IBM

IBM COBOL Set for AIX
Getting Started

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> **Note!**
>
> Before using this information and the product it supports, be sure to read the general information under "Notices" on page v.

First Edition (October 1995)

This edition applies to Version 1, Release 1 of IBM COBOL Set for AIX (Part numbers 28H2176 and 33H4408) and to all subsequent releases and modifications until otherwise indicated in new editions. Make sure you are using the correct edition for the level of the product.

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Contents

Installing COBOL Set for AIX 1

Getting Started 15

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About This Book

Welcome to IBM COBOL Set for AIX, IBM's new COBOL development environment for AIX! IBM COBOL Set for AIX gives you a comprehensive development environment designed specifically for mission-critical, client/server applications.

IBM COBOL Set for AIX supports local and remote access to DB2, CICS, and VSAM, giving you access to data and transactions nearly anywhere in your enterprise. And all the IBM COBOL family of solutions support high subset ANSI 85 COBOL functions, so your applications can be ported across supported platforms, whether they are running on a mainframe, an RS/6000, or a personal computer with OS/2.

IBM COBOL Set for AIX supports object-oriented extensions, allowing you to move your applications to object-orientation at the level and pace you desire.

IBM COBOL Set for AIX provides an integrated development environment, with easy access to visual tools and project file management. IBM COBOL Set for AIX is fully integrated with the new industry-standard UNIX** interface specification, the Common Desktop Environment (CDE). CDE integrates your tools and files, so selecting a file also selects the application you need to control the execution of a program, examine and modify data, and perform many other useful functions. Integrated within the Common Desktop Environment are visual tools that will help you create, edit, debug, and manage your applications.

How This Book Will Help You

This book will help you install and get started using the IBM COBOL Set for AIX application development environment.

This book assumes experience in installing AIX programs and familiarity with using the AIX user interface. For information on AIX, see your operating system documentation.

Installing COBOL Set for AIX

"Installing COBOL Set for AIX" describes how to install IBM COBOL Set for AIX.

Installing IBM COBOL Set for AIX

IBM COBOL Set for AIX is available on CD-ROM or 8mm tape and includes the following:

- IBM COBOL Set for AIX Version 1
- IBM XLDB Source Level Debugger
- SMARTdata UTILITIES
- SMARTsort Application
- IBM Information Presentation Facility/6000 (IPF/X)
- Software Development Environment (SDE)

Specified Operating Environment

The following hardware and software requirements apply to COBOL Set for AIX.

Hardware requirements

COBOL Set for AIX Version 1 and its generated object programs run programs run on RISC System/6000 family processors running IBM AIX Version 4.1.3 (or subsequent releases), including POWER, POWER2, and PowerPC processors, configured with at least one supported display, keyboard, and mouse.

Software requirements

Required programs

COBOL Set for AIX Version 1 and its generated object programs run under the following system environment (or subsequent releases):

- IBM AIX Version 4.1.3.

Optional programs

In order to use COBOL Set for AIX with optional programs such as DB2 and CICS, additional products are required. For specific information on prerequisites and corequisites, refer to the .toc file on the product tape or CD-ROM. Some prerequisite information is also in the product Request for Announce (RFA).

How COBOL Set for AIX is packaged

This table summarizes the COBOL Set for AIX install images.

Table 1 (Page 1 of 2). COBOL Set for AIX install images		
Install Image	**Description**	**Estimated Storage Required for Installed Image (MB)**
cobol.cmp	IBM COBOL for AIX Base	8
cobol.rte	IBM COBOL for AIX Run-time	1.5

How COBOL Set for AIX is packaged

Table 1 (Page 2 of 2). COBOL Set for AIX install images		
Install Image	**Description**	**Estimated Storage Required for Installed Image (MB)**
cobol.dbg	IBM COBOL for AIX Debugger	.2
cobol.ipf	IBM COBOL for AIX On-line Documentation	3.0
cobol.man	IBM COBOL for AIX man page	.03
cobol.msg.en_US	IBM COBOL for AIX Messages	.15
cobol.msg.Ja_JP	IBM COBOL for AIX Messages	.2
cobol.msg.ja_JP	IBM COBOL for AIX Messages	.2
cobol.ps	IBM COBOL for AIX PostScript** Files	11.5
SdU.vsam	SMARTdata UTILITIES VSAM	.5
SdU.ddc	SMARTdata UTILITIES DD&C	18
SdU.dfm	SMARTdata UTILITIES DFM	4.5
SdU.sfs	SMARTdata UTILITIES Shared File System	3
SdU.ipf	SMARTdata UTILITIES On-Line Documentation	2.5
SdU.ps	SMARTdata UTILITIES PostScript Files	11.5
smartsort	SMARTsort Application	2.5
SdU.msg.en_US	SMARTdata UTILITIES Messages	.02
SdU.msg.Ja_JP	SMARTdata UTILITIES Messages	.02
SdU.msg.Zh_CN	SMARTdata UTILITIES Messages	.02
xldb	IBM XLDB Source Level Debugger	1.5
xldb.msg.Ja_JP	IBM XLDB Source Level Debugger Messages	1.5
xldb.help.Ja_JP	IBM XLDB Source Level Debugger Online Help	1.5
ipfx.rte	IBM Information Presentation Facility/6000	2
ipfxmsg.rte	IBM Information Presentation Facility/6000 Messages	2
sde.tools	Software Development Environment (SDE) Tools	5.3
sde.Dt	SDE Common Desktop Environment	1.3
sde.loc.Ja_JP	SDE LPEX Local-specific Configuration	.02
sde.loc.ja_JP	SDE LPEX Local-specific Configuration	.02
sde.msg.Ja_JP	SDE Message Catalogs	.06
sde.msg.ja_JP	SDE Message Catalogs	.06
sde.ps	SDE PostScript Files	2

Installing product images

> **Note to users**
>
> If you have a beta test (or other) version of COBOL Set for AIX currently installed
> on your system, you must DEINSTALL all files and perform a special installation
> step in order to correctly install COBOL Set for AIX.

In 8 mm format, COBOL Set for AIX, Version 1 Release 1 comes on one tape. After
installing the product, please be sure to read the product README file.

Procedure to install from tape or CD-ROM

1. **If you do not have a version (beta or other) of COBOL Set for AIX currently
   installed, skip to step 2.** If you do have a beta test version of COBOL Set for AIX
   installed, enter the following on the AIX command line:

   ```
   installp -u cobol SdU xldb ipfx sde smartsort
   ```

   This command DEINSTALLs all filesets from your system.

2. Insert the tape or CD-ROM into the appropriate drive. For most CD-ROM players,
   you must first insert the CD-ROM into a caddy, and then insert the caddy into the
   CD-ROM drive.

3. Log on as a user with root authority.

4. You can use INSTALLP from the command line to install or you can use the System
   Management Interface Tool (SMIT).

Using INSTALLP to install COBOL Set for AIX

If you want to install just COBOL Set for AIX, you need to install SdU.vsam first. Issue
the following on the command line for installation from tape (rmt0 could be rmt1 or
some other number depending on the number of tape drives you have):

```
installp -ac -d /dev/rmt0 SdU.vsam cobol
```

If you are installing from CD-ROM, you would use this slightly modified command:

```
installp -ac -d /dev/cd0 SdU.vsam cobol
```

If you want to install everything instead of just COBOL and VSAM, issue the following
command (specifying the appropriate device driver):

```
installp -ac -d /dev/rmt0 all
```

Note to users

Many of the products available require prerequisite products. If you have a problem installing something, refer to the `.toc` file for information about prerequisites and corequisites. The Request for Announce (RFA) also lists prerequisite information.

Note: The SMIT windows might vary with different levels of the AIX operating system. The figures and descriptions that follow use the windows that the majority of users will see.

Using SMIT to install COBOL Set for AIX

If you are on a server with the desktop installed, you can get to SMIT by selecting the following icons in the order listed:

1. Toolbox
2. System Administration
3. SMIT

Otherwise, you can get to SMIT by entering the following on the AIX command line:

```
smit
```

Either of these methods invokes the System Management Interface Tool (SMIT), which presents a menu driven environment for the installation process.

