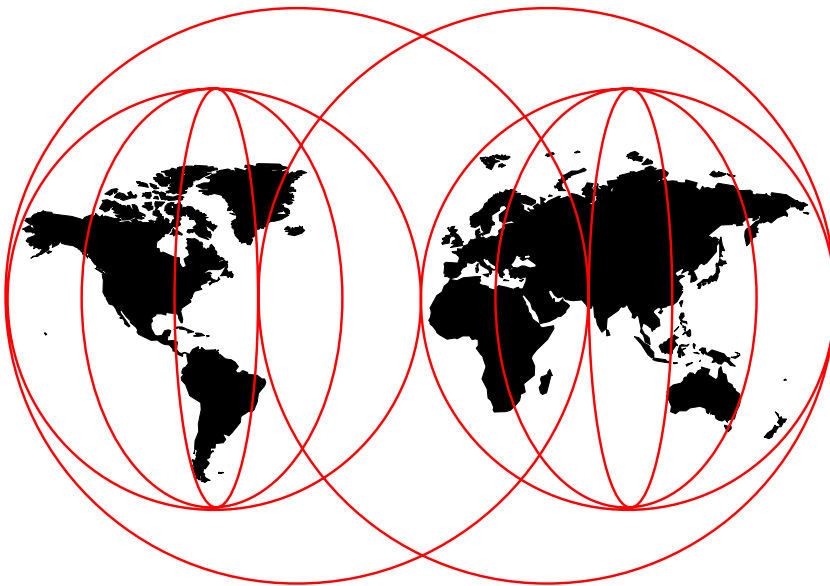IBM

e-business Application Solutions on OS/390 Using Java: Samples

A. Louwe Kooijmans, J. Cheong, R. Conway, T. Knopp, C. Lee,
B. O'Donnell, H. Potter, J. Scanlon, B. Steinke, E. Van Aerschot

International Technical Support Organization

http://www.redbooks.ibm.com

SG24-5365-00

SG24-5365-00

IBM

International Technical Support Organization

**e-business Application Solutions on OS/390
Using Java: Samples**

May 1999

First Edition (May 1999)

This edition applies to the following products:

- OS/390 Version 2 Release 5
- Java Development Kit Version 1.1.6 for OS/390
- DB2 for OS/390 Java Database Connectivity
- Lotus Domino Go Webserver Release 5.0
- WebSphere Application Server for OS/390 Version 1.1 (beta)
- IBM CICS Transaction Server for OS/390 Release 3 (LA)
- CICS Gateway for Java Version 2.0
- IBM DB2 Server for OS/390 Version 5
- IBM DB2 Connect (Personal Edition), Version 5.0
- IBM IMS Transaction Server for OS/390 Version 6
- IMS TCP/IP OTMA Connection
- MQSeries for MVS/ESA V1.2
- MQSeries Bindings for Java for OS/390 (beta)
- VisualAge for Java Enterprise Edition for OS/390
- Windows NT Version 4.00 Workstation (with fix pack 3)

Preface

This publication includes a CD-ROM with samples, documentation and links to documentation related to using Java in e-business applications on OS/390.

Installing, using and examining the samples on this CD-ROM is a very effective way to get started with e-business solutions on OS/390 using Java and WebSphere Application Server. The samples include applications using servlets, JavaServer Pages, Java Database Connectivity, SQLJ, CICS Gateway for Java, Java Record I/O and more.

We recommend you to refer to *e-business Application Solutions on OS/390 Using Java, Vol. I*, SG24-5342, for technical information about the required subsystems and connectors.

The sample code associated with this redbook is also available in softcopy on the Internet from the redbooks Web server.

Point your Web browser to:

```
ftp://www.redbooks.ibm.com/redbooks/sg245342
```

Alternatively, you can go to the following URL and select **Additional Materials**:

```
http://www.redbooks.ibm.com
```

The Team That Wrote The Samples

The CD-ROM was produced by a team of specialists from around the world working at the International Technical Support Organization Poughkeepsie Center.

Alex Louwe Kooijmans is a senior IT Specialist at the International Technical Support Organization, Poughkeepsie Center. Before joining the ITSO, he worked as an application developer in MVS and AS/400 environments. During the last few years, he mainly held assignments as an IT architect in IBM Global Services projects. He holds a bachelor's degree in Computer Science and teaches and writes extensively on Java in relation to the OS/390 platform.

