



Getting Started with Java and AS/400: Java on AS/400



Getting Started with Java and AS/400: Java on AS/400

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Chapter 1. What can you do with Java and AS/400?

» Java has the potential to connect users with information regardless of its source. Whether the data comes from the web, a database, an integrated file system, or any other entity, Java can control it. Using Java with your AS/400 opens a new world of flexibility and manageability. You can create applications that run from just about anywhere, and still provide access to your AS/400 resources. You can use the web, Java, and AS/400 together with ease. This list highlights only **some** of the many advantages Java and AS/400 have to offer.

Internet applications

- Use the web, Java, and AS/400 together with servlets.
- Provide secure connections to AS/400.
- Create dynamic HTML with AS/400 Toolbox for Java HTML classes.
- Create Java applets.

AS/400 applications

- Call AS/400 programs and service programs.
- Perform administrative tasks with AS/400 Toolbox for Java utility classes.
- Create client/server database applications with the AS/400 Toolbox for Java JDBC drivers.
- Create native AS/400 database applications with the AS/400 Developer Kit for Java JDBC drivers.
- Access legacy AS/400 data and applications.
- Create optimized Java code for specific AS/400 operations using the AS/400 Developer Kit for Java.
- Create client/server Java applications with the AS/400 Toolbox for Java.
- Easily create graphical user interfaces (GUIs) with the Graphical Toolbox, a visual editing tool. (Uses the AS/400 Toolbox for Java)

Java in general

- Create graphical user interfaces (GUIs) to present and request data from users.
- Enjoy the benefits of Object-Oriented programming with Java. (i.e. code reuse, inheritance, abstraction)
- Use Java with other languages, such as C++ and RPG.
- Enjoy Java's inherent features such as, garbage collection, security, and platform independence.



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Chapter 2. Setting up Java on AS/400

It's easy to set up Java programming on your AS/400 system. To create your first Java application on AS/400 complete the following steps:

1. Installing licensed programs for Java.
 - a. AS/400 Developer Kit for Java (5769-JV1)
 - b. Qshell Interpreter (5769-SS1)
2. Creating a Java application.
 - a. Creating a directory for your Java application.
 - b. Writing a Java application.
 - c. Compiling your Java application.
 - d. Optimizing your Java application.
 - e. Running your Java application.

Continuing with Java on AS/400

Make sure to see the AS/400 Developer Kit for Java documentation for all the resources, tips, and information you need while creating your Java applications. Keep up-to-date with the latest technologies and innovations; see Other Information about Java and AS/400 for links and other resources.

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AS/400 Developer Kit for Java overview

The AS/400 Developer Kit for Java is optimized for use in an AS/400 server environment; it allows you to create and run Java programs on AS/400. The AS/400 Developer Kit for Java is a compatible implementation of the Sun Microsystems, Inc. Java Technology, and functions much like their Java Development Kit (JDK). It provides AS/400-specific core classes, utilities, tools, and a Java runtime environment.

For more information about AS/400 Developer Kit for Java, see the *AS/400 Developer Kit for Java* product information.

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Qshell Interpreter and Java

You might have written some Java programs on other platforms, like Windows or UNIX. If so, you know the standard Java commands such as **java**, **javac**, **jdb**, and **rmic**. And, if you have spent any time on an AS/400, you know that AS/400 commands are unique in the computing world.

If you want to know how standard Java commands and AS/400 commands can possibly work together, the answer is Qshell Interpreter. Qshell Interpreter provides a UNIX-like command environment, or shell (in fact, Qshell closely resembles the UNIX Korn shell). Install Qshell Interpreter, and you can run the

standard Java commands *and* AS/400 commands from the same environment. Qshell Interpreter is not needed for running Java on AS/400, but it sure helps.

For more information about Qshell Interpreter, see the *Qshell Interpreter* product documentation.

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PTFs for Java and AS/400

For those of you new to the AS/400 platform, a PTF, or program temporary fix is a temporary solution to or bypass of a problem diagnosed by IBM as resulting from a defect in a current unaltered release of a licensed program. PTFs are designed to replace one or more objects in the product. Generally, PTFs are incorporated in a future release of the product.

