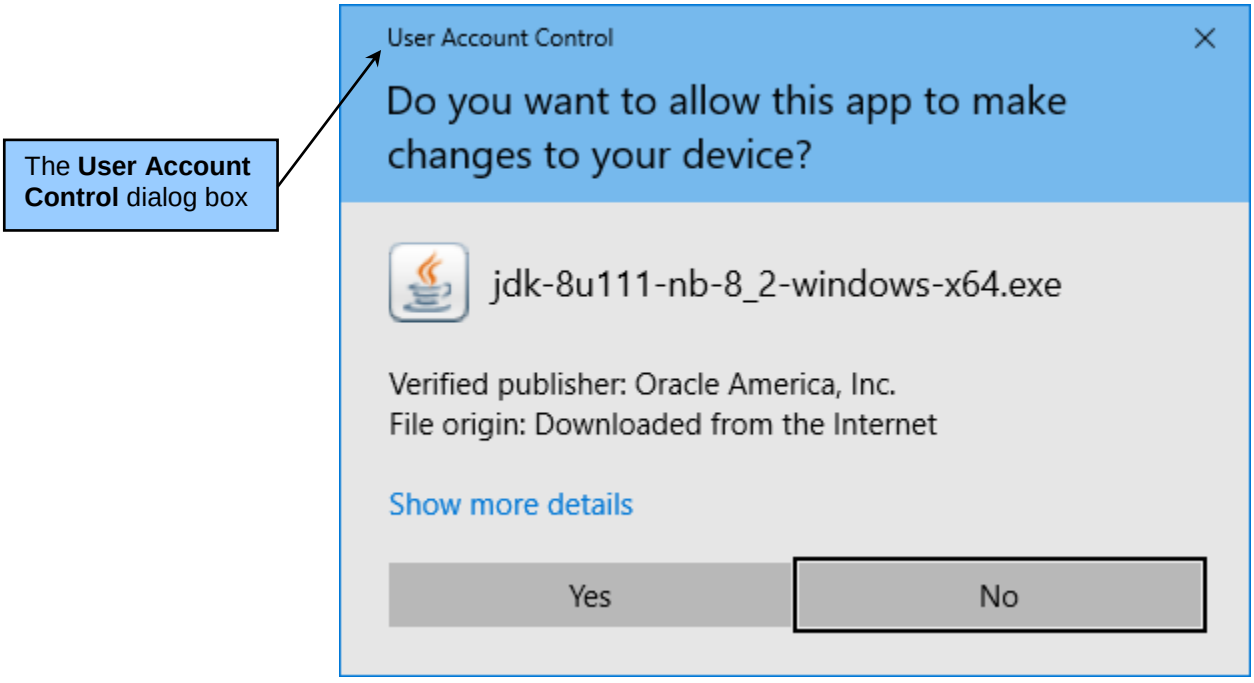


Figure I-25 — The User Account Control Dialog Box

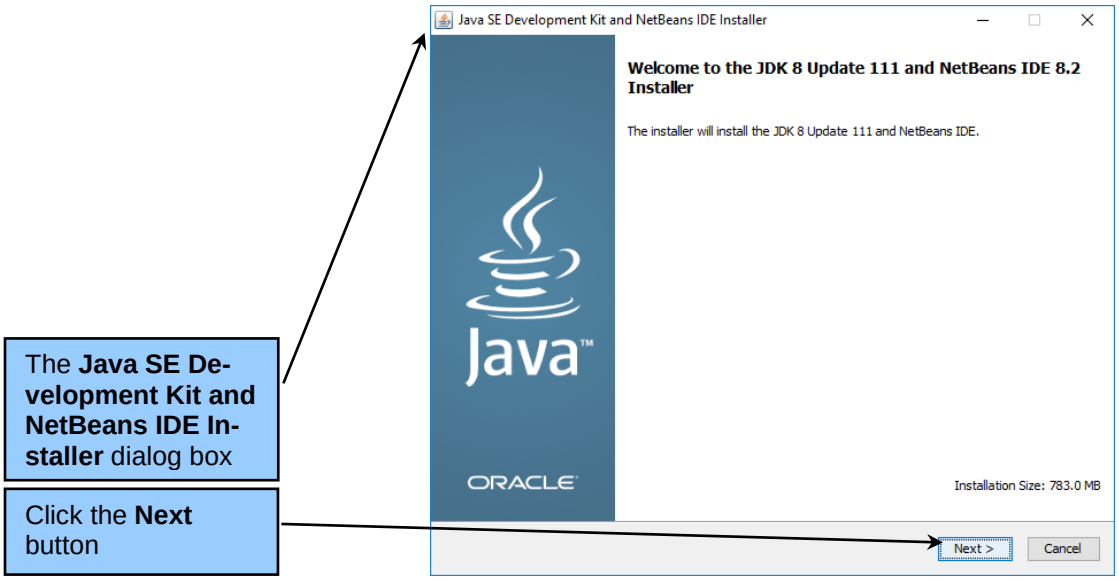


Figure I-26 — The Java SE Development Kit and NetBeans IDE Installer Dialog Box

13. The *Summary* page is displayed, as shown in Figure I-30. This page reviews the setup data. Use the defaults, and click the **Install** button.
14. The Java JDK and NetBeans IDE are installed on your computer.
15. When the installation is complete, the *Java SE Development Kit and NetBeans IDE Installer* dialog box Setup Complete page displays as shown in Figure I-30. Click the **Finish** button to close the *Java SE Development Kit and NetBeans IDE Installer* dialog box.
16. Close Microsoft Edge (or the Web browser that you used).

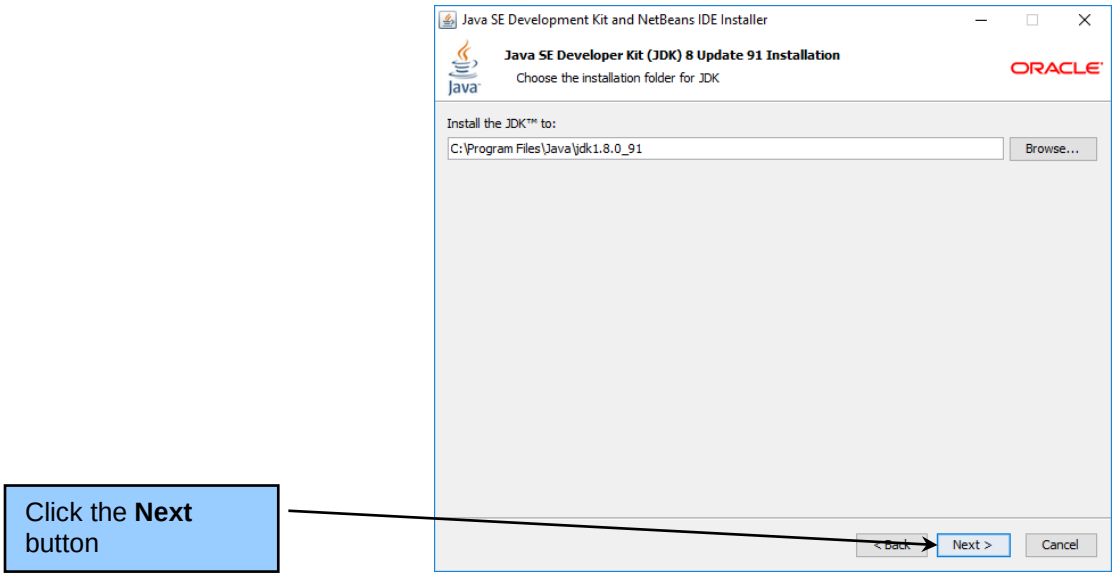
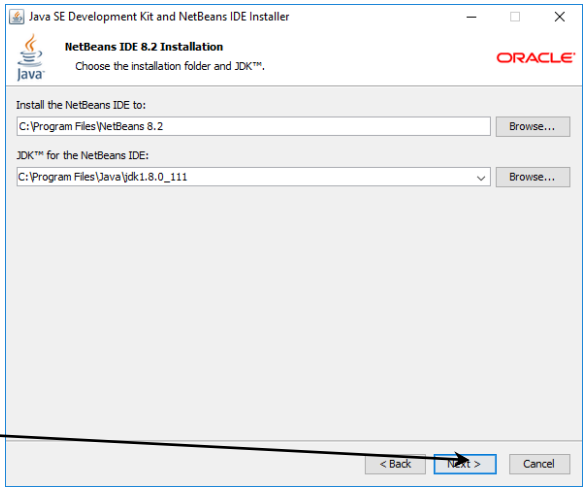
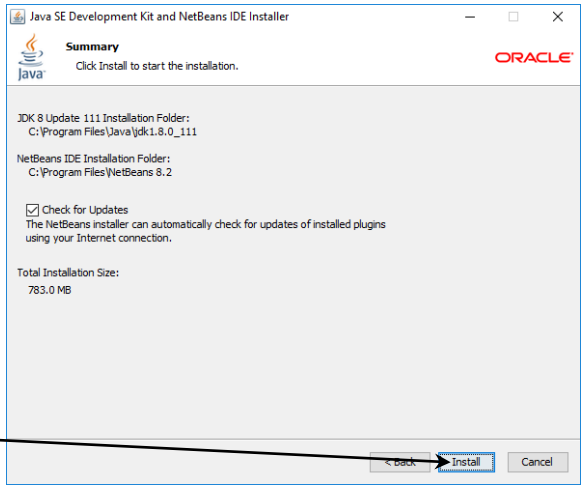


Figure I-27 — The Java SE Developer Kit (JDK) 8 Update111 Installation Page



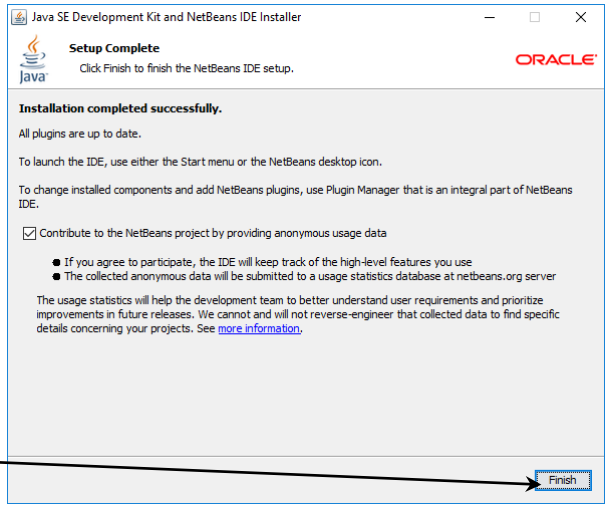
Click the **Next** button

Figure I-28 — The NetBeans IDE 8.2 Installation Page



Click the **Install** button

Figure I-29 — The Summary Page



Click the **Finish** button

Figure I-30 — The Setup Complete Page

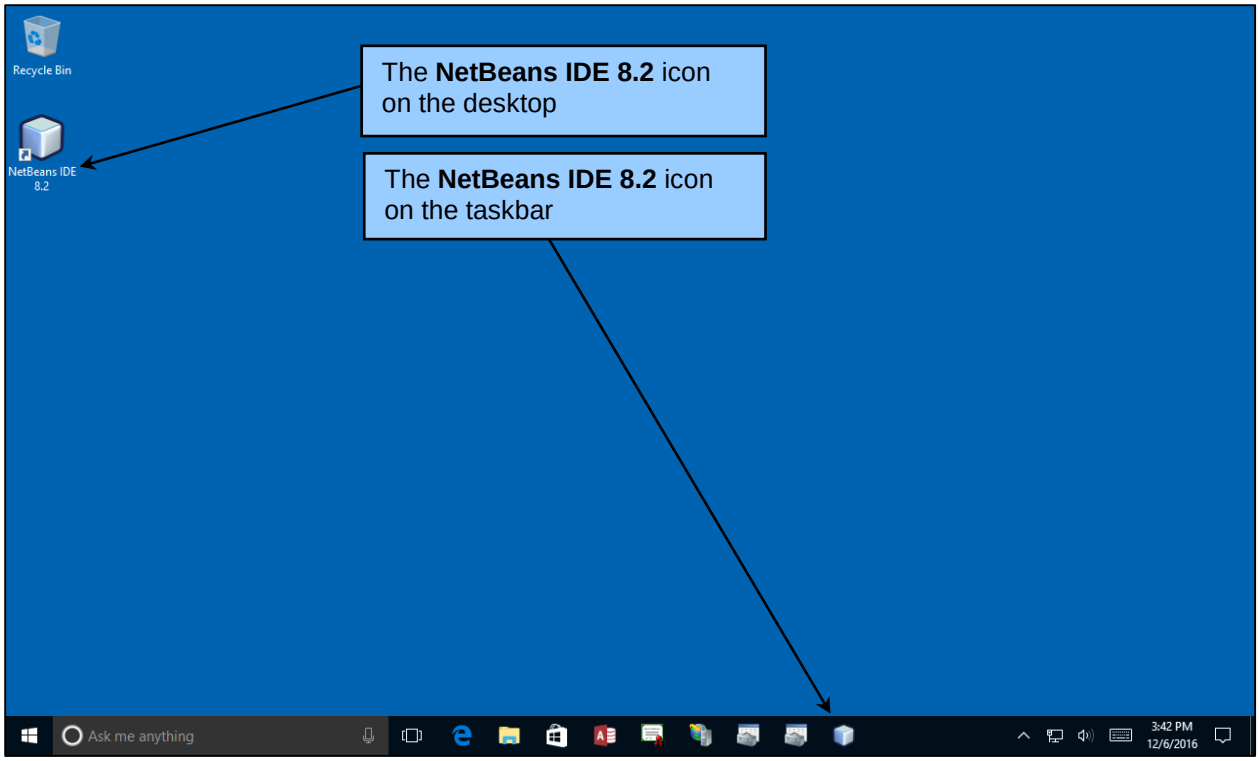


Figure I-31 — The NetBeans Icon on the Windows Desktop and Taskbar

Now we can open the NetBeans IDE and set up our file storage in *C:\Documents\NetBeansProjects*. We will not use NetBeans to create any files at this point—we will only set it up for future work. The NetBeans icon will show up in the Windows desktop. You can right-click the icon to pin it to the taskbar if desired. Both options are shown in Figure I-31.