Jeong Sik Cheong is a sales specialist in South Korea. He has two years of experience in the Network Computing field. He holds a bachelor's degree in Agro-chemistry from Seoul National University. His areas of expertise include Web, Java, VisualAge for Java and Web-to-CICS solutions. He has written extensively on JavaServer Pages.

iii

Rich Conway is an Advisory Technical Support Specialist at the International Technical Support Organization, Poughkeepsie Center. He has 19 years experience in MVS and OS/390 as a systems programmer. While working at the ITSO, he has been a project leader and has written on e-business and UNIX Systems Services on the OS/390 platform.

Trevor Knopp is a Technical Architect in IBM New Zealand and has seven years of experience in designing object-oriented solutions. He holds a Masters degree in Medical Physics from the University of Otago. His areas of expertise include object-oriented design and software development.

Chor Hock Lee is a Solution Architect in IBM Australia. He has 14 years of experience in the Information Technology field. He holds a Bachelor of Science degree in Computer Science from the University of New South Wales, Sydney, Australia. His areas of expertise include e-business and Application Architecture, Design and Development. He has written extensively on integrating CICS (on the S/390 in particular) and Internet technologies.

Bill O'Donnell is one of the owners of OAS Software Consulting in the USA, specializing in Java and Web deployment on OS/390. He has 15 years of experience in Technical Support for OS/390. His areas of expertise include the OS/390 Operating System and Java and Web deployment on OS/390.

Hilon Potter is a Senior Software Engineer in the US. He has 17 years of experience in MVS. His areas of expertise include OS/390 Webserver, UNIX System Services, and OS/390 new technology in general.

John Scanlon is a Senior Engineer in IBM Poughkeepsie, NY USA. He has 34 years of experience in Computer Systems. He holds a degree in Systems and Information Science from Syracuse University. His areas of expertise include Computer Systems Architecture, Network Architecture and Application Development. He has written extensively on Logical Partitioning and Multimedia Content Delivery.

Boris-Michael Steinke is an IT Specialist in Germany. He has eight years of experience in object-oriented technologies and client/server computing. He has studied business management at Ludwig Maxemilian University in Munich, Germany. His areas of expertise include distributed object-orientated application development in OO languages like C++ and Java. Currently, he is working as a Senior Consultant for a German IT company, mainly on projects with financial service companies. He is responsible for the development of OO approach models and design patterns for distributed C/S applications based on Java using Internet technologies. He also teaches OO methodologies and the Java and C++ programming language for IBM education and training in Germany and Switzerland.

Egide Van Aerschot has 30 years of field experience with many Finance and Government customers. He was responsible for many projects involving S/390 mainframes related to IMS, DB2 and MQSeries. He designed and installed several client server projects with Distributed Computer Environment (DCE) and Advanced Program-to-Program Communication (APPC). In recent years he participated in several residencies at the International Technical Support Organization and was involved in the design of solutions to access existing data and transactions from the Internet.

Thanks to the following people for their invaluable contributions to this project:

Terry Barthel
International Technical Support Organization, Poughkeepsie Center

Ian Burrows
IBM, Toronto Lab

Ella Buslovich
International Technical Support Organization, Poughkeepsie Center

Clarence Clark
IBM, Poughkeepsie

Christine Casey
IBM, Endicott

Evgeny Deborin
International Technical Support Organization, San Jose Center

Carol Dixon
International Technical Support Organization, Poughkeepsie Center

Mike Fulton
IBM, Toronto Lab

Bob Haimowitz
International Technical Support Organization

Sally Howard
Java Technology Centre, Hursley Park, UK

Mike Oliver
IBM, Poughkeepsie

Brian Peacock
Java Technology Centre, Hursley Park, UK

Roland Trauner
International Technical Support Organization, Poughkeepsie

Tommy Toomire
IBM, Santa Theresa Lab

Lulu Wong
IBM, Toronto Lab

Comments Welcome

Your comments are important to us!

We want our redbooks to be as helpful as possible. Please send us your comments about this or other redbooks in one of the following ways:

- Fax the evaluation form found in "ITSO Redbook Evaluation" on page 21 to the fax number shown on the form.

- Use the online evaluation form found at `http://www.redbooks.ibm.com/`

- Send your comments in an Internet note to `redbook@us.ibm.com`

Chapter 1. Installing the Contents of the CD-ROM

This booklet contains information regarding the contents of the enclosed CD-ROM. The samples on this CD have been developed in conjunction with the writing of redbook *e-business Application Solutions on OS/390 Using Java, Vol. I*, SG24-5342. You may find it necessary to refer to that book for further information on the required environment in which the samples run.

The CD-ROM has three parts:

- A directory structure containing sample code (sources) and documentation

- A "tar" file containing the samples (both sources and run versions) for installation on the OS/390 server

- A readme file in both PDF format and html format, containing the same text as this chapter

1.1 Directory Contents

The directory structure on the CD-ROM contains sample code, documentation and links to other resources. If you have a browser installed on your workstation, your system will automatically show the front page, `index.html`, after you have inserted the CD-ROM.