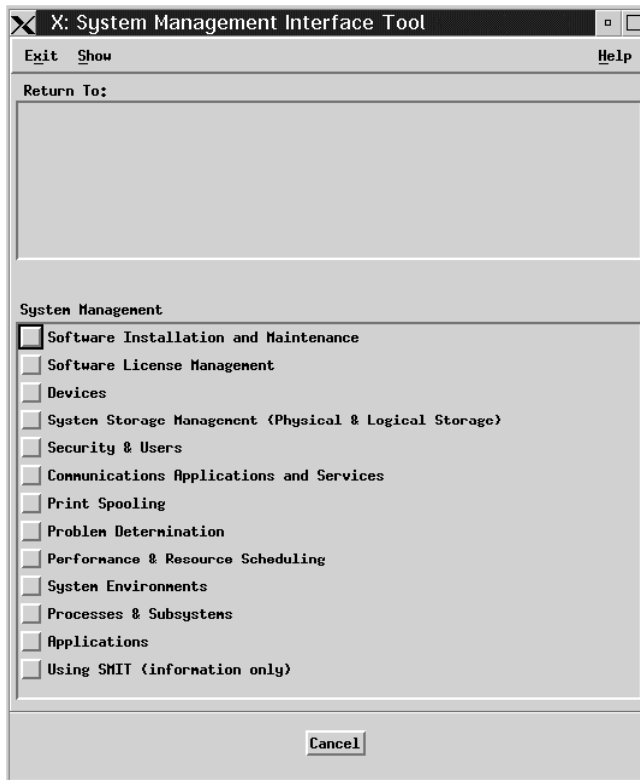1. Select `Software Installation and Maintenance` from the first panel.

Figure 1. System Management panel

2. Select `Install and Update Software` from the next panel.

```
┌──────────────────────────────────────────────────────────┐
│ X  X: System Management Interface Tool          □ ☐       │
├──────────────────────────────────────────────────────────┤
│ Exit  Show                                      Help      │
│ Return To:                                                │
│ ┌──────────────────────────────────────────────────────┐ │
│ │ ☐  System Management                                 │ │
│ │                                                      │ │
│ │                                                      │ │
│ │                                                      │ │
│ └──────────────────────────────────────────────────────┘ │
│                                                           │
│ Software Installation and Maintenance                     │
│ ┌──────────────────────────────────────────────────────┐ │
│ │ ☐  Install and Update Software                       │ │
│ │ ☐  Maintain Installed Software                       │ │
│ │                                                      │ │
│ │                                                      │ │
│ │                                                      │ │
│ │                                                      │ │
│ │                                                      │ │
│ │                                                      │ │
│ └──────────────────────────────────────────────────────┘ │
│                      ┌────────┐                           │
│                      │ Cancel │                           │
│                      └────────┘                           │
└──────────────────────────────────────────────────────────┘
```
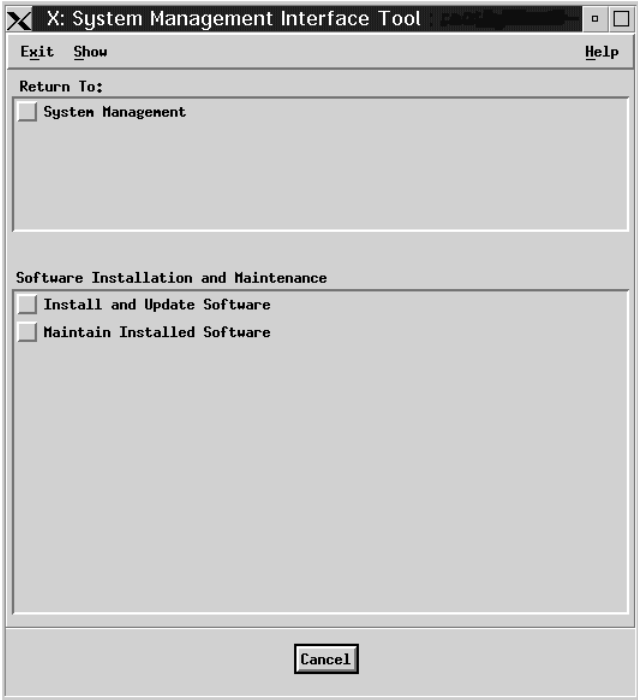
Figure 2. Software Installation and Maintenance panel

3. Next, choose `Install/Update Selectable Software (Custom Install)`.
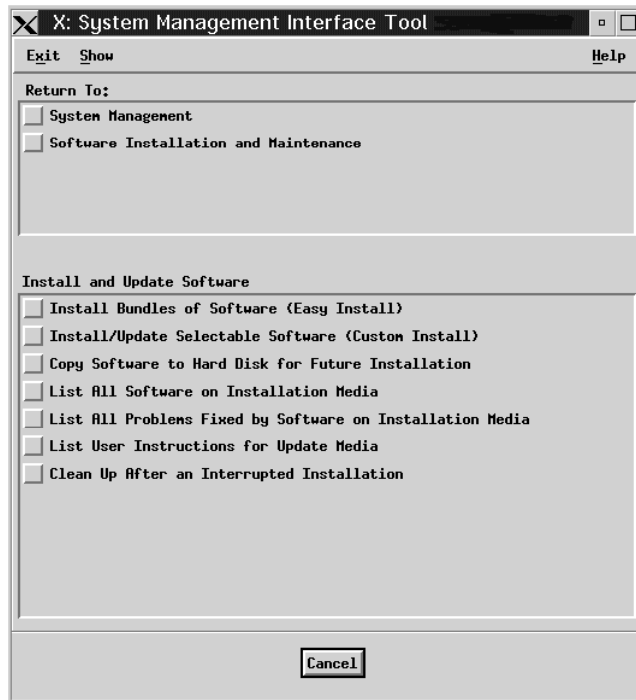

Figure 3. Install and Update Software Panel

4. You should now see a screen similar to the one shown in Figure 4. Click on
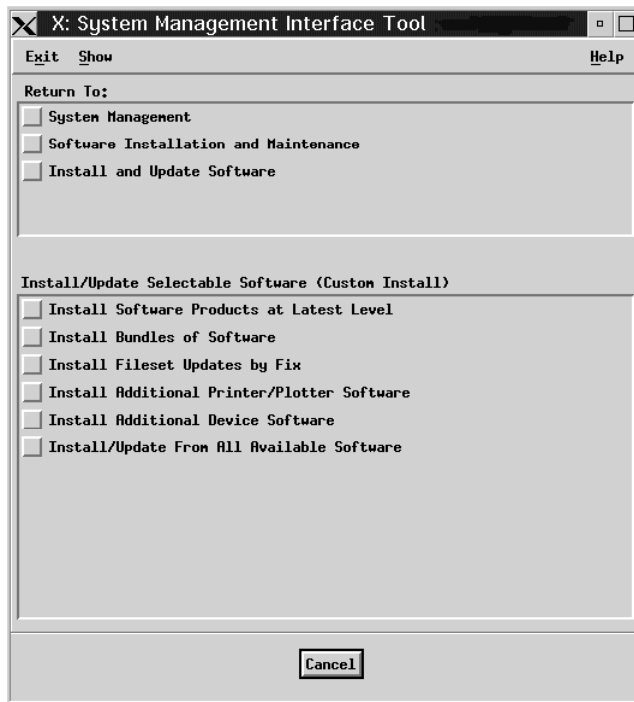   `Install/Update from All Available Software.`

Figure 4. Install/Update Selectable Software (Custom Install) panel

5. By clicking on the `List` button in the `X: Install/Update From All Available Software` window (same as Figure 6 on page 12 except the entry field is empty), you get a list of available device drivers.
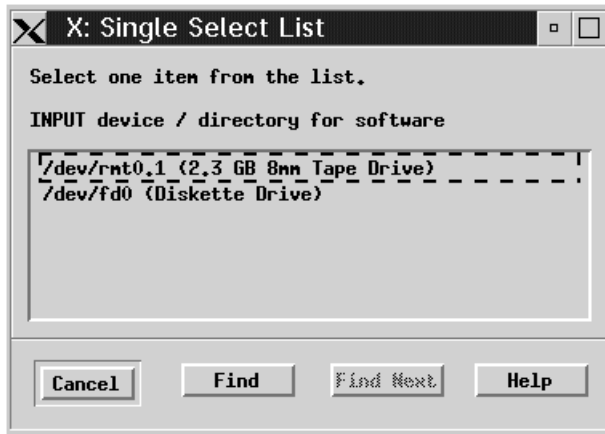

Figure 5. Single Select List panel

This example shows that the tape drive is being selected. Highlight the appropriate device drive by clicking on the text in that line. (If your machine has a CD-ROM driver, CD-ROM would also appear in the list of choices.)

