Using NetBeans™ IDE 5.5

Your Guide to Getting Work Done in NetBeans IDE

Welcome to the Using NetBeans™ IDE 5.5 guide. This guide is designed to give you a more detailed introduction to the IDE than is available in the Quick Start guide by exploring the main aspects of the IDE. This guide is geared mostly to newcomers to NetBeans IDE 5.5, whether you are new to using IDEs or an experienced IDE user that is switching over from a different development environment. However, readers of this guide are assumed to have at least a basic understanding of the Java programming language and related technologies.

Note – This guide does not cover the IDE's Java EE features or module development features. For more information about using NetBeans IDE for these purposes, see the `Java EE Applications Learning Trail` and the `NetBeans Modules and Rich-Client Applications Learning Trail` at `http://www.netbeans.org`.

CHAPTER **1**

Setting Up Projects

This section covers the basics of setting up your IDE to start developing your own projects. The process of managing project contents and properties is centered around the Projects window. The most common tasks in setting up a project are creating a project, setting the project's target JDK, and configuring the project's properties such that resource libraries are available to it.

This section covers:

Basic IDE Concepts

Before you start setting up your project, let's take a minute to get acquainted with some of the basic concepts involved with using the IDE.

Projects

In the IDE, you always work inside of a project. An IDE project is a group of Java source files and associated information about what belongs on the classpath, how to build and run the project, and so forth. You can create standard projects that use an IDE-generated Ant script to build the project, or create free-form projects that are based on your existing Ant scripts. The IDE stores project information in a project folder which includes an Ant build script and properties file that control the build and run settings, and a `project.xml` file that maps Ant targets to IDE commands.

Note: Though the IDE puts source directories within the project folder by default, your source directories do not necessarily need to be located in the project folder.

The following table summarizes the major differences between standard projects and free-form projects.

Standard Projects	Free-Form Projects
The IDE uses a NetBeans-generated Ant build script to build, run, clean, test, and debug your application.	The IDE uses targets in an existing Ant script to build, run, clean, test, and debug your application. If the Ant script does not contain targets for some of these functions, the functions are unavailable. You can write targets to implement these functions, either in your Ant script or in a secondary Ant script.
Some standard IDE projects (Java Application, Java Class Library, Web Application, Enterprise Application, and EJB Module) are created with only one source folder, you can add more. Standard IDE projects with existing sources (Java Application, Web Application, Enterprise Application, and EJB Module) can have any number of source folders. Source folders can be added and removed after project creation. You can also create dependencies with other NetBeans projects. You can also use multiple source folders in standard projects by creating a separate project for each source folder and create dependencies between the projects.	Each project can have any number of source folders. Source folders can be added and removed after project creation. You can also create dependencies with other NetBeans projects.

Standard Projects	Free-Form Projects
The project classpath is controlled by the libraries you add to the project. You can add libraries in the Libraries pane of the Project Properties dialog box or by right-clicking the Libraries node of your project in the Projects window and choosing Add Library. Any changes are immediately registered in the IDE-generated Ant script.	The project classpath is controlled by your Ant script. The classpath settings in the Classpath page of the Project Properties dialog box only tell the IDE which classes to make available for code completion and refactoring. When you change the classpath settings in the Ant script, you have to update the settings in the project's properties.
The build process is customized by setting basic options in the Project Properties dialog box or by overwriting targets in the NetBeans-generated Ant script.	All compilation and runtime options are set in the Ant build script.
The IDE builds one JAR file (for J2SE projects) or WAR file (for web projects) for your project.	The IDE builds as many output files as are specified in the project's Ant script.

The IDE contains the following standard project templates:

Java application icon

Java Application. Template for creating a skeleton J2SE project with a main class.

Java application icon

Java Class Library. Template for creating a skeleton Java class library without a main class.

Java application icon

Java Project with Existing Sources. Template for creating a J2SE project based on your own Java sources.

Web application icon

Web Application. Template for creating a skeleton web application.

Web application icon

Web Project with Existing Sources. Template for creating a web project based on your own web and Java sources.

Enterprise application icon

Enterprise Application. Template for creating a skeleton enterprise application.

Enterprise application icon **Enterprise Application with Existing Sources.** Template for importing an enterprise application into a standard IDE project.

EJB module icon **EJB Module.** Template for creating an Enterprise JavaBeans module.

EJB module icon **EJB Module with Existing Sources.** Template for importing an enterprise JavaBean module into a standard IDE project.

The IDE contains the following free-form project templates:

Free-form project icon **Java Project with Existing Ant Script.** Template for creating a J2SE project based on your own Java sources, built using your own Ant build script.

Free-form project icon **Web Project with Existing Ant Script.** Template for creating a web project based on your own web and Java sources, built using your own Ant build script.

Free-form project icon **EJB Module with Existing Ant Script.** Template for importing an EJB module into an IDE project that uses your own Ant build script.

Ant

Apache Ant is a Java-based build tool used to standardize and automate build and run environments for development. The IDE's project system is built directly on top of Ant. All of the project commands, like Build Main Project or Debug Main Project, call targets in the project's Ant script. You can therefore build and run your project outside the IDE exactly as it is built and run inside the IDE.

It is not necessary to know Ant to work with the IDE. You can set all the basic compilation and runtime options in the project's Project Properties dialog box and the IDE automatically updates your project's Ant script. If you are familiar with Ant, you can customize a standard project's Ant script or write your own Ant script for a project.

Even if you are an expert at using Ant, you probably still need to look in the Ant manual every once in a while. You can install the Ant manual directly in the IDE help system by going to the NetBeans Update Center and installing the Ant Documentation module. See Installing New Modules from the Update Center for more information on using the Update Center.

If you are looking for resources on learning Ant, see `http://ant.apache.org/resources.html`.

Creating a Project

To create a new project, choose File > New Project (Ctrl-Shift-N). When the New Project wizard appears, simply select the right template for your project and complete the remaining wizard steps.

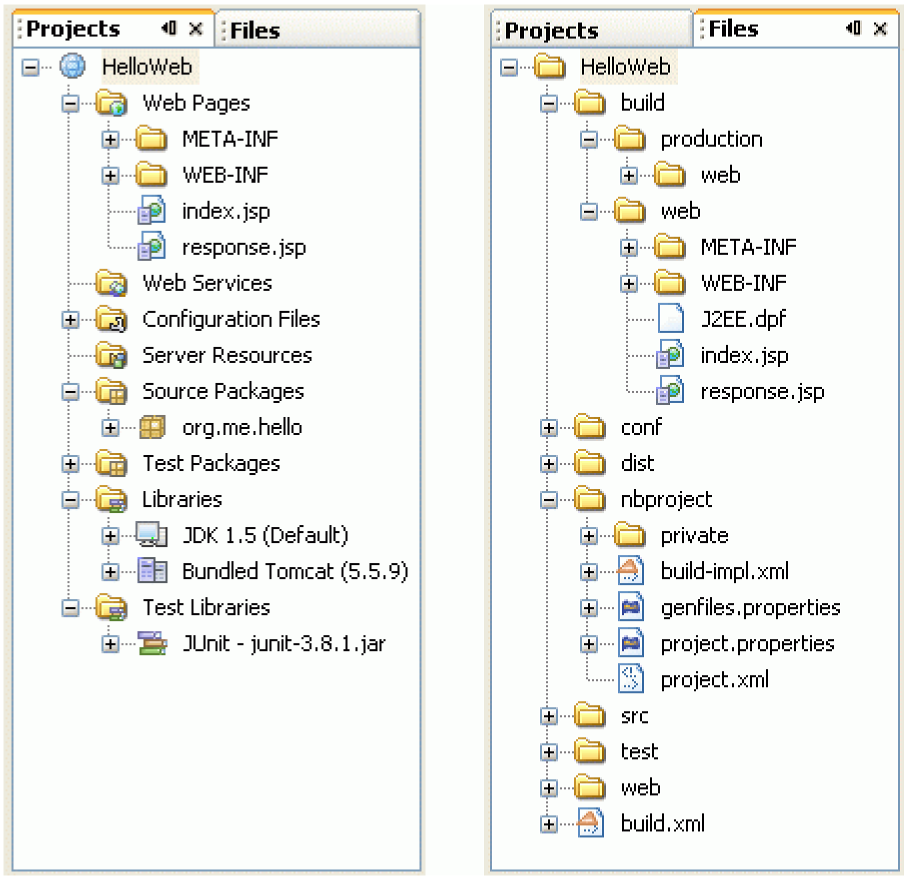
For instructions on using the New Project wizard, see the following documents:

- `Quick Start Guide`
- `Quick Start Guide for Web Applications`

When you finish creating a project, it opens in the IDE with its logical structure displayed in the Projects window and its file structure displayed in the Files window:

- The Projects window is the main entry point to your project sources. It shows a logical view of important project contents such as Java packages and Web pages. You can right-click any project node to access a contextual menu of commands for building, running, and debugging the project, as well as opening the Project Properties dialog box. The Projects window can be opened by choosing Window > Projects (Ctrl-1).
- The Files window shows a directory-based view of your projects, including files and folders that are not displayed in the Projects Window. From the Files window, you can open and edit your project configuration files, such as the project's build script and properties file. You can also view build output like compiled classes, JAR files, WAR files, and generated Javadoc documentation. The Files window can be opened by choosing Window > Files (Ctrl-2).

In addition, you can use the Favorites window to access any location on your computer. This is convenient when you want to access files and directories that are outside of your project directories. The Favorites window does not know anything about project classpath and membership, so no project-related commands like Compile File are available. You can open a class file in the Favorites window by double-clicking the file, however because there is no classpath information associated with that file you may see compilation errors when viewing the file in the Source Editor. You can open the Favorites window by choosing Window > Favorites (Ctrl-3).



Projects and Files windows

Setting the Main Project

When you develop a large application consisting of numerous source folders, it is common to split up your code into separate projects. Typically, one of these projects serves as the entry point for your application and, if it is a J2SE application, contains the application's main class. To tell the IDE which of your projects is the main entry point for your application, you set one project to be the main project. The IDE provides commands that act on the main project. For example, running the Build Main Project command builds both the main project and all of its required projects, thereby ensuring that all of your compiled classes are up-to-date. To set a project as the main project, right-click the project node in the Projects window, and choose Set as Main Project. Only one project can be the main project at any time.

Importing Projects

You can import your project into NetBeans by using the project templates in the New Project wizard to create a NetBeans project based on your project type. After choosing the project type in the New Project wizard, choose the project template that uses existing sources, or if the project you want to import already has an Ant script, choose the template that uses your existing Ant script. Step through the wizard to locate the sources you want to import to create your project. Depending on which template you choose, the IDE creates a either a standard project with your existing sources or a free-form project using your existing sources and Ant script.

For more information on importing source code into the IDE, see the following step-by-step guides:

- `Importing Existing Java Source Code into NetBeans 5.5`
- `Importing a 3rd Party Project as a Free-Form Project`

Setting the Target JDK in a Project

By default, the IDE uses the version of the J2SE platform (JDK) with which the IDE runs as the default Java platform for compilation, execution, and debugging. You can view your IDE's JDK version by choosing Help > About and clicking the Detail tab. The JDK version is listed in the Java field.

You can run the IDE with a different JDK version by starting the IDE with the `--jdkhome jdk-home-dir` switch from the command line or in your IDE-`HOME/etc/netbeans.conf` file. For more information, see Configuring IDE Startup Switches.

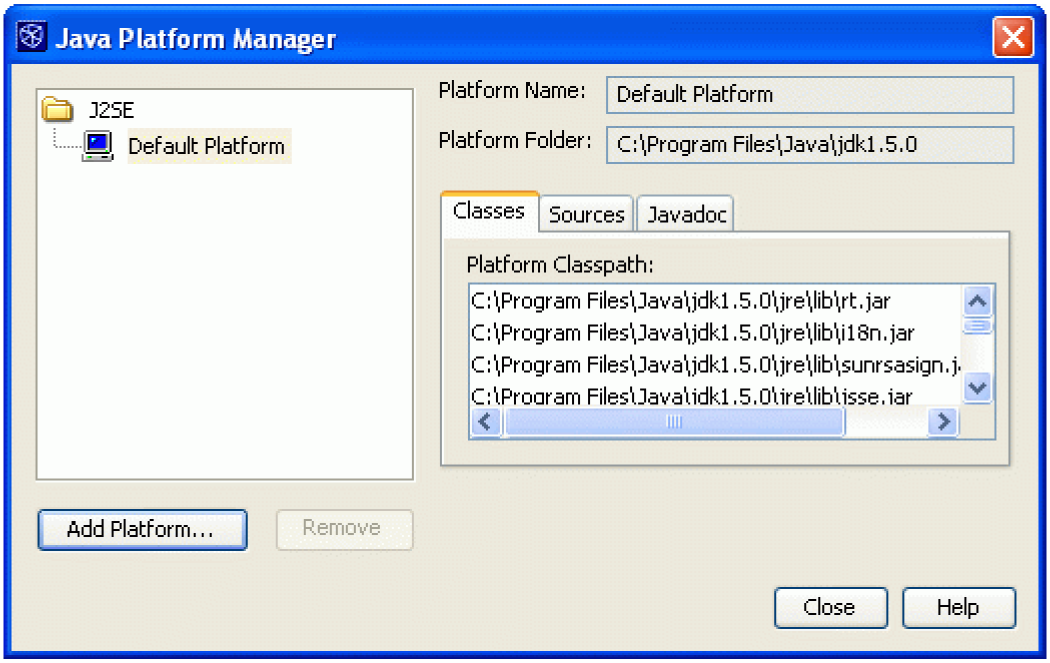
In the IDE, you can register multiple Java platforms and attach Javadoc and source code to each platform. Switching the target JDK for a standard project does the following:

- Offers the new target JDK's classes for code completion.
- If available, displays the target JDK's source code and Javadoc documentation.
- Uses the target JDK's executables (`javac` and `java`) to compile and execute your application.
- Compiles your source code against the target JDK's libraries.

You can switch the target JDK of your project by doing the following:

- **Standard projects.** In standard projects you switch the target JDK in the Libraries panel of the Project Properties dialog box.
- **Free-form projects.** In free-form projects you have to set the target JDK in the Ant script itself, then specify the source level in the Sources page of the Project Properties dialog box. You set the source level in the Project Properties dialog box because this is what the IDE uses to determine the JDK to use for your Javadoc and sources for your project. If the IDE cannot find a JDK corresponding to the source level specified, the IDE's default JDK is used.

To register a new Java platform, choose Tools > Java Platform Manager from the main menu. Specify the directory that contains the Java platform as well as the sources and Javadoc needed for debugging.



Platform Name: Default Platform
Platform Folder: C:\Program Files\Java\jdk1.5.0

Platform Classpath:
```
C:\Program Files\Java\jdk1.5.0\jre\lib\rt.jar
C:\Program Files\Java\jdk1.5.0\jre\lib\i18n.jar
C:\Program Files\Java\jdk1.5.0\jre\lib\sunrsasign.j
C:\Program Files\Java\jdk1.5.0\jre\lib\jsse.jar
```

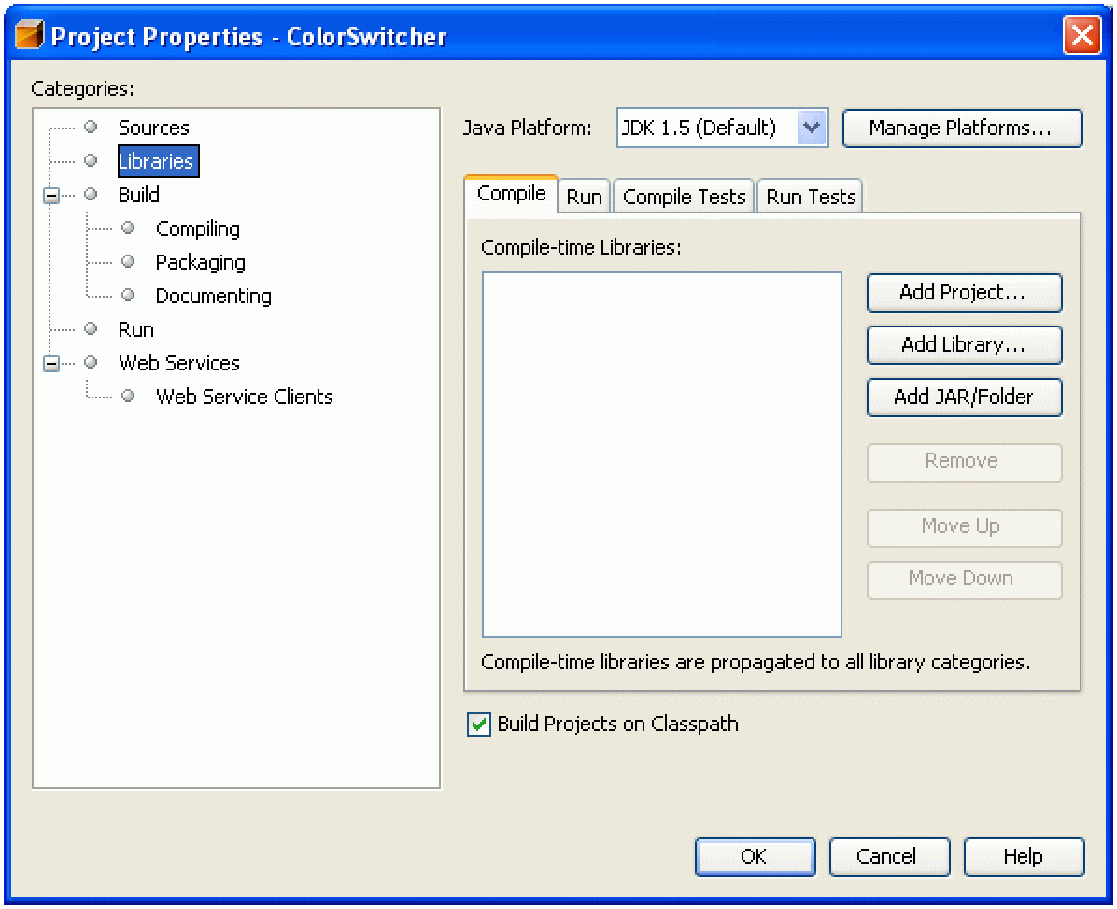
Java Platform Manager

Managing a Project's Classpath

Adding a group of class files to a project's classpath tells the IDE which classes the project should have access to during compilation and execution. The IDE also uses classpath settings to enable code completion, automatic highlighting of compilation errors, and refactoring. You can edit the classpath declarations for an existing project in the Project Properties dialog box.