During your deployment cycle to the AS/400 system, it is a good idea to keep an eye on which PTFs are needed to run your product successfully. Your customers will also need to know this information. Therefore, it is highly recommended that you have the latest PTFs installed and applied on your AS/400 system.

Make sure you visit the following links for the most current information:

- **AS/400 Toolbox for Java PTFs**
- **WebSphere Application Server PTFs**

Also, it is recommended that you request every 2 months or so the latest Group PTF for the following licensed products:

OS/400 release	Product(s)	Group PTF
V4R2	5769-999 (SLIC)	SF99065
	5769-SS1 (XPF)	
	5769-JV1 (Java)	
V4R3	5769-999 (SLIC)	SF99066
	5769-SS1 (XPF)	
	5769-JV1 (Java)	
V4R4	5769-999 (SLIC)	SF99067
	5769-SS1 (XPF)	
	5769-JV1 (Java)	

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What's new for V4R5

Install Java 2 Software Development Kit (J2SDK)

V4R5 works with the Java 2 Software Development Kit which includes the JDK 1.2 and Swing 1.1 classes.

New examples

Two code examples were added to show how Java can interact with the AS/400 database.

What can you do with Java and AS/400?

A new section titled What can you do with Java and AS/400? was added.

How to see your current position in our information:



The small links at the top of each page show you where you are in our information. These links are displayed in a directory structure format. To see where you are, read through the links. For example, if you look at the top of this page, you see:

Getting started with Java and AS/400 \ What's new for V4R5

These links show that you are in the "What's new for V4R5" information under the "Getting Started with Java and AS/400" topic.

How to see what's new or changed:

To help you see where technical changes have been made, this information uses:

- The  image to mark where new or changed information begins.
- The  image to mark where new or changed information ends.

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Chapter 3. Installing the licensed programs for Java on AS/400

To program Java on AS/400, you must install AS/400 Developer Kit for Java. A suggested installation, the Qshell Interpreter, provides a UNIX-like shell environment that provides support for standard Java commands.

To install these licensed programs, follow these steps:

1. At the AS/400 command prompt, type:
GO LICPGM
Press **Enter**.
The *Work with Licensed Programs* display appears.
2. Select menu option **11** to install the licensed programs.
3. Scroll through the list by pressing the PageDown key. Find **5769SS1 OS/400 - QShell Interpreter**, and if it has not been installed, type **1** (Install) in the *Option* blank in front of it.

Note: To find out if a licensed program has been installed, press **F11** on the *Install Licensed Programs* display. An installed licensed program displays ***COMPATIBLE** in the *Installed Status* field.

If QShell Interpreter does not appear on the *Install Licensed Programs* menu at all, you need to use the restore licensed programs (RSTLICPGM) method to install the licensed programs from CD-ROM, disk, or tape.

4. Next, look for **5769JV1**. Notice that 5769JV1 has five entries, a base component (AS/400 Developer Kit for Java) and four options (Java Developer Kit 1.1.6 through Java Developer Kit 1.2) as shown below:

5769JV1	*BASE	AS/400 Developer Kit for Java
5769JV1	1	Java Developer Kit 1.1.6
5769JV1	2	Java Developer Kit 1.1.7
5769JV1	3	Java Developer Kit 1.2
5769JV1	4	Java Developer Kit 1.1.8

The AS/400 Developer Kit for Java provides support for multiple JDK's. You can install a combination of options and program with any. If your Java program does not specify which JDK version to use, a default JDK is selected. For more information about multiple JDK versions and AS/400 Developer Kit for Java, see *AS/400 Developer Kit for Java* product documentation.

Note: You may have to scroll through several pages to find both entries. If one (or both) of these choices does not appear on the *Install Licensed Programs* menu, you need to use the restore licensed programs (RSTLICPGM) method to install the licensed programs from CD-ROM, disk, or tape.

5. Press **Enter**. The programs will begin installing.

When the licensed programs are finished installing, the *Work with Licensed Programs* display appears again.

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Installing a licensed program with the Restore Licensed Program command for Java on AS/400

The programs listed in the *Install Licensed Programs* display are those supported by the LICPGM installation when your system was new. Occasionally, new programs become available which are not listed as licensed programs on your system. If this is the case with the program you want to install, you must use the Restore Licensed Program (RSTLICPGM) command to install it.