Once you select the drive, focus is returned to the previous window, but this time the name of the display driver appears in the entry field as shown in Figure 6.
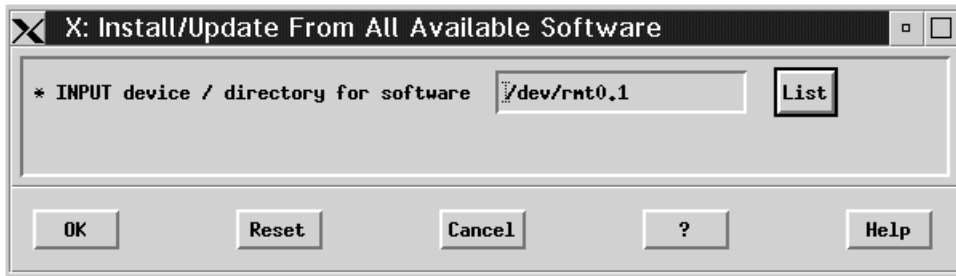

Figure 6. Install/Update From All Available Software panel (device selected)

6. In the next panel (see Figure 7), click on the List button next to the entry field for SOFTWARE to install.
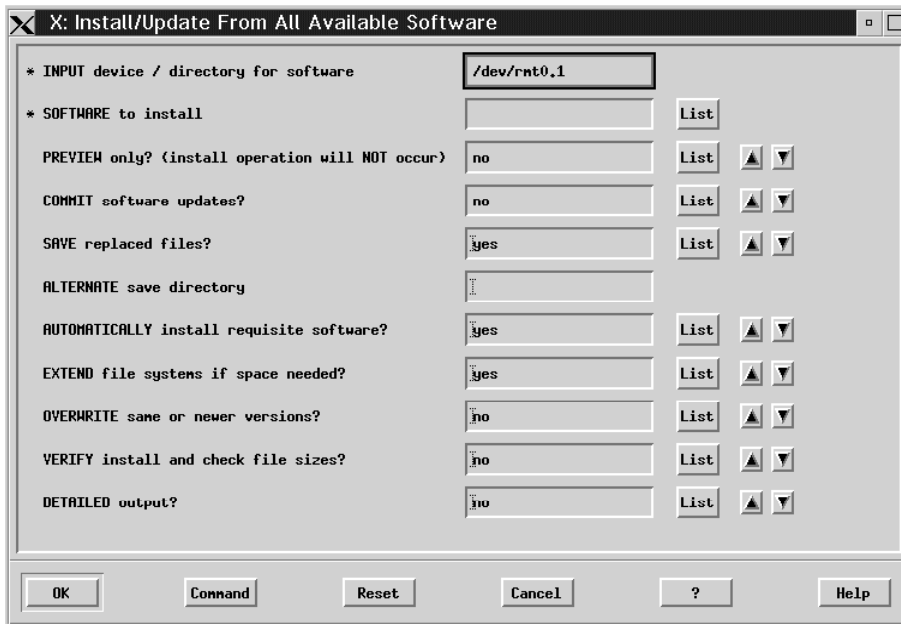

Figure 7. List all available software

This step should takes more time because it brings up a list of images available on the tape or CD-ROM. The list for COBOL Set for AIX is shown in Figure 8.

7. The final step is to select the images that you want to install by scrolling through the list and highlighting the names of the images. Figure 8 shows the cbl.* images highlighted. Even though SdU.vsam does not appear in this screen, it would also have to be selected in order to install COBOL.
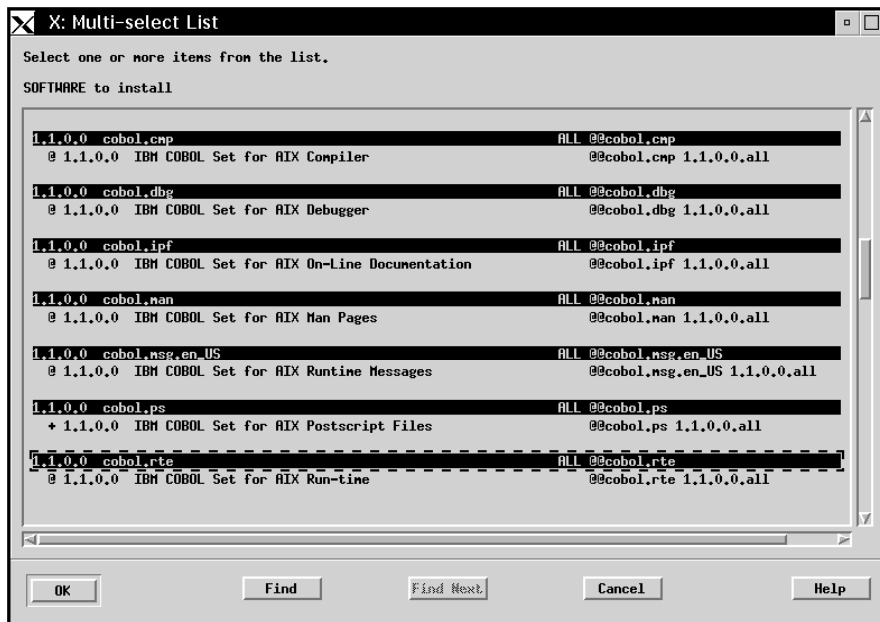
Figure 8. Multi-select list panel (COBOL images selected)

Once you have highlighted all of the images you want to install, click on the OK which returns you to the panel shown in Figure 7 on page 12. This time, however, the entry field SOFTWARE to install has the information you selected in it.

Click on the OK button to proceed with the actual installation. When the installation is complete, you can exit from SMIT and customize the COBOL compiler and installation options.

Customizing COBOL Options

You can set the COBOL compiler and installation options after you have installed COBOL Set for AIX. You can start the **Compiler Default Options Tool** in one of the following ways:

- Change directory to where compiler is installed, which is where IGYCDOPT is located. Issue the command `diamond`.

- In the current directory, use the full path name to IGYCDOPT as the command argument. For example:

  `diamond /u1/cobdev/coblcs/IGYCDOPT`

  To find IGYCDOPT, you can issue the command `which IGYCDOPT`.

To view the online help for this tool, you need to have the IBM Information Presentation Facility/6000 installed on your system.

Getting Started

"Getting Started" provides a guide to learning about IBM COBOL Set for AIX. It assumes that you have installed the product on your workstation, and that you are ready to get going. If you have not installed the product yet, follow the instructions in "Installing COBOL Set for AIX" on page 1.

You also need to know how to use a mouse to manipulate windows, icons, and other objects in the AIX user interface.

The topics in this section are:

Introducing IBM COBOL Set for AIX

IBM COBOL Set for AIX is a COBOL development environment for creating, compiling, and running applications on AIX.

It offers the best of both traditional and cutting-edge COBOL programming. It provides a set of workstation tools for developing COBOL applications. COBOL Set for AIX also features object-oriented extensions to COBOL, which enables you to create object-oriented programs in a language familiar to you.

What You Can Do Using COBOL Set for AIX

COBOL Set for AIX enables you to create stand-alone AIX COBOL applications and to integrate your COBOL application across a client/server environment.

Create AIX COBOL Applications

COBOL Set for AIX provides a complete set of visual, workstation application development tools to edit, compile, and debug your code.

Create Client/server Applications

COBOL Set for AIX provides client/server support not only through its ability to run COBOL programs on many different platforms, but also through its ability to access data sources throughout your enterprise.