- **Standard projects.** In standard projects, the IDE maintains separate classpaths for compiling and running your project, as well as compiling and running JUnit tests (for J2SE applications). The IDE automatically adds everything on your project's compilation classpath to the project's runtime classpath. You can add JAR files, libraries, and dependent projects to the project's compilation classpath in the Compile tab of the Project Properties dialog box. You can also right-click the Libraries node in the Projects window and add JAR files, libraries and projects to your project.
- **Free-form projects.** In free-form projects, your Ant script handles the classpath for all of your source folders. You declare the classpath in the New Project wizard when you set up your free-form project. The classpath settings for free-form projects only tell the IDE what classes to make available for code completion and refactoring. You can declare the classpath for free-form projects using the Java Sources Classpath panel in the Project Properties dialog box. For more, see Managing the Classpath in Free-form Projects below.

If you have attached Javadoc and source files to a JAR file in the Library Manager, the IDE automatically adds the Javadoc and source files to the project when you register the JAR file on a project's classpath. You can step into classes and look up Javadoc pages for the classes without configuring anything else.



Java Platform: JDK 1.5 (Default)

Compile-time libraries are propagated to all library categories.

[✓] Build Projects on Classpath

Project Properties dialog box

Managing Dependencies Between Projects

If each of your source roots is a separate standard project, you have to set up the classpath dependencies between the projects. Typically you set up one main project containing the project main class (in J2SE projects), and several required projects. A required project is a project that has been added to another project's classpath. When you clean and build a project, the IDE also cleans and builds its required projects. The required project's Javadoc and sources are also made available to the receiving project.

You can add any required projects to your project by right-clicking the Libraries node in the Projects window, or you can add them by specifying them in the Compile tab in the Project Properties dialog box. When you want to add a required project, select the project folder whose JAR files you want to add to the classpath (the file chooser displays the icon for IDE project folders *Project folder icon*). When adding projects in the Project Properties dialog box, make sure that the Build Projects on Classpath checkbox is selected.

If you want to add a free-form project to the classpath of a standard project, you have to add the free-form project's JAR file to the standard project's classpath. To do this, you must first declare all of the free-form project's output files in the Output panel of the free-form project's Project Properties dialog box.

Setting up Free-form Projects

In free-form projects, the IDE uses targets in an existing Ant script to build, run, clean, test, and debug your application. If the Ant script does not contain targets for some of these functions, the functions are unavailable. To implement these functions you write targets either in your Ant script or in a secondary Ant script.

For more on setting up free-form projects, see the following article:

- [Advanced Free-Form Project Configuration]

Editing and Running Ant Scripts

The IDE automatically recognizes Ant scripts and displays them as Ant script nodes (*Ant icon*) rather than as normal XML files. You can right-click Ant scripts in the Projects window, Files window, or Favorites window to access a pop-up menu of commands. You can also expand the Ant script node to see an alphabetical list of subnodes representing the Ant script's targets. Each of these subnodes also has a contextual menu of commands.

In the Projects, Files, and Favorites windows, an Ant script's subnodes are flagged in the following ways:

Emphasized Ant target	**Emphasized Ant target.** These targets include a description attribute, which is displayed as a tooltip. You define the target's description attribute in the Source Editor.
Normal Ant Target	**Normal Ant target.** A target without a description attribute.

The only way to edit an Ant script is in the Source Editor. Double-click any of the Ant script's subnodes to jump to that target's location in the Source Editor. All of the normal XML search tools, selection tools, and keyboard shortcuts are available for editing Ant scripts, and the IDE provides code completion for all standard Ant tasks.

When you create a target that you want to run from the command line, give the target a description attribute. Then, if you forget the names of the targets or what they do, you can run the ant `-projecthelp <script>` command from the command line. With this command, Ant lists only those targets that have a description attribute, together with their descriptions. Especially when there are many targets in your Ant build script, emphasizing some and de-emphasizing others can be a useful way to distinguish between those that you use a lot and those that you use less often.

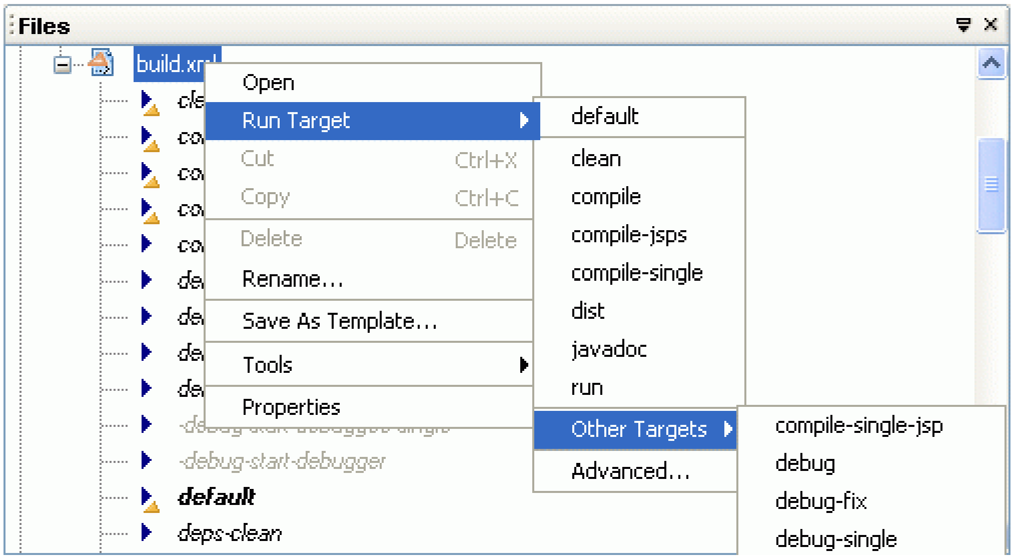
The font style of a subnode's label in the Projects, Files, and Favorites windows indicates the following:

- **Normal**
  A target that is defined within the current Ant script.
- **Italics**
  A target that is imported from another Ant script.
- **Greyed out**
  An internal target that cannot be run directly. Internal targets have names beginning with '-'.
- **Bold**
  The default target for the script, if there is one. The default target is declared as an attribute of the project, together with other project attributes, such as its name. You define the project's default attribute in the Source Editor.

Targets that are imported from another script but are overridden in the importing script are not listed. Only the overriding target is listed.

You can run targets in an Ant script from the Ant script's node in the Projects window, Files window, or Favorites window. To do so, right-click the Ant script node and choose a target from the Run Target submenu. Targets are sorted alphabetically. Only emphasized targets are listed. Choose Other Targets to run a target that has not been emphasized with a description attribute. Internal targets are excluded from these lists because they cannot be run independently.

Instead of running a target by using the Ant script node's contextual menu, you can simply right-click the target's node and choose Run Target.



Running an Ant target

Managing the Classpath in Free-form Projects

In free-form projects, your Ant script handles the classpath for all of your source folders. To make project sources available to Ant, you need to specify the classpath for the project sources. If you have any custom tasks, you also need to add these tasks to Ant's classpath.

For more on using your own Ant scripts to compile, run, and debug free-form projects, see the following articles:

- Importing Existing Java Source Code into NetBeans IDE 5.0
- Advanced Free-Form Project Configuration

Specifying the Classpath for Project Sources

In free-form projects you tell the IDE what classes to make available for code completion and refactoring and specify the classpath for these project sources. You specify the classpath in the Java Sources Classpath settings in the Project Properties dialog box. You do this because by default the IDE ignores your environment's CLASSPATH variable whenever it runs Ant.

The classpath variable you set in the Project Properties dialog box does not affect the actual classpath of the project, which is specified in the Ant script. Declaring the classpath in the Project Properties dialog box does not change the actual compilation or runtime classpath of the source folders. However, the project classpath variable must match the classpath used by your Ant script in order to provide the correct information for code completion, error highlighting, and refactoring commands. You have to set an explicit classpath in your build scripts because the IDE ignores your environment's CLASSPATH variable whenever it runs Ant. If you change the classpath of one, you must change the class path of the other

Specifying the Classpath for Custom Tasks

In free-form projects, you can call up and run custom Ant tasks in your build script. For your Ant script to use customs tasks, you must include the tasks in the Ant script's classpath. For example, you may add a task to your build script to format your code with Jalopy. In order to do this, however, you have to add the Jalopy JAR file to Ant's classpath.

You can add custom tasks to Ant's classpath within the IDE by doing either of the following:

- Providing an explicit classpath to the tasks in your build script. This is the recommended method for specifying the location of JAR files that contain custom tasks used by your Ant script, as it ensures that your build scripts will be fully portable. You can write your tasks and include instructions to compile them and produce a JAR file in the build file. To use these tasks, include the long form of `taskdef`, which includes a classpath. Here is a simple example of such a task:

```
<project name="test" default="all" basedir=".">
    <target name="init">
        <javac srcdir="tasksource" destdir="build/taskclasses"/>
        <jar jarfile="mytasks.jar">
            <fileset dir="build/taskclasses"/>
        </jar>
        <taskdef name="customtask" classname=
"com.mycom.MyCustomTask">
            <classpath>
                 <pathelement location="mytasks.jar"/>
            </classpath>
        </taskdef>
    </target>
</project>
```

The advantage of this method is that no special preparation is needed to begin using the script. The script is entirely self-contained and portable. This method also makes it easier to develop your tasks within the IDE, as the script compiles them for you automatically.

To make your build scripts even more robust, use a property instead of a hard-coded location to specify the classpath to your tasks. You can store the property in the build script itself or in a separate ant.properties file. You can then change the classpath setting throughout your script by simply changing the value of the specified property.

- Configuring the Ant Classpath property in the Options window. If you cannot declare a classpath in your build script, or you are using third-party build scripts which you cannot alter, you can add tasks to Ant's classpath in the IDE in the Options window.

Note: When you modify the Ant classpath in the Options window, when you run Ant in the IDE the task is on Ant's classpath for all projects.

CHAPTER **2**

Creating and Editing Files

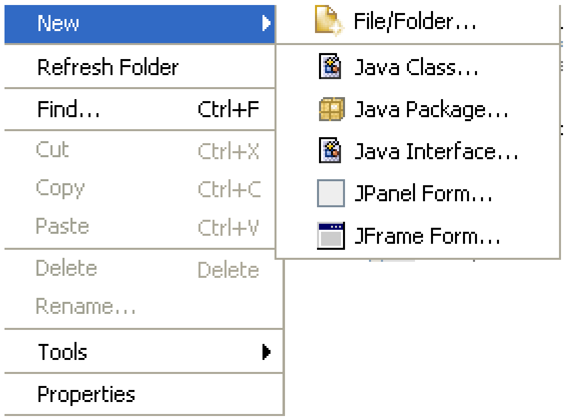
Creating and editing Java source code is the most important function that the IDE serves, since that's what developers generally spend most of their day doing. NetBeans IDE provides a wide range of tools that can complement any developer's personal style, regardless of whether you prefer to code everything by hand or want the IDE to generate large chunks of code for you.

This section covers the following topics:

Creating Java Files

NetBeans IDE contains templates and wizards that you can use to create all kinds of source files, from Java source files to XML documents to resource bundles.

Perhaps the easiest way to create a file (once you have already created a project) is to right-click the project node of the project for which you want to create the file in the Projects window. You can then choose the desired file type from the New pop-up menu when you right-click the project node. The New submenu contains shortcuts to commonly-used templates and a File/Folder command that you can use to open the New File wizard and access all NetBeans templates.



Choosing a template from the New menu

The New File wizard enables you to create a new file based on the IDE's default file templates. The file templates are grouped by type. In addition to the default file templates, you can customize the templates the IDE uses to create files and also create your own templates. Having the option to use your own templates can be useful if a certain file type needs to have standard elements, or you want to change the way other elements are generated. When you create your own templates, you can make them available in the New File wizard.

Using File Templates

You use the Template Manager to modify and create new templates by choosing Tools from the main menu and choosing Template Manager. You can create a new template by copying an existing template and then clicking Edit. For example, if you want to create a new Java class template, you can duplicate an existing Java class template, then select the new class and then click Open in Editor. You can now modify the class in the Source Editor and save it. The new class is now available in the New File wizard.

If you have an existing template that you would like to add to the IDE, click Add and locate the file on your system. The file is now available as a template in the New File wizard.

Using GUI Templates

If you want to visually edit a Java GUI form using the IDE's GUI Builder, you have to create the form's source file using the IDE's Java GUI Forms templates. This template group contains templates for AWT and Swing forms. For example, you cannot create a normal Java class file and then change it to extend JPanel and edit it in the GUI Builder.

For more information about creating Java GUIs in the IDE, see the following:

- GUI Building in NetBeans IDE 5.5

Editing Java Files in the Source Editor

The Source Editor is your main tool for editing source code. It provides a wide range of features that make writing code simpler and quicker, like code completion, highlighting of compilation errors, syntax highlighting of code elements, as well as other advanced formatting and search features.

Although the Source Editor can be considered a single IDE component, it is really a collection of editors. Each type of source file has its own editor that provides different functionality. In this section we'll be dealing with the Java editor, but many of the same concepts apply to other editors. To open a Java source file in the Source Editor, double-click the file's node in the Projects window or Files window.

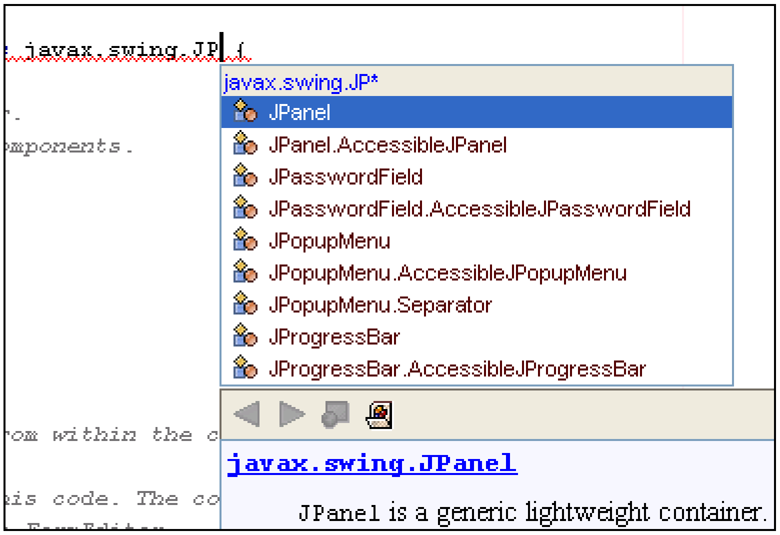
The IDE has many mechanisms for generating different types of code snippets. The following mechanisms are some of the most commonly used.

- **Code Completion** (Ctrl-Space). When you are typing your code, you can use the shortcut to open up the code completion box. The code completion box contains a context-sensitive list of options to complete the statement you are currently typing. Continue to type additional characters to narrow down the number of options presented in the code completion box.
- **Code Templates.** For many commonly used code snippets you can use multi-keystroke abbreviations instead of typing the entire snippet. The IDE expands the abbreviation into the full code snippet after you press the spacebar.
- **Editor Hints** (Alt-Enter). If the IDE detects an error, such as missing code, the IDE can suggest missing code to fix the error, and then insert that code where necessary. When the insertion point is in the line marked as containing an error, the IDE displays a lightbulb icon in the margin to indicate a suggested fix for that line. Use the keyboard shortcut or click the lightbulb to display the suggestion. Select the hint you want and press Enter to have the fix generated in your code.

The following topics illustrate how to get the most out of these features.

Code Completion

When typing Java identifiers in the Source Editor, you can use the IDE's code completion box to help you finish expressions. When the code completion box appears, a box with Javadoc documentation also appears displaying any documentation for the currently selected item in the code completion box. You can disable the Javadoc box in the Options window.



```
javax.swing.JP {
```

javax.swing.JP*
JPanel
JPanel.AccessibleJPanel
JPasswordField
JPasswordField.AccessibleJPasswordField
JPopupMenu
JPopupMenu.AccessibleJPopupMenu
JPopupMenu.Separator
JProgressBar
JProgressBar.AccessibleJProgressBar

javax.swing.JPanel

JPanel is a generic lightweight container.

Code completion example

You can use the code completion box to generate a variety of code, including the following:

- Fill in the names of classes and class members, as well as any necessary import statement.
- Browse Javadoc documentation of available classes.
- Generate whole snippets of code from dynamic code templates. You can customize code templates and create new ones. See Configuring the Editor below for more information.
- Generate getter and setter methods.

To open the code completion box, type the first few characters of an expression and then press Ctrl-space. Alternately, you can open the code completion box by pausing after typing a period (.) in an expression. The code completion box opens with a selection of possible matches for what you have typed so far. You can narrow the selection in the code completion box by typing additional characters in the expression.

To use the code completion box to complete the expression, continue typing until there is only one option left and press Enter, or scroll through the list and select the option you want and then press Enter. To close the code completion box without entering any selection, press Esc. To turn off code completion in the Source Editor, see Configuring the Editor.