To install a licensed program with the Restore Licensed Program (RSTLICPGM) command, follow these steps:

1. Put the tape or CD-ROM containing the licensed program in the appropriate drive.
2. On the AS/400 command line, type:
RSTLICPGM
and press the **Enter** key.
The *Restore Licensed Program (RSTLICPGM)* display appears.
3. In the *Product* field, type the ID number of the licensed program you want to install.
4. In the *Device* field, specify your install device.

Note: If you are installing from a tape drive, the device ID is usually in the format TAPXX , where XX is a number, like 01 .

5. Keep the default settings for the other parameters in the *Restore Licensed Program* display. Press the **Enter** key.
6. More parameters appear. Keep these default settings also. Press the **Enter** key.
The program will begin installing.

When the licensed program is finished installing, the *Restore Licensed Programs* display appears again.

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Chapter 4. Creating a Java application for your AS/400

You can create a Java application that runs on your AS/400 using any of several different methods. However, it's easiest writing your Java applications on your workstation and saving them on your AS/400 through a mapped network drive.

Note: If you do not a network drive set up on your workstation, you can use AS/400 Client Access to map a network drive to your AS/400.

Developing Java applications on your workstation allows you to take advantage of one of the numerous graphical-based integrated development environment (IDE) products for Java and other programming tools that are currently on the market.

Follow these steps to create a Java application:

1. Creating a directory on your AS/400 for your Java applications.
2. On your workstation, write your Java application and save it on your network drive.

Note: If you cannot map a network drive to your AS/400, you can write a Java application on your AS/400 system.

3. Compiling your Java application from Qshell Interpreter.
4. Optimizing your Java application from Qshell Interpreter.
5. Running your Java application from Qshell Interpreter.

Creating graphical applications An introduction and link to running Java graphics on AS/400. If you do not plan on using graphics, skip this section.

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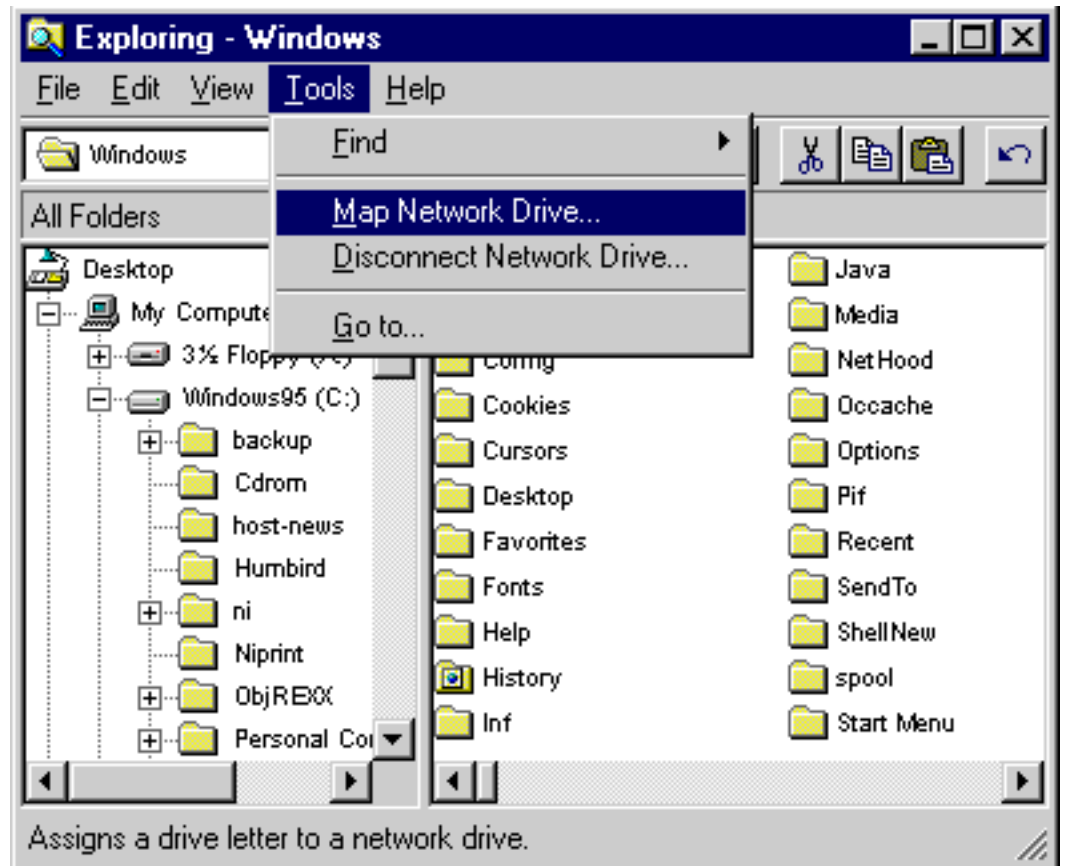
Mapping a network drive to AS/400