Running the NetBeans IDE:

1. Click the **NetBeans** icon on the taskbar. The NetBeans window is displayed as shown in Figure I-32.
2. Click the Help command at the top of the window, and then the Check for Updates command. If they are any updates available, download and install them. If there are no updates, just click the **Finish** button.
3. If you installed any update, restart NetBeans, which completes the updates.
4. Click the **Tools** command and then the **Plugins** command to display the Plugins dialog.
5. Click **Available Plugins** tab box as shown in Figure I-33, and then use the Search box to search for **PHP**. Your list will be slightly different from what is shown here as new plugins are developed. You may need to scroll down to find the PHP plugin itself.
6. From the resulting list, choose the plugin label as only **PHP**, and then click the **Install** button that appears. Note that installing the PHP plugin will require some other associated plugins to be installed, so accept installing the entire set of plugins by clicking the **Next** button, accepting the terms, and clicking the **Install** button again. After the PHP plugins are installed, you are given the option of restarting NetBeans. Restart NetBeans!

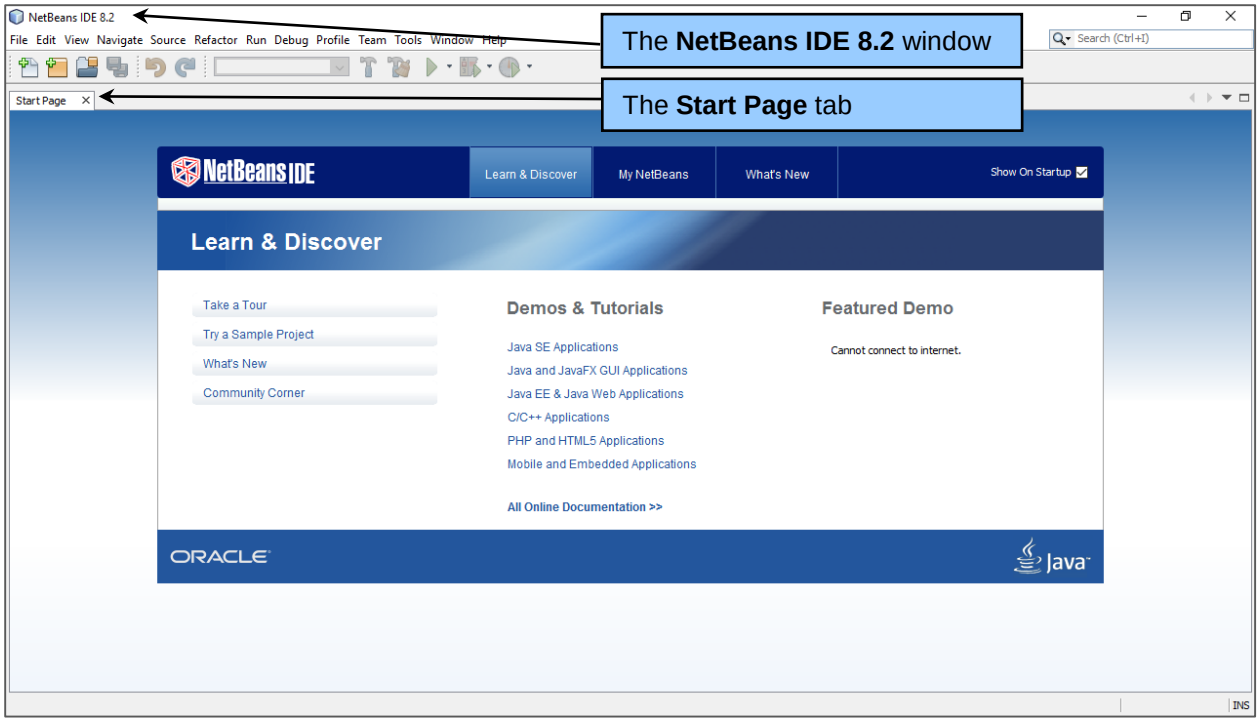


Figure I-32 — The NetBeans IDE 8.2 Window

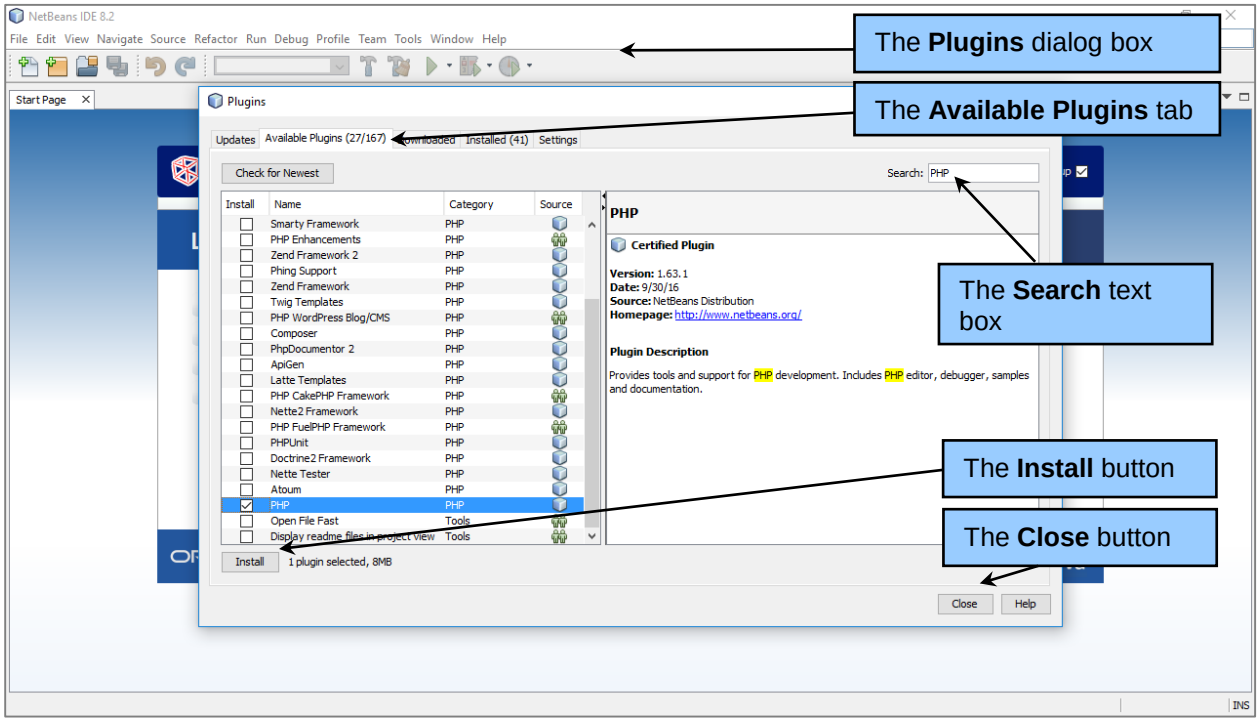


Figure I-33 — The Plugins Dialog Box Window

7. After restarting NetBeans to complete the plugin installation, close the NetBeans IDE.

We now have the NetBeans IDE ready for use, but be sure to keep it updated. We will need it to create and edit Web page files, particularly PHP Web page files. All we need now is to install PHP itself.

What Is PHP?

PHP, which is an abbreviation for **PHP: Hypertext Processor** (which was previously known as the *Personal Hypertext Processor*), is a scripting language that can be embedded in Web pages. PHP is extremely popular. In January 2013, more than 2 million Internet domains had servers running PHP.[2] The May 2014 TIOBE Programming Community Index ranked PHP as the seventh most popular programming language (following, in order, C, Java, Objective–C, C++, Visual Basic and C#). PHP appears to be maintaining popularity among programmers and Web page designers. PHP is easy to learn and can be used in most Web server environments and with most databases. It is also an open source product that is freely downloadable from the PHP Web site.

To organize downloaded files, we suggest that you create a **Download folder** on your C:\ drive (as *C:\Download*) to hold your downloaded files. Within this folder, create folders for each company (i.e., Microsoft, PHP), and within these folders create a folder for each file downloaded. For example, the PHP file we download will be stored in the *C:\Download\PHP* folder.

As this is being written, there are three generally available numbered releases of PHP currently available at the PHP Web site at http://windows.php.net/download: PHP 5.6 (5.6.29), 7.0 (7.0.14), and 7.1 (7.1.0) [there is no PHP 6.0]. Each release is available in a both a *thread-safe (TS)* and a *non-thread-safe (NTS)* version for both the 32-bit (x86) and 64-bit (x64) versions of the Windows OS. These terms refer to the ability of the computers CPU to handle threaded instructions. In general, use the NTS version and FastCGI mode for Windows Web servers, and use the TS version for Apache.

Further, the releases are available in VC11 and VC14 versions. VC11 versions require that the *Visual C++ Redistributable for Visual Studio 2012* (x86 or x64 depending on the operating system—go to http://www.microsoft.com/en-us/download/details.aspx?id=30679) be installed, and VC14 versions require that the *Visual C++ Redistributable for Visual Studio 2015* (x86 or x64 depending on the operating system—go to https://www.microsoft.com/en-us/download/details.aspx?id=48145) be installed. The Visual C++ redistributable ***must*** be installed before PHP is installed.

For our use, because we are running the Microsoft IIS Web server on a 64-bit version of Window 10, ideally we would like to use PHP 5.6 V11 x64 NTS (5.6.29). However, the 64-bit versions are clearly labeled experimental and we only want to use production versions of our software. Therefore, we will use the PHP 5.6 V11 x86 NTS (5.6.29) as available on the PHP for Windows Web site at http://windows.php.net/download.

[2] See the PHP Web site at http://php.net.

How Do I Install PHP?

Even having chosen which version of PHP to use, the question of installing PHP is a bit more complicated because there are more options. These include:

- Downloading and installing PHP manually.
- Downloading the **Microsoft Web Platform Installer (WPI) 5.0** and installing PHP using that utility (for Windows operating systems only).
- Using Microsoft Installations from Microsoft Web sites.

In general, manually downloading and installing gives us the most control over the installation, it is also the most complex installation. PHP release 5.3 provided a Windows installer download, but that option is no longer available in PHP 5.4, 5.5, and 5.6. To install PHP 5.6, we will use WPI 5.0, as this is the easier setup for a Windows computer. (However, this means we will install PHP 5.6.0, not the current 5.6.28) For other operating systems, download the appropriate files for your operating system, following the installation instructions in the documentation at https://secure.php.net/docs.php.

Installing PHP 5.6 using the Microsoft WPI 5.0:

1. Open the Microsoft Edge Web browser (or an alternate Web browser), and go to https://www.microsoft.com/web/downloads/platform.aspx.
2. The *Microsoft Web Platform Installer 5.0* page is displayed, as shown in Figure 1-34.
3. Click the **Free Download** button shown in Figure I-34 to start downloading WPI 5.0.
4. When the *What do you want to do with* ***wpilauncher.exe?*** *From:* ***download.microsoft.com.*** message box is displayed, click the **Save** button.
5. When the ***wpilauncher.exe*** *finished downloading* message box as shown in Figure I-34 appears, click the **Run** button.