The IDE uses the classes on your compilation classpath to provide suggestions for code completion and other features. Classes from the target JDK version, other commonly used project-specific APIs like the Servlet, JSP, JSTL and XML APIs, as well as the sources you have manually added to the classpath can be used in code completion. For details, see Managing a Project's Classpath.

Code Templates

You can use code templates to speed up the entry of commonly used sequences of reserved words and common code patterns, such as for loops and field declarations. The IDE comes with a set of templates, and you can create your own code templates in the Options window. For more on how to configure how code templates are implemented in the Source Editor, see Configuring the Editor. For more on the syntax used for creating your own code templates, see Special Code Template Syntax.

A code template can be composed of bits of commonly used text, or it can be more dynamic, generating a skeleton and then letting you easily tab through it to fill in the variable text. Where a code snippet repeats an identifier (such as an object name in an instance declaration), you just have to type the identifier name once.

For example, if you enter `forc` and press the space bar, it expands into

```
for (Iterator it = collection.iterator(); it.hasNext();) {
       Object elem = (Object) it.next();
}
```

Once the code is expanded in the Source Editor, you can simply press tab to jump to the next variable in the code snippet.

If an abbreviation is the same as the text that you want to type and you do not want it to be expanded into something else, press Shift-spacebar to keep it from expanding.

You can access code templates by doing the following in the Source Editor:

- Typing the first few letters of the code, pressing Ctrl-spacebar, and then selecting the template from the list in the code completion box. The Javadoc box displays the full text of the template.
- Typing the abbreviation for the code template directly in the Source Editor and then pressing the spacebar. You can find the abbreviations for the built-in Java code templates by opening the Editor settings in the Options window and choosing the Code Templates tab.

Special Code Template Syntax

When you create code templates, there are several constructs that you can use to customize the way the code template behaves. The Special Code Template Syntax table lists the most useful of these constructs. You can look at the default IDE code templates for the abbreviations `fori`, `forc`, and `newo` in the Source Editor Abbreviations for Java Files table to see these constructs in action.

Editor Hints

When the IDE detects an error for which it has identified a possible fix, a lightbulb icon appears in the left margin of that line. You clan click the lightbulb or press Alt-Enter to display a list of possible fixes. If one of those fixes suits you, you can select it and press Enter to have the fix generated in your code.

Often, the "error" is not a coding mistake but a reflection of the fact that you have not gotten around to filling in the missing code. In those cases, the editor hints simply automate the entry of certain types of code.

Refactoring

Refactoring is the restructuring of code, using small transformations, in which the result does not change any program behavior. Just as you factor an expression to make it easier to understand or modify, you refactor code to make it easier to read, simpler to understand, and faster to update. Just as a refactored expression must produce the same result, the refactored program must be functionally equivalent with the original source.

Some common motivations for refactoring code include:

- Making the code easier to change or easier to add a new feature
- Reducing complexity to promote understanding
- Removing unnecessary repetition
- Enabling use of the code for alternate or more general needs

Most refactoring commands are accessible from the Refactor menu on the main menu bar. You can also right-click in the Source Editor or on a class node in the Projects window and choose a command from the Refactor submenu. You can use the Undo command to roll back all the changes in all the files that were affected by the refactoring.

The IDE provides the following features to facilitate code refactoring:.

Command	**Description**
Find Usages	Finds all occurrences of the name of the specified class, method, or field.
Rename	Enables you to rename all occurrences of a class, variable, or method to something more meaningful. In addition, it updates all source code in your project to reference the element by its new name.
Safely Delete	Deletes a code element after making sure that there are no references to that element in your code.
Change Method Parameters	Enables you to change the parameters and the access modifier for the given method.
Encapsulate Fields	Generates accessor methods (getters and setters) for a field and optionally updates all referencing code to access the field using the getter and setter methods.
Move Class	Enables you to move a class into another class or package and to move a static field or a static method from one class to another. In addition, it updates all effected source code in your project to reference the element in its new location
Pull Up	Moves a method to a class's superclass. You can also use this command to declare the method in the superclass and keep the method definition in the current class.
Push Down	Moves a method to a class's subclass. You can also use this command to keep the method declaration in the current class and move the method definition to subclass.
Extract Method	Creates a new method based on a selection of code in the selected class and replaces the extracted statements with a call to the new method.
Extract Interface	Creates a new interface based on a selection of methods in the selected class and adds the new interface to the class's `implements` clause

Command	**Description**
Extract Superclass	Creates a new superclass based on a selection of methods in the selected class. You can have the class created with just method declarations, or you can have whole method definitions moved into the new class.
Use Supertype Where Possible	Change code to reference objects of a superclass (or other type) instead of objects of a subclass.
Move Inner to Outer Level	Moves a class up one level. If the class is a top-level inner class, it is made into an outer class and moved into its own source file. If the class is nested within the scope of an inner class, method, or variable, it is moved up to the same level as that scope.
Convert Anonymous Class to Inner	Converts an anonymous inner class to a named inner class.

Working With Import Statements

In the IDE, there are several ways to help you make sure that your Java class has all the necessary import statements:

- For the whole file, by pressing Alt-Shift-F (Fix Imports) when the insertion point is in the file in the Source Editor.
- Individually, by pressing Alt-Shift-I (Fast Import) when the insertion point is in the referenced class name in your code.
- If you use code completion to fill in the name of class, any necessary import statements are automatically added. You can also use code completion to use a customized code template. You can modify the variables in the custom code template to add the required import statement when that template is used.
- If suggested as an editor hint in the IDE, you can click the lightbulb icon in the margin to add the suggested import statements.

The IDE's Fix Imports command adds import statements that are needed by your code and removes unused import statements. It does not, however, remove fully-qualified class names from code and replace them with import statements. The Fast Import command, on the other hand, enables you to choose how you want the import handled in your code.

The IDE's Fast Import command enables you to:

- Generate an import statement for the class.
- Generate an import statement for the package.
- Generate a fully qualified name in the code.

Formatting Java Source Code

The IDE automatically formats your code as you write it. You can also reformat specific lines of code or even entire files. The following table lists some common formatting commands.

Keyboard Shortcut	Description of Command
Ctrl-Shift-F	Reformat the entire file or whatever text is selected in the Source Editor.
Ctrl-T	Shift the current line or selection one tab to the right.
Ctrl-D	Shift the current line or selection one tab to the left.
Ctrl-E	Remove the current line.
Ctrl-Shift-T	Comment out the current line or all selected lines with line comments ("//").
Ctrl-Shift-D	Remove comments. This command only works for lines that begin with line comments ("//").

Navigating in the Source Editor

When you are dealing with a large group of files, the ability to quickly navigate within and between source files is critical to your productivity. When you are working in a document in the Source Editor, the Navigate menu contains commands that enable you to quickly jump to elements within a document according to the currently selected element, as well as between documents.

Navigating Within a Java File

The IDE provides several mechanisms to make it easier to view and navigate a given Java file:

- **Navigator window.** The Navigator window appears below the Projects window and provides a list of members (for example, constructors, fields, and methods) in the currently selected Java file. When you click on an element, the insertion point is placed at the line containing that element in the Source Editor.
- **Bookmarks.** You can create bookmarks in your source file to help you easily jump back to specific places in the file. You can toggle bookmarks on and off by right clicking the line in the margin of the file or by choosing Toggle Bookmark

(Ctrl-F2) in the Navigate menu. You can move between those places where your insertion point has been by using the Alt-K and Alt-L keyboard shortcuts, or by choosing Back or Forward in the Navigate menu.

- **Navigate Menu.** Use the Navigate menu to access commands for quickly navigating between elements in your code.

The following table lists shortcuts to some commands in the Navigate menu.

Keyboard Shortcut	Description of Command
Alt-Shift-O	**Go to Class.** Opens the Fast Open dialog box, which lets you quickly open a file. Start typing a class name in the dialog box. As you type, all files that match the typed prefix are shown.
Alt-O	**Go to Source.** Jumps to the source code for the currently selected class, method, or field, if the source is available. Alternately, you can hold down the Ctrl key and hover the mouse over the identifier and then click the identifier when it is underlined in blue.
Alt-G	**Go to Declaration.** Similar to the previous shortcut, this opens the file where the variable at the insertion point is declared.
Ctrl-B	**Go to Super Implementation.** Jumps to the super implementation of the currently selected method (if the selected method overrides a method from another class or is an implementation of a method defined in an interface).
Alt-L	**Forward.** Go to the next location in the jump list for the currently selected file. The jump list is a history of all locations where you made modifications in the Editor.
Alt-K	**Back.** Go to the previous location in the jump list for the currently selected file.
Ctrl-G	**Go to line.** Enter any line number for the current file and press Enter to jump to that line.
Ctrl-F2	**Toggle Bookmark.** Add a bookmark (bookmark icon) to the line of code that the insertion point is currently on. If the line already contains a bookmark, this command removes the bookmark.
F2	**Next Bookmark.** Go to the next bookmark.

Keyboard Shortcut	Description of Command
Shift-F2	**Previous Bookmark.** Go to the previous bookmark.
Alt-Shift-L	Go to the next jump list location in all files (not the currently selected file).
Alt-Shift-K	Go to the previous jump list location in all files (not the currently selected file).

Search and Selection Tools

The following list gives you a quick overview of the search and selection tools that are available in the Source Editor:

Keyboard Shortcut	Description of Command
Ctrl-Shift-O	Switch to the Search Results window.
Ctrl-Shift-P	Find in Projects.
Ctrl-F	Search for text in the currently selected file. The Source Editor jumps to the first occurrence of the string and highlights all matching strings.
Ctrl-H	Replace text in the currently selected file.
F3	Find the next occurrence of the word you searched for.
Shift-F3	Find the previous occurrence of the word you searched for.
Ctrl-F3	Search for the next occurrence of the word that the insertion point is on.
Alt-Shift-H	Toggle on/off search result highlighting.

Navigating Between Documents

The Source Editor makes it easy to manage large number of open documents at one time. Each open document is represented by its own tab in the area directly below the IDE's toolbar. The tabs appear in the order in which you opened the documents, however, you can change a tab's position by simply grabbing and dragging it to the desired location along the row of tabs. Use the left and right buttons in the top-right corner to scroll through the row of tabs.

To switch between open files, do any of the following:

- Use the drop-down list at the top-right of the Source Editor. The drop-down list displays all of your open files in alphabetical order.
- Press Alt-Left and Alt-Right to move one editor tab to the left or right.
- Press Ctrl-Tab to open the IDE window manager, which contains icons for each open document in the Source Editor as well as all open windows like the Projects window.

Other useful IDE features that assist you in navigating your documents include:

- **Go to Class.** Choosing Go to Class in the Navigate menu opens up a dialog box enabling you to quickly locate a class by name. When you choose a class the source file is opened in the Source Editor.
- **Maximize the Source Editor.** Double-click any document tab or press Shift-Escape to hide all other IDE windows. If you have split the Source Editor, only the partition you maximize is displayed.
- **Clone a document.** Right-click the document tab in the Source Editor and choose Clone Document. This enables you to have two partitions displaying the same document.
- **Split the Source Editor.** Grabbing any document tab and drag it to the left or bottom margin of the Source Editor. A red box shows you where the new Source Editor partition will reside once you drop the document. Source Editor panes can be split any number of times.
- **Move documents between Source Editor partitions.** Grab the document tab and drag it to the row of tabs in the destination partition.

Configuring the Editor

You can configure Source Editor settings in the Options window by choosing either Editor or Fonts & Colors in the left pane. Use the tabs to choose the editor settings you want to modify. Some editor settings can be modified according to the file type. In this section, we will focus on configuring the Java editor, but many of the settings are the same for all editors.

Here is a quick overview of some of the more common customizations to the Source Editor:

- **View or change code templates.** To view or change code templates, select Editor in the left pane of the Options window and then click the Code Templates tab. Choose an editor by choosing a language from the drop-down menu. For example, to change code templates used in the Java editor, choose Java from the drop-down menu. You can now add, remove or modify the abbreviations you can use when editing Java files. To modify a code template abbreviation, select the abbreviation and edit the text in the Expanded Text field.
- **View or change recorded macros.** Click the Macros tab to add, modify and remove macros. Enter the code for macro in the Macro Code area.

- **Change the indentation** used in your code. Click the Indentations tab to modify indentation properties.
- **Turn off code completion.** To turn off code completion, select Editor in the left pane of the Options window and then click the General tab and unselect the checkbox for the Auto Popup Completion Window property.
- **Modifying fonts and colors.** You can use the Options window to set the font size and color for code. In the Options window, choose Fonts & Colors in the left pane and click the Syntax tab. Select All Languages from the Language drop-down menu, select Default as the element type, and modify the Font property to change the font size for all text in the Source Editor. You can also choose a specific language from the drop-down menu to limit your modifications to that language and modify language-specific settings. For example, you can select Java from the Language drop-down menu and select a category to change the font and color of each type of Java code, such as method names or strings.

CHAPTER 3

Building Applications

This section explains the basics of building standard and free-form projects in the IDE, and how you can customize the build process by modifying the Ant build script the IDE uses when building your project.

In this section you will learn about the following:

Using Ant Build Scripts

Ant build scripts are XML files that contain targets, which in turn contain tasks. Ant tasks are executable bits of code that handle the processing instructions for your source code. For example, you use the `javac` task to compile code, the `java` task to execute a class, and so forth. You can use Ant's built-in tasks, use tasks written by third parties, or write your own Ant tasks. You do not need to know Ant to work with the IDE. If you are looking for resources on learning Ant, see `http://ant.apache.org/resources.html`.

You use Ant build scripts to build your project in the following ways:

- **Standard projects.** In standard projects the IDE generates the build script based on the options you enter in the New Project wizard and the project's Project Properties dialog box. You can set all the basic compilation and runtime options in the project's Project Properties dialog box and the IDE automatically updates your project's Ant script. If you know how to work with Ant, you can customize a standard project's Ant script or write your own Ant script for your project.

- **Free-form projects.** In free-form projects, the IDE relies on your existing Ant script to provide targets for IDE actions, such as building, running, and debugging.

Building Projects, Packages, and Files

Compilation in the IDE is simple. Once you have ensured that your project's compilation classpath is set correctly., you need only select the project, package, or file you want to compile and choose the appropriate Build or Compile command. The IDE then compiles the files.

To compile a project, package, or file in the IDE, select it in the Projects window and do one of the following:

- In the main menu, choose **Build > Build Main Project (F11)** to build the main project. Alternately, you can click the Build button in the toolbar.
- In the main menu, choose **Build > Clean and Build Main Project (Shift-F11)** to clean and build the main project. Alternately, you can click the Clean & Build button in the toolbar.
- In the Projects window, right-click the project node and choose **Build Project** to build the project.
- In the Projects window, right-click the project and choose **Clean Project** to clean the project.
- In the Projects window, right-click the package and choose **Compile Package (F9)** to compile a package.
- In the Projects window, right-click the file and choose **Compile File (F9)** to compile a file. Alternatively, choose **Build > Compile File (F9).** Note that if you are using a free-form project, this command is disabled by default. You have to write an Ant target for compiling the currently selected file in the IDE and map it to the Compile File command.

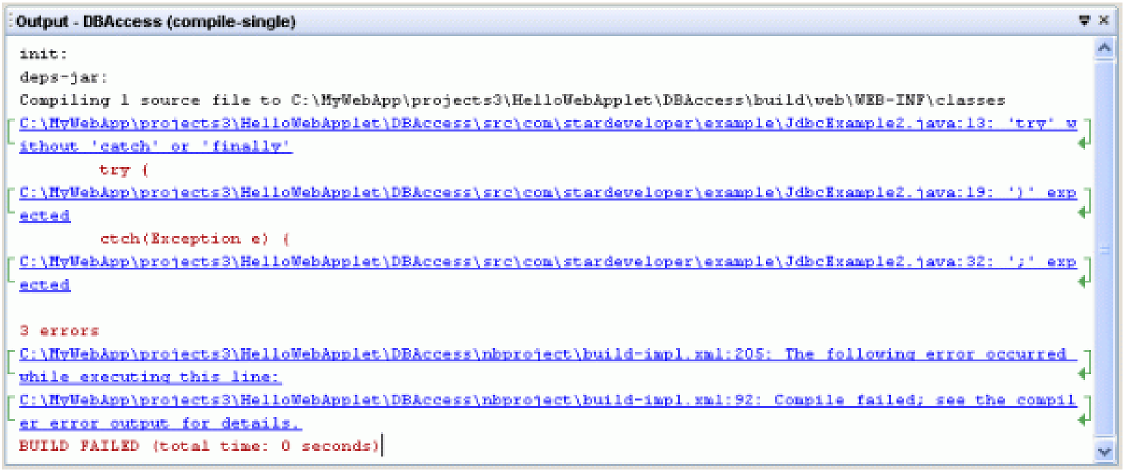
Whenever you invoke compile commands, the IDE displays the output including any compilation errors encountered in the Output window, as described in the following section.

If you expand a standard project's project directory node in the Files window, you will notice that the IDE compiles classes to the build folder. In addition, the IDE builds a JAR file for Java projects from your project sources automatically. The JAR file is generated to the dist directory of your project folder. In free-form projects, your Ant script controls output file creation.

Fixing Compilation Errors

The IDE displays output messages and any compilation errors in the Output Window. This multi-tabbed window is displayed automatically whenever you generate compilation errors, debug your program, generate Javadoc documentation, and so on. You can also open this window manually by choosing Window > Output (Ctrl-4).