For these steps, you need AS/400 Client Access for Windows installed on your AS/400 and on your workstation. For more information on how to install and configure AS/400 Client Access, see the AS/400 Technical Studio Client Access

Workshop. 

You must have a connection configured for the AS/400 system before you can map a network drive.

1. Open Windows Explorer:
 - a. Right-click on the **Start** button on your Windows taskbar.
 - b. Click **Explore** in the pop-up menu.
2. Select **Map Network Drive** from the **Tools** pulldown menu.



3. Select the drive (for example, X:) you want to connect to your AS/400.
4. Type the path name to the your AS/400 system. For example:
 \\MYAS400
 where MYAS400 is the name of your AS/400 system.



5. If the **Reconnect at logon** checkbox is empty, click on it.
6. Click **OK** to finish.

Your mapped drive will appear in the **All Folders** section of Windows Explorer.

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Creating a directory on your AS/400

You should create a directory on your AS/400 in which you can save your Java applications. If you have previously created a directory that you would like to use to store your Java programs, you can skip these steps.

To create a directory on your AS/400, follow these steps:

1. Sign on to your AS/400.
2. On the AS/400 command line, type:
CRTDIR DIR('/mydir')
 where *mydir* is the name of the directory you are creating.
 Press the **Enter** key.
 A message appears at the bottom of your screen, stating **"Directory created."**

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Writing a Java application on your workstation

If you have an integrated development environment (IDE) product installed on your workstation, use it to code your Java application. See the instructions that came with your software for information on creating a Java application.

If you do not have an IDE or other programming software, you can always code your Java application into a any text-based editor (like Windows Notepad).

However you code your application, save it in the directory you created on your AS/400, which you access through the drive you have mapped to your AS/400 system. Make sure you follow the Java naming convention when you choose the name of your application.

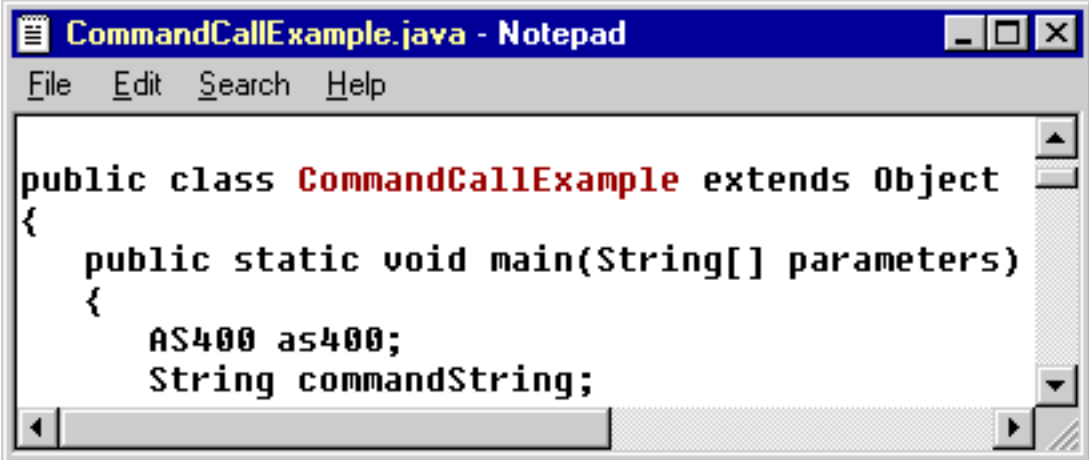
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Naming your Java application

When naming your Java application, make sure you use the proper naming convention—name the application with the same name as the class you are creating.