It is highly recommended to have a TCP/IP connection to the Internet, because some of the links point to URLs on the Internet.

1.2 The tar File

The tar file on the CD contains basically the same components as the directory described in 1.1, "Directory Contents"; however, the tar file is packaged in such a way that you can easily unpack it on your OS/390 system. If you succeed in installing the package on your OS/390 system, you can:

- Access the "content" on OS/390 from your browser

- Run the samples on the OS/390 system

1.3 Installing the Package on OS/390

In this section we describe the steps to follow to install the package on your OS/390 system. We will not describe the installation and configuration of the required subsystems, but we will refer to sources of information, if appropriate.

The following assumes some level of understanding of the UNIX System Services environment. It also assumes that you have a working knowledge of Java and the WebSphere Application Server running on OS/390.

Because selected demos use DB2 and CICS, you will need to have those subsystems customized as well. It is beyond the scope of this section to discuss how to install and configure DB2 and CICS, but we explain some important prerequisites to running the Java and JSP demos.

Note: For IMS and MQSeries we have only included source code examples. They are not meant to be installable demos or samples.

1.3.1 Prerequisite Software on OS/390

We used the following products in the development and testing of the samples.

> ── **Important** ──────────────────────────────────
>
> We mention the versions of the products that we used for the development and testing of our samples. However, you may be able to use them with higher versions of the products mentioned, but a newer version of a product may require another setup or may not even support the samples as we developed them.

- OS/390 Version 2 Release 5
- IBM WebSphere Application for OS/390 Version 1.1 (beta)
- Java for OS/390 (JDK Version 1.1.6)
- CICS Gateway for Java Version 2.0
- IBM DB2 Server for OS/390 Version 5.1
- IBM CICS Transaction Server for OS/390 Release 3 (LA)
- IBM IMS Transaction Server for OS/390 Version 6.1
- MQSeries for MVS/ESA V1.2
- MQSeries Bindings for Java for OS/390 (beta)
- DB2 for OS/390 Java Database Connectivity
- SQLJ support for DB2 Version 5 on OS/390

  Refer to the following URL for availability of SQLJ:

  ```
  http://www.ibm.com/software/data/db2/os390/sqlj.html
  ```

1.3.2 Installing the tar File on your OS/390 Server

The size of the tar file is approximately 28 MB. Perform the following steps to install the tar file on OS/390:

1. Logon to OS/390 and go into the `omvs` shell.

2. Create a directory to hold the tar file and its unpacked contents.

   We recommend that you create a subdirectory inside /u, like SG245342. Also, you may find it useful to create a separate HFS data set for the sample package. The following JCL can be used to do this:

   ```
   //HFSALLOC JOB (POK,999),HFSALL,MSGLEVEL=(1,1),MSGCLASS=X,
   //  CLASS=A,NOTIFY=userid
   //*
   //STEP01  EXEC PGM=IEFBR14
   //HFS       DD DSN=OMVS.SG245342.HFS,SPACE=(CYL,(160,5,1)),  1
   //             DSNTYPE=HFS,DCB=DSORG=PO,
   //             DISP=(NEW,CATLG,DELETE),
   //             STORCLAS=OPENMVS,VOL=SER=volser,UNIT=unit
   ```

   Notes:

   > **1** Depending on your type of DASD, allocate sufficient space to be able to hold about 30 MB.

   Once you have created the HFS data set, you can mount it with the following command from TSO:

   ```
   MOUNT FILESYSTEM(OMVS.SG245342.HFS) MOUNTPOINT(/u/SG245342) TYPE(HFS)
   ```

3. Open an ftp connection between your workstation and your OS/390 server.

4. Go to the directory you just created.

5. Transfer the file in binary format into the preferred subdirectory.

6. Unpack the tar file with the command:

   ```
   tar -xvf SG245342.tar
   ```

   This command will lead to the creation of all the subdirectories and files, as follows:

   ```
   drwxr-xr-x   3 ALEX     TSO          0 Apr 23 15:12 config
   drwxr-xr-x  13 ALEX     TSO          0 Feb 16 16:36 html
   drwxr-xr-x   5 ALEX     TSO          0 Apr 23 15:27 imsmq
   drwxr-xr-x   3 ALEX     TSO          0 Feb 19 09:26 java
   drwxr-xr-x   2 ALEX     TSO          0 Apr 23 14:28 mvs
   ```

7. Once the unpacking is done, you may want to change the permission bits and the owner of the directories and files in the package. Useful commands are:

- `chown <userid> <name>` for changing the ownership
- `chmod xxx <name>` for changing the permission bits

The unpacking of the tar file will result in five other subdirectories to be created:

config   Contains sample configuration files

html   Contains the Web content

imsmq   Contains sample sources on how to use IMS and MQ

java   Contains the Java source and class files that make up the samples

mvs   Contains MVS components needed to set up and use the back-end systems

1.3.3 Moving the MVS Components to Data Sets

The `mvs` directory contains the components that you will need to set up the MVS side of some samples. Most of them are stored in a special format called TSO TRANSMIT OUTDATA.