One important function of the Output window is to notify you of errors found while compiling your program. The error message is displayed in blue underlined text and is linked to the line in the source code that caused the error, as illustrated in the image below. The Output window also provides links to errors found when running Ant build scripts. Whenever you click an error link in the Output window, the Source Editor jumps to the line containing the error automatically. You can also use the F12 and Shift-F12 keyboard shortcuts to move to the next and previous error in the file.



```
init:
deps-jar:
Compiling 1 source file to C:\MyWebApp\projects3\HelloWebApplet\DBAccess\build\web\WEB-INF\classes
C:\MyWebApp\projects3\HelloWebApplet\DBAccess\src\com\stardeveloper\example\JdbcExample2.java:13: 'try' w
ithout 'catch' or 'finally'
        try {
C:\MyWebApp\projects3\HelloWebApplet\DBAccess\src\com\stardeveloper\example\JdbcExample2.java:19: ')' exp
ected
        ctch(Exception e) {
C:\MyWebApp\projects3\HelloWebApplet\DBAccess\src\com\stardeveloper\example\JdbcExample2.java:32: ';' exp
ected

3 errors
C:\MyWebApp\projects3\HelloWebApplet\DBAccess\nbproject\build-impl.xml:205: The following error occurred 
while executing this line:
C:\MyWebApp\projects3\HelloWebApplet\DBAccess\nbproject\build-impl.xml:92: Compile failed; see the compil
er error output for details.
BUILD FAILED (total time: 0 seconds)
```

Output window showing compilation errors

Every action that is run by an Ant script, such as compiling, running, and debugging files, sends its output to the same Output window tab. If you need to save the messages displayed in the Output window, you can copy and paste it to a separate file. You can also set Ant to print the command output for each new target to a new Output window tab by choosing Tools > Options, clicking the Ant node in the Miscellaneous category, and deselecting the checkbox for the Reuse Output Tabs from Finished Processes property.

Filtering Output Files

When you create a JAR file or a WAR file, you usually want to include just the compiled `.class` files and any other resource files located in your source directory, such as resource bundles or XML documents. The default filter does this for you by excluding all `.java`, `.nbattrs`, and `.form` files from your output file.

You can create additional filters using regular expressions to control the Output files. To specify which files to exclude, right-click your project in the Projects window and choose Properties to open the Project Properties dialog box. In the left pane, click on Packaging. In the right pane, enter regular expressions in the text box to specify the files to exclude when packaging the JAR or WAR files. In addition to the default expressions, here are some additional regular expressions you can use:

Regular Expression	Description
`\.html$`	Exclude all HTML files
`\.java$`	Exclude all Java files
`(\.html$)\|(\.java$)`	Exclude all HTML and Java files
`(Key)|(\.gif$)`	Exclude all GIF files and any files with `Key` in their name

For a guide to regular expression syntax, see jakarta.apache.org.

Customizing the Build Process

By customizing your Ant script you can customize how your project is built. For example, you can write an Ant target that compiles the currently selected file and then map the target to the IDE's Run File command.

In **standard projects**, Ant scripts are stored in your project folder. The main Ant script for a standard project is `build.xml`. The IDE calls targets in `build.xml` whenever you run IDE commands. This file contains a single import statement that imports targets from `build-impl.xml`. In `build.xml`, you can override any of the targets from `build-impl.xml` or write new targets.

In **free-form projects**, the IDE uses targets in an existing Ant script to build, run, clean, test, and debug your application. If the Ant script does not contain targets for some of these functions, the functions are unavailable. To implement these functions you write targets either in your Ant script or in a secondary Ant script. You can then map commands in the IDE to these targets.

Build Files in Standard Projects

In standard projects, `build-impl.xml` is the Ant script that contains all of the instructions for building, running, and debugging the project. You should never edit this file. You can, however, open it to examine the Ant targets that are available to be overridden, and then modify `build.xml` to override any of the targets, or write new targets.

With standard projects, you can customize the build process by doing any of the following:

- Entering basic options, like classpath settings and JAR filters, in the New Project wizard when you create a project, or afterwards in the Project Properties dialog box.
- Editing properties in `nbproject/project.properties`. This file stores Ant properties with important information about your project, such as the location of your source and output folders. You can override the properties in this file. Be careful when editing this file. For example, the output folder is deleted every time you clean your project. You should therefore never set the output folder to the same location as your source folder without first configuring the clean target to not delete the output folder.
- Customizing existing or creating new Ant targets by doing any of the following:
  - Add instructions to be processed before or after an Ant target is run. Each of the main targets in `build-impl.xml` also has a `-pre` and `-post` target that you can override in `build.xml`. For example, to get RMI working with regular projects, type the following in `build.xml`:

```
<target name="-post-compile">
  <rmic base="${build.classes.dir}" includes="**/Remote*.class"/>
</target>
```

  - Change the instructions in an Ant target. Copy the target from `build-impl.xml` to `build.xml` and make any changes to the target.
  - Create new targets in `build.xml`. You can also add the new target to the dependencies of any of the IDE's existing targets. Override the existing target in `build.xml` then add the new target to the existing target's depends property. For example, the following adds the `new-target` target to the run target's dependencies:

```
<target name="new-target">
    <!-- target body... -->
</new-target>


<target name="run" depends="new-target,myprojname-impl.run"/>
```

Notice that you do not need to copy the body of the run target into `build.xml`.

The following table lists some common tasks for redefining a JAR file that you may find useful:

To perform this task	Follow these steps
Specify which files are added to a JAR file.	Right-click the project node in the Projects window and choose Properties. Click the Packaging subnode (under Build) and configure the filter and compression settings using the Exclude from JAR File field. For more, see Filtering Output Files
Change a JAR file's name and location.	In the Files window, go to the nbproject folder in your project folder and open `project.properties` in the Source Editor. Enter the full path to the JAR file in the dist.jar property.
Specify the manifest file for a JAR file.	In `project.properties`, type the name of the manifest file in the `manifest.file` property. The file name must be specified relative to the project's `build.xml` file. Note that if you are using the Java Application template, the IDE creates a manifest file for you.
Disable the generation of a JAR file for a project.	In the Files window, open your project folder and open `build.xml`. Override the jar target to have no contents and no dependencies. For example, add the following to `build.xml`: `<target name="jar" />`

Build Files in Free-form Projects

In free-form projects, the IDE uses targets in an existing Ant script to build, run, clean, test, and debug your application. If the Ant script does not contain targets for some of these functions, the functions are unavailable. To implement these functions you write targets either in your Ant script or in a secondary Ant script. You can then map commands in the IDE to these targets.

If you want to run an IDE command and you do not have a target for that command, the IDE can generate the target for you. When the IDE generates the target, the target is generated in a separate build script and automatically mapped to the command.

For examples of writing Ant targets in free-form projects, see the following article:

- `Advanced Free-form Project Configuration`

Writing Custom Ant Tasks

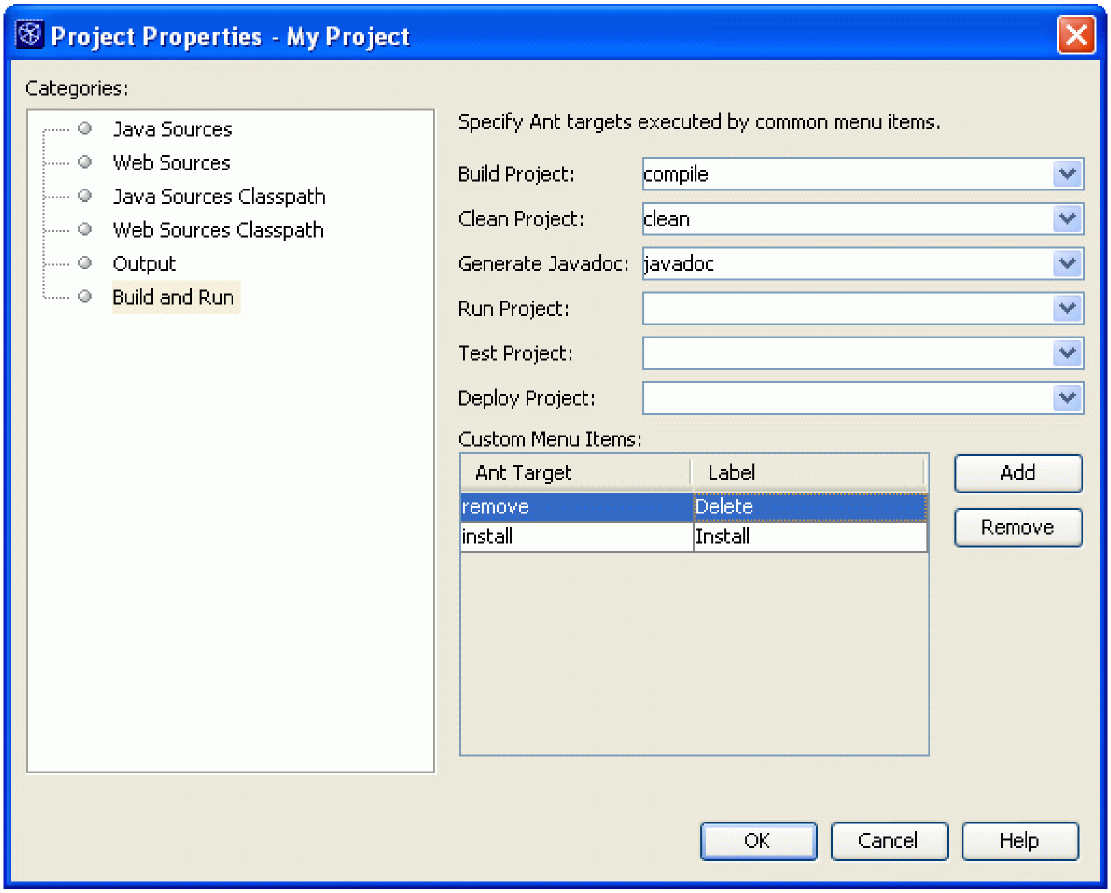
You can use custom Ant tasks to expand on the functionality provided by Ant's built-in tasks. Custom tasks are often used to define properties, create nested elements, or write text directly between tags using the `addText` method.

To create a custom Ant task in the IDE, press Ctrl-N and select the Custom Task template from the Ant Build Scripts folder. When you create the custom Ant task file, the template opens in the Source Editor. The template contains sample code for many of the common operations performed by Ant tasks. After each section of code, the template also shows you how to use the task in an Ant script.

Mapping Custom Ant Targets to Project Commands

In free-form projects, you map IDE commands to targets in your Ant script. By doing so, you can, for example, add an item for a Debug Project target to the project's contextual menu.

Click Build and Run in the left panel of the Project Properties dialog box.



Specify Ant targets executed by common menu items.

Build Project: compile
Clean Project: clean
Generate Javadoc: javadoc
Run Project:
Test Project:
Deploy Project:

Custom Menu Items:

Ant Target	Label
remove	Delete
install	Install

Run targets in the Project Properties dialog box

For each command, choose an Ant target from the drop-down. The drop-down contains each of the targets in your Ant script. However, if your Ant script uses an `<import>` statement to import targets from another Ant script, the targets do not show up in the drop-down list in the Project Properties dialog box. To map commands to these targets, type the names of the targets into the list.

You map other commands, like those that run on individual files, by editing the `project.xml` file manually. For details, see `Advanced Free-form Project Configuration`.

CHAPTER 4

Running Applications

Because the IDE is built entirely on top of Ant, it uses an Ant script to run your applications.

- **Standard projects.** If you are using a standard project, the IDE generates the build script based on the options you enter in the project's Project Properties dialog box. For Java applications, you can set the project's main class, runtime arguments, VM arguments, and working directory in the Project Properties dialog box.
- **Free-form projects.** If you are using a free-form project, the IDE uses your existing Ant script to run your application. You can write a target that executes the currently selected file in the IDE and map it to the Run File command.

This section covers the following topics:

Running Projects and Files

For Java projects, you typically set the project that contains the program's main class as the main project. For web projects, the main project is the project that is first deployed. To run a project, package, or file, choose one of the following:

- In the main menu, choose **Run > Run Main Project (F6)** to run the main project. Alternately, you can use the Run Main Project button in the toolbar.
- In the Projects window, right-click the project and choose **Run Project** to run a project. Note that for Java projects, the project must have a main class.

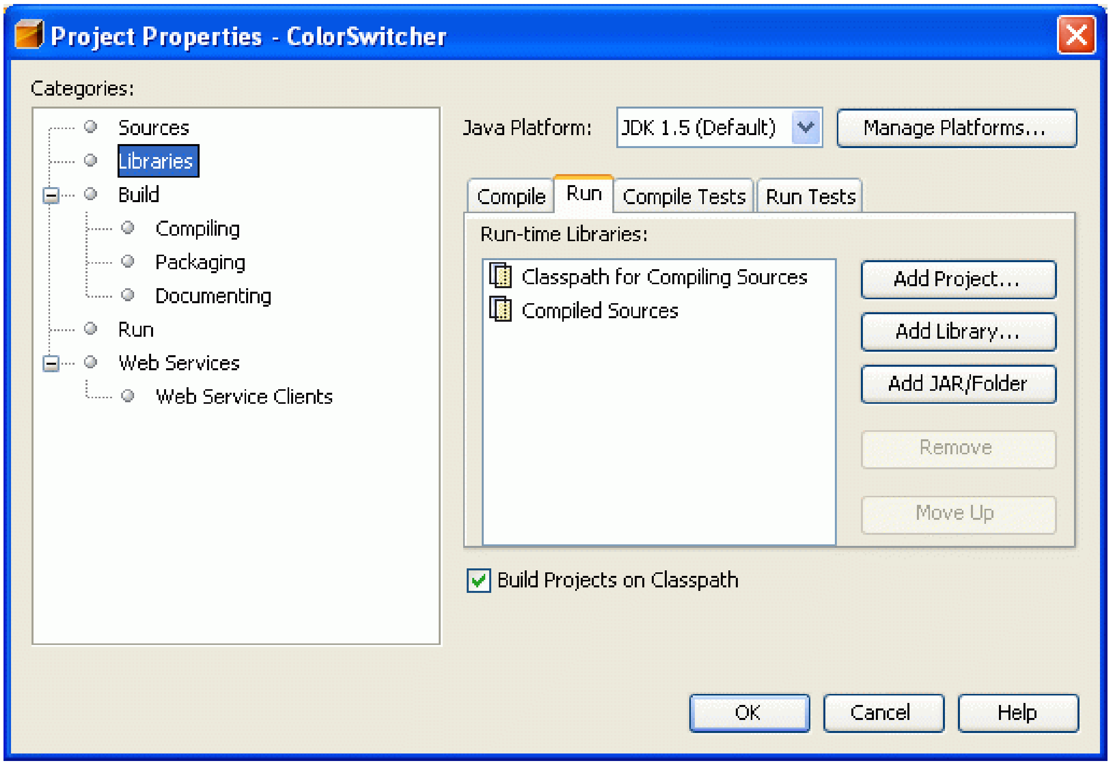
- In the Projects window, right-click the file and choose **Run File (Shift+F6)** to run a file. Alternatively, choose **Run > Run File > Run *filename* (Shift+F6)** in the main menu to run a runnable class. Note that if you are using a free-form project, this command is disabled by default. You have to write an Ant target for running the currently selected file in the IDE and map it to the Run File command.

When you run the project the IDE displays any compilation errors and output in the Output window. For more, see Fixing Compilation Errors.

Customizing Runtime Options

By default, the IDE does not specify a main class, runtime arguments, or JVM arguments. The runtime classpath of each standard project contains the project's compiled classes and everything in the project's compilation classpath. You can view the project's compilation classpath by opening the Project Properties dialog box and selecting the Libraries node in the Categories pane and then clicking the Compile tab in the right pane.

To change project runtime options, open the Project Properties dialog box by right-clicking the project node in the Projects window and choosing Properties. Next, select the Libraries node in the Categories pane and click the Run tab in the right pane of the dialog box. Note that to access settings for the main class, program arguments, the working directory for program execution and VM options, you have to select the Run node. In the next section we'll take a closer look at how to configure the runtime classpath



Java Platform: JDK 1.5 (Default)

Run-time Libraries:

Classpath for Compiling Sources
Compiled Sources

[✓] Build Projects on Classpath

Specify the runtime settings in the Project Properties dialog box

Setting the Runtime Classpath

To add projects, libraries, JAR files, and folders to the project's runtime classpath, use the buttons on the right side of the Run-time Libraries list in the Project Properties dialog box.

If your project uses special libraries dynamically at runtime through an indirect interface or reflection (like JDBC drivers or JAXP implementations), you have to add these libraries to the runtime classpath. You also have to adjust your runtime classpath if the runtime dependencies between your projects do not match the compilation dependencies between the projects. For example, imagine that project A compiles against project B, and project B compiles against project C, but project A does not compile against project C. This means that project A only has project B on its runtime classpath. If project A requires both project B and project C during execution, you have to add project C to project A's runtime classpath.

In free-form projects, your Ant script handles the classpath for all of your source folders. The classpath settings for free-form projects in the Project Properties dialog box only tell the IDE what classes to make available for code completion and refactoring. For more, see Managing the Classpath in Free-form Projects.

Setting the Main Class and Runtime Arguments

To set the project's main class, select the Run node in the Categories pane of the Project Properties dialog box and type the fully-qualified name in the Main Class field (for example, `org.myCompany.myLib.MyLibClass`). The main class must exist in the project or in one of the JAR files or libraries in the project's runtime classpath. Afterwards, type any necessary runtime arguments in the Arguments field.

If you use the Browse button to choose the project main class, the file chooser only shows classes in your project source directory. If you want to specify a class in one the libraries on the classpath, you have to type the fully-qualified name of the class in the Main Class field.

Setting JVM Arguments

You can specify JVM arguments for the project in the Project Properties dialog box. Open the Project Properties dialog box and click Run in the Categories pane and then type a space-separated list of JVM arguments in the VM Options field.