For example, the Java application listed below creates the class **CommandCallExample**.



```
public class CommandCallExample extends Object
{
    public static void main(String[] parameters)
    {
        AS400 as400;
        String commandString;
```

If you look at the example title bar, you will notice it's named **CommandCallExample.java**.

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Writing your Java program on AS/400

To create a source physical file for your Java program, create the source code for the file, and copy the source code to a stream file, follow these steps:

1. To create the source physical file for your Java program, a library in which to save it is needed.

Note: On AS/400, libraries are not equivalent to directories. The system does not allow you to save a source physical file in a directory. You must save the file in a library.

Create a library. On the AS/400 command line, type:

CRTLIB LIB(mylib)

where *mylib* is the name of the library you are creating.

Press the **Enter** key.

A message appears at the bottom of your display, stating **"Library created."**

2. Create the source physical file for your Java program. Type:

CRTSRCPF FILE(mylib/myfile)

where *mylib* is the name of the library you created in the previous step and *myfile* is the name of the file you are creating.

Note: When choosing a name for the source physical file, you do not have to follow Java file naming conventions (for example, naming your Java application after the class that is instantiated). The file you are creating here acts only as a receptacle for your Java source code. You can create another file for the source code later.

Press the **Enter** key.

A message appears at the bottom of your screen, stating **"File MYFILE created in library MYLIB."**

3. Create the source code for the file, using PDM.
4. Copy the source code to a stream file in your directory. Java applications on AS/400 must reside in a directory in the integrated file system. If you copy your source code to a stream file, you can save it in your directory.

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Creating the Java source code

Now that you have created the source physical file, you need to add the code. This part of the setup uses PDM (Programming Development Manager) to create the code and manipulate the file.

1. Start PDM. On the AS/400 command line, type:

STRPDM

and press the **Enter** key.

The *AS/400 Programming Development Manager (PDM)* screen appears.

2. The source code for your file is associated with a source member of the file. Create and edit the source member. Type **3** for **Work with members** and press the **Enter** key.

The *Specify Members to Work With* display appears.

3. Fill out the display as shown below:

File	myfile
Library	mylib

where *myfile* is the name of the file you created, and *mylib* is the name of the library in which you saved the file.

Press the **Enter** key.

4. Press **F6** to **Create** the file member.

Edit the source member. The *Start Source Entry Utility (STRSEU)* display appears.

5. Fill out the display as shown below:

```
Source file . . . . . > myfile
Library . . . . . > mylib
Source member . . . . . myclass
Source type . . . . . TXT
```

where *myfile* is the name of your Java program, *mylib* is the name of the library in which you saved it, and *myclass* is the name of the file member you are creating.

Note: You may want to replace *myclass* with an abbreviated form of your Java class name.

Press the **Enter** key.

A message appears at the bottom of your display, stating “**Member MYCLASS added to file mylib/MYCLASS.**” The SEU *Edit* display also reappears.

6. In the *Edit* display, without pressing the **Enter** key, type your Java program code.

Press the **Enter** key.

The *End of data* line appears immediately below the line you typed.

Press **F3** to exit the *Edit* display.

7. Save the source member. The *Exit* screen appears. Fill out the display as shown below:

```
Change/create member . . . . . Y
Member . . . . . myclass
File . . . . . myfile
Library . . . . . mylib
Print member . . . . . N
Return to editing . . . . . N
Go to member list . . . . . N
```

where *myclass* is the name of your Java program, where *myfile* is the name of your physical source file, and where *mylib* is the name of the library in which you saved your file.

Press the **Enter** key.

The *Work with Members Using PDM* screen appears.

8. Exit PDM by pressing **F3** twice.

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Copying your Java code to a stream file

Before you can compile and run your Java application, you must save it in a directory in the integrated file system. To save your Java source code in a directory, you must copy the code to a stream file:

1. On the AS/400 command line, type:

CPYTOSTMF

and press the **F4** key.

The *Copy To Stream File (CPYTOSTMF)* display appears.