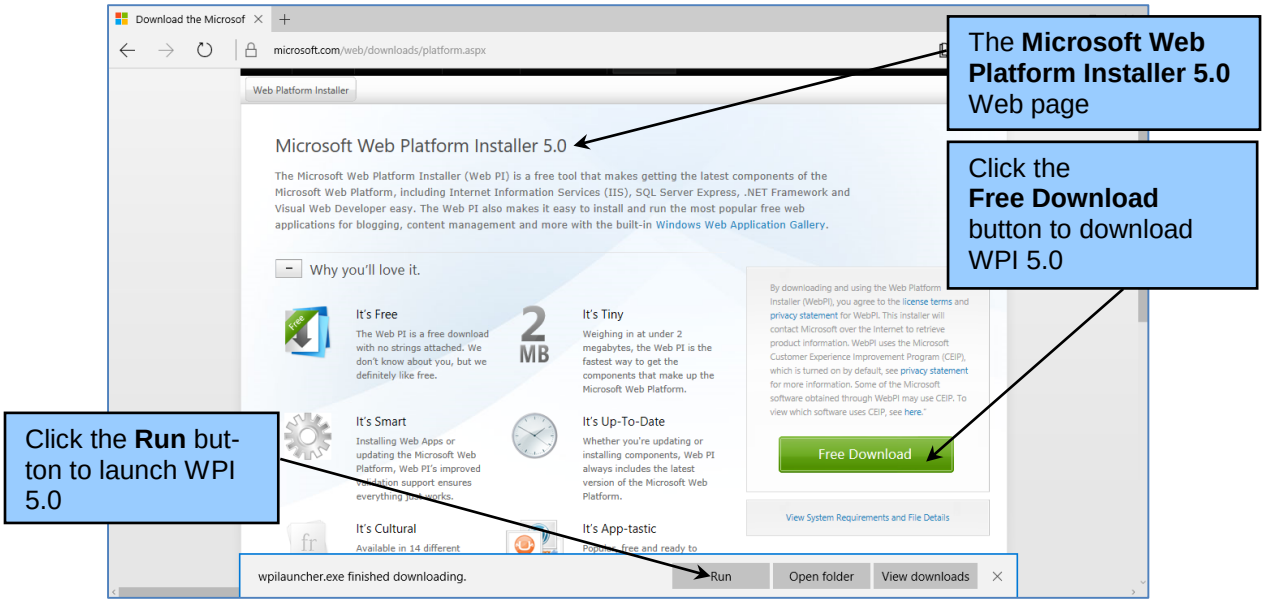


Figure I-34 — Launching the Microsoft Web Platform Installer (WPI) 5.0

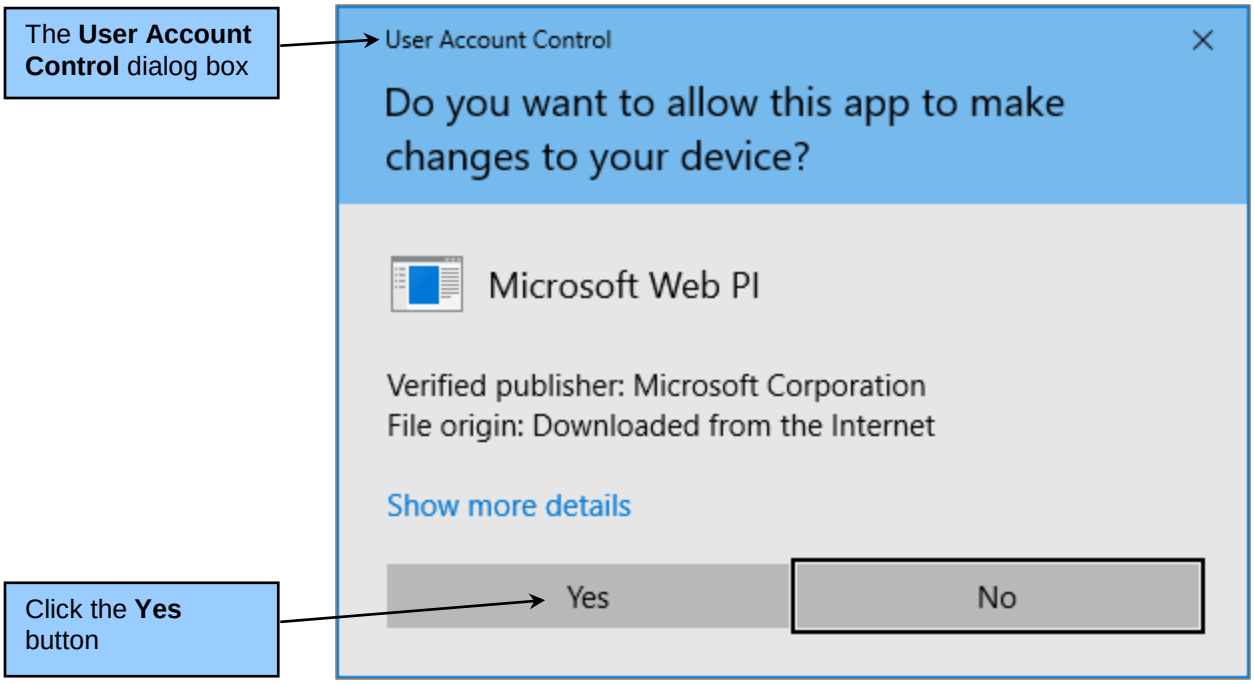


Figure I-35 — The User Account Control Dialog Box for WPI 5.0

6. A **User Account Control** dialog box is displayed, as shown in Figure I-35. Click the **Yes** button.
7. The **Web Platform Installer 5.0** window is opened with the **Spotlight** page displayed, as shown in Figure I-36. Your page may look slightly different as products change frequently.
8. Type **PHP** into the Web Platform Installer 5.0 search text box, and then press the **Enter** key.
9. The search results for PHP are displayed, as shown in Figure I-37.
10. Click the **Add** button for PHP 5.6.24. Note that WPI 5.0 has only PHP 5.6.24, not the current 5.6.29—this will not affect our work in any way.
11. **IMPORTANT:** The WPI 5.0 will automatically add the *Microsoft Drivers 3.2 for PHP v5.6 for SQL Server in IIS* program to the list of programs to be installed when you add PHP 5.6.24 to the installation group. **Click the Remove button to remove it from the selected program list**.
12. Click the **Install** button.
13. The Web Platform Installer 5.0 **Prerequisites** page is displayed, as shown in Figure I-38. Note that besides PHP 5.6.24, the Microsoft *PHP Manager for PHP* is included in the list. This is OK!
14. Click the **I Accept** button to begin the installation. *Note:* surprising results ahead!
15. PHP 5.6.24 is installed, along with some other programs Microsoft has decided to throw in without warning us! Somehow PHP 5.3.28 was installed, along with its prerequisite Microsoft Visual C++ 2008 Redistributable Package. A command-line program called RunPHP Helper was also installed. These programs are not a problem, so no damage was done.
16. PHP Manager failed to install. This seems to be a problem when installing it on Windows 10 specifically, but we don't need this program, and again no damage was done. See Figure I-39.

The **Microsoft Web Platform Installer 5.0** Window

The **Spotlight** page is displayed

The **search text box**—type **PHP** in this text box, then press the **Enter** key

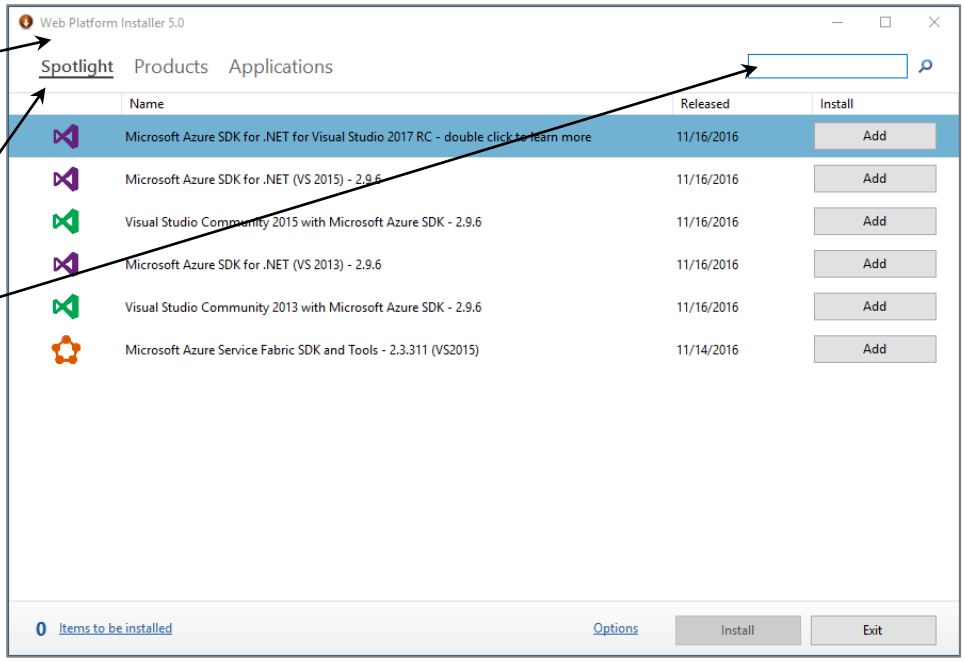


Figure I-36 — Searching for PHP Products and Applications

The **Search results for PHP** page

Microsoft Drivers 3.2 for PHP v5.6 for SQL Server in IIS—this will be selected when you select PHP 5.6.24 and you must remove it from the selected items

PHP 5.6.24—Click the **Add** button to select it (the button becomes a Remove button after the selection is made)

Click the **Install** button

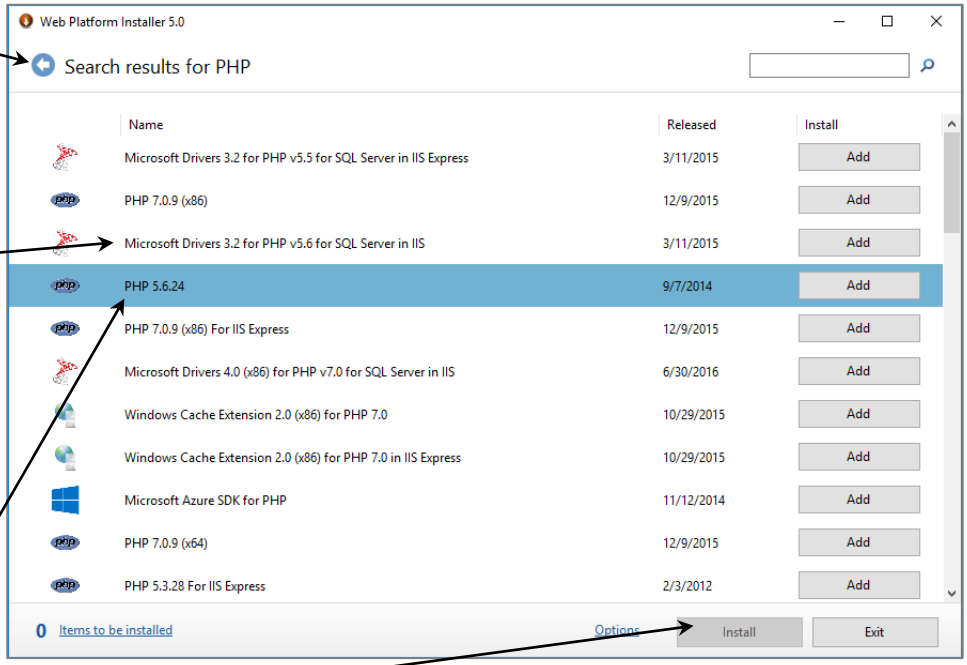


Figure I-37 — Selecting PHP 5.6 and PHP Manager for IIS

17. Click the **Finish** button.
18. Close the Web Platform Installer and the Web browser.
19. Maximize the Internet Information Systems (IIS) Manager (it may be on the task bar if you need to start it), and double-click the **Handler Mappings** icon in Features View. The Features View tab is at the bottom of the window. As shown in Figure I-40, *PHP_via_FastCGI* is in the list of enabled handlers. You may need to scroll down to find it. This shows that PHP 5.6.24 was installed correctly and is ready for use.
20. Close the Internet Information Systems (IIS) Manager.

This completes the installation of PHP 5.6.24 on Windows 10. The same installation can be done on other Windows operating systems, including Windows Server 2012 R2.

Note that this installation of PHP 5.6.24 on Windows uses the **FastCGI protocol**, which is a variant of the older **Common Gateway Interface (CGI)**. Microsoft prefers that we use FastCGI with PHP for IIS, so WPI 5.0 automatically installs it—which is definitely an advantage of using WPI 5.0. We could manually download and install PHP 5.6, but then we would have to manually set up the FastCGI interface for PHP, which is *not* simple, For more information on FastCGI, see http://en.wikipedia.org/wiki/FastCGI and http://www.iis.net/downloads/microsoft/fastcgi-for-iis.