You can set system properties by typing the following in the VM Options field:

```
-Dname=value
```

CHAPTER **5**

Debugging Applications

Debugging is the process of examining your application for errors. You debug by setting breakpoints and watches in your code and running it in the debugger. You can execute your code one line at a time and examine the state of your application in order to discover any problems.

The IDE uses the Sun Microsystems JPDA debugger to debug your programs. When you start a debugging session, all of the relevant debugger windows appear automatically at the bottom of your screen. You can debug an entire project, any executable class, and any JUnit tests. The IDE also lets you debug applications are running on a remote machine by attaching the debugger to the application process.

When you run or debug web applications, JSP pages, or servlets, you can use the HTTP Monitor to monitor data flow. The HTTP Monitor appears by default and gathers data about HTTP requests that the servlet engine processes. For each HTTP request that the engine processes, the monitor records data about the incoming request, the data states maintained on the server, and the servlet context. You can view data, store data for future sessions, and replay and edit previous requests. For details on the HTTP Monitor, choose Help > Help Contents in the main menu.

For free-form projects, you have to write an Ant target for the Debug Project command. You can also write targets to debug specific files and map these targets to the project's commands.

In this section you will learn about:

Basic Debugging

In this section, we will use a simple example to demonstrate how to start a debugging session, step through your code manually, and monitor variables and method calls. We will leave more advanced functions like setting breakpoints and watches for the following sections.

Our example for this section is the Array Fill application. This application is very simple. It creates an array of `sampleBeans`, each one of which has two properties, `firstName` and `lastName`. It then assigns values to the properties of each bean and prints out the values.

The first thing you want to do is run the application to see if it throws any exceptions. Download and extract the ArrayFill example .zip archive (http://www.netbeans.org/files/documents/4/446/ArrayFill.zip). To open the ArrayFill project in the IDE, press CTRL-Shift-O, locate the extracted ArrayFill folder and click Open Project Folder. The ArrayFill project opens in the IDE and the logical strucure of the project is visible in the Projects window.

In the Projects window, expand the `arrayfill` package under the Source Packages. The arrayfill package contains two classes: `ArrayFill` and `SampleBean`. Right-click `ArrayFill.java` and press Shift-F6 to execute it. The output that appears in the Output window should be similar to the following:

```
java.lang.NullPointerException
            at arrayfill.ArrayFill.loadNames(arrayFill.java:27)
            at arrayfill.ArrayFill.main(ArrayFill.java:34)
            Exception in thread "main"
            Java Result: 1
```

Starting a Debugging Session

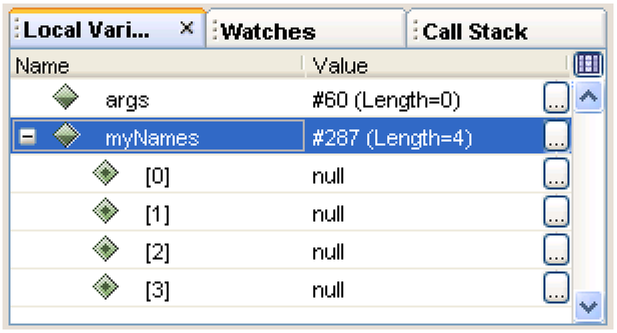
When you start a debugging session in the IDE, the IDE compiles the files that you are debugging, runs them in debug mode, and displays debugger output in the Debugger windows. To start a debugging session, select the file that you want to debug and choose one of the following commands from the Run menu:

- **Debug Main Project** (F5). Runs the main project until the first breakpoint is encountered.
- **Step Into** (F7). Starts running the main project's main class and stops at the first executable statement.
- **Run to Cursor** (F4). Starts a debugging session, runs the application to the cursor location in the Source Editor, and pauses the application.

If more than one project is open in the IDE, make sure that Array Fill is set as the main project by right-clicking the ArrayFill node in the Projects window and choosing Set Main Project from the contextual menu. Press F7 to step into the main project's main class. If the main class for the project is not set, the IDE prompts you to set it. Then the IDE opens the file in the Source Editor, displays the Output window and Debugger windows, and stops just inside the `main` method.

Debugger Windows

Let's take a minute to look at the Debugger windows. The Debugger windows automatically open whenever you start a debugging session and close when you finish the session. By default, the IDE opens three Debugger windows: the Local Variables window, Watches window, and Call Stack window.



Name	Value
args	#60 (Length=0)
myNames	#287 (Length=4)
[0]	null
[1]	null
[2]	null
[3]	null

Debugger windows with the Local Variables window fronted

You can open other Debugger windows by choosing from the Window > Debugging menu. When you open a Debugger window during a debugging session, it closes automatically when you finish the session. If you open a Debugger window when no debugging session is open, it stays open until you close it manually. You can arrange Debugger windows by dragging them to the desired location.

The following table lists the Debugger windows.

Name	Shortcut	Description
Local Variables	Alt-Shift-1	Lists the local variables that are within the current call.
Watches	Alt-Shift-2	Lists all variables and expressions that you elected to watch while debugging your application.
Call Stack	Alt-Shift-3	Lists the sequence of calls made during execution of the current thread.

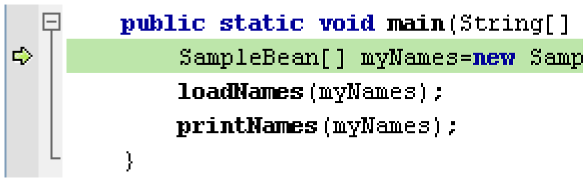
Name	Shortcut	Description
Classes	Alt-Shift-4	Displays the hierarchy of all classes that have been loaded by the process being debugged.
Breakpoints	Alt-Shift-5	Lists the breakpoints in the current project.
Sessions	Alt-Shift-6	Lists the debugging sessions currently running in the IDE.
Threads	Alt-Shift-7	Lists the thread groups in the current session.
Sources	Alt-Shift-8	Lists the source directories on your project classpath. You can set whether to step into or step over classes by deselecting their source folders here. The IDE automatically steps over JDK classes; if you want to step into them, select the JDK sources in this window.

Stepping Through Your Code

You can use the following commands in the Run menu to control how your code is executed in the debugger:

- **Step Over (F8).** Executes one source line. If the source line contains a call, executes the entire routine without stepping through the individual instructions.
- **Step Into (F7).** Executes one source line. If the source line contains a call, stops just before executing the first statement of the routine.
- **Step Out (Alt-Shift-F7).** Executes one source line. If the source line is part of a routine, executes the remaining lines of the routine and returns control to the caller of the routine.
- **Pause.** Pauses application execution.
- **Continue (Ctrl-F5).** Continues application execution. The application will stop at the next breakpoint.
- **Run to Cursor (F4).** Runs the current session to the cursor location in the Source Editor and pauses the application.

In our example, use the F7 key to step through the code one line at a time. The NullPointerException occurred in the loadNames call, so when you step to that call, watch the value of the names array in the Local Variables view. Each of the beans have a value of null. You can continue stepping through the loadNames method - the names beans are null throughout.



```
public static void main(String[]
    SampleBean[] myNames=new Samp
    loadNames(myNames);
    printNames(myNames);
}
```

Stepping into your code in the debugger

The problem here is that while the line

```
SampleBean[] myNames=new SampleBean[fnames.length];
```

initiates the array that holds the beans, it does not instantiate the beans themselves. The individual beans have to be instantiated in the loadNames method by adding the following code:

```
names[i]=new SampleBean();
```

before the line names[i].setLastName(lnames[i]); in the loadNames method.

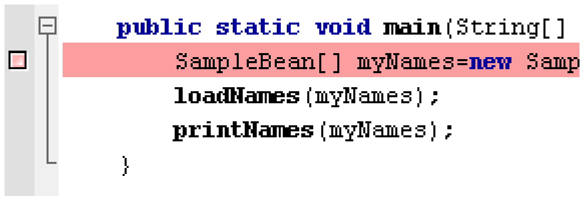
Working With Breakpoints

Most applications are far too big to examine one line at a time. More likely, you set a breakpoint at the location where you think a problem is occurring and then run the application to that location. You can also set more specialized breakpoints, such as conditional breakpoints that only stop execution if the specified condition is true or breakpoints for certain threads or methods.

In this section, we will use the ArrayFill class from the last example, so you will have to recreate the bug by commenting out the code you added above.

Setting a Breakpoint

If you just want to set a simple line breakpoint, you can click the left margin of the desired line. A line breakpoint icon (▣ *breakpoint icon*) appears in the margin. You can remove the line breakpoint by clicking it again.



```
public static void main(String[]
    SampleBean[] myNames=new Samp
    loadNames(myNames);
    printNames(myNames);
}
```

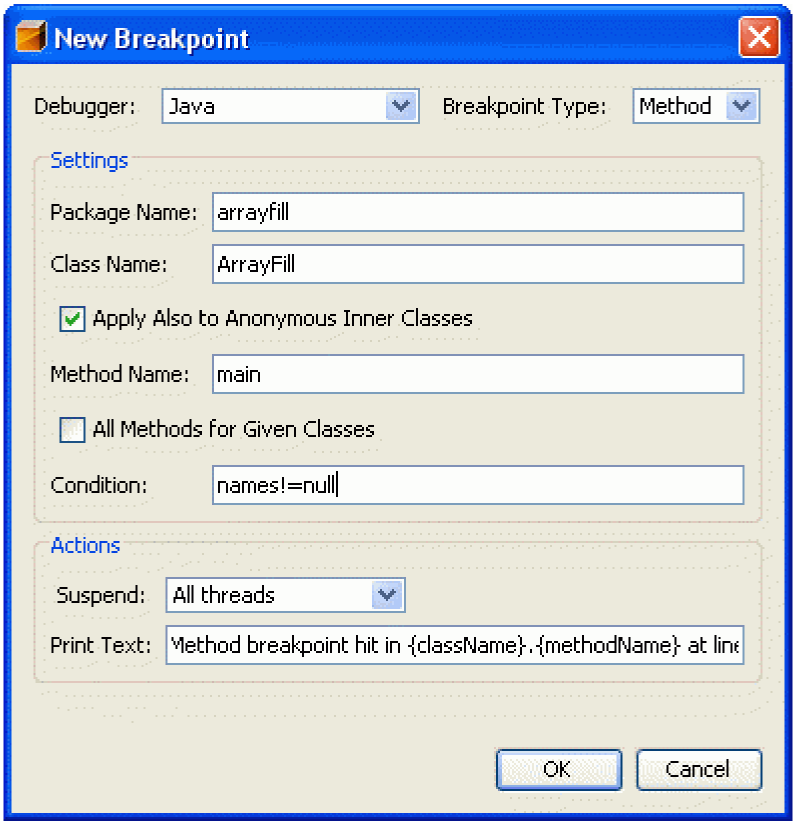
Setting a breakpoint in the source editor

For more complex breakpoints, use the New Breakpoint (Ctrl-Shift-F8) command in the Run menu. The New Breakpoint dialog box lets you choose the type of breakpoint you want to create and set breakpoint options such as conditions for breaking or the information that the breakpoint prints to the Output window.

Setting Conditions for a Breakpoint

Conditional breakpoints only stop execution if a specified boolean expression is true. If you want to set a conditional breakpoint, open the New Breakpoint dialog box and enter an expression in the Condition field.

For example, open `ArrayFill.java`, set the insertion point in the `loadNames` method call in the `main` method, and press Ctrl-Shift-F8. In the dialog box, enter `myNames!=null` in the Condition field and click OK. Then press F5 to start debugging the project. The execution should break within the `loadNames` method.



Debugger: Java
Breakpoint Type: Method

Package Name: arrayfill
Class Name: ArrayFill
[✓] Apply Also to Anonymous Inner Classes
Method Name: main
[ ] All Methods for Given Classes
Condition: names!=null

Suspend: All threads
Print Text: Method breakpoint hit in {className}.{methodName} at line

Setting a conditional breakpoint

Customizing the Output for a Breakpoint

In the New Breakpoint dialog box, you can also specify what information is printed when a breakpoint is reached. Enter any message in the Print Text field at the bottom of the dialog box. You can use variables to refer to certain types of information you want displayed.

Breakpoint Types

The following table lists the different breakpoint types that are available.

Type	Description
Line	You can break execution when the line is reached, or when elements in the line match certain conditions.
Method	When you set a breakpoint on a method name, application execution stops every time the method is executed.
Exception	You have several options for setting a breakpoint on an exception. You can break whenever a specific exception is caught, whenever a specific exception is not handled in the source code, or whenever any exception is encountered regardless of whether the application handles the error or not.
Variable	You can stop execution of your application whenever a variable in a specific class and field is accessed (for example, the method was called with the variable as an argument) or modified.
Thread	You can break application execution whenever a thread starts, stops, or both.
Class	When you set a breakpoint on a class, you can stop the debugger when the class is loaded into the virtual machine, unloaded from the virtual machine, or both.

Setting Watches

A watch enables you to track the changes in the value of a variable or expression during application execution. To set a watch, select the variable or expression you want to set a watch on in the Source Editor, then right-click and choose New Watch (Ctrl-Shift-F7).

You can also create fixed watches in the Watches view. While a normal watch describes the content of a variable, a fixed watch describes the object that is currently assigned to the variable. To create a fixed watch, right-click any item in the Local Variables or Watches view and choose Create Fixed Watch.

CHAPTER 6

Connecting to Databases

This section explains the basics of creating a connection to a database in the IDE that you can then use in your project.

This section covers the following topics:

Once you have set up the connection to your database, you can perform the following simple operations that are related to JDBC-compliant databases:

- Connect to a database
- Create, browse and edit database structures
- Write, edit and execute SQL commands on a connected database
- Enter SQL queries and see the results immediately
- Connect to multiple databases concurrently
- Migrate table schemas across databases from different vendors

You can use the database connection you create when developing projects in the IDE. You can also use the IDE to help you set up a database connection pool and register the resources with the Sun Java System Application Server to use in your application.

Setting Up Your Resources

You use Java™ Database Connectivity (JDBC™) technology to connect to a database. The JDBC application programming interface (API) is Sun Microsystems' API for connecting to databases that support Structured Query Language (SQL). The JDBC API is a package of object-oriented objects that includes `Connection`, `ResultSet`, and `Statement`. Each object contains various API methods, for example, `connect()`, `close()`, and `prepareStatement()`. You will use these objects and methods later in this section. To do so, you need to use a database that supports SQL.

A database runs in a database server. You can use the database server bundled with the Sun Java System Application Server or any JDBC-compliant SQL server. Once you have your server resources, you need to make them available to the IDE and your project.

Bundled databases

If your IDE is bundled with the Sun Java System Application Server, or you have installed and registered the Sun Java System Application Server with the IDE, you already have one of the following databases servers. The database servers include several sample databases.

- **Derby.** The Derby database is bundled with the Sun Java System Application Server 8.2 and above. If Sun Java System Application Server 8.2 is registered with the IDE, you can start and stop the Derby server and create databases directly from the main menu by choosing Tools > Derby Database > Start Derby Server. When you start the server, you will see something similar to the following in the Output window:

```
Server is ready to accept connections on port 1527.
```

- **Pointbase.** The Pointbase database is bundled with the Sun Java System Application Server 8.1. If Sun Java System Application Server 8.1 is registered with the IDE, you can start and stop the Pointbase database server directly from the main menu by choosing Tools > Pointbase Database > Start Local Pointbase Database. When you do this, you will see something similar to the following in the Output window:

```
Starting Server C:\Program Files\Java\jdk1.5.0_01\bin\java
Server started, listening on port 9092, display level: 0 ...
```

Other databases

You are not limited to working with the Pointbase or Derby databases. For the IDE to communicate with a database server, the IDE requires a driver supporting the JDBC API ("JDBC driver"), which translates JDBC calls into the network protocols that are used by SQL databases. To work with other databases, you need to install the database server and the JDBC driver.

Connecting to Databases

You use the Databases node in the Runtime window when creating a connection to a database. If the Runtime window is not open, you can open it by choosing Window > Runtime in the main menu (Ctrl-5). Expand the Databases node to see the available drivers and database connections.

The Drivers node in the Runtime window displays the drivers available to the IDE. Depending on your system configuration, you may already have Derby or Pointbase database drivers available. If the driver for your database server is not listed, you need to add the driver before you can work with your database in the IDE and your projects.

Icon	Description
Loadable driver icon	The driver can be loaded by the IDE and you can connect to the database.
Unloadable driver icon	The IDE cannot connect to the database using this driver because the driver's JAR or ZIP file isn't placed in the specified location. You can correct the location by right-clicking the driver node and choosing Customize.

Table showing database driver icons

You create a database connection in the Runtime window using the driver for your database server. Once you have created a database connection, you can connect to and modify the database and use the database in your application.

Adding Database Drivers

To add a database driver, right-click the Drivers node and choose New Driver from the pop-up menu. The New JDBC Driver dialog box appears. Click Add and browse to the location of your database driver and select the database driver's JAR or ZIP file. When you select the driver, the Driver Class and Name appear in the dialog box.

If the Driver Class field is empty or incorrect, click Find. The IDE searches the JAR file that you selected and finds all classes that implement the JDBC API Driver interface (`java.sql.Driver`). Select the correct driver class from the Driver Class drop-down list and click OK. After adding the new driver, when you expand the Drivers node a new node is displayed for the new driver. The nodes under the Drivers node represent the registered drivers you can use.