COBOL Set for AIX enables you to create applications with AIX as your client and either OS/2, AIX, or MVS as the server.
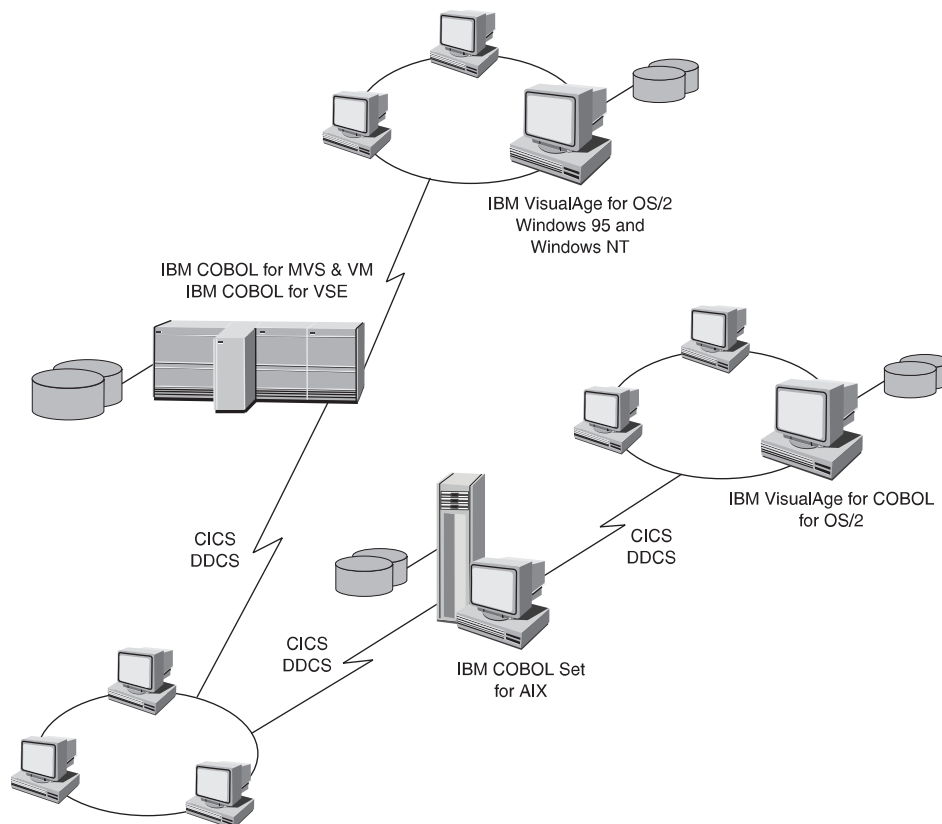
Figure 9. Client/server Computing Using COBOL Set for AIX. The COBOL Set for AIX execution environment crosses many platforms.

For data support, COBOL Set for AIX gives you local and remote access to DB2, CICS, and VSAM.

Create Object-Oriented Applications

COBOL Set for AIX's object-oriented extensions offer greater opportunities for extending and reusing software. They enable you to develop new applications by defining data and the functions that operate on that data together in software modules called **classes**. This gives you the flexibility to change the structure of the data later without having any impact on the applications that access that data. These classes can then serve as the building blocks for reuse.

Your COBOL Set for AIX Development Environment

COBOL Set for AIX provides a complete development environment for creating the many possible types of applications. Common Desktop Environment (CDE) integrates your development environment by organizing your workplace into a logical grouping of source files and their associated tools.

Edit, Compile, and Debug

COBOL Set for AIX provides a set of visual tools to edit, compile, and debug your programs. When you set up your application project, these tools are available from the pop-up menus of your source files.

Analyze Program Performance

The COBOL Set for AIX compiler can produce profiling information, which enables you to tune and understand your programs. The information can be examined by AIX profiling commands, such as **prof**, **gprof**, and **tprof**.

Depending on the level of profiling information you choose, you can get different levels of information about your program's performance. Not only can the commands trace procedures in your executable module, they can also trace entry points to AIX and application shared libraries. They can also monitor your program execution and generate a statement-by-statement trace of the run.

Access Local and Remote Data

COBOL Set for AIX provides you with access to your data in the following ways:

- VSAM data locally using the VSAM/6000 record file system and remotely using VSAM APIs

- Local and remote DB2 data using DB2/6000

- Local and remote data access using CICS for AIX.

Now that you know about some of the basic concepts, you are ready to develop your first COBOL Set for AIX application.

Build Your First COBOL Set for AIX Application

The chapter will to guide you through building your first COBOL Set for AIX application. The steps you follow here teach you the basic principles that you will use for further applications that you build. When you finish, you will have an application that displays a customized greeting.

Figure 10 shows you what the application's interface will look like when you have finished.
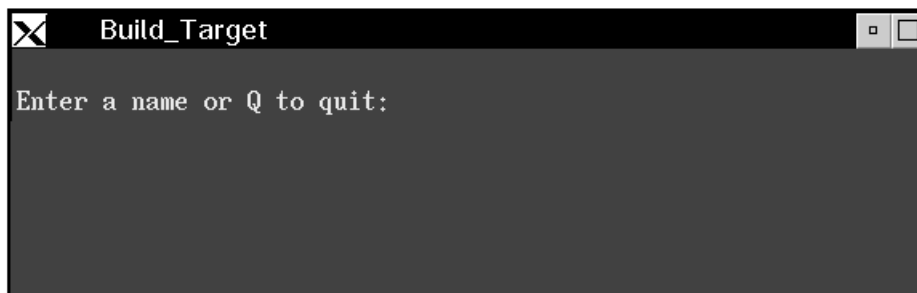
Figure 10. Hello Application. A COBOL program you can create using COBOL Set for AIX.

The main steps are:

- Creating the Application
- Building the Application
- Debugging the Application
- Running the Application

This chapter assumes that you are familiar with using the AIX user interface.

Creating the Application

To create the application, you will use the LPEX Editor to create your COBOL source file.

1. Double-click on the **LPEX Editor** icon in the **&aixcobaf.** application folder. The **LPEX Editor File Name** dialog box appears.

2. In the **File Name** entry box, type the file name `hello.cbl`. This will create the file in the current directory. To save the file in a different directory, type the path name before the file name.

3. Click on **OK**. The dialog box closes and the LPEX document and message windows open, as shown in Figure 11 on page 22.

Figure 11. LPEX Editor Document and Message Windows

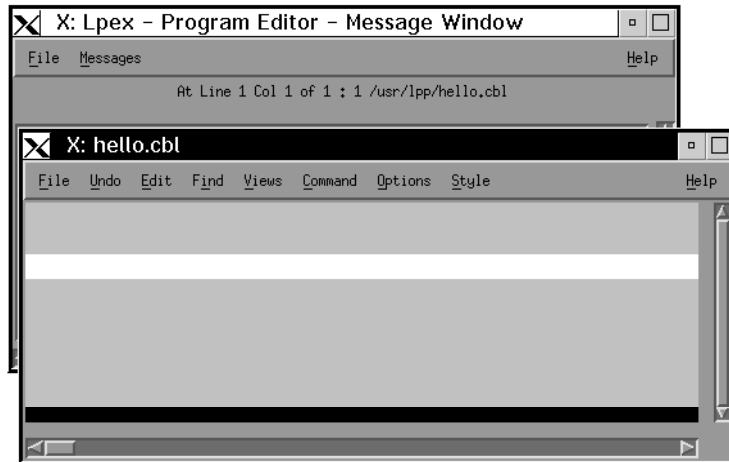> **Note:** Detailed online help is available for the LPEX Editor. If you need more information on using LPEX, click on the **Help** button on the menu bar.
>
> Select **Overview** to get overview information on LPEX.
>
> Select **On Item** to get help on a particular screen item. When you select **On Item**, the cursor changes into a question mark. Move the question mark over the screen item you want help on, then click on the left mouse button.
>
> Press **F1** to get information about the specific screen you have selected.

4. Enter the source code for the Hello program into the LPEX document window, as shown in Figure 12 on page 23. To add blank lines to the document window, press the **Enter** key.