2. Fill out the display as shown below:

```
From database file member . . .  
      '/QSYS.LIB/mylib.LIB/myfile.FILE/myclass.MBR'  
To stream file . . . . .  
      '/mydir/myjavaclass.java'  
Stream file option . . . . . *NONE  
Data conversion options . . . . *AUTO  
Database file CCSID . . . . . *FILE  
Stream file code page . . . . . 819
```

Note: Entering **819** in the *Stream file code page* field saves the file as ASCII.

where *mylib* is the name of the library you created, *myfile* is the name of your file, and *myclass* is the name of the source member you created for your source code.

Replace *mydir* with the name of the directory in which you want to save your Java program, and replace *myjavaclass* with the class name of your Java application.

Note: See Name your Java application for more information on the Java file naming convention.

Press **Enter** twice.

A message appears at the bottom of your screen, stating **“Database file member copied to object.”**

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Stream file

An AS/400 stream file is a file that contains a continuous stream of data, similar to UNIX and Windows files. The source physical file you created is a structured AS/400 database file. To compile your AS/400 Java application, it must be in a format the Java compiler recognizes, which is a stream file.

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Compiling your Java application from Qshell Interpreter

To compile and run your Java application on AS/400, use Qshell Interpreter. Qshell is a UNIX-like command entry environment on AS/400 that allows you to run the standard Java commands (like `javac` and `java`) on your AS/400 system.

Follow these steps to compile your Java application:

1. Make the directory that contains your Java application the current directory.

On the AS/400 command line, type:

CHGCURDIR DIR('/mydir')

where *mydir* is the name of the directory in which you saved your Java application.

Press the **Enter** key.

A message appears at the bottom of your screen, stating **"Current directory changed."**

2. Enter Qshell Command Entry. On the AS/400 command line, type:

QSH

and press the **Enter** key.

The *QSH Command Entry* screen appears.

3. Compile your Java application.

On the Qshell command line, type:

javac myclass.java

where *myclass* is the name of your Java application.

Press the **Enter** key.

After your application is finished compiling, the shell prompt (by default, a `$`) appears, signalling that Qshell is ready for another command.

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Optimizing your Java application

On AS/400, you have the option to optimize your Java application with the Create Java Program command.

CRTJVAPGM creates a hidden service program, associated with your class file, that improves performance. CRTJVAPGM also has an OPTIMIZE parameter that allows you to select the level of optimization for your service program.

Note: It's advised that you run the CRTJVAPGM command on all Java classes, JAR files, and ZIP files you create.
--

To optimize your Java application, complete these steps:

1. In the *QSH Command Entry* screen, enter CL command entry by pressing **F21** (**Shift** and **F9**).

The command section of the *QSH Command Entry* screen is replaced with the *Command* area.

2. On the *Command* line, type:

CRTJVAPGM

and press the **F4** key.

The CRTJVAPGM (Create Java Program) display appears.

3. In the *Class file or JAR file* field, type:

'/mydir/myclass.class'

where *mydir* is the path name of the directory in which your Java application is saved, and where *myclass* is the name of your compiled Java application.

Note: See *AS/400 Developer Kit for Java* documentation for more information about the parameters on the CRTJVAPGM command.

4. In the *Optimization* field, type **10**.

Note: You can specify an optimization level of up to 40. An optimization level of 40 increases the efficiency (i.e. running speed) of the Java application, but it also limits debug capabilities. In the early stages of developing a Java application, you may want to set your optimization level at 10 so you can more easily debug your application. See *AS/400 Developer Kit for Java* documentation for more information.

5. Press the **Enter** key.

A message appears, stating that a Java program has been created for your class.

6. Press **F12** to exit CL command entry and return to Qshell.

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Running your Java application from Qshell Interpreter

To run your Java application on your AS/400:

1. On the Qshell command line, type:

java *myclass*

where *myclass* is the name of your compiled Java application.

Press the **Enter** key.

2. Your Java application runs. After it is finished, the shell prompt (by default, a **\$**) appears, signalling that Qshell is ready for another command.

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Creating graphical applications with Java on AS/400

If you are familiar with Java programming, you know that Java provides graphical user interface classes. Currently, the Swing and Abstract Window Toolkit (AWT) classes provide graphics for Java applications. However, AS/400 does not currently support Java windowing graphics on locally-attached terminals or emulator sessions.