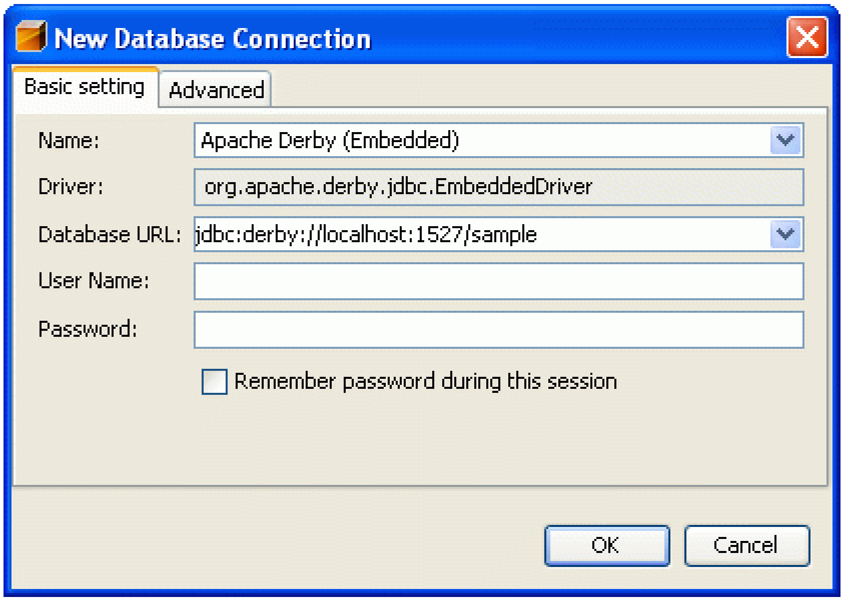
Note that when you have made your database driver available to the IDE, you still need to make it available to your project. At this stage, you can use the IDE to access and modify your database, but you cannot access and modify your database from your project. To access your database from your project, you need to create a database connection that your project can use.

Establishing a Database Connection

In order to establish a connection to a database, first make sure your database server is up and running. If you are using one of the database servers bundled with the IDE, you can start the database by choosing the Derby or Pointbase database from the Tools menu and then choosing Start. When the database server is ready, a message indicating the server has started appears in the Output window.

Before you can open a connection to a database on your database server, you first need to supply the connection details for the connection. You only need to supply the details to create a connection once, and after setting up the initial connection you can easily use the database connection node in the Runtime window to connect to and disconnect from a database.

To create a database connection, right-click the driver node and choose Connect Using to open the New Database Connection dialog box.



Name: Apache Derby (Embedded)
Driver: org.apache.derby.jdbc.EmbeddedDriver
Database URL: jdbc:derby://localhost:1527/sample
User Name:
Password:
☐ Remember password during this session

New Database Connection dialog box

Specify the Database URL and the username and password for your database server. For example, if you are connecting to the database `sample` on your local installation of the bundled Derby database, your Database URL will look like this:

```
jdbc:derby://localhost:1527/sample
```

Click OK after you enter the required connection details. When you click OK, two things happen:

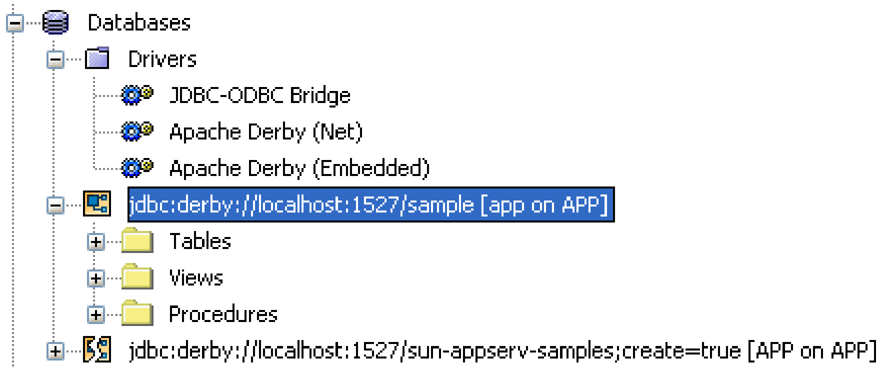
- The IDE opens a connection to the database.
- A database connection node appears under the Databases node.

Working with a Database Connection

Each database connection node in the Runtime window represents a connection to a database. You need to set up a separate connection to each database on your database server that you want to use. You can use the database connection node to do the following:

- Check the status of the database connection. The database connection icon is whole when the database is connected.
- Open or close a connection to the database by right-clicking the node and choosing Connect or Disconnect.

- View the properties of the connection, including the location of the database and the drivers used, by right-clicking the node and choosing Properties.
- Execute an SQL command in the SQL Editor by right-clicking the node and choosing Execute Command. The SQL Editor enables you to write and execute SQL commands on any connected database.



```
Databases
    Drivers
        JDBC-ODBC Bridge
        Apache Derby (Net)
        Apache Derby (Embedded)
    jdbc:derby://localhost:1527/sample [app on APP]
        Tables
        Views
        Procedures
    jdbc:derby://localhost:1527/sun-appserv-samples;create=true [APP on APP]
```

Databases node in the Runtime window showing drivers and database connections

When connected to a database, you can expand the database connection node to view the structure of the database. By right-clicking nodes under the database connection node you can access commands enabling you to modify the structure of the database, including creating, populating and deleting tables and columns. You can also easily view the data in the tables and columns by right-clicking the table or column and choosing View Data from the pop-up menu.

Note – You can create a table by executing an SQL command in the SQL Editor or by using the Create Table dialog box. If you use the Create Table dialog box, you cannot set the `auto_increment` property, which means that you have to add a new value for the primary key manually whenever you add values to populate the table.

Setting Up a Database Connection Pool

A database connection pool is a group of reusable connections that a server maintains for a particular database. Applications requesting a connection to a database obtain that connection from the pool. When an application closes a connection, the connection is returned to the pool. Connection pool properties may vary with different database vendors. Some common properties are the URL for the database name, user name, and password.

When setting up a database connection pool, you also create a JDBC resource (also called a data source). A JDBC resource provides applications with a connection to a database. Typically, there is at least one JDBC resource for each database accessed by an application. It is possible to have more than one JDBC resource for a database.

To create a connection pool, you need to check that you have the following:

- An open enterprise application or web application.
- Access to a running database server. The proper drivers for the database server must be registered with the IDE in order to connect to the database.
- A database connection for your database. You can see the available database connections by expanding the Databases node in the Runtime window.
- A running deployment server such as the Sun Java System Application Server, which is registered with the IDE. If your server is not registered you can use the Server Manager to register the server by going to Tools > Server Manager in the main menu.

If you are deploying your application to the Sun Java System Application Server, the IDE enables you to easily set up a database connection pool and the required data sources using the New File wizard. You can create JDBC resources and connection pools for your application by opening the New File wizard in the IDE and choosing the Sun Resources category and then selecting the type of resource you want to create. You can use the New File wizard to do the following:

- Create a connection pool by extracting the connection information from an existing database connection or from a connected database
- Create a JDBC resource using an existing connection pool or create a new connection pool within the wizard

When you use the New File wizard to set up your connection pool, the IDE generates the necessary files based on the specified connection. The resources are registered with the Sun Java System Application Server when you deploy your application to the server.

If you are deploying your application to a server other than the Sun Java System Application Server, you need to set up your resources by editing the source file for the resource.

CHAPTER 7

Configuring the IDE

One of the main strengths of the IDE is its versatile configurability. You can customize your working environment to fit your needs and personal development style. Having all of these options can, however, make it difficult to find the exact setting you are looking for.

In this section you will learn about the following:

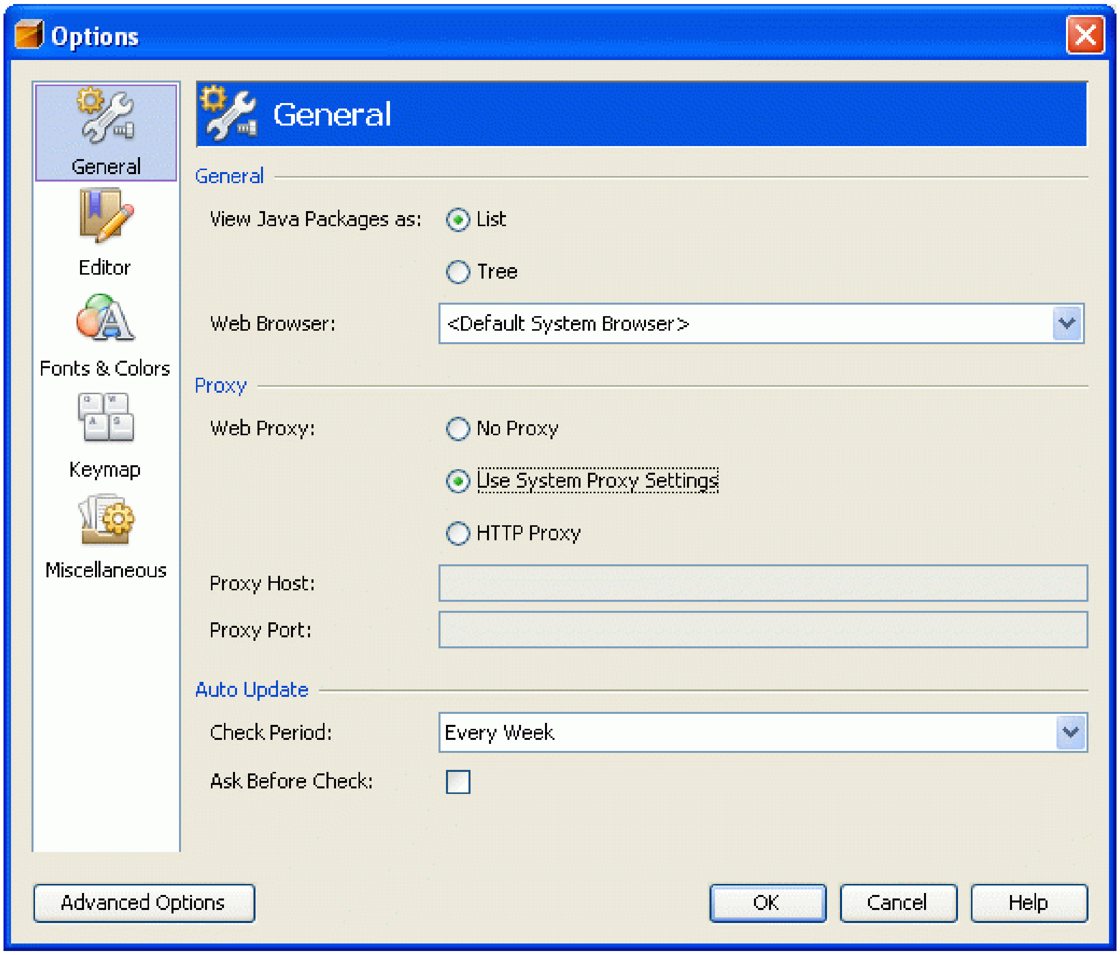
- Setting IDE Default Settings
  - Configuring General Java Settings
  - Working With File Types
  - Configuring Ant Settings
- Enabling and Disabling IDE Functionality
  - Disabling Modules
  - Installing New Modules from the Update Center
- Boosting NetBeans Performance
  - Configuring IDE Startup Switches
  - Tuning JVM Switches for Performance

To configure project-level settings such as a project's properties and JDK level, see Setting Up Projects.

Setting IDE Default Settings

The main tool for configuring default settings in the IDE is the Options window. You can open the Options window by choosing Tools > Options from the main menu.

IDE settings are grouped into categories in the Options window. When you open the Options window, you are in the Basic view by default. In Basic view, you click on a category in the left pane to display the settings options in the right pane. Depending on the category, you can click on the tabs or nodes in the right pane to see additional settings.



General

View Java Packages as: [✓ List] Tree

Web Browser: <Default System Browser>

Proxy

Web Proxy: No Proxy [✓ Use System Proxy Settings] HTTP Proxy

Proxy Host:

Proxy Port:

Auto Update

Check Period: Every Week

Ask Before Check: ☐

Options dialog box

To access more advanced settings, click the Advanced Options button at the bottom of the Options window. In this Advanced view, you select a node in the left pane of the window and the properties you can modify are displayed in the right pane. An ellipsis (...) button next to the property indicates that a property editor is available for a property.

Configuring General Java Settings

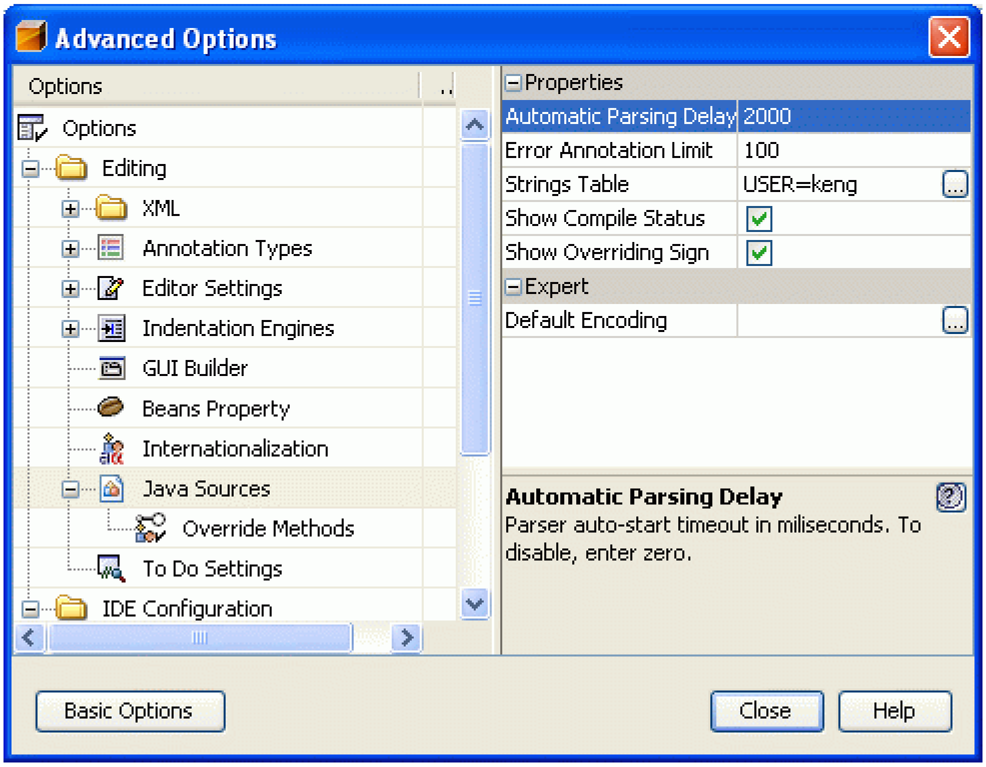
The first thing you should do to configure the IDE is make sure it is using the correct Java Standard Development Kit (JDK) version. The JDK in which the IDE runs is important because it is automatically used as the platform against which all of your sources are compiled and executed. See Setting the Target JDK in a Project for details.

To see which JDK your IDE is running on, choose Help > About and click the Detail tab. The location of the JDK is listed as Java Home. By default, the IDE uses the JDK that is specified in your system's registry as the most recent. If you only have one version of the JDK installed on your computer, this is not a problem. If you have multiple JDK versions installed, it can be a good idea to configure a startup switch to explicitly specify which JDK the IDE should use. You can do so by using the `--jdkhome` JDK folder switch (for example, `--jdkhome c:\jdk1.5.0_04`) on the command line, or by specifying the JDK location in your `netbeans.conf` file.

Another important tool in defining Java settings is the Java Sources node in the Advanced view in the Options window. The Java Sources node, which is located under the Editing node, contains general settings for how the IDE handles Java source files. The following settings are available in the Java Sources node:

- **Automatic Parsing Delay.** Specifies the time (in milliseconds) between a pause in typing or moving around in the Source Editor and the time that internal parsing information is refreshed. The default is two seconds. The IDE uses the internal parser to automatically update information about the current Java source file. You can disable automatic parsing by setting this property to zero. If this property is disabled, a Java file is parsed only when the file is saved or compiled.
- **Error Annotation Limit.** Sets the amount of errors that are highlighted in the Source Editor for each open file. Set this property to zero to disable error annotation for Java files.
- **Strings Table.** Specifies the `_USER_` macro in templates and enables you to create your own macros for use in templates.
- **Show Compile Status.** If selected, displays the compile status badge on the node for a Javaclass file when that file needs to be compiled.

- **Default Encoding.** Specifies the default encoding that the IDE uses to display and save `.java` files. Type an encoding name or leave blank to use your system's default encoding. This setting does not affect the encoding used to compile classes in the IDE.



Properties	
Automatic Parsing Delay	2000
Error Annotation Limit	100
Strings Table	USER=keng
Show Compile Status	✓
Show Overriding Sign	✓
Expert	
Default Encoding	

Automatic Parsing Delay
Parser auto-start timeout in miliseconds. To disable, enter zero.

Setting Java sources properties in the Options dialog box

Working With File Types

The IDE recognizes the standard file extensions for most types of files. For example, it knows that files with the extensions `.htm`, `.html`, and `.shtml` should all be treated as HTML files. Many file types, like XML, can have nonstandard file extensions that the IDE does not recognize.

If you want to treat all files with a certain file extension as a certain type of file, go to the Options window, click the Advanced button and expand IDE Configuration > System > Object Types. The Object Types node contains all of the file types that the IDE is currently configured to work with. You can use the Extensions and MIME Types property to specify which file extensions should be treated as a given type of file.

For example, JavaHelp^{TM} map files are XML documents that have a `.jhm` extension. You can treat all JavaHelp map files as XML documents by adding `.jhm` to the list of Extensions and MIME Types for the XML Object object type.