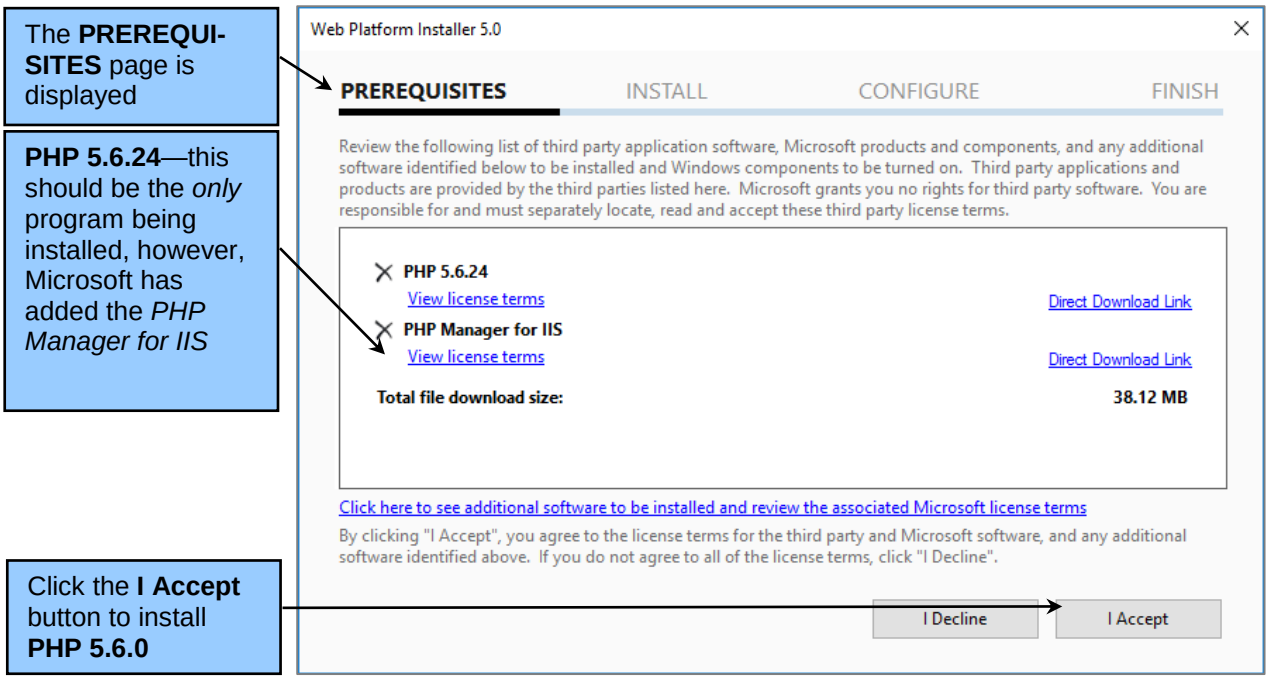


Figure I-38 — The PREREQUISITES Page

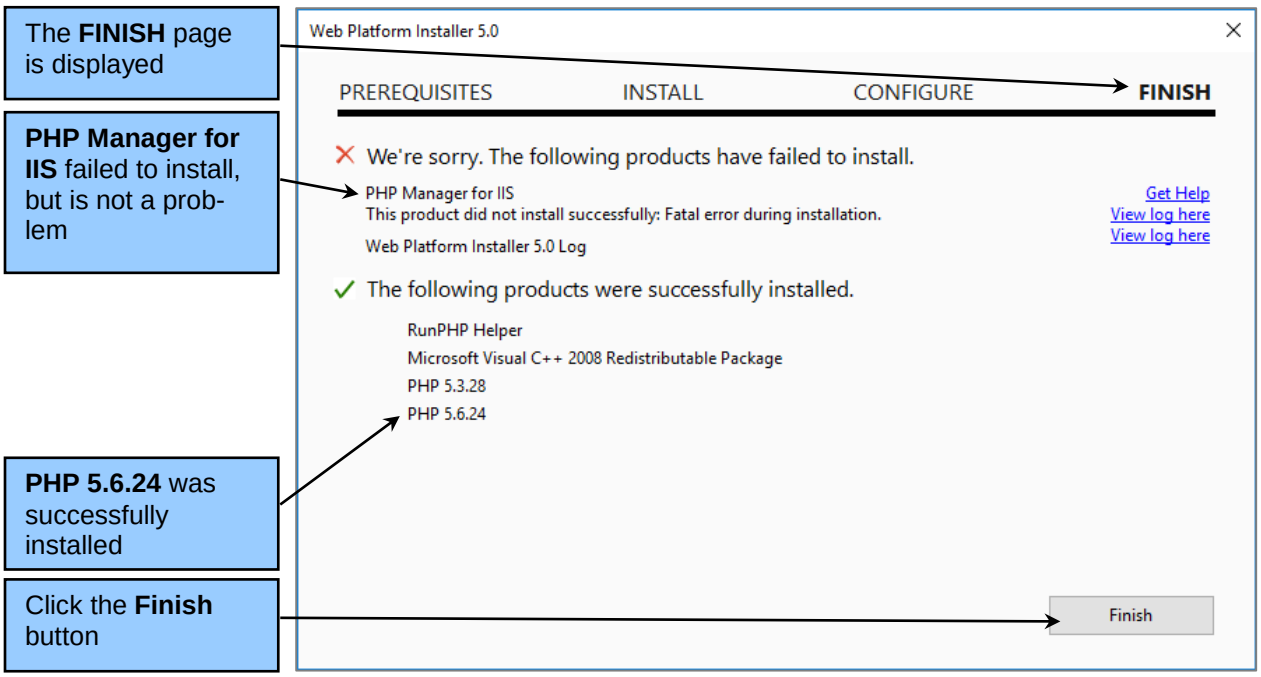


Figure I-39 — The FINISH Page

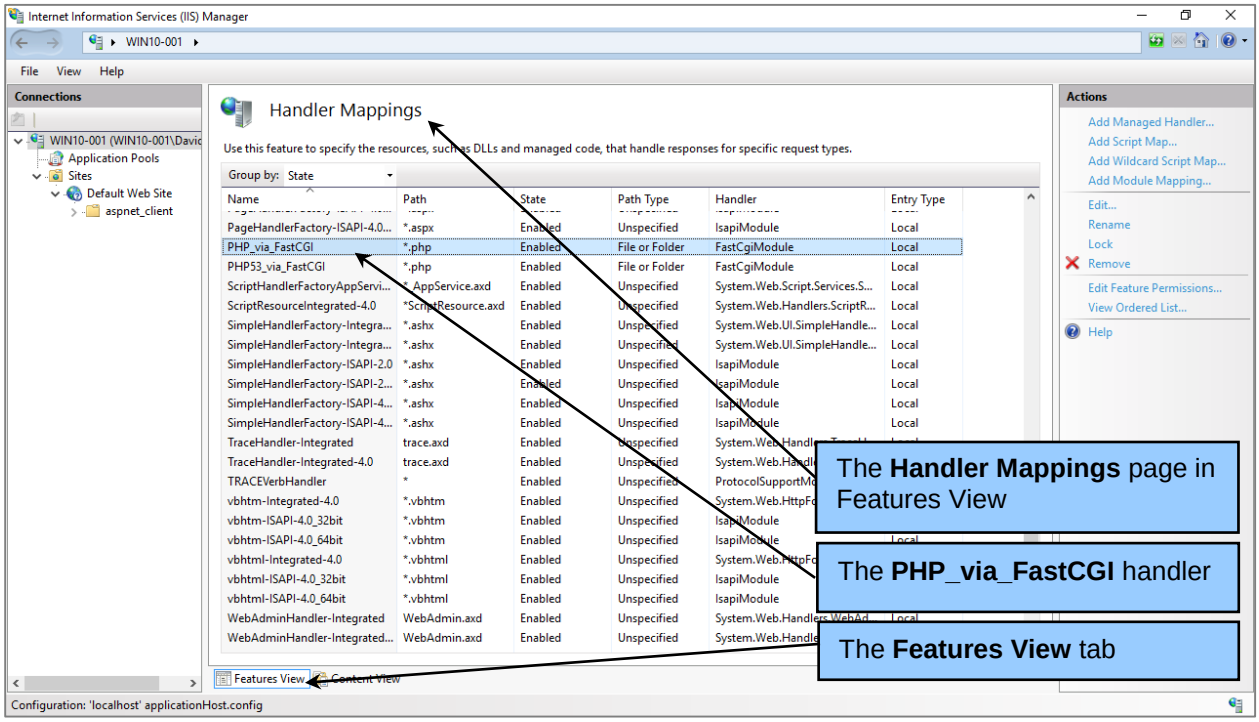


Figure I-40 — The PHP_via_FastCGI Handler in Handler Mappings

How Do I Check PHP to Make Sure It Is Running Correctly?

PHP should now be ready for use. However, there is an easy test we can perform to be sure PHP is running properly. This will also give us an opportunity to use NetBeans to create our first PHP Web page.

How Do I Create a Web Page Using the NetBeans IDE?

The NetBeans IDE organizes Web pages into NetBeans Projects, and projects with PHP pages can be organized as NetBeans PHP projects. We will create a project for testing our PHP installation and then create our PHP test page in that project.

Creating a NetBeans PHP Project:

1. Click the **NetBeans** icon on the taskbar.
2. The NetBeans IDE is loaded.
3. Close the NetBeans **Start Page** using the Start Page **X [Close]** button.
4. Click the **New Project** button. The New Project dialog box is displayed, as shown in Figure I-41.
5. Select the category **PHP** and the project type **PHP Application**, as shown in Figure I-41.
6. Click the **Next** button. The New PHP Project dialog box *Name and Location* page is displayed, as shown in Figure I-42.
7. On the New PHP Project dialog box *Name and Location* page, type in the project name **DBC-e08-PHP-Test**, and select **PHP 5.6** as the PHP version. For the Sources folder, browse to **C:\inetpub\wwwroot** and click the **Open** button. Click the **Next** button on the Name and Location page.