Note that there are two bugs in the HELLO program. The first is a syntax error in the ACCEPT statement. The variable INPUT-NAME is misspelled. You will fix this later using the Program Builder and LPEX. The second bug is a logic error in the IF statement. The program prompts the user to "Enter a name or Q to quit:," yet the program only tests for lowercase q. You will use the Program Debugger to fix this later.

```
*************************************************************
 IDENTIFICATION DIVISION.
*************************************************************

 PROGRAM-ID.    HELLO.
 AUTHOR.        Tester.

*************************************************************
 ENVIRONMENT DIVISION.
*************************************************************
 CONFIGURATION SECTION.
*SOURCE-COMPUTER.
*OBJECT-COMPUTER.

*************************************************************
 DATA DIVISION.
*************************************************************
 WORKING-STORAGE SECTION.

 01  PROGRAM-WORK-FIELDS.
     05  INPUT-NAME           PIC X(30).
     05  OUTPUT-NAME          PIC X(37).

 01  PROGRAM-FLAGS.
     05  LOOP-FLAG            PIC 9(01).
         88  LOOP-DONE                   VALUE 1.
         88  LOOP-NOT-DONE               VALUE 0.

*************************************************************
 PROCEDURE DIVISION.
*************************************************************

 0000-MAINLINE.

     INITIALIZE PROGRAM-WORK-FIELDS
             PROGRAM-FLAGS.

     PERFORM UNTIL LOOP-DONE
         DISPLAY " "
         DISPLAY "Enter a name or Q to quit:"
         ACCEPT INPUT-NAEM
         IF INPUT-NAME = "q"
             SET LOOP-DONE TO TRUE
         ELSE
             MOVE SPACES TO OUTPUT-NAME
             MOVE "Hello, " TO OUTPUT-NAME (1:7)
             MOVE INPUT-NAME TO OUTPUT-NAME (8:30)
             DISPLAY OUTPUT-NAME
         END-IF
     END-PERFORM.

 0000-EXIT.
     GOBACK.
```

Figure 12. Source Code for the Hello Application

5. When you have finished creating the source program, you can close the LPEX
   document window. Select **File**, then select **Close Document**. Leave the LPEX
   Message window open; you will need to reopen your source file to fix the logic
   error later.

Now that you have created your source file, you are ready to build the application.

Building the Application

Use the Program Builder to build your COBOL applications. Building an COBOL Set for AIX application using Program Builder involves creating a makefile and creating a target executable.

Note: You need /usr/dt/bin in your path.

Creating the Make File

The makefile tells the build program how to create the target program; for example, which compiler options to use when creating the program.

You use the makefile to tell the build program what the *target*, or final output from the build will be. A target can be either a library or a program. The makefile lists file dependencies and contains rules for generating one type of file (for example, the object file) from another type (for example, COBOL source).

To create the makefile for the Hello program:

1. Double-click on the **Program Builder** icon in the **&aixcobaf.** application folder. The Program Builder window appears, as shown in Figure 13.
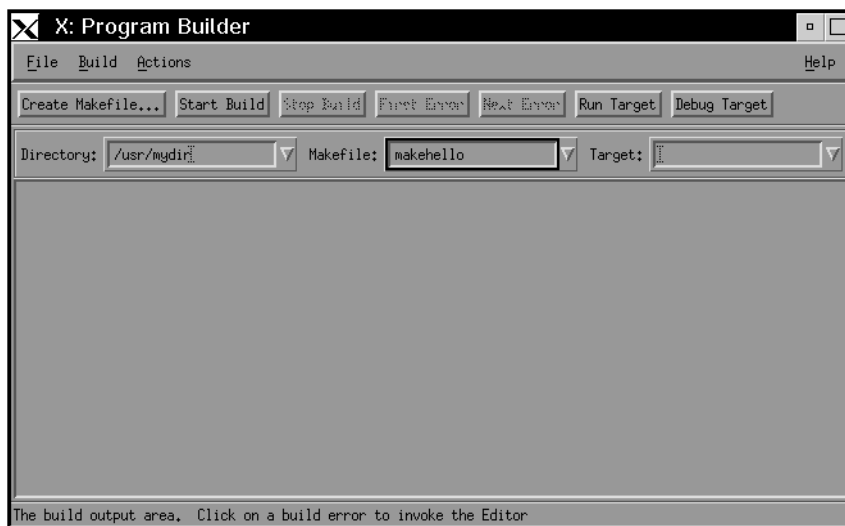
```
┌────────────────────────────────────────────────────────────────────┐
│ ▧  X: Program Builder                                        ▫ □    │
├────────────────────────────────────────────────────────────────────┤
│ File  Build  Actions                                          Help  │
├────────────────────────────────────────────────────────────────────┤
│ Create Makefile... │ Start Build │ Stop Build │ First Error │ Next Error │ Run Target │ Debug Target │ │
│                                                                      │
│ Directory: │/usr/mydir│  ▽  Makefile: │makehello│  ▽  Target: │    │ ▽ │
│ ┌──────────────────────────────────────────────────────────────┐   │
│ │                                                                │   │
│ │                                                                │   │
│ │                                                                │   │
│ │                                                                │   │
│ │                                                                │   │
│ │                                                                │   │
│ │                                                                │   │
│ │                                                                │   │
│ │                                                                │   │
│ │                                                                │   │
│ └──────────────────────────────────────────────────────────────┘   │
│ The build output area.  Click on a build error to invoke the Editor │
└────────────────────────────────────────────────────────────────────┘
```

Figure 13. Program Builder window

2. Since you are creating a new makefile for the Hello program, enter makehello in the **Makefile** field. This will be the name of the new makefile.

3. Click on the **Create Makefile**. The Create Makefile window appears.

4. To specify the program hello.out as the target, click on the **Program** button. Type the name hello.out in the **Program** field.

5. To specify the COBOL linker, go to the **Linker** pane and select **cob2** as the linker in the **Command** box. Click on the **Apply** button to save the settings for the project. The Create Makefile window should now resemble Figure 14 on page 25.
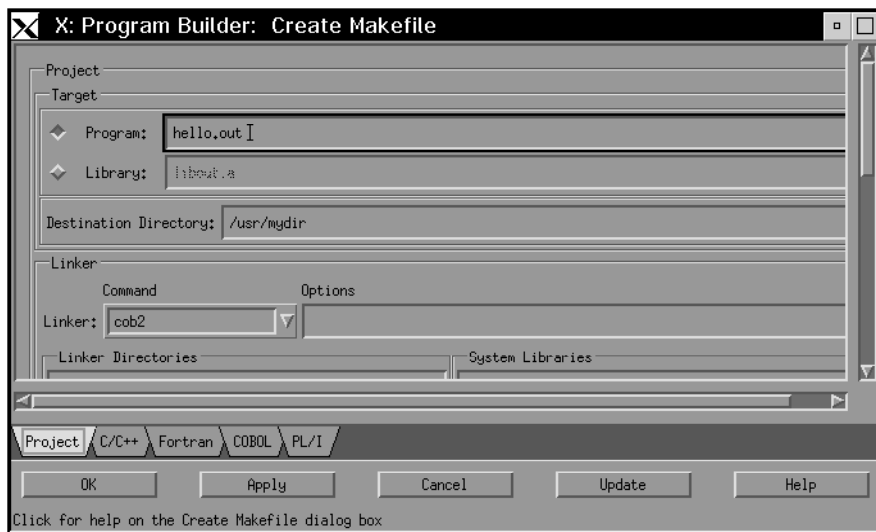

Figure 14. Create Makefile window with Project settings

6. You also set compiler options for your program in the Create Makefile window. Click on the **COBOL** tab at the bottom of the Create Makefile window. The COBOL window appears.

7. In the **Compiler** pane, click on the **Prepare object code for debugging** button or type -g in the **Options** field. This specifies that the compiler produces symbolic information used by the Program Debugger. The COBOL window should now resemble Figure 15 on page 26.
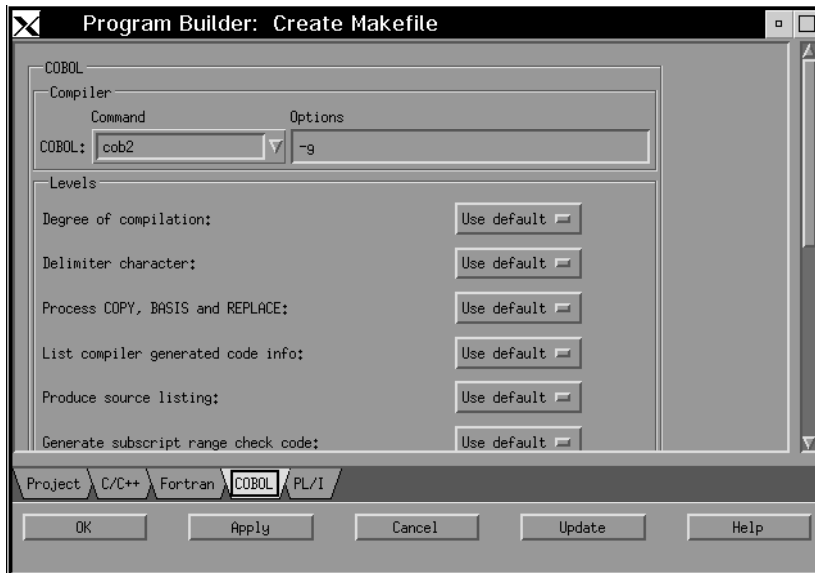
Figure 15. Create Makefile window with COBOL settings

> 8. Click on the **OK** button to close the dialog box and create the makefile.