Configuring Ant Settings

You can configure additional Ant settings in the Options window by opening the Options window, selecting the Miscellaneous category in the left pane and clicking the Ant node in the right pane. You can specify the following properties:

- **Ant Home.** The installation directory of the Ant executable used by the IDE.
- **Properties.** Configures custom properties to pass to an Ant script each time you call Ant.
- **Classpath.** Specify additional JAR files and directories to be used in Ant. Type the full path in the Classpath property.
  Note: You should only add items to the Ant classpath that are needed to run custom tasks. You should not use the Classpath settings to manage the compilation or runtime classpath of your project source folders.

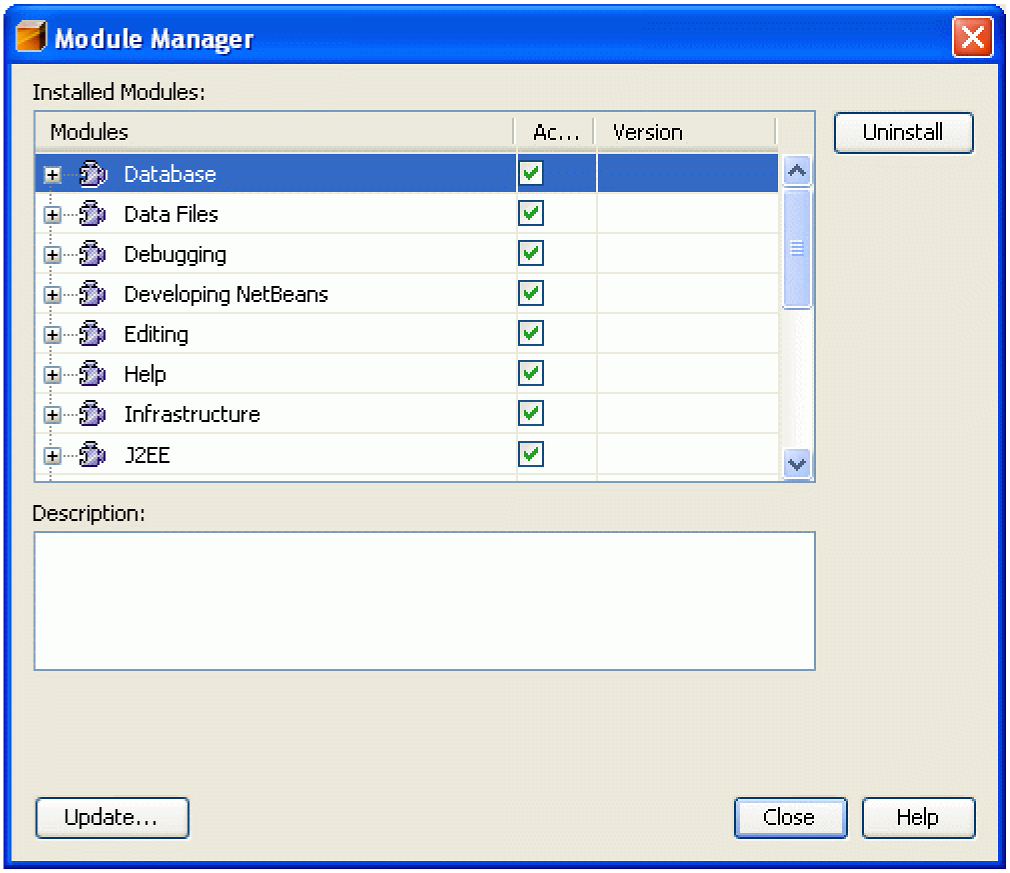
Enabling and Disabling IDE Functionality

NetBeans IDE is a fully modular IDE, meaning that its functionality is provided by modules that plug into the core NetBeans infrastructure. If you do not use the functionality provided by certain modules, you can turn those modules off. Turning off unused modules helps improve your IDE's startup time and performance. You can also add functionality to your IDE by downloading new modules from the Update Center.

Disabling Modules

The Module Manager is the most convenient tool for enabling and disabling modules. Disabling a module only causes the IDE to ignore the module. The module is not deleted and it can be enabled again at any time.

To open the Module Manager, choose Tools > Module Manager. The Module Manager displays all the modules registered with the IDE and if they are registered. You can enable or disable a module by selecting or deselecting the active checkbox for that module. You can uninstall a module by selecting the module in the list and clicking Uninstall. To check if new modules are available from the Update Center, click Update.



Modules	Ac...	Version
Database	✓	
Data Files	✓	
Debugging	✓	
Developing NetBeans	✓	
Editing	✓	
Help	✓	
Infrastructure	✓	
J2EE	✓	

Module Manager

The Module Manager groups related modules into module groups. For example, the Java group contains all of the modules that deal with Java development. You can disable all modules in a module group by unchecking the checkbox in its Active column, or expand the module group node to disable individual modules. When only certain modules in a module group are disabled, the Active column for the group is checked [`boolean`]. When you are finished, click Close to activate your changes.

Certain modules depend on other modules to function properly. Disabling or enabling one of these modules may require you to also disable or enable the modules upon which it depends. If this is the case, the IDE displays a dialog that tells you which modules will also be disabled or enabled and asks for your confirmation.

Installing New Modules from the Update Center

You can add functionality to your IDE by downloading new modules from the NetBeans Update Center. To connect to the Update Center, choose Tools > Update Center from the main window. In the Update Center wizard, select the Update Centers that you want to connect to. Make sure that your proxy information is properly configured and that you can connect to the Internet. You can edit your proxy configuration using the Proxy Configuration button on the wizard page. Click Next when you are ready to proceed.

The second page of the wizard shows you all of the modules that are available on the Update Centers. The wizard only displays modules that are not already installed in your IDE or newer versions of modules that are already installed. Select any module to see detailed information about the module, including a description, the version number of the module on the Update Center, and the version number of the module already installed on your system.

To download a module for installation, select the module in the left pane and click the Add button. When you are ready to proceed, click the Next button to view the modules' certificates and install the modules.

Boosting NetBeans Performance

You can monitor your IDE's performance with the Memory toolbar. To view the Memory toolbar, right-click anywhere in the toolbar area and select Memory in the pop-up menu. The Memory toolbar has a slide that shows you how much of the IDE's memory is currently being used and how close it is to automatically performing garbage collection. You can manually initiate garbage collection by clicking the Memory toolbar.

You can boost NetBeans performance by adjusting the JVM switches with which you start the IDE.

Configuring IDE Startup Switches

You can use Java startup switches to configure the IDE. You can add startup switches to the IDE on the command line or by entering them in a special file called `netbeans.conf`, which is located in the `etc` folder in the NetBeans installation folder. You can enter IDE-specific startup switches and pass arguments directly to the JVM in which the IDE runs.

For example, to set the `-Xmx` (maximum heap size) for the JVM in which the IDE runs, either add the line `-J-Xmx64m` to your `netbeans.conf` file or launch the IDE from the command line by typing the following on UNIX systems:

```
./netbeans.sh -J-Xmx64m
```

or, on Windows systems, the following:

```
netbeans.exe -J-Xmx64m
```

The `netbeans.conf` file can have the various JVM switches separated either by spaces or on separate lines. Note that the JVM does not start when switches are passed that it does not understand. When this error occurs, the JVM returns a message pointing out the switch that caused the problem, as with the following example:

```
java -foo

Unrecognized option: -foo

Could not create the Java virtual machine.
```

The following table lists the available startup switches.

Startup Switch	**Description**
`-h` `--help`	Print descriptions of common startup parameters.
`--cp:p` *additional_classpath*	Prefix the specified classpath to the IDE's classpath.
`--cp:a` *additional_classpath*	Append the specified classpath to the IDE's classpath.
`--fontsize` *size*	Set the font size, expressed in points, in the IDE's user interface. If this option is not used, the font size is 11 points.
`--jdkhome` *jdk_home_dir*	Use the specified version of the Java™ 2 SDK instead of the default SDK. By default on Microsoft™ Windows systems, the loader looks into the registry and uses the latest SDK available. You should back up your user directory before you upgrade the SDK that the IDE uses. If you later need to revert to the previous JDK, switch to the backed up user directory to ensure that you do not lose any settings. To switch the IDE's user directory, use the `-userdir` switch detailed below.

Startup Switch	Description
`-J`*`jvm_flag`*	Pass the specified flag directly to the JVM.
`-J-Dsun.java2d.noddraw=true`	Prevent the use of DirectX for rendering. This switch might prevent problems that occur on some Microsoft Windows systems with faulty graphics cards.
`-J-Dnetbeans.debugger.jpda.transport=dt_shmem` *`userdir`*	Force the IDE to use the shared memory connection when starting a debugging session with the Debug > Start command. This parameter has no effect when you attach the debugger to an already running process.
`--laf` *`UI_class_name`*	Selects the given class as the IDE's look and feel. The following are two examples of look and feel classes: • `com.sun.java.swing.plaf.motif.MotifLookAndFeel` • `javax.swing.plaf.metal.MetalLookAndFeel`
`--locale` *`language[:country[:variant]]`*	Use the specified locale.
`--open` *`file`*	Open the file in the Source Editor.
`--open` *`file:line number`*	Open the file in the Source Editor at the specified line.
`--userdir` *`userdir`*	Explicitly specify the `userdir`, which is the location in which user settings are stored. You can determine the current user directory in the About dialog box. Choose Help > About and then click the Detail Tab. The tab lists the location of the User Dir as well as other product details.

Tuning JVM Switches for Performance

JVMs offer a variety of standard and non-standard switches that tune memory allocation and garbage collection behavior. Some of these settings can benefit the performance of the IDE.

Note that `-X` and especially `-XX` JVM switches are officially "unsupported" because they are often JVM or JVM-vendor specific. The switches discussed in this section are available for Sun Microsystems J2SE 1.4.2 and J2SE 1.5. Users of other JVM implementations may need to remove these switches in order to run the IDE.

The following settings should produce better-than-factory setting performance on most systems. With the exception of setting the "permanent area" size, these switches have been the defaults for the IDE for some time, and should already be present in your netbeans.conf file.

- **`-J-Xverify:none`**
  This switch turns off Java bytecode verification, making classloading faster and eliminating the need for classes to be loaded during startup solely for the purposes of verification. This switch significantly improves startup time.
- **`-J-Xms32m`**
  This setting tells the Java virtual machine to set its initial heap size to 32 megabytes. By telling the JVM how much memory it should initially allocate for the heap, we save it growing the heap as the IDE consumes more memory.
- **`-J-Xmx128m`**
  This setting specifies the maximum amount of memory that the Java virtual machine should use for the heap. Placing a hard upper limit on this number means that the Java process cannot consume more memory than physical RAM available. This limit can be raised on systems with more memory - the 128 megabyte setting helps to ensure that the IDE performs tolerably on 256Mb systems. **Note:** Do not set this value to near or greater than the amount of physical RAM in your system or it will cause severe swapping during major collections.
- **`-J-XX:PermSize=20m`**
  This is a more exotic JVM switch, but one which also improves startup time. This setting sizes the "permanent area" of memory, where classes are kept. Since we know that all of IDE's classes take up a specific amount of memory, we give the JVM a hint as to how much memory it will need. This setting eliminates major garbage collection events during startup on many systems. Users of SunONE Studio or other IDEs that include more modules may want to set this number higher.

Listed below are some additional JVM switches which have either anecdotally or measurably impacted NetBeans performance on some, not all, systems. Your mileage may vary, but they may be worth a try.

- **`-J-XX:CompileThreshold=100`**
  This switch will make startup time slower, by instructing the HotSpot JVM to compile many more methods down to native code sooner than it otherwise would. The reported result is snappier performance once the IDE is running, since more of the UI code will be compiled rather than interpreted. This value represents the number of times a method must be called before it will be compiled.

- **`-J-XX:+UseConcMarkSweepGC -J-XX:+UseParNewGC`**
  Try these switches if you are having problems with intrusive garbage collection pauses. This switch causes the JVM to use different algorithms for major garbage collection events (also for minor collections, if run on a multiprocessor workstation), ones which do not "stop the world" for the entire garbage collection process. If you are using the PermSize switch, you should also add the line `-J-XX:+CMSClassUnloadingEnabled` to your `netbeans.conf` file so that class unloading is enabled (it isn't by default when using this collector). **Note:** It is unclear as yet if this collector helps or hurts performance on uniprocessor machines.
- **`-J-XX:+UseParallelGC`**
  Some tests have shown that, at least on systems fairly well equipped with memory, the durations of minor garbage collections is halved when using this collection algorithm, on uniprocessor systems. Note that this is paradoxical - this collector is designed to work best on multiprocessor systems with gigabyte heaps. No data is available on its effect on major garbage collections. Note: this collector is mutually exclusive with `-J-XX:+UseConcMarkSweepGC` . The measurements supporting the use of this algorithm can be found on the performance web site.

CHAPTER **8**

Quick Reference

This section lists common tasks for application development, keyboard shortcuts for use in the IDE, and abbreviations for coding in the Source Editor. You can see a complete list of keyboard shortcuts by choosing Menu > Keyboard Shortcuts from the main menu.

You can also modify and assign keyboard shortcuts for IDE actions in the Options window. To view or change shortcuts for IDE actions, open the Options window and choose Keymap in the left pane. In the right pane, select the action and enter or change the keyboard shortcut in the Shortcuts text area.

This section covers:

Window Navigation Shortcuts

Keys	Action
Ctrl-0	Switches focus to the Source Editor.
Ctrl-1/Ctrl-Shift-1	Switches focus to the Projects window.
Ctrl-2/Ctrl-Shift-2	Switches focus to the Files window.
Ctrl-3/Ctrl-Shift-3	Switches focus to the Favorites window.
Ctrl-4	Switches focus to the Output window.
Ctrl-5	Switches focus to the Runtime window.
Ctrl-6	Switches focus to the To Do window.
Ctrl-7	Switches focus to the Navigator window.
Ctrl-8/Ctrl-Shift-8	Opens the Versioning window.
Alt-Shift-1	Opens the Local Variables debugger window.
Alt-Shift-2	Opens the Watches debugger window.
Alt-Shift-3	Opens the Call Stack debugger window.
Alt-Shift-4	Opens the Classes debugger window.
Alt-Shift-5	Opens the Breakpoints debugger window.
Alt-Shift-6	Opens the Sessions debugger window.
Alt-Shift-7	Opens the Threads debugger window.
Alt-Shift-8	Opens the Sources window.
Ctrl-Tab	Toggles through the open windows in the order that they were last used. The dialog box displays all open windows and each of the open documents in the Source Editor.
Shift-Escape	Maximizes the Source Editor or the present window.
Ctrl-F4	Closes the current tab in the current window. If the window has no tabs, the whole window is closed.
Ctrl-Shift-F4	Closes all open documents in the Source Editor.
Shift-F4	Opens the Documents dialog box, in which you can save and close groups of open documents.
Alt-right	Displays the next tab in the current window.
Alt-left	Displays the previous tab in the current window..

Project Tasks

To perform this task	Follow these steps
Create a project.	1. Choose File > New Project (Ctrl-Shift-N). 2. Select the right template for your project.
Add a JAR file to a standard project's classpath.	1. In the Projects window, right-click the node for the project and choose Properties. 2. In the Project Properties dialog box, select the Libraries node in the Categories pane and ensure the Compile tab is selected. 3. Click Add JAR and select the JAR file in the file chooser. Note: If you also want to attach source code and Javadoc for the JAR file, click Add Library instead.
Set up compilation dependencies between projects.	1. In the Projects window, right-click the node for the project and choose Properties. 2. In the Project Properties dialog box, select the Libraries node in the Categories pane and ensure the Compile tab is selected. 3. Click Add Project and select the project folder for the project that you want to add to the classpath.
Open required projects.	• In the Projects window, right-click the project node and choose Open Required Projects.
Build a project.	• Choose Build > Build Main Project (F11) or right-click any project node and choose Build Project.
Clean a project.	• Right-click the project node and choose Clean Project.
Clean and build a project.	• Right-click the project node and choose Clean and Build Main Project (Shift-F11).
Run a project.	• Choose Run > Run Main Project (F6) or right-click any project node and choose Run Project.
Stop a running project.	• Choose Build > Stop Build/Run.
Debug a project.	• Choose Run > Debug Main Project (F5) or right-click any project and choose Debug Project.

To perform this task	Follow these steps
Specify sources for a JAR file on the project classpath.	1. Choose Tools > Library Manager from the main window. 2. If the JAR file is not already registered in the Library Manager, create a new empty library using the Add Library button. 3. Select the library in the left panel of the Library Manager. 4. In the Classpath tab, click Add JAR/Folder and specify the location of the JAR file containing the compiled class files. Note: A library can contain multiple JAR files. 5. In the Sources tab, add the folder or archive file containing the source code.
Specify Javadoc for a JAR file on the project classpath.	1. Choose Tools > Library Manager from the main window. 2. If the JAR file is not already registered in the Library Manager, register the JAR file as described above. 3. In the Javadoc tab, click Add ZIP/Folder and specify the location of the Javadoc files.
Set the main project.	• Right-click the project node and choose Set Main Project.

CVS Tasks

To perform this task	Follow these steps
Check out sources.	1. Select CVS > Checkout from the main menu. 2. In the CVS dialog box, specify the CVS repository root location and password and click Next. 3. Specify the modules you wish to check out. You can checkout specific modules and branches by clicking the Select button and choosing from options available. 4. Specify the location of the local folder. 5. Click Finish to check out the files.
Update local file versions.	1. In the Project, Files or Favorites window, right-click the file's node that you wish to update and choose CVS > Update.
Diff files.	1. In the Project, Files or Favorites window, right-click the appropriate revision node and choose CVS > Diff.
Commit local changes.	2. Ensure that your local copies of the files are up to date by right-clicking and choosing CVS > Update before proceeding. 3. Right-click the files or directories you wish to commit and choose CVS > Commit.
Merge revisions.	1. In the Project, Files or Favorites window, right-click the appropriate revision node and choose CVS > Merge Changes from Branch. 2. In the Merge Changes from Branch dialog box, specify the options for the merge and click Merge.
Configure global VCS options.	1. Choose Tools > Options and click the Advanced Options button in the Options window. 2. Expand the Server and External Tool Settings node and then the Diff and Merge Types node in the left pane. 3. Select the node to modify in the left pane and edit the desired properties in the right pane of the Options window.