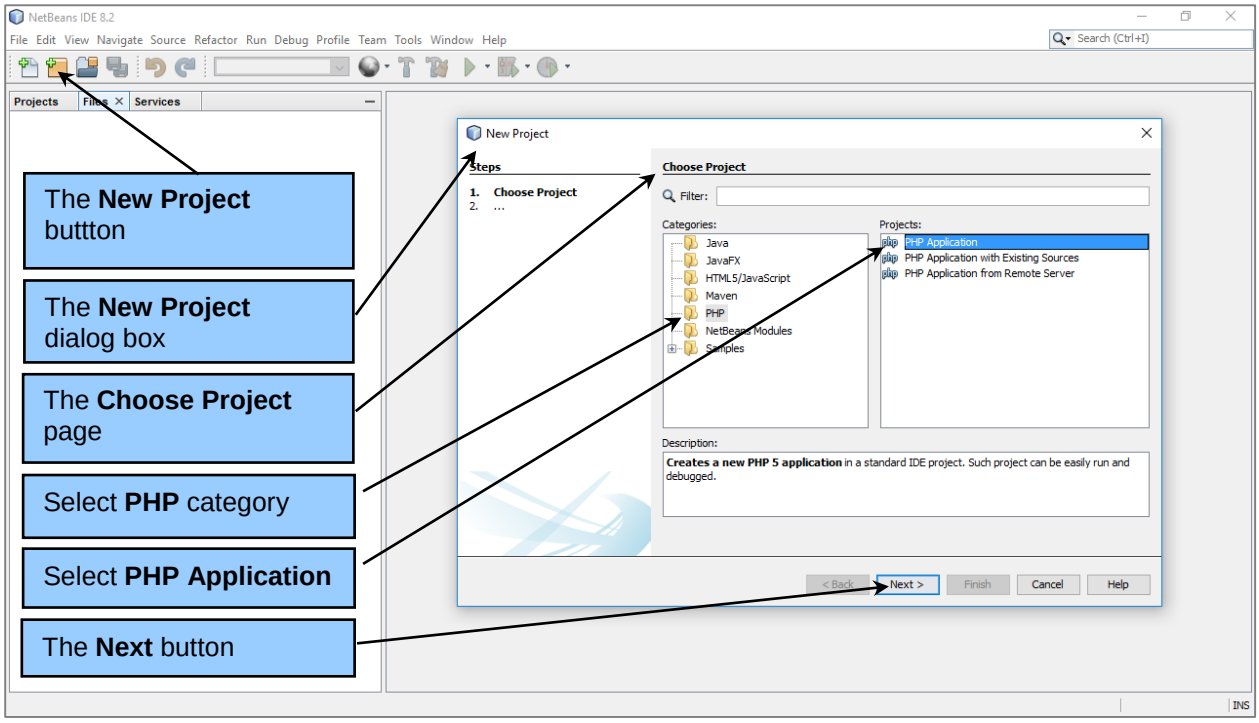


Figure I-41 — The New Project Dialog Box—Choose Project Page

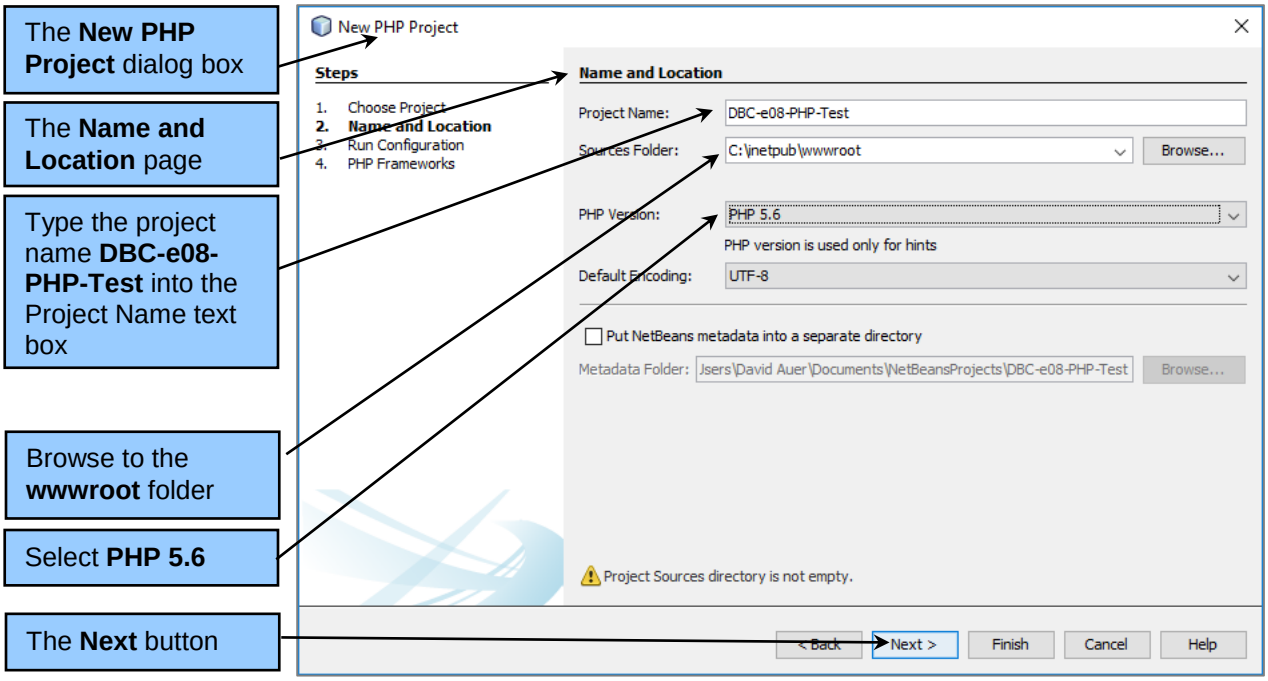


Figure I-42 — The New PHP Project Dialog Box—Name and Location Page

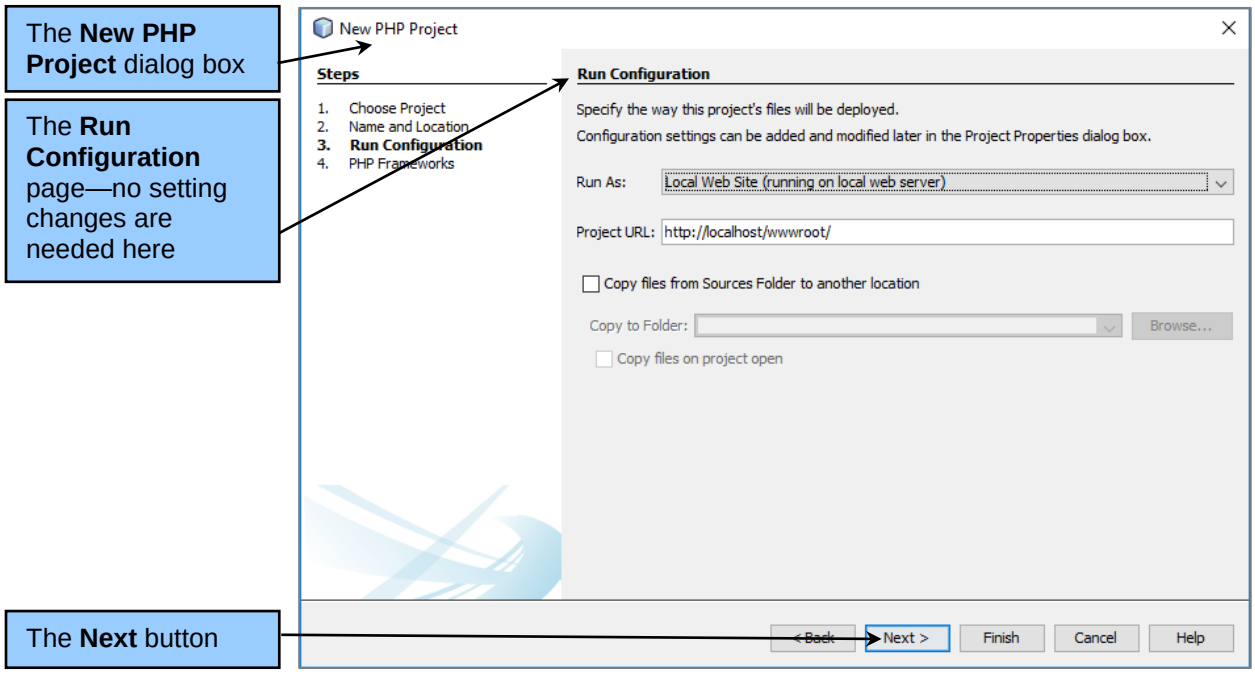


Figure I-43 — The New PHP Project Dialog Box—Run Configuration Page

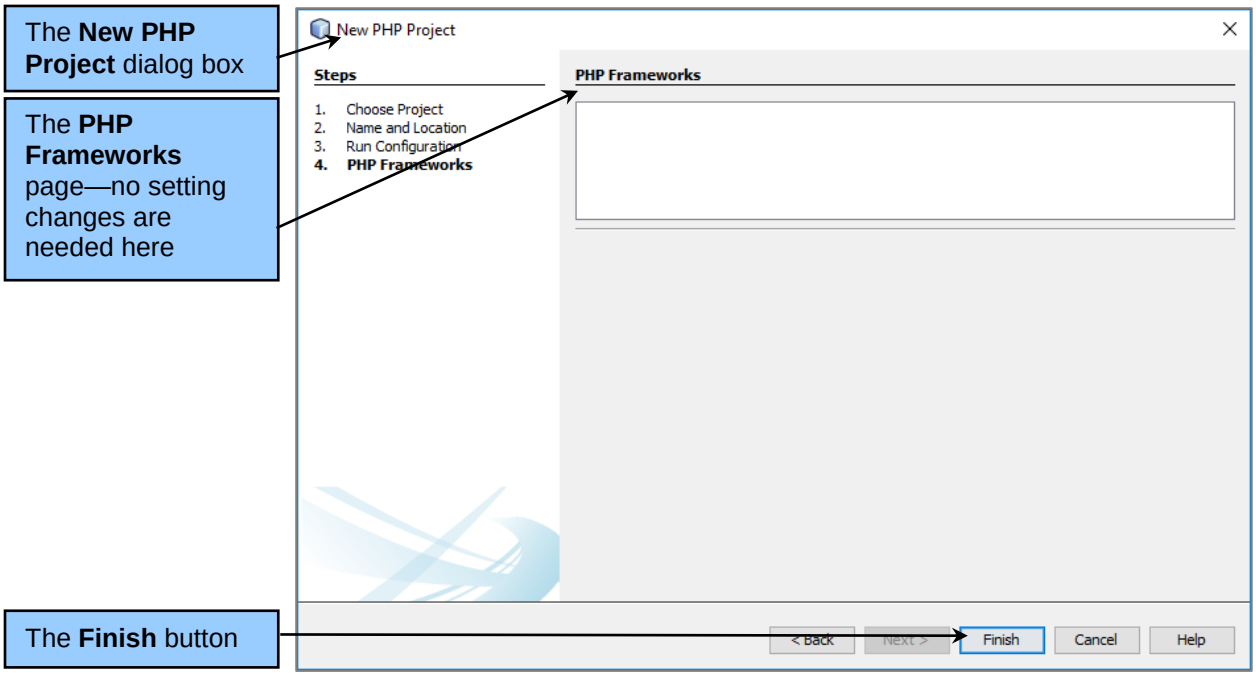


Figure I-44 — The New Project Dialog Box—PHP Frameworks Page

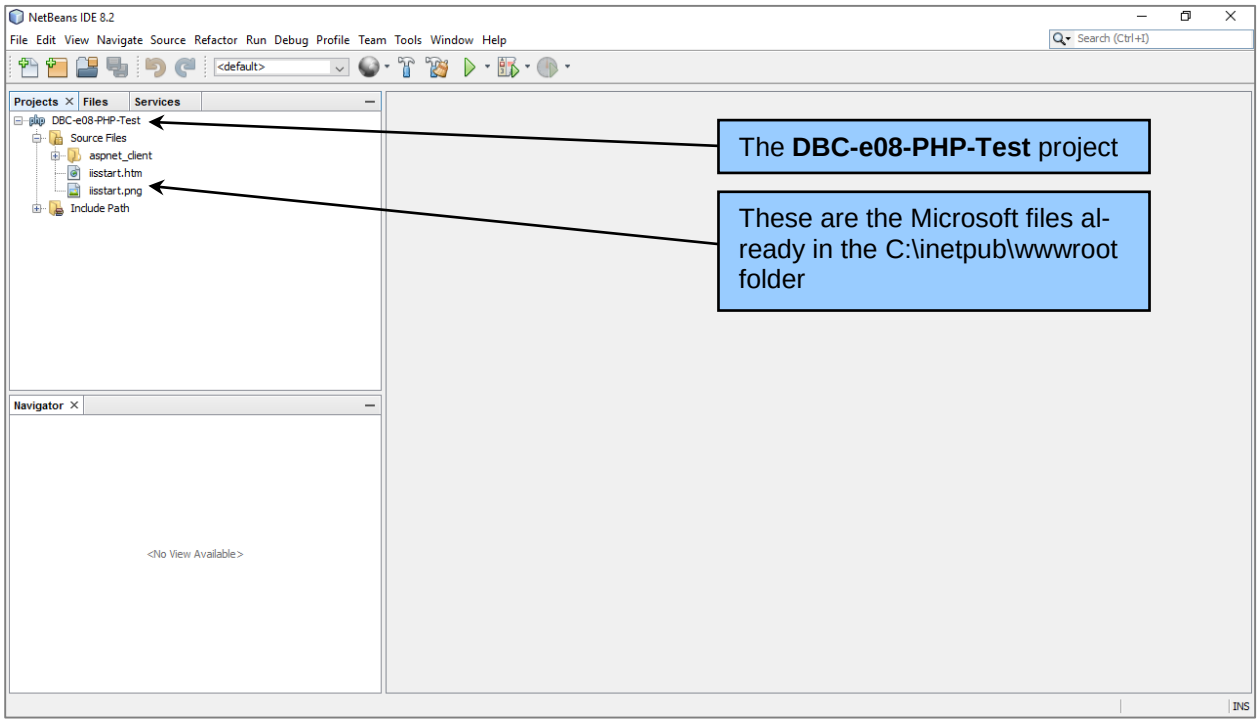


Figure I-45 — The DBC-e08-PHP-Test Project

8. The New PHP Project dialog box *Run Configuration* page is displayed, as shown in Figure I-43. There is nothing we need to configure on the *Run Configuration* page, so click the **Next** button.
9. The New PHP Project dialog box *PHP Frameworks* page is displayed, as shown in Figure I-44. There is nothing we need to configure on this page, so click the **Finish** button.
10. The DBC-e08-PHP-Test project is created and available for use, as shown in Figure I-45. Note that because we are using *C:\inetpub\wwwroot* as the source folder, the existing IIS files already in that folder are displayed in our project.

We now need to recreate a PHP file that will display a PHP-based Web page. The PHP Web page that we will create has a single purpose—to demonstrate that PHP has been successfully installed on the host computer by displaying a Web page containing PHP installation settings. The PHP settings are obtained by using the PHP **phpinfo()** command. All PHP commands must be enclosed in PHP delimiters so that the PHP processer will recognize the PHP code and execute it as such. The standard PHP delimiters are **<?php** and **?>** (there are other delimiters that can be used, but we have no need for them and will not discuss them here). We will now create a well-known and often-used PHP Web page that has to be the shortest possible, executable PHP page!

As noted above in step 10, because we are using *C:\inetpub\wwwroot* as the source folder, the existing IIS files already in that folder are displayed in our project. And because the folder is not empty, NetBeans does not automatically create a new file. If, on the other hand, we specify an *empty folder* as the source folder for the project, NetBeans automatically creates a file named *index.php* in the empty folder.

Because NetBeans did not create a *.php file for use, we will have to create it ourselves. We will name the file *phptest.php* instead of *index.php*. However, the initial HTML and PHP code for the *index.php* file that NetBeans creates is identical to the initial HTML and PHP code for the *phptest.php* file we will create. This code can be seen below in Figure I-48.

Creating a NetBeans PHP Web Page:

1. Click the **New File** button to issue the *File | New File* command. The New File dialog box is displayed, as shown in Figure I-46.
2. In the *Choose File Type* page of the New File dialog box, select the **PHP** category and **PHP Web Page** file type, as shown in Figure I-46.
3. Click the **Next** button. The *Name and Location* page of the New File dialog box is displayed, as shown in Figure I-47.
4. Type the filename **phptest** into the File Name text box.
5. All the other settings are correct, so click the **Finish** button to create the phptest.php file, as shown in Figure I-48.
6. Leave the NetBeans IDE open.