Now that you have created the makefile for the Hello program, you are ready to build the target.

Building the Target

When you build the target, Program Builder runs the makefile and the target is created.

To build the Hello program:

1. Ensure that the source file, `hello.cbl`, is accessible to the Program Builder. Check the directory name shown in the **Directory** field and make sure it is the directory in which you have stored `hello.cbl`.

2. Ensure that the **Target** field is blank, so that Program Builder will use the target `hello.out` you specified in the makefile.

3. Check that the **Makefile** field shows `makehello`, the makefile for the Hello program.

4. Click on the **Start Build** button.

The Program Builder compiles and links the `hello.cbl` file into `hello.out`, the executable program. The bottom part of the Program Builder window shows output from the build operations. Because the `hello.cbl` source file has a syntax error in the ACCEPT statement, the Hello program is built with errors. You can correct errors found during build from the Program Builder window.

Fixing Errors during Build

When Program Builder encounters errors during build, such as syntax errors, it displays them in the Program Builder window. To fix these errors, you can click on the error line or click on the **First Error** button. This will display the source file in an LPEX editor window at the point at which the error occurred. You can quickly fix the error and rebuild the program.

To fix the error in the Hello program:

1. Click on the error line or the **First Error** button in the Program Builder window.

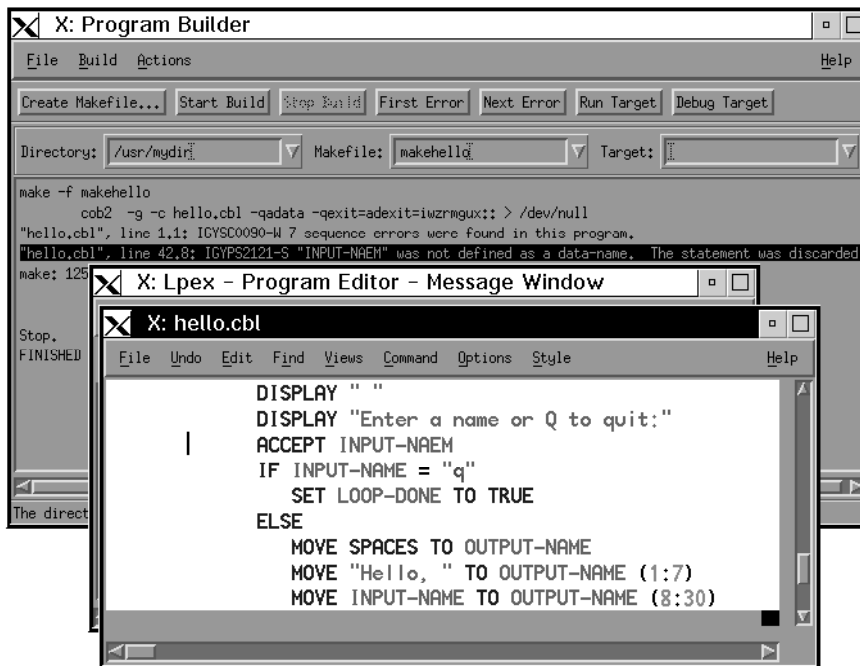2. LPEX displays the source file, positioned at the error, as shown in Figure 16.

Figure 16. Program Builder and LPEX windows. These tools enable you to easily fix errors found during build.

3. Change the ACCEPT statement to read as follows:

   ```
   ACCEPT INPUT-NAME
   ```

4. Save the file.

5. In the Program Builder window, click on the **Start Build** button again.

The Hello program should now build without errors.

Debugging Your Application

Although the Hello program built without errors, the program contains the error in the IF statement.

To debug the Hello program:

1. Ensure that hello.out is specified in the **Target** field.

2. Click on **Debug Target**. The Program Builder starts the Program Debugger (xldb) to debug the project target, as shown in Figure 17.

   Optionally, you can drag[1] the executable file from the File Manager window and drop it on the **Debugger** icon.

Figure 17. Program Debugger window

3. From the Debugger source window, set a breakpoint on the IF statement by clicking on it with the left mouse button.

4. To see the values of the variables when you run the program, click on the PROGRAM-WORK-FIELDS in the Locals window with the left mouse button. In the structure window, click on **more**. Click on PROGRAM-WORK-FIELDS in the Locals window again, then click on **more** in the structure window again. You should see the following in the Locals window:

---

[1] To drag and drop an object, move the mouse pointer over the object you want to move or copy and press the left mouse button. Move the object over the place you want it, then release the mouse button.

```
PROGRAM-WORK-FIELDS: { INPUT-NAME: Z""
                       OUTPUT-NAME: Z""}
```

When the INPUT-NAME and OUTPUT-NAME variables change, you will be able to
see the result.

5. Run the program to the IF statement by clicking on **Continue** in the Commands
   window.

6. Enter Q when the application prompts you to do so. The program stops at the
   breakpoint on the IF statement.

7. Run the IF statement by clicking on **Next** in the Commands window. Notice that
   the IF test failed and the program took the ELSE path.

8. Notice that the value of INPUT-NAME in the Locals window is **Q**, yet the program
   tests for **q**.

9. Exit the Debugger and fix the bug in the source file. Click on **Exit** in the Com-
   mands window to exit the Debugger.

To fix the bug in the program, you need to edit the hello.cbl source file.

1. You can drag the hello.cbl file from the File Manager and drop it onto the **LPEX**
   icon, or you can follow these steps:

   a. Locate the LPEX message window and select **Edit**. A File Selection dialog
      appears.

   b. To open hello.cbl, find that file name in the list of files, then click on it.

   c. Ensure that hello.cbl appears in the **Open file** field near the bottom of the
      dialog window.

   d. Click on **OK** to load the file.

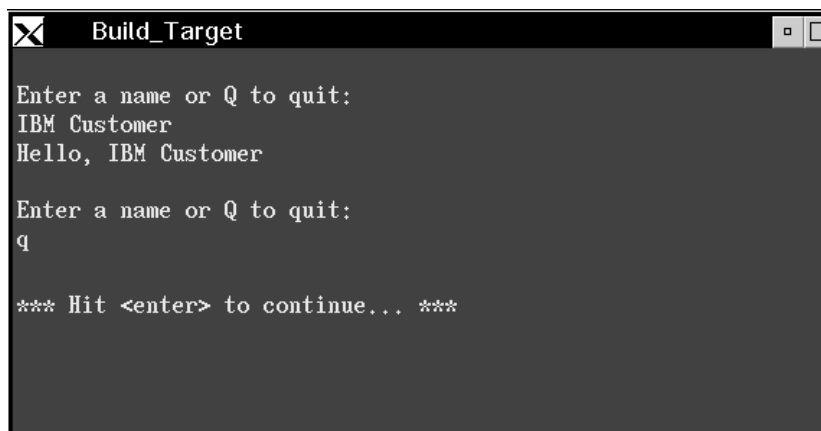2. Change the IF statement to read as follows:

   ```
   IF FUNCTION UPPER-CASE (INPUT-NAME) = "Q"
   ```

3. In the document window, select **File**, then select **Close Document**. Click on **Yes**
   in the Quit confirmation dialog.

Now that the bug is fixed, click on the **Start Build** button to rebuild the program. The
program should now build and run without errors.

Running Your Application

To run the Hello program:

1. Ensure that hello.out is specified in the **Target** field of the Program Builder window.

2. Click on **Run Target**

3. The Hello program runs, as shown in Figure 18. Enter a name, then enter Q or q to quit the program.

```
Build_Target

Enter a name or Q to quit:
IBM Customer
Hello, IBM Customer

Enter a name or Q to quit:
q

*** Hit <enter> to continue... ***
```

Figure 18. The Hello application in action...