Configuring Tasks

To perform this task	Follow these steps
Configure general options	1. Choose Tools > Options from the main menu. 2. In the left pane of the Options window, select a category in the left pane to display the settings options in the right pane. 3. Specify the desired settings in the right pane of the Options window.
Set the IDE's web browser	1. Choose Tools > Options from the main menu. 2. Select the General category in the left pane of the Options window and select the desired browser from the Web Browser drop-down list.
Configure proxy settings	1. Choose Tools > Options from the main menu. 2. Select the General category in the left pane of the Options window and specify the proxy settings in right pane. To use a proxy server, select the HTTP Proxy check box and type the Proxy Host and Proxy Port.
Configure the Auto Update feature	1. Choose Tools > Options from the main menu. 2. In the Check Period drop-down list, choose how often you want the IDE to automatically check the Update Center for updates.
Configure Advanced IDE options	1. Choose Tools > Options from the main menu. 2. Click the Advanced Options button in the Options window to see the the Advanced view. 3. Select a node in the left pane and set the properties as desired in the right pane.
Configure General Java Settings	1. From the main menu, choose Tools > Options. 2. In the Advanced Options view, expand the Editing node and select Java Sources in the left pane of the window. 1. Set properties as desired in the right pane of the window.

To perform this task	Follow these steps
Customize the IDE's Menus	1. In the Advanced Options view, expand IDE Configuration > Look and Feel > Menu Bar. 2. Right-click the Menu Bar node and choose Add > Menu. 3. In the New Menu dialog box, type a name for the menu and click OK. The IDE adds an empty menu to the main window. 4. Expand the Actions node and find the command you want to add to the menu, then right-click the command node and choose Copy. 5. Expand the Menu Bar node, right-click the node of the menu you just created, and choose Paste > Copy.
Customize the toolbar in the IDE	1. From the main window, choose View > Toolbars > Customize, or right-click the IDE toolbar and choose Customize. 2. In the Customize Toolbars dialog box, click New Toolbar and name your toolbar. 3. The IDE adds an empty toolbar to the main window. You can now drag an item from the Customize Toolbars dialog box to your new toolbar.
Install additional modules	1. Choose Tools > Update Center from the main menu. 2. Designate the update center location you want to connect to in the Update Center wizard and click Next. 3. Select the modules you wish to install. 4. Review the licensing agreement and click Accept.
Enable and disable modules	1. Choose Tools > Module Manager from the main menu to open the Module Manager. 2. Select or deselect the Active checkbox to activate or deactivate that module. You can check for new modules by clicking the Update button in the Module Manager to open the Update Center Wizard.

Source Editor Tasks

To perform this task	Follow these steps
Open a file that is not available in the Projects window or the Files window.	1. Choose File > Open File (Ctrl-O). 2. In the file chooser, navigate to the file and then click Open.
Maximize a tab in the Source Editor.	Do one of the following: • Double-click a file's tab in the Source Editor. • Make sure that the Source Editor window has focus and then press Shift-Escape. • Choose Window > Maximize.
Revert a maximized Source Editor to its previous size.	Do one of the following: • Double-click a file's tab in the Source Editor. • Press Shift-Escape. • Choose Window > Restore.
Display line numbers.	Choose View > Show Line Numbers.
View two files simultaneously.	1. Open two or more files. 2. Click the tab of one of the files and drag it to the side of the window where you want the file to be placed. Once the red preview box appears indicating the correct location for the window, release the mouse button to drop the window. The window can be split horizontally or vertically, depending on where you drag the tab.
Split the view of a single file.	1. Right-click the document's tab in the Source Editor and choose Clone Document. 2. Click the tab of the cloned document and drag it to the part of the window where you want the copy to be placed.
Format code automatically.	• Right-click in the Source Editor and choose Reformat Code. If any text is selected, only that text will be reformatted. If no text is selected, then the whole file is reformatted.

Source Editor Abbreviations for Java Files

Abbreviation	Expansion
ab	abstract
bo	boolean
br	break
ca	catch {
cl	class
cn	continue
df	default;

dowhile	do {
	    ${cursor}
	} while (${condition});

En	Enumeration
eq	equals
Ex	Exception
ex	extends
fa	false
fi	final
fl	float

forc	for (Iterator it =
	collection.iterator(); it.hasNext();) {
	    Object elem = (Object)
	it.next();
	
	}

fore	for (Iterator it =
	collection.iterator(); it.hasNext();) {
	    Object elem = (Object)
	it.next();
	
	}

fori	for (int i = 0; i < ${arr
	array}.length; i++) {
	    ${cursor}
	}

fy	finally
ie	interface

Abbreviation	Expansion
if	if (${condition}) { ${cursor} } else { }
im	implements
iof	instanceof
ir	import
le	length
newo	Object name = new Object(args);
Ob	Object
pe	protected
pr	private
psf (or Psf)	private static final
psfb (or Psfb)	private static final boolean
psfi (or Psfi)	private static final int
psfs (or Psfs)	private static final String
pst	printStackTrace();
psvm	public static void main(String[] args) { ${cursor} }
pu	public
re	return
serr	System.err.println ("
sout	System.out.println ("
St	String
st	static
sw	switch (
sy	synchronized
tds	Thread.dumpStack();
th	throws

Abbreviation	Expansion

`trycatch`	`try {`
	`    ${cursor}`
	`} catch (Exception e) {`
	
	`}`

`tw`	`throw`
`twn`	`throw new`
`wh`	`While (`

`whilei`	`while (it.hasNext()) {`
	`    Object elem = (Object)`
	`it.next();`
	`    ${cursor}`
	`}`

Source Editor Abbreviations for JSP and Servlet Files

Abbreviation	Expansion
`ag`	`application.getValue("`
`ap`	`application.putValue("`
`ar`	`application.removeValue("`
`cfgi`	`config.getInitParameter("`
`jg`	`<jsp:getProperty name="`
`jspf`	`<jsp:forward page="`
`jspg`	`<jsp:getProperty name="`
`jspi`	`<jsp:include page="`
`jspp`	`<jsp:plugin type="`
`jsps`	`<jsp:setProperty name="`
`jspu`	`<jsp:useBean id="`
`oup`	`out.print("`
`oupl`	`out.println("`
`pcg`	`pageContext.getAttribute("`
`pcgn`	`pageContext.getAttributeNamesInScope("`
`pcgs`	`pageContext.getAttributesScope("`
`pcr`	`pageContext.removeAttribute("`
`pcs`	`pageContext.setAttribute("`
`pg`	`<%@ page`
`pga`	`<%@ page autoFlush="`
`pgb`	`<%@ page buffer="`
`pgc`	`<%@ page contentType="`
`pgerr`	`<%@ page errorPage="`
`pgex`	`<%@ page extends="`
`pgie`	`<%@ page isErrorPage="`
`pgim`	`<%@ page import="`
`pgin`	`<%@ page info="`
`pgit`	`<%@ page isThreadSafe="`
`pgl`	`<%@ page language="`
`pgs`	`<%@ page session="`

Abbreviation	Expansion
`rg`	`<request.getParameter("`
`sg`	`session.getValue("`
`sp`	`session.putValue("`
`sr`	`session.removeValue("`
`tglb`	`<%@ taglib uri="`

Source Editor Abbreviations for XML and DTD Files

Abbreviation	Expansion
`?xm`	`<?xml version="1.0" encoding="UTF-8"?>`
`!do`	`<!DOCTYPE>`
`!cd`	`<![CDATA[|]]>`
`!at`	`<!ATTLIST |>`
`!el`	`<!ELEMENT |>`
`!en`	`<!ENTITY |>`
`pu`	`PUBLIC "|"`
`sy`	`SYSTEM "|"`
`!at`	`<!ATTLIST |>`
`!el`	`<!ELEMENT |>`
`!en`	`<!ENTITY |>`
`!no`	`<!NOTATION |>`
`pu`	`PUBLIC "|"`
`sy`	`SYSTEM "|"`
`cd`	`CDATA`
`em`	`EMPTY`
`en`	`ENTITY`
`ens`	`ENTITIES`
`fi`	`#FIXED`
`im`	`#IMPLIED`
`nm`	`NMTOKEN`
`nms`	`NMTOKENS`
`nn`	`NOTATION`
`pc`	`#PCDATA`

Special Code Template Syntax

Code Template Syntax Construct	Explanation
`${cursor}`	Indicates where the insertion point should go after the code snippet has been added to your code.
`${`*`Identifier`*`}`	Indicates an identifer that needs to be filled in when you use the code template. When you use this construct in a template definition, replace *`Identifier`* with the identifer name that you want to appear in the template.
`index`	An attribute that you can use within a `${`*`Identifier`*`}` segment to designate that an unused variable name should be generated in the code snippet. For example, you could use `${ind index}`.
`type=` `"`*`FullyQualifiedType`*`"` `editable="false"`	An attribute that you can use within a `${`*`Identifier`*`}` segment to generate a class name. When you use the code template, an import statement for the class is also inserted into your code. For example, you could use `${cce itype= "java.lang.ClassCastException" editable="false"}` to have `ClassCastException` inserted into your code and make sure that the import statement is generated, if necessary. Specifying `editable= "false"` ensures that `ClassCastException` is not selected for editing once the template is inserted into your code.
`instanceof=` `"`*`FullyQualifiedType`*`"`	An attribute that you can use within a `${`*`Identifier`*`}` segment to designate the type that the identifier must represent an instance of. For example, you could use `${collection instanceof= "java.util.Collection"}` where collection is the default identifier in the template and `java.util.Collection` is the class of which the identifier must represent an instance.

Build Tasks

To perform this task	Follow these steps
Add a JAR file to a project's classpath.	1. In the Projects window, right-click the node for the project and choose Properties. 2. In the Project Properties dialog box, select the Libraries node in the Categories pane and ensure the Compile tab is selected. 3. Click Add JAR and select the JAR file in the file chooser. **Note:** If you also want to attach source code and Javadoc for the JAR file, click Add Library instead.
Add an IDE project to a project's classpath.	1. In the Projects window, right-click the node for the project and choose Properties. 2. In the Project Properties dialog box, select the Libraries node in the Categories pane and ensure the Compile tab is selected. 3. Click Add Project and select the project folder for the project that you want to add to the classpath.
Build a project.	• Choose Build > Build Main Project (F11) or right-click any project in the Projects window and choose Build Project.
Compile a single file.	• Choose Build > Compile File (F9).
Clean a project.	• In the Projects window, right-click the project node and choose Clean Project.
Clean and build the main project.	• Choose Build > Clean and Build Main Project (Shift-F11).
View build products, such as JAR files and generated Javadoc.	1. In the Files window, expand the project folder node. 2. Open the build folder to view the project's compiled classes. **Note:** Javadoc files and built libraries, like JAR files and WAR files, are in the dist folder.
Correct compilation errors.	• In the Output window, double-click any Java syntax error to jump to the location in the source code where the error occurred. • In the Output window, double-click any Ant error to open the Ant script in the target that failed.

Running J2SE Application Tasks

To perform this task	Follow these steps
Set the runtime classpath.	1. Right-click the project node in the Projects window and choose Properties. 2. Select the Libraries node in the Categories pane. 3. Use the Add Project, Add Library, or Add JAR/Folder buttons to add the required file type to the project's classpath. **Note:** By default, the project's runtime classpath contains the project's compiled sources and everything on the compilation classpath.
Set the project main class	1. Right-click the project node in the Projects window and choose Properties. 2. Select the Run node in the Categories pane. 3. Type the fully qualified name of the class in the Main Class field.
Set the runtime arguments.	1. Right-click the project node in the Projects window and choose Properties. 2. Select the Run node in the Categories pane. 3. Enter the arguments in the Arguments field.
Set JVM arguments.	1. Right-click the project node in the Projects window and choose Properties. 2. Select the Run node in the Categories pane. 3. Type a space-separated list of arguments in the VM Arguments field.
Set the working directory for execution.	1. Right-click the project node in the Projects window and choose Properties. 2. Select the Run node in the Categories pane. 3. Type the full path to the working directory in the Working Directory field.
Run a project.	• Choose Run > Run Main Project (F6). • Right-click any project in the Projects window and choose Run Project.
Run a single file.	1. Select one or more files in the Projects window, Files window, or Source Editor. 2. Choose Run > Run File > Run *`your_filename`* from the main menu.

Running Web Application Tasks

To perform this task	Follow these steps
Set request parameters for JSP files.	1. In the Projects or Files window, navigate to the project's JSP file. 2. Right-click the JSP file and choose Properties. 3. Type the necessary parameters in the Request Parameters property field in the `URL_query_string` format.
Set execution URIs and parameters for servlets.	1. Select the servlet in the Projects or Files window. 2. Choose Tools > Set Servlet Execution URI in the main menu. 3. Type the execution URI and parameters. 4. Click OK. Note that you can only set a request URI for a servlet if it has servlet mappings in the deployment descriptor (`web.xml` file). The default URI is defined in the deployment descriptor.
Set the runtime classpath.	In the Projects window, right-click the Libraries node and choose Add Project, Add Library, or Add JAR/Folder, to add the necessary item to the project's classpath. Note that by default, the project's runtime classpath contains the project's compiled sources and everything on the compilation classpath.
Set the web server.	1. In the Projects window, right-click the project node and choose Properties. 2. Select the Run node in the Categories pane. 3. Select the web server from the Server drop-down.

To perform this task	Follow these steps
Set the context path and relative URL.	1. In the Projects window, right-click the project node and choose Properties. 2. Select the Run node in the Categories pane. 3. Type the desired path in the Context Path field and, optionally, a relative URL.
Run a project.	• Choose Run > Run Main Project (F6) • Right-click any web project in the Projects window and choose Run Project.
Run a single file.	1. Select one or more files in the Projects window, Files window, or Source Editor. 2. Choose Run > Run File > Run *`your_filename`* from the main menu.

Debugging Tasks

To perform this task	Follow these steps
Start a local debugging session.	• To debug the main project, choose Run > Debug Main Project (F5). • To debug any individual project, right-click the project and choose Debug Project.
Start a remote debugging session.	1. On the computer where program is located, start the program in debugging mode. 2. On the computer where the IDE is running, open the projects that contain the source for the program. 3. Choose Run > Attach Debugger. 4. Select the connector type, enter any required process information, and then click OK. **Note:** See your VM documentation for information about the connectors it provides.
Debug a single file.	• Select any runnable file in the Projects window and choose Run > Run File > Debug `your_filename`.
Finish a debugging session.	• To finish the current session, choose Run > Finish Debugger Session (Shift-F5). • To finish any session, open the Sessions window (Alt-Shift-6), right-click the session, and choose Finish.
Set a breakpoint.	• To set a line breakpoint, open the file in the Source Editor and click in the left margin on the desired line (Ctrl-F8). • In the Source Editor, select the element of code on which you want to set a breakpoint and choose Run > New Breakpoint (Ctrl-Shift-F8). Then set the breakpoint type and additional options in the New Breakpoint dialog box.
Modify breakpoint properties.	• Open the Sessions window (Alt-Shift-6), right-click the session, and choose Customize.
Set a watch.	• Right-click a variable or expression in the Source Editor and choose New Watch (Ctrl-Shift-F7).
Suspend and resume a thread.	• Open the Threads window (Alt-Shift-7), right-click the thread, and choose Suspend or Resume.

To perform this task	Follow these steps
Manage which JDK classes the debugger steps into.	• Open the Sources window (Alt-Shift-8) and select the checkbox for the archive file or directory containing the JDK sources. • Open the Sources window (Alt-Shift-8) and uncheck the checkbox for the source directories you do not want to step into.
Pop a call from the call stack.	• To pop the most recent call from the call stack, choose Run > Stack > Pop Topmost Call. • To pop multiple calls, open the Call Stack window (Alt-Shift-3), right-click the call that you want to remain at the top of the call stack, and choose Pop to Here.
View information for a call on the call stack.	• To move one level away from the main routine, choose Run > Stack > Make Callee Current (Ctrl-Alt-up arrow). • To move one level toward the main routine, choose Run > Stack > Make Caller Current (Ctrl-Alt-down arrow). • To make a call current, double-click the call in the Call Stack window.

JUnit Tasks

To perform this task	Follow these steps
Create a test for existing sources.	1. Right-click the class or package node for which you wish to generate a test and choose Tools > JUnit Tests > Create Tests (Ctrl-Alt-J). 2. Set the parameters for the test skeleton generator in the Create Tests dialog box and click OK.
Create an empty test.	1. Choose File > New File. 2. Select JUnit in the Categories pane and Empty Test in the File Types pane. Click Next. 3. Enter a name for the test class in the Class Name field. 4. Select the target package from the Package combo box and set any required options. 5. Click Finish.
Run a test for a class.	1. Select the node of the class you wish to test. 2. From the Main menu, choose Run > Run File > Test filename (Ctrl-F6).
Run tests for an entire project.	• Right-click the node of the project for which you wish to run tests and choose Test Project (Alt-F6).
Edit a test.	1. Right-click the node for the source whose test you wish to edit. 2. Choose Tools > JUnit Tests > Open Test (Ctrl-Alt-K) from the contextual menu.
Debug a test.	1. Select the class for whose test you wish to debug. 2. Choose Run > Run File > Debug Test for filename (Ctrl-Shift-F6).
Configure JUnit.	1. Choose Tools > Options. 2. Expand the Testing node and select JUnit Module Settings. 3. Edit the necessary properties and then click Close.