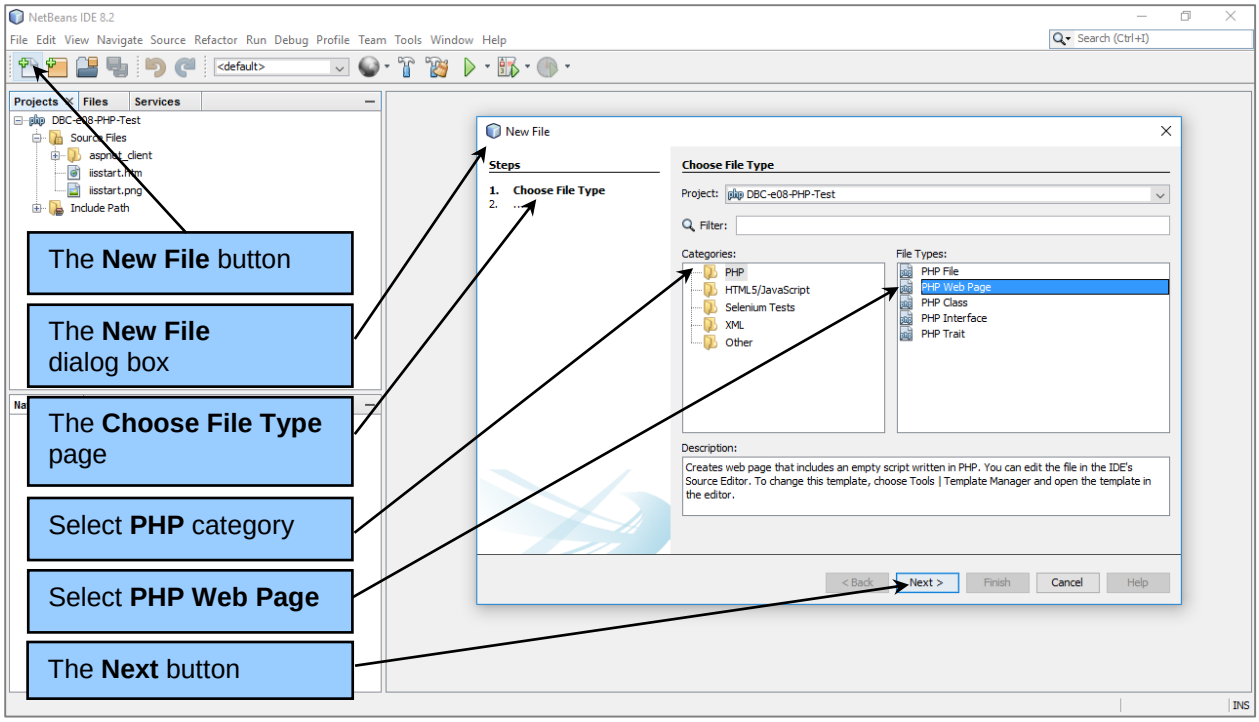


Figure I-46 — The New File Dialog Box—Choose File Type Page

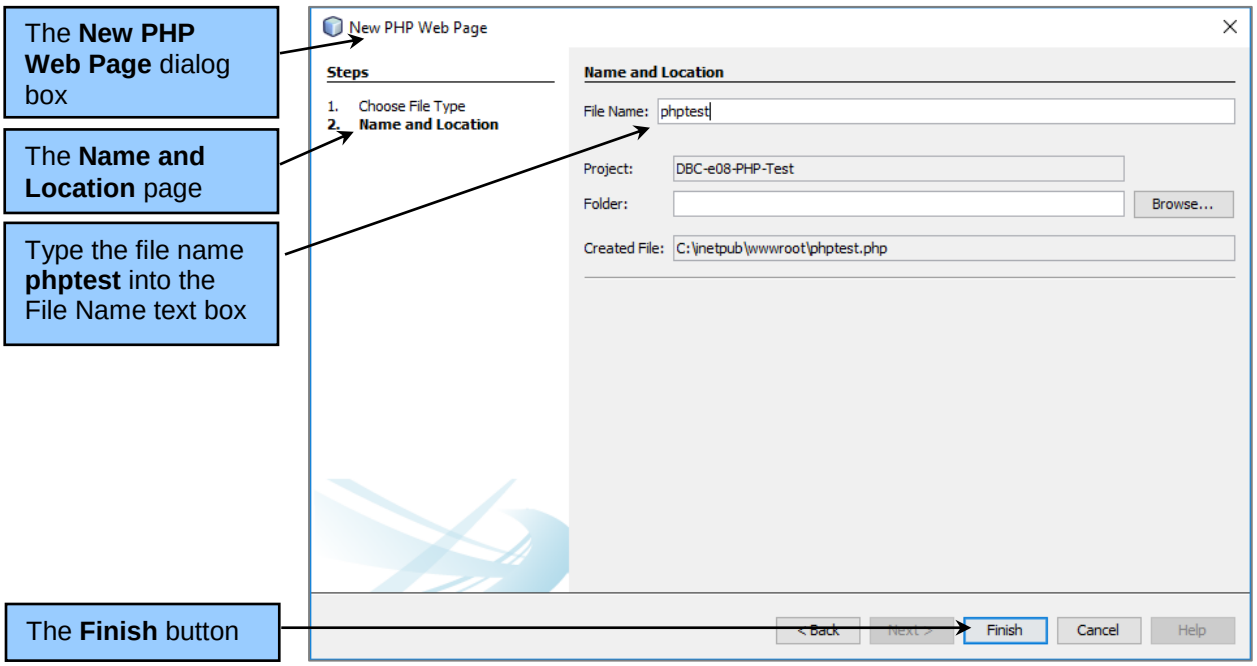


Figure I-47 — The New PHP Web Page Dialog Box—Name and Location Page

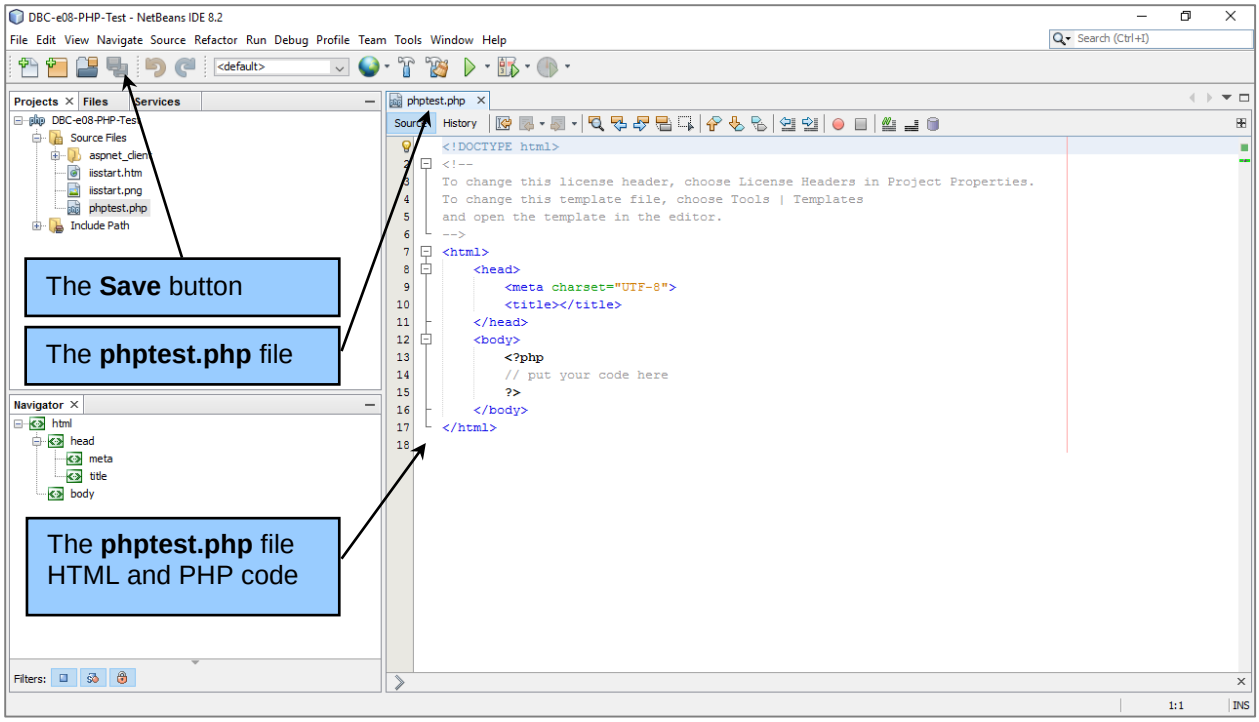


Figure I-48 — The phptest.php File with Initially Generated Code

Creating the DBC-e08-PHP-Test Web page:

1. Edit the phptest.php code in the NetBeans IDE so that it looks like the code in Figure I-49. Ignore any warnings generated by the NetBeans editor.
2. Click the **Save** button on the top-left of the NetBeans toolbar.
3. Close the phptest.php page and the NetBeans IDE.

Now that we have created our phptest.php file, it is time to see if PHP is working correctly.

Viewing the phptest.php Web Page on the Web Site:

1. Open the **Microsoft Edge** Web browser or whichever Web browser you use.
2. Type in the URL **http://localhost/phptest.php** , and then press the Enter key. The PHP information Web page is displayed in the Web browser, as shown in Figure I-50. The fact that we can see this page demonstrates that PHP is correctly installed. Note that you can scroll through this page to see the current setting for the various PHP parameters.
3. Close **Microsoft Edge** or whichever Web browser you are using.

Now that we have demonstrated that PHP is working correctly, we have completed our main work in this Appendix. We have (1) installed and configured the IIS Web server and the associated file directory structure, (2) installed PHP, and (3) installed NetBeans and used it to create a PHP Web page.

Before wrapping up this appendix, however, let's take a brief look at some of the finer points of PHP setup and configuration.

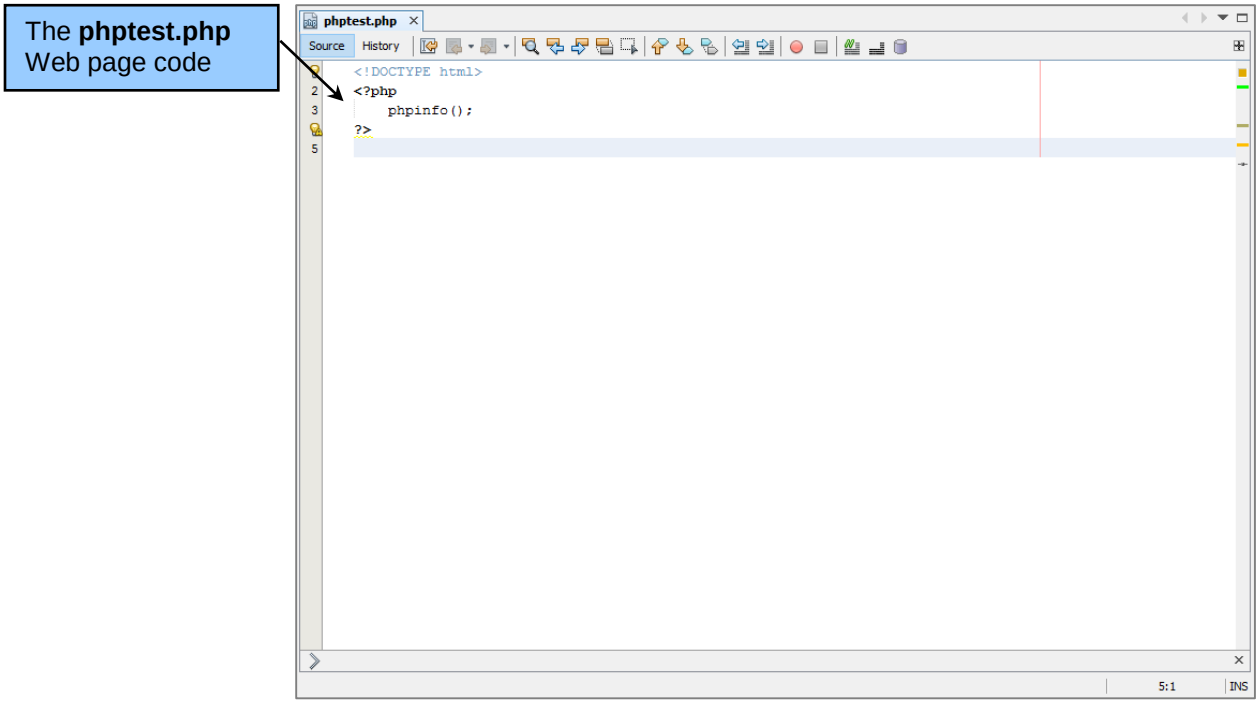


Figure I-49 — The phptest.php HTML and PHP Code

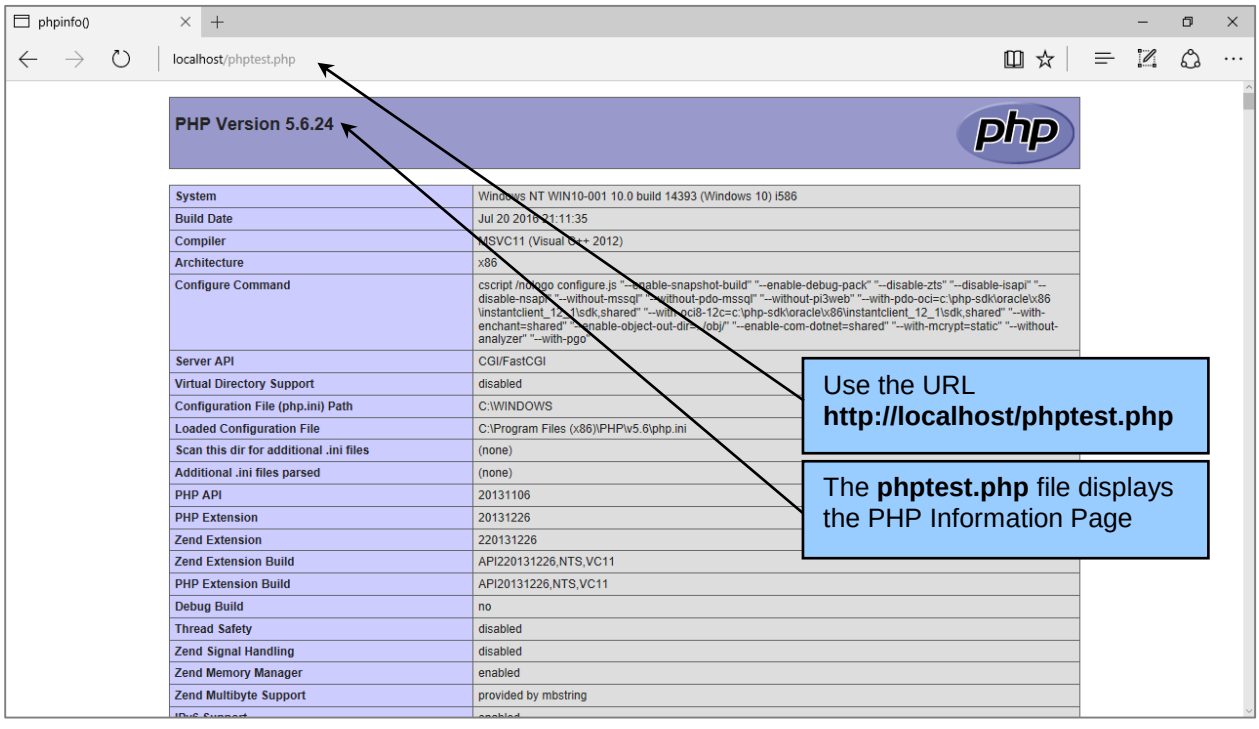


Figure I-50 — The PHP Information Page in the Web Browser

How Do I Manage the PHP Configuration?