Tools in the COBOL Set for AIX

COBOL Set for AIX consists of several application development tools. This section provides an overview of these tools.

Common Desktop Environment

The Common Desktop Environment (CDE) integration for COBOL Set for AIX consists of a COBOL application folder, which is integrated within the CDE Application Manager. The COBOL Set for AIX application folder contains icons representing tools and applications. The COBOL application folder contains icons for the LPEX Editor, Program Builder, Program Debugger, and COBOL Set for AIX Documentation.

CDE integration of the COBOL tools enables you to invoke the tools in a simple and consistent manner. You can

- Double-click on an icon to launch the correct application for the file.

  For example, you can double-click on a COBOL source file to display the file in the LPEX editor.

  CDE recognizes different types of files using a data-type database. A data type identifies the files of a particular format and associates them with the appropriate applications. These associations mean that you do not have to remember command line invocations for your tools.

- Drag a file icon and drop it onto one of the COBOL Set for AIX tools.

  For example, to open a COBOL source file, you can drag the icon from the File Manager or the Desktop and drop it onto the **LPEX** icon. LPEX opens with the COBOL source file displayed and ready for editing.

- Click on an object in the File Manager with the right-hand mouse button to display the actions you can perform on the object you have selected.

  For example, you can click on an icon representing a particular COBOL source file (an object), and the available actions displayed are **Open**, **Make**, and **Print**, where **Open** displays the COBOL source file in an LPEX window.

  The actions available on an executable file are different, because it is a different object type. When you click on an executable file with the right-hand mouse button, the available actions are **Execute**, **Make**, **Debug**, and **Edit**.

LPEX Editor

The LPEX Editor provides parsers for COBOL and other programming languages. For example, different COBOL constructs, such as comments, are shown in different colors. This enables you to quickly find items in your source code, and even identify some syntax errors before you compile the program.

31

COBOL for AIX

COBOL Set for AIX supports development of new COBOL applications that are targeted for the workstation environment.

Compiler and Run-time Environment

The COBOL Set for AIX compiler and run-time environment supports the high subset of ANSI 85 COBOL functions, just like the other IBM COBOL products. Your applications can be compiled and run on supported platforms, whether they are created on a mainframe, an AIX workstation, or a personal computer with OS/2.

There are some differences between IBM COBOL for MVS & VM and COBOL Set for AIX . These differences are documented in the *Summary of Differences: Host COBOL and Workstation COBOL* sections of the *IBM COBOL Set for AIX Programming Guide* and the *IBM COBOL Language Reference*.

Object-oriented Extensions

COBOL Set for AIX's object-oriented (OO) language extensions are based on the emerging ANSI OO COBOL standard and are a syntax extension to COBOL. These are the same OO extensions you get with IBM COBOL for MVS. These extensions implement a complete OO paradigm that allows you to define object classes, instantiate objects, subclass objects, and have objects inherit characteristics from other objects.

COBOL Set for AIX creates language-neutral objects that interoperate with objects created in other SOM[2]-enabled OO languages. This is provided through COBOL Set for AIX's Direct-to-SOM capability.

C Interoperability

COBOL Set for AIX supports interoperability with C. Your COBOL program can pass parameters on CALL statements so that CALLs to C functions can be made matching all the parameter types that C supports. COBOL programs can also receive returned values from C functions using the CALL...RETURNING language extension.

Distributed Data Access

COBOL Set for AIX also provides a set of functions that enable your applications to handle data across distributed environments. These services include:

Local VSAM record file system

Transparent access from your COBOL programs to remote VSAM record files using local VSAM APIs

---

[2] SOM, or *System Object Model*, is the IBM object-oriented programming technology for building, packaging, and manipulating class libraries. SOM conforms to the Object Management Group's (OMG) Common Object Request Broker Architecture (CORBA) standards.

Copy, sort, and merge functions for both record and byte files

General data conversion APIs and services for both character and numeric data.

These services complement their counterpart services on the mainframe, enabling you to create client/server and cooperative processing applications using the IBM COBOL language. Your applications can also call the utilities directly using the application programming interfaces (APIs) that come with the utilities.

Program Builder

The Program Builder manages the repetitive tasks of compiling, linking, and correcting errors in program source code. It provides a graphical user interface to simplify setting and saving compiler and linker options.

Program Builder provides a window to list build errors. Selecting a compile error in the list launches the LPEX Editor with the appropriate source file and positions the cursor at the error.

Program Builder also creates a makefile that is used by the AIX make command to construct and maintain programs and libraries. It determines build dependencies by scanning the source code files for dependency information.

Program Debugger

The Program Debugger (xldb) helps detect and diagnose errors in code developed with the COBOL Set for AIX.

The Program Debugger provides several windows where you can display debugging information and perform debugging actions.

Using the Program Debugger, you can run your program, set breakpoints, monitor variables, monitor the registers, and monitor storage and the call stack. You can also debug C, C++, FORTRAN, and PL/I functions that your application might use.

Tasks and Information for COBOL Set for AIX

The following table maps the tasks you can perform with COBOL Set for AIX to the steps for beginning the task and the information you need to continue the task.

To do this	Here's how to get started	For more information, see
Install the products	Insert the COBOL Set for AIX CD-ROM or tape in the CD-ROM or tape drive. Follow the installation instructions.	"Installing COBOL Set for AIX" on page 1
Customize COBOL options	Invoke the **Compiler Default Options Tool** after installing COBOL Set for AIX to set COBOL compiler and installation options.	"Customizing COBOL Options" on page 14
Learn about COBOL Set for AIX	Double-click on the **&aixcobaf. Set Documentation** icon in the **&aixcobaf.** application folder.	*IBM COBOL Set for AIX Getting Started*
Create COBOL source code	Open the LPEX Editor and create a COBOL source file with the extension `.cbl`. Enter the COBOL source code.	*IBM COBOL Set for AIX Programming Guide* *IBM COBOL Language Reference Manual* *LPEX User's Guide and Reference*
Edit a COBOL source file	Drag the COBOL file from the File Manager and drop it onto the **LPEX Editor** icon.	LPEX Editor online help *LPEX User's Guide and Reference*
Build a COBOL program	Double-click on the **Program Builder** icon in the **&aixcobaf.** application folder. Specify your COBOL source file as the target, create the makefile and specify compiler options using the **Create Makefile** dialog, then select **Start Build**.	Program Builder online help *Program Builder User's Guide*
Debug and test your programs	Build your program using the debug option. From the **Program Builder** window, ensure that the executable program to be debugged is the target, and select **Debug Target**.	Program Debugger online help Program Builder online help *Program Builder User's Guide*
Analyze program performance	Set the **-p** or **-pg** compiler options, then build your program. Use one of the AIX profiling commands (**prof**, **gprof**, or **tprof**) to analyze the program.	Program Builder online help *Program Builder User's Guide* *IBM COBOL Set for AIX Programming Guide*
Access DB2 data	Create a COBOL source file. See the *IBM COBOL Set for AIX Programming Guide* for considerations for creating COBOL programs that access DB2 data.	*IBM COBOL Set for AIX Programming Guide*
Create CICS transactions	Create a COBOL source file. See the *IBM COBOL Set for AIX Programming Guide* for considerations for creating COBOL programs that use CICS.	*IBM COBOL Set for AIX Programming Guide*

To do this	Here's how to get started	For more information, see
Access VSAM files (remote file access)	This is an advanced topic. See the referenced publications for information on how to perform this task.	*IBM COBOL Set for AIX Programming Guide*
		VSAM in a Distributed Environment
Write object-oriented applications.	This is an advanced topic. See the referenced publication for information on how to perform this task.	*IBM COBOL Set for AIX Programming Guide*
Print COBOL Set for AIX publications	The COBOL Set for AIX publications are included as PostScript files with the product. The files are located in the **/ps** directories. Use your site's procedures for printing PostScript files.	"Printing Publications" on page 39
Understand warranty information	See the enclosures in the COBOL Set for AIX product box.	*IBM COBOL Set for AIX License Information*
		Program License Agreement

Using the Information with COBOL Set for AIX

You can get information from many sources while using COBOL Set for AIX. Besides this guide, there is:

- *IBM COBOL Set for AIX Programming Guide*, which helps you create, compile, link, and run COBOL Set for AIX application programs

- *IBM COBOL Language Reference Manual*, which provides you with the IBM COBOL language syntax

- **&aixcobaf. Documentation** tool, which enables you to view the online reference information

- Online help, which gives you help from within the COBOL Set for AIX tools

Your Next Step for Learning COBOL Set for AIX

If you have completed "Build Your First COBOL Set for AIX Application" on page 21, you already have a taste for using COBOL Set for AIX.