AS/400 Developer Kit for Java features Remote AWT capabilities. With Remote AWT configured on your AS/400 and a client workstation, the AWT graphics of your AS/400 Java application (running on your AS/400) can be displayed remotely on your client workstation.

To set up Remote AWT, visit the AS/400 Developer Kit for Java documentation on setting up Remote AWT.



Chapter 5. Other information about Java and AS/400

Learn Java! Take a look at some Java education links. And, be sure to look at this list of Java and AS/400 resources which points to books, manuals, websites, magazines, and newsgroups discussing Java on AS/400.


Internet applications, Java, and the AS/400 system

- Servlets Create servlets and put the web, Java, and AS/400 together.
- *Building AS/400 Internet-Based Applications with Java*  shows how to design and build AS/400 Internet- or intranet-based Java applications, applets, and servlets. If you are interested in Java and AS/400's e-business capabilities, this redbook is for you. You will need Adobe Acrobat Reader to view this document.

Client/Server Java Links

- *AS/400 Toolbox for Java* product information. This is the online manual for AS/400 Toolbox for Java. Learn about the product features and how to use them. The "Tips for Programming" section, in particular, provides important tips for writing Java applications that use AS/400 Toolbox for Java classes.
- AS/400 Toolbox for Java home page .  Visit this site for information about using AS/400 Toolbox for Java, troubleshooting, code updates, and downloads.
- *Building AS/400 Client/Server Applications with Java*  (ITSO Redbook) features projects and code examples using AS/400 Toolbox for Java. (You will need Adobe Acrobat Reader to view this document.)

Java on AS/400 Links

- *AS/400 Developer Kit for Java* product documentation. This is the online manual for AS/400 Developer Kit for Java. Learn about the product features and how to use them.
- *Java for RPG Programmers*.  Currently, this is the only AS/400-specific introduction to Java. Even if you do not know RPG, you will still find the book invaluable for its description of Java in AS/400 terms.

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Getting Started with Java and AS/400: Servlets






Servlets are Java applications that run on and interact with a Java-enabled web server. Just as applets run in a browser's Java virtual machine, servlets run in a web server's Java virtual machine.

Servlets perform many of the same functions that CGI (common gateway interface) programs do. However, because servlets can be pre-loaded by the web server, servlets are usually faster than CGI programs that perform the same functions. Servlets are also easier to write and maintain than CGIs, and they are reusable across other server platforms.

The first step to getting started with servlets is to set up your web server with a Java runtime. To do this, install a Java application server on your AS/400. IBM WebSphere Application Server 2.03 for AS/400 comes free with V4R5 OS/400.

Setting up WebSphere Application Server 

More servlet resources

- **IBM WebSphere Application Server** 
- *“Servlets: The New 5250 Model”* 
- **Introduction to servlets on AS/400 (V4R3)** 
- **JavaSoft Servlets** . This site is Sun Microsystem’s home for Java Servlets. Check out the Servlet API (applied programming interface) and links to other non-platform specific servlets resources.
- **Servlet Central**  is an on-line “Server-side Java Magazine” which features articles about servlet development. It has an extensive Resources section with links to other servlet information.
- **WebSphere Application Server PTFs** Lists the PTFs needed to ensure Websphere runs correctly.

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Java and AS/400 resources

If you find a helpful Java and AS/400 source on the Internet that is not listed here, send us your comments.

- Books (page 20)
- Product documentation (manuals)
- ITSO Redbooks
- Magazines (page 21)
- Internet sites (page 21)
- Newsgroups, forums, and mailing lists

Note: See the Java education page for information about learning the Java programming language.

Books

- *Java for RPG Programmers*  by Phil Coulthard and George Farr of IBM Toronto. Currently the only available AS/400-specific guide to Java, this book is extremely helpful for Java programming on AS/400. Also includes a MINQ Java tutorial CD-ROM, *Introduction to Java Programming using VisualAge for Java Enterprise*.