Unfortunately, the default WPI 5.0 installation leaves out a critical file that we need for our work in Chapter 7. We will modify our PHP installation to fix that problem. Specifically, we are missing the PHP PDO ODBC capabilities—PHP automatically provides standard ODBC support, but support for the PDO version of ODBC requires a separate file.

In our discussion of PHP earlier in this appendix, we said that there were several options for installing PHP, including:

- Downloading and installing PHP manually.
- Downloading the **Microsoft Web Platform Installer (WPI) 5.0** and installing PHP using that utility (for Windows operating systems only).
- Using Microsoft Installations from Microsoft Web sites.

Because it provided all the basic functionality needed for Chapter 7 on Web database processing applications, we chose to use the Microsoft Web Platform Installer (WPI) 5.0 to simplify the PHP installation.

However, we still need to understand how to modify the PHP installation or provide the PHP functionality that we need. Specifically, while the Microsoft WPI 5.0 installation does install and enable the full set of the **PHP dynamic extension *.dll files** that PHP uses to extend PHP functionality to various DBMS products, other installations may not, and vendors such as Microsoft provide additional drivers that are not in the installed set. The *.dll files are **Microsoft dynamic linked library** files, which provide the ability to share program capabilities and functionalities between programs by letting each of the programs use a common *.dll file.

For PHP, the dynamic extension *.dll files are stored in the *..\PHP\ext* folder or, more specifically for our installation of PHP, *C:\Program Files (x86)\PHP\v5.6\ext*. Figure I-51 shows the contents of this folder as created by the WPI 5.0 installation of PHP 5.6.24. Note the inclusion of two files for use with MySQL, one of which is the updated and preferred file, but there are *no* files for SQL Server (it would be labeled *php_mssql.dll*).

These files provide the ability for PHP to make application calls directly to a DBMS, rather than using **Open Database Connectivity (ODBC)** as discussed in Chapter 7 (ODBC drivers are automatically installed when you install Microsoft Access 2016, SQL Server 2016 and Oracle Database XE, while the installation of the MySQL/ODBC Connector is discussed in Appendix C for MySQL 5.7). For example, the PHP statement used in Figure 7-18 to send an SQL statement to the SQL Server database using PHP's built-in OBDC capability is:

```
// Execute SQL statement
$RecordSet = odbc_exec($Conn,$SQL);
```

If we were using the php_mysqli.dll (which is the *updated* MySQL file) to add the capability to send the statement directly to SQL Server, the PHP statement would be:

```
// Execute SQL statement
$RecordSet = mysqli_query($Conn,$SQL);
```

If we need PHP dynamic extensions not provided in the Microsoft installer PHP installation, we have a couple of options:

- Download the PHP Zip version, extract the files manually, and move any needed files into our existing PHP installation.
- Reinstall PHP and select additional needed drivers.
- Download additional updated drivers from DBMS providers and then update the installation manually.

In this section, we'll discuss how to update that installation manually. There are two steps: First, add the needed PHP dynamic extension *.dll files to the ..\PHP\{PHP version}\ext folder, and second, update the PHP configuration to activate the *.dll files.

The PHP configuration is controlled by the *php.ini* file, which is stored in the ..\PHP folder. Therefore, this means we need to:

- Download a copy of the PHP *.ZIP file used for manual installation.
- Unzip the *.ZIP file in a location other than the locations of the PHP installation.
- Copy the needed dynamic extension *.dll files to the ..\PHP\{PHP version}\ext folder.
- Update the php.ini file in the ..\PHP folder.
- Reboot the computer so that the revised PHP configuration file will be used when PHP is used.

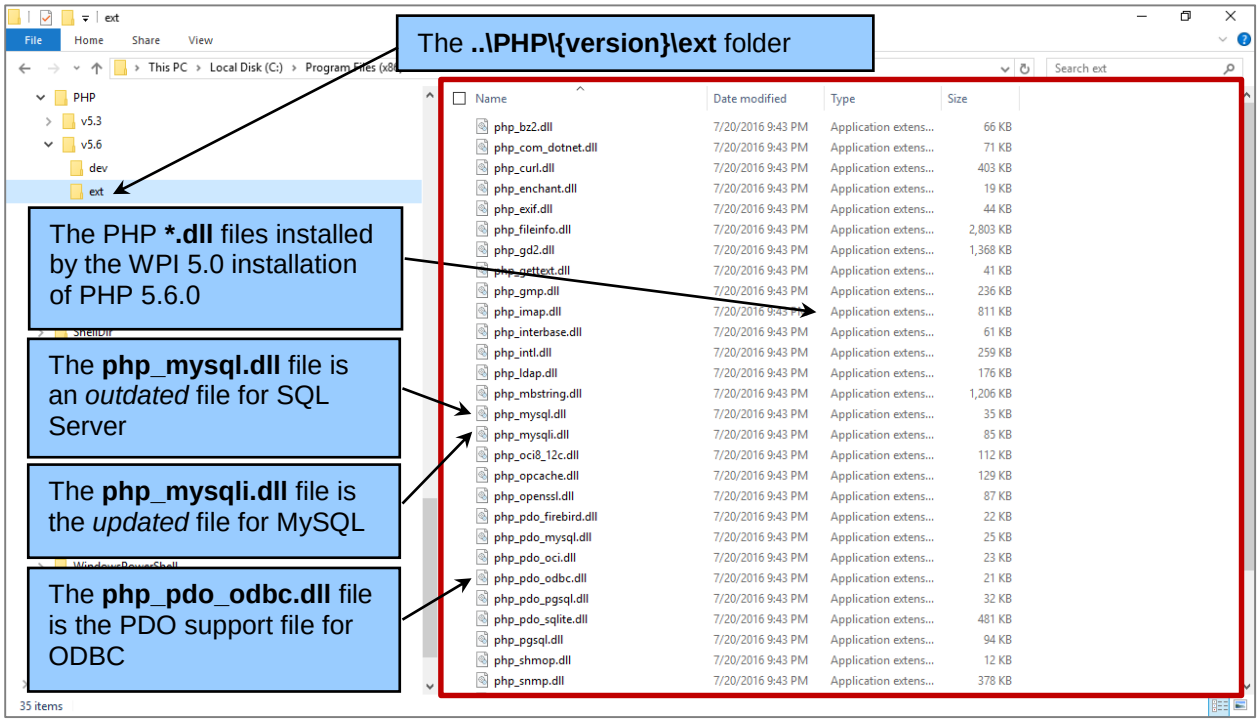


Figure I-51 — The PHP *.dll Files Installed by WPI 5.0 for PHP 5.6.24

Note that the version of PHP that is installed on a Windows 10 computer running IIS 10 is the **PHP Non-Thread-Safe Windows version for FastCGI**. You don't need to worry about the technical details of this name, but if you download a version of PHP from the PHP Web site, then be sure to download a non-thread-safe version to ensure compatibility. If you are interested in learning more about FastCGI or exactly what non-thread-safe means, browse the Microsoft PHP on IIS Web site at http://php.iis.net/ .

The **PHP php.ini configuration file** is a plain text file that can be edited as necessary to control the configuration of PHP on a specific computer. While in a manual or non-Windows installation of PHP the extensions are placed in a Dynamic Extensions section of the standard php.ini, in the Windows installer installation the extensions are placed at the end of the php.ini file. This does make them easier to find and edit! The extensions in the current php.ini file are shown in Figure I-52. A line is provided for each dynamic extension *.dll that is activated by the installation.

Now let's actually update the Windows PHP installation. For Chapter 7, we need the PHP PDO ODBC extension enabled. We also note that there are no Microsoft SQL Server *.dll files. The current Microsoft SQL Server extension is the **Microsoft Drivers 3.2 for PHP for SQL Server**. The drivers are available at http://www.microsoft.com/en-us/download/details.aspx?id=20098.

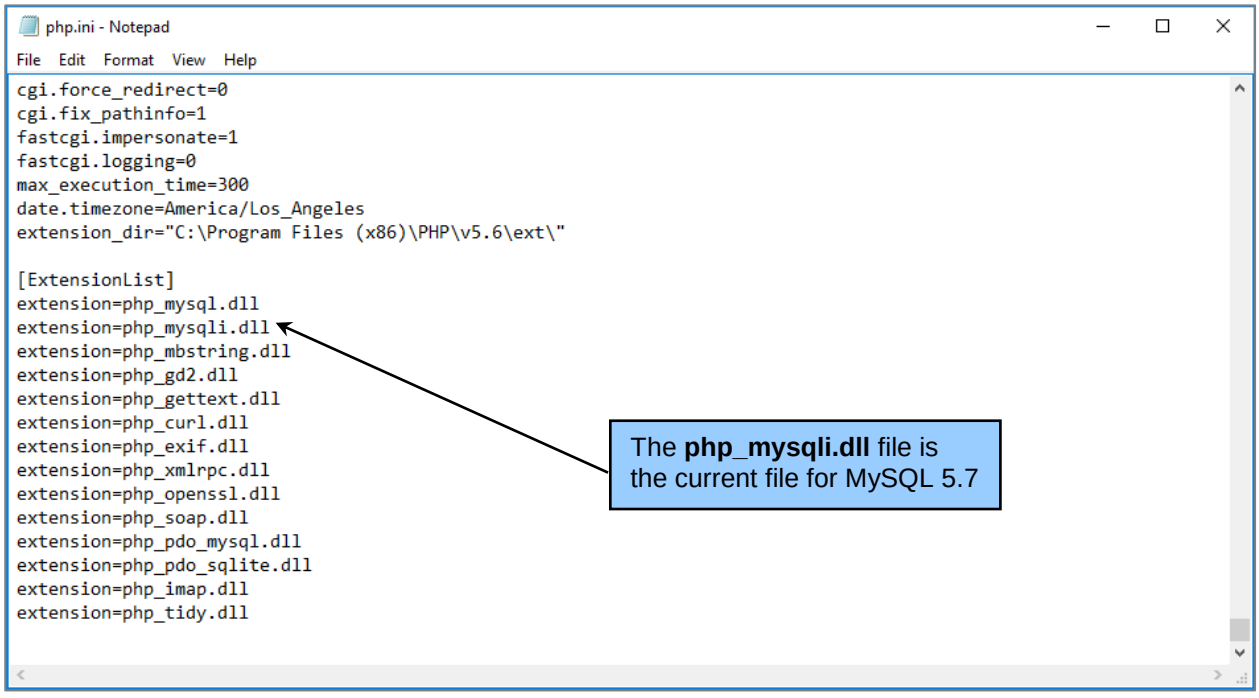


Figure I-52 — The Dynamic Extensions of the php.ini Configuration File

Creating the C:\Download\Microsoft\SQL-Server-Driver-For-PHP Folder:

1. Open File Explorer (not Windows Edge).
2. Expand the **This PC** tree.
3. Expand **Download**.
4. Click the **Download** folder to select it, and then click the **New Folder** button.
5. Create a new folder named **Microsoft**.
6. Click the **Microsoft** folder to select it, and then click the **New Folder** button.
7. Name the new folder **Microsoft-PHP-Drivers-3.2**.
8. Leave File Explorer open.

Downloading the Microsoft Drivers for PHP for SQL Server File:

1. Open **Microsoft Edge** (or the Web browser that you use).
2. Type in the URL http://www.microsoft.com/download/en/details.aspx?id=20098 and then press **Enter** button. The *Microsoft Drivers for PHP for SQL Server* Web page is displayed.
3. Click the **Download** button.
4. Choose the file name **SQLSRV32.EXE**, then click the **Next** button.
5. A message bar is displayed asking if you want to save the file.
6. Click **Save as**. The Save As dialog box is displayed.
7. Browse to the **This PC\Download\Microsoft\Microsoft-PHP-Drivers-3.2** folder, and then click the **Save** button.
8. The file is downloaded, and a message bar is displayed stating the file is downloaded. Close the message bar.
9. Close Microsoft Edge (or the Web browser that you use).

Installing the Microsoft PHP drivers for SQL Server requires a different installation procedure than the one used for most Windows programs because even though the downloaded filename is named *SQLSRV32.exe*, we actually downloaded a compressed file and the executable *.exe only indicates that the file will expand when we run it.

Installing the Microsoft Drivers 3.2 for PHP for SQL Server:

1. In File Explorer, browse to the downloaded **SQLSRV32.exe** file in **This PC\Download\Microsoft\Microsoft-PHP-Drivers-3.2** folder.
2. Double-click the file to run it.
3. If an Open File – Security Warning dialog may be displayed asking “Do you want to run this file?” If it is, click the **Run** button.
4. A Microsoft Drivers 3.2 for PHP for SQL Server dialog box is displayed asking you to accept a licensing agreement. Click the **Yes** button.
5. A Microsoft Drivers 3.2 for PHP for SQL Server dialog box is displayed asking you where you want to place the extracted files. Click the **Browse** button. A Browse for Folder dialog box is displayed.