Once you have started using COBOL Set for AIX for developing your own applications, online help and online reference information can help you find specific information. Each of the tools has its own online help, which enables you to find specific information about using the tools.

Using the Online Reference Information

All of the COBOL Set for AIX documentation is available as online reference information. You can access the online reference information in one of the following ways:

- Double-click on the **&aixcobaf. Documentation** icon in the **&aixcobaf.** application folder.

- Click on the **&aixcobaf. Documentation** icon in the **&aixcobaf.** application folder, press mouse button 3, then select the menu command **&aixcobaf. Documentation**.

- In a Terminal Emulator, perform the following steps:

  1. All on one line, enter the command

         export BOOKSHELF=/usr/lpp/cobol/ipf:/usr/lpp/SdU/ipf/:
          /usr/lpp/sde/ipf/C:$BOOKSHELF

  2. Enter the command

         xview ibmcob "COBOL Set for AIX Reference Manuals"

37

Using the Online Help

Help on how to use any menu choice or window in an COBOL Set for AIX tool is available through online help. You can access different kinds of help in one of the following ways:

- Select an item from a **Help** pop-up or menu bar choice in any COBOL Set for AIX window. The help menu bar choice in a window gives you access to the forms of help available for the tool you are using. You can also select the **Help index** menu choice to view an list of the topics

- Click on the **Help** pushbutton, where available.

Locating Online Help Topics

When using online help, sometimes you may not find the help you need right away. There are several ways to find the information you want.

Using Hypertext

Within some help windows, certain words or phrases are highlighted. To obtain additional information about a highlighted word or phrase, double-click on the word or phrase. You can also press the Tab key until the cursor is on the word or phrase (reverse video by default), and then press Enter.

Using the Help Index and Contents

The Help Index and the Contents display the list of available help windows.

To Use the Help Index: From an COBOL Set for AIX tool window, select the **Help** menu bar choice, then select **Help index**. You can also see the help index by pressing **F11** or clicking on the **Index** pushbutton while any help window is open.

If you want to view an index topic, double-click on the topic. After you select a topic, the help information for that topic appears in a window.

To Use the Contents: From a help window, select the **Options** menu, then select **Contents**. The Contents window appears. A plus sign ("+") next to a topic indicates that help is available for sub-topics related to that topic. Click on the plus sign to see the complete list.

If you want to view a topic, double-click on the topic. After you select a topic, the help information for that topic appears in a window.

Using Search

To search for a topic in an COBOL Set for AIX tool's online help:

1. Select **Search** from the **Services** menu.

2. In the **Search for** field, type the word or phrase you want to search for.

3. Select one radio button to indicate where you want to look for the word or phrase.

4. Select **Search**. If the word or phrase is not found, a message window is displayed.

5. If your word or phrase is found, a search window appears with a list of topics in which the word or phrase is found. Choose a topic you would like to view, then double click on the topic.

Printing Online Help Topics

To print an online help topic, click on the **Print** pushbutton on an online help window.

You can also copy the help window contents to a file for viewing or printing later. Select the **Services** menu bar choice from an online help window, then select **Copy to file**.

Getting COBOL Set for AIX Publications

All of the COBOL Set for AIX publications and many of the related IBM COBOL publications are included as viewable softcopy files and as PostScript files.

Printing Publications

The COBOL Set for AIX publications are included with the product as printable, formatted PostScript (`.ps`) files. They are located in the `/ps` directories of COBOL Set for AIX, SMARTdata UTILITIES, and SDE Common Desktop Environment product directories.

To print these files, follow the procedure for your installation for printing PostScript files.

Ordering Publications

You can order printed copies of these publications using one of the following methods:

- If you are a customer in the United States, call IBM Software Manufacturing Solutions at 1-800-879-2755. You can also fax a request to the National Publication Order Center at 1-800-445-9269.

- If you are an international customer, contact your IBM Authorized Dealer or your IBM Marketing Representative.

COBOL Product	Book Title	Order Number
IBM COBOL Set for AIX	Licensing	n/a
	Getting Started	GC26-8425
	IBM COBOL Language Reference	SC26-4769
	Programming Guide	SC26-8423
	Program Builder User's Guide	SC09-2201
	LPEX User's Guide and Reference	SC09-2202
	VSAM in a Distributed Environment	SC26-7064
	Data Description and Conversion	SC26-7066
	Data Description and Conversion: A Data Language Reference	SC26-7092
	SMARTsort for OS/2 and AIX	SC26-7099

COBOL Product	Book Title	Order Number
IBM VisualAge for COBOL for OS/2	Licensing	n/a
	Getting Started	GC26-8421
	IBM COBOL Language Reference	SC26-4769
	Programming Guide	SC26-8419
	VSAM in a Distributed Environment	SC26-7063
	Data Description and Conversion	SC26-7091
	Data Description and Conversion: A Data Language Reference	SC26-7092
	SMARTsort for OS/2 and AIX	SC26-7099
IBM COBOL for MVS & VM	Compiler and Run-Time Migration Guide	GC26-4764
	Installation and Customization under MVS	SC26-4766
	Licensed Program Specifications	GC26-4761
	Programming Guide	SC26-4767
	Diagnosis Guide	SC26-3138
	IBM COBOL Language Reference	SC26-4769

You can also order books by the set. These are included in a bill-of-forms (BOF).

IBM COBOL Set for AIX (SBOF-7334) - Includes:

Language Reference (SC26-4769)
Programming Guide (SC26-8423)
Program Builder User's Guide (SC09-2201)
LPEX User's Guide and Reference (SC09-2202)

SMARTdata UTILITIES for AIX (SBOF-6132) - Includes:

VSAM in a Distributed Environment (SC26-7064)
Data Description and Conversion (SC26-7066)
Data Description and Conversion: A Data Language Reference (SC26-7092)
SMARTsort for OS/2 and AIX (SC26-7099)

Getting Support for Using COBOL Set for AIX

You or your company may need more assistance in using COBOL Set for AIX. IBM provides support, consulting services, and education for using COBOL Set for AIX and the IBM COBOL family of products.

Getting Product Support

There are several ways for you to get product support for COBOL Set for AIX.

- You can use CompuServe to submit problems to IBM and communicate directly with the COBOL product development team. For CompuServe membership information, call 1-800-848-8199 and request Representative 239.

  As a CompuServe member, you can access CompuServe using a modem. At the ! command prompt enter, GO IBMLANG. Place your messages and comments regarding COBOL in "Section 11, COBOL Language."

- If you are not a CompuServe user, send your comments to:

  IBM Corporation
  Department M80/E251
  P.O. Box 49023
  555 Bailey Avenue
  San Jose, CA 95161-9023

- You can also fax comments to the attention of the COBOL development team at (408)463-2425.

Getting Consulting Services

IBM provides service offerings for COBOL Set for AIX as well as the rest of the IBM COBOL family of products. For more information about consulting services in the United States, call 1-800-IBM-3333, ext. STAR703. For consulting services in other countries, contact your IBM representative.

Getting Education and Training

IBM provides education and training for COBOL Set for AIX as well as the rest of the IBM COBOL family of products. You can request information or enroll in courses in one of the following ways:

- For more information about the course offerings in the United States and Canada, call 1-800-IBM-8322. For education and training in other countries, call 001-520-574-4500. These phone numbers are available Monday through Friday, 8:00 a.m. to 8:00 p.m., New York time.

- If you have access to the World Wide Web, you can access the **Global Campus** page as follows:

  1. To get to the **IBM Home Page**, enter the Uniform Resource Locator `http://www.ibm.com`.

  2. Select **Products, services, and support**, then select **Education Solutions**.

  3. From the **Global Campus** page, you can select the appropriate country to view information about education offerings and enrollment.

Index

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