Product documentation (manuals)

- *AS/400 Developer Kit for Java*


- *AS/400 Toolbox for Java*
- *Qshell Interpreter*

ITSO Redbooks

ITSO Redbooks 

- *Building AS/400 Applications with Java*  has examples of migrating RPG applications to Java.
- *Building AS/400 Client/Server Applications with Java*  features projects and code examples using AS/400 Toolbox for Java.

Note: You will need Adobe Acrobat Reader  to view this document.




- *Building AS/400 Internet-Based Applications with Java*  shows how to design and build AS/400 Internet- or intranet-based Java applications, applets, and servlets. If you are interested in Java and AS/400's e-business capabilities, this redbook is for you.






Note: You will need Adobe Acrobat Reader  to view this document.

Magazines

- *NEWS/400* magazine  offers several good AS/400 and Java resources in its Java Community  such as *The Java Tutorial*, Java articles archive, and a Java newsletter called *Java Enterprise Solutions*.
- *Midrange Computing* magazine .  Since MC does not publish many of their articles on the Internet, you will probably want to get a subscription for the good Java articles they frequently feature. You can also browse through and order back issues for any good articles you might have missed. MC also publishes the *AS/400 NetJava Expert*  newsletter.

Internet sites

- AS/400 and Java home page  features white papers on AS/400 and Java, providing links to other Java resources.
- AS/400 Toolbox for Java home page.  View all sorts of information about AS/400 Toolbox for Java, including evaluation downloads, troubleshooting, and frequently-asked questions.
- Qshell Interpreter home page  provides references, downloads, and frequently-asked questions about the Qshell Interpreter licensed program.

- AS/400 Partners in Development Java page.  The most comprehensive site dedicated to Java and AS/400, this home page features articles, demonstrations, solutions, resources, and information about “real world” Java implementations by AS/400 business partners.
- IBM Centre for Java Technology Development.  Visit this site from IBM Hursley for Java news, information, free code downloads, and environment support for all IBM platforms.
- IBM Java home page.  Subtitled “The Ultimate Resources for Java Developers,” IBM’s main Java site offers developer tools and assistance, technology previews, Java tutorials and education, feature articles, and JCentral, a search engine tuned to Java on the Internet.
- IBM SanFrancisco home page.  IBM SanFrancisco is a Java-based collection of business application components that allows you to assemble server-side applications from pre-existing parts. The SanFrancisco home page provides information and resources about the project.
- VisualAge for Java and AS/400 home page.  If you are interested in what an integrated development environment (IDE) like VisualAge for Java can do for your Java and AS/400 programming, see this site.

Newsgroups, forums, and mailing lists

Newsgroups

- IBM Hursley AS/400 Java Environment newsgroup 
- AS/400 newsgroup 

Forums

- IBM Hursley AS/400 Java Environment forum 
- *Midrange Computing* Java Programming Discussion forum 
- *News/400* Java forum 

Mailing lists

- *MIDRANGE dot COM* JAVA/400 mailing list 

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Java education




Learning Java does not have to be expensive. You can find several good Java tutorials on the Internet as well as other materials like books and articles.

Listed below are some good resources for learning about Java programming. See both 22 and 23 links.

See Java and AS/400 resources for other links that will be helpful in your Java education. **AS/400-specific Java education**

- AS/400 Partners in Developer Java Education  features AS/400-specific Java education such as books, Internet-based courses, classroom training, and workshops.
- This course is part of the IBM Education and Training AS/400 Curriculum. 
- NEWS/400's Java Tutorial  features a collection of articles written by Java and AS/400 experts Phil Coulthard and George Farr.
- *Java for RPG Programmers*  by Phil Coulthard and George Farr of IBM Toronto. Currently the only available AS/400-specific guide to Java, this book is extremely helpful for learning Java programming for AS/400. The book also includes a MINQ Java tutorial CD-ROM, *Introduction to Java Programming using VisualAge for Java Enterprise*.

General Java education

- IBM Java Education  includes online courses, classroom training, white papers, tutorials, articles, books, and FAQs.
- The Java Tutorial  lists online Java tutorials (basic and advanced Java topics) available from Sun Microsystems, Inc.
- Java® Programming Language Basics, Part 1  walks through how to use the Java® 2 Platform software to create and run three common types of programs written for the Java platform: applications, applets, and servlets. (Sun Microsystems, Inc.)

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