6. In the Browse for Folder dialog box, browse to **This PC\Download\Microsoft\Microsoft-PHP-Drivers-3.2**, and then click the **OK** button.
7. In the Microsoft Drivers 3.2 for PHP for SQL Server dialog box, click the **OK** button.
8. The compressed files are expanded.
9. A Microsoft Drivers 3.2 for PHP for SQL Server dialog box is displayed thanking you for downloading the file. Click the **OK** button.
10. The expanded files are now visible in the This PC\Download\Microsoft\Microsoft-PHP-Drivers-3.2 folder, as shown in Figure I-53.
11. Since we have installed PHP 5.6.24 as a non-thread-safe FastCGI program, we will use the files named **php_sqlsrv_56_nts.dll** and **php_pdo_sqlsrv_56_nts.dll**.
12. For **each** of these files:
    a. Right click the **filename** to display the shortcut menu. In the shortcut menu, click the **Copy** command.
    b. Click the **C:\Program Files(x86)\PHP\v5.6\ext** folder to select it.
    c. Right click the **ext** folder to display the shortcut menu. In the shortcut menu, click the **Paste** command.
    d. Because the *C:\Program Files (x86)\PHP\v5.6\ext* folder is a protected system folder, a Destination Folder Access Denied dialog box appears. Click the **Continue** button to confirm that this is an operation that we actually want to do.
13. The **php_sqlsrv_56_nts.dll** and **php_pdo_sqlsrv_56_nts.dll** files are now copied to the ..\PHP\ext folder.
14. Leave File Explorer open.

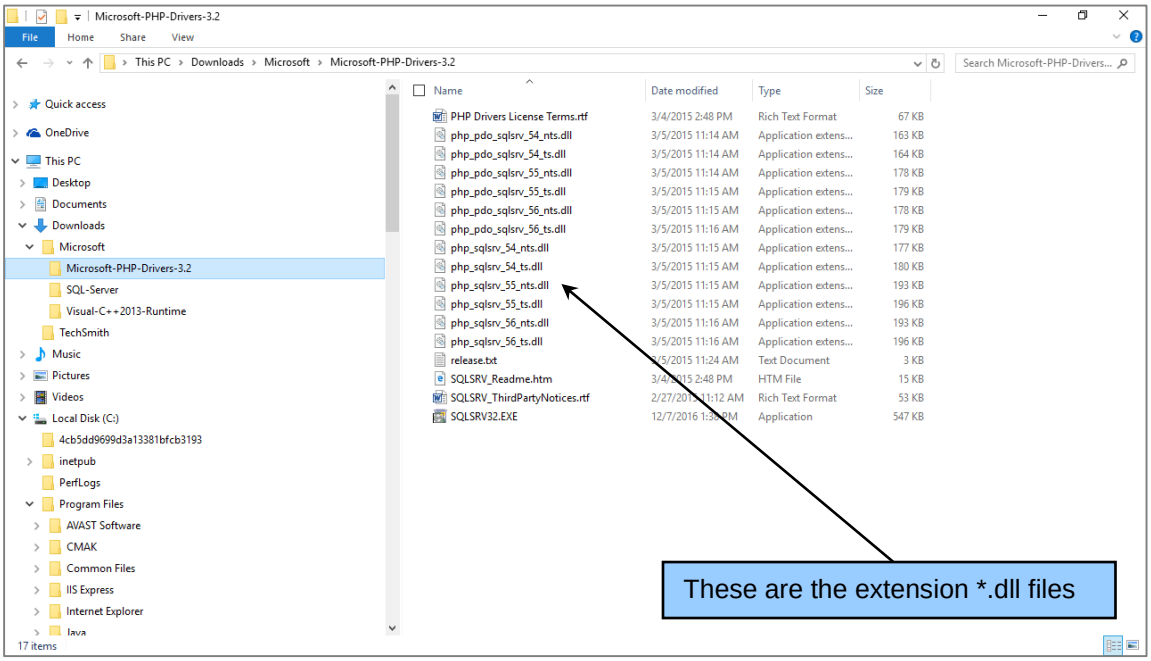


Figure I-53 — The Microsoft Drivers 3.2 for PHP for SQL Server Dynamic Extension and Help Files

Now that we installed the new PHP dynamic extension *.dll files in the correct location, we need to update the php.ini file to enable use of these files. However, this is a bit tricky because the file is in a protected area.

Updating the PHP php.ini File:

1. Click the Windows 10 **Windows** key button to display the Windows 10 menu.
2. Find the **Notepad** program in **Windows Accessories**.
3. Right-click **Notepad** to display the options.
4. In options, click **More** | **Run as administrator**.
5. A User Account Control dialog box is displayed, asking if you want to allow Notepad to make changes to the computer. Click the **Yes** button. Notepad is opened.
6. In Notepad, click **File**, then click **Open** to display the Open dialog box.
7. In the Open dialog box, browse to **C:\Program Files(x86)\PHP\v5.6**, change the file extensions being displayed to **All Files (*)** so that you can see all the files in the PHP folder, and then click the **php.ini** file to select it as shown in Figure I-54.
8. In the Open dialog box, click the **Open** button. The php.ini file is opened for editing in Notepad.
9. Scroll to the Dynamic Extensions section of the php.ini file.
10. As shown in Figure I-55, edit the file by adding the following lines:

```
[PHP_PDO_ODBC]
extension=php_pdo_odbc.dll
[PHP_SQLSRV_56_NTS]
extension=php_sqlsrv_56_nts.dll
[PHP_PDO_SQLSRV_56_NTS]
extension=php_pdo_sqlsrv_56_nts.dll
```

11. Click **File**, then click **Save** to save the edited php.ini file.
12. Close **Notepad**.
13. Close **File Explorer**.
14. Close any other open programs and reboot the computer so that the new drivers are available for use.

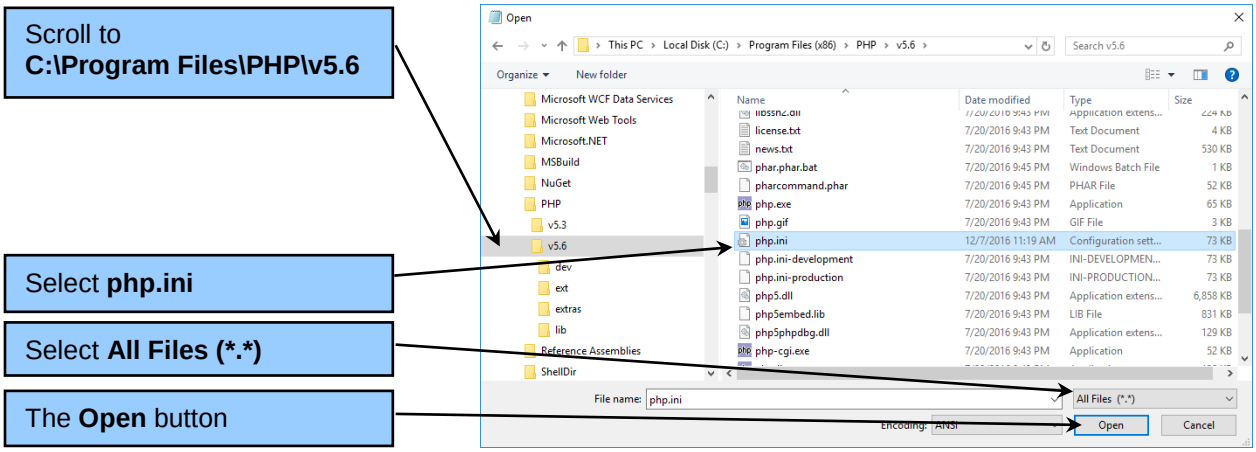


Figure I-54 — Opening the php.ini File in Notepad

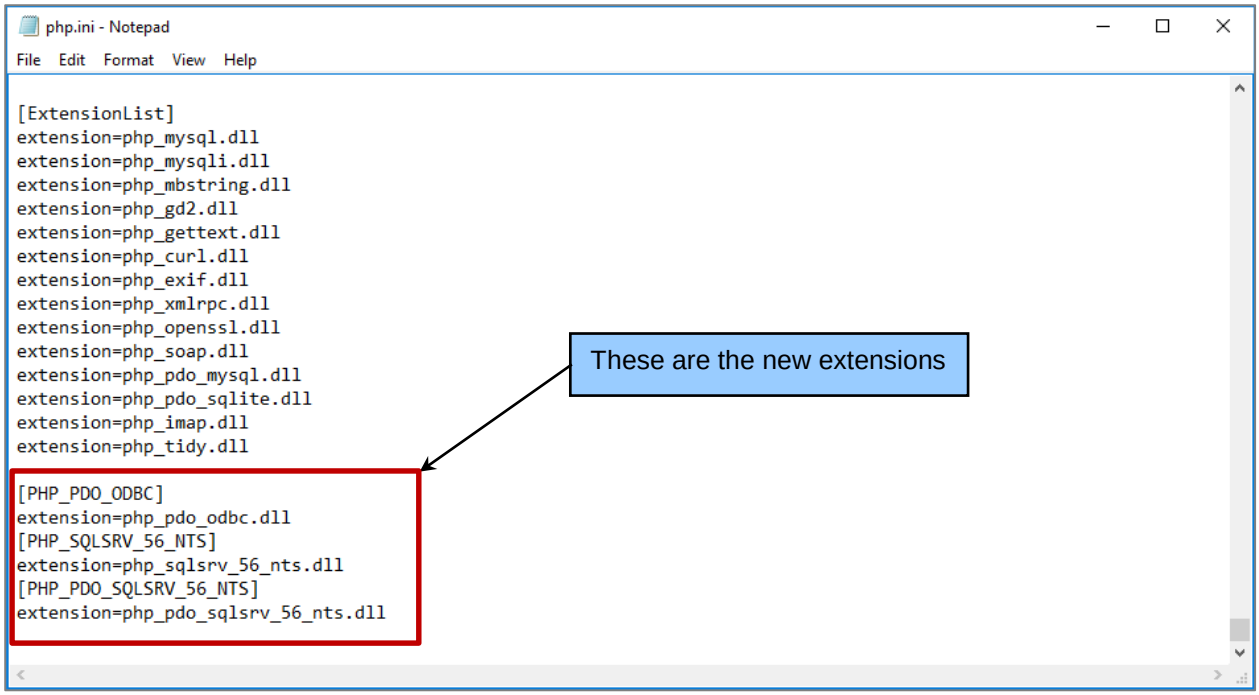


Figure I-55 — The Added Dynamic Extensions in the php.ini Configuration File

At this point, as noted in the steps above, the computer must be rebooted so that the new extensions will be enabled for use in PHP applications. In practical terms, this means that you can use the PHP programming language functionality added by these dynamic extensions in your PHP Web pages.

For example, as previously discussed, the PHP statement used in Figure 7-18 to send an SQL statement to the SQL Server database using PHP's built-in OBDC capability is:

```
// Execute SQL statement
$RecordSet = odbc_exec($Conn,$SQL);
```

If we decide to use the php_pdo_sqlsrv_56_nts.dll to add PDO capability to send the statement directly to SQL Server, the PHP statement would be:

```
// Execute SQL statement
$RecordSet = sqlsrv_query($Conn,$SQL);
```

Now you should understand the limitations of the Microsoft installer installation that we have been using as well as know how to upgrade that installation as needed.

KEY TERMS

<?php and ?>	**Apache**
http://localhost	**iisstart.htm**
inetpub folder	**integrated development environment (IDE)**
Internet Information Services (IIS)	**Internet Information Services (IIS) Manager**
Java Software Development Kit (JDK)	**Microsoft Drivers 3.2 for PHP for SQL Server**
Microsoft dynamic linked library	**Microsoft Web Platform Installer (WPI) 5.0**
NetBeans IDE	**ODBC Data Source Administrator**
Open Database Connectivity (OBDC)	**PHP**
PHP: Hypertext Processor	**PHP Data Objects (PDO)**
PHP dynamic extension *.dll files	**PHP Non-Thread-Safe Windows version for FastCGI**
PHP php.ini configuration file	**phpinfo() command**
security permissions	**wwwroot folder**

REVIEW QUESTIONS

I.1 Why is the material in this appendix important?

I.2 What Web server is typically used with the Windows operating systems? What Web server is typically used with the Linux operating system?

I.3 Briefly describe how to install IIS on the Windows 10 operating system.

I.4 What utility is used to manage IIS?

I.5 What utility is used to manage ODBC?

I.6 How do you add a program icon to the Windows 10 Taskbar?

I.7 How is the file system that supports IIS structured?

I.8 Briefly describe how to view a Web page that has been created in the IIS Web server.

I.9 What are Windows security permissions?

I.10 Briefly describe how to manage Windows security permissions.

I.11 What is an IDE?

I.12 What is the NetBeans IDE?

I.13 What is the Java Software Development Kit (JDK)? Why is it needed for the NetBeans IDE?

I.14 Briefly describe how to install the JDK.

I.15 Briefly describe how to install the NetBeans IDE.

I.16 What is PHP? Is PHP a popular Web site development language?

I.17 What are the three options for installing PHP described in this appendix? Which option do the authors recommend using?

I.18 Briefly describe how to install PHP.

I.19 Briefly describe how to create a PHP Web page using the NetBeans.

I.20 What is the purpose of the *phptest.php* Web page created in this chapter?

I.21 What is the purpose of PHP dynamic extension *.dll files?

I.22 What are the *Microsoft Drivers 3.2 for PHP for SQL Server*?

I.23 Using the *Microsoft Drivers 3.2 for PHP for SQL Server* as an example, briefly describe how to install and enable additional PHP dynamic extension *.dll files to an existing PHP installation.

I.24 Why must the *php_pdo_odbc.dll* extension be activated in the PHP installation?

EXERCISES

There are no separate Project Questions for this appendix—simply be sure that you completed all the steps described in the appendix and that your Web site and PHP development environment are complete and ready for use with Chapter 7.