You will find the following files in the `mvs` subdirectory:

```
-rwxr-xr-x   1 ALEX     TSO        6480 Apr 26 15:10 cobol.copybook.xmit
-rwxr-xr-x   1 ALEX     TSO      112080 Apr 26 15:10 cobol.source.xmit
-rwxr-xr-x   1 ALEX     TSO      690400 Apr 26 15:10 db2.data.xmit
-rwxr-xr-x   1 ALEX     TSO       67500 Apr 26 15:12 db2.unload
-rwxr-xr-x   1 ALEX     TSO       13840 Apr 26 15:11 dbrmlib.xmit
-rwxr-xr-x   1 ALEX     TSO        2240 Apr 26 15:12 dsnaoini
-rwxr-xr-x   1 ALEX     TSO       50800 Apr 26 15:09 jcl.xmit
-rwxr-xr-x   1 ALEX     TSO       30240 Apr 26 15:14 load.xmit
```

In order to work with these files, they must be copied to traditional MVS data sets. You can use the TSO OGET command to pull these files out of the HFS and put them in data sets.

You can use the following JCL to pre-allocate the data sets on OS/390.

Note: Pre-allocation is necessary to give the data sets the correct LRECL, RECFM and BLKSIZE. You must use the LRECL and RECFM as indicated in the following JCL.

```
//ALLOC  JOB (POK,999),MSGCLASS=T,NOTIFY=USERID
//*
//* Allocate the demo data sets
//*
//NCXALLO EXEC PGM=IEFBR14
//JCL     DD DISP=(NEW,CATLG),SPACE=(TRK,(10,5)),UNIT=SYSDA,
//          DCB=(LRECL=80,RECFM=FB,BLKSIZE=3120),DSN=hlq.JCL.XMIT
//DATA    DD DISP=(NEW,CATLG),SPACE=(TRK,(5,2)),UNIT=SYSDA,
//          DCB=(LRECL=80,RECFM=FB,BLKSIZE=3120),DSN=hlq.DB2.DATA.XMIT
//COBSRC  DD DISP=(NEW,CATLG),SPACE=(TRK,(10,5)),UNIT=SYSDA,
//          DCB=(LRECL=80,RECFM=FB,BLKSIZE=3120),DSN=hlq.COBSRC.XMIT
//COBCPY  DD DISP=(NEW,CATLG),SPACE=(TRK,(10,5)),UNIT=SYSDA,
//          DCB=(LRECL=80,RECFM=FB,BLKSIZE=3120),DSN=hlq.COBCPY.XMIT
//DBRMPY  DD DISP=(NEW,CATLG),SPACE=(TRK,(10,5)),UNIT=SYSDA,
//          DCB=(LRECL=80,RECFM=FB,BLKSIZE=3120),DSN=hlq.DBRMLIB.XMIT
//LOADPY  DD DISP=(NEW,CATLG),SPACE=(TRK,(20,10)),UNIT=SYSDA,
//          DCB=(LRECL=80,RECFM=FB,BLKSIZE=3120),DSN=hlq.LOAD.XMIT
//DSNAOI  DD DISP=(NEW,CATLG),SPACE=(TRK,(5,5)),UNIT=SYSDA,
//          DCB=(LRECL=80,RECFM=FB,BLKSIZE=3120),DSN=hlq.DSNAOINI
//DB2UNL  DD DISP=(NEW,CATLG),SPACE=(TRK,(10,5)),UNIT=SYSDA,
//          DCB=(LRECL=4092,RECFM=VB,BLKSIZE=4096),DSN=hlq.DB2.UNLOAD
```

After you have allocated the data sets, use the TSO OGET command to copy the files from the HFS to MVS data sets. Following is a sample of the commands.

```
   Menu  List  Mode  Functions  Utilities  Help
  --------------------------------------------------------------------------
                              ISPF Command Shell
  Enter TSO or Workstation commands below:

  ===>



  Place cursor on choice and press enter to Retrieve command

  => OGET '/u/SG245342/mvs/jcl.xmit' 'hlq.JCL.XMIT' BINARY
  => OGET '/u/SG245342/mvs/db2.data.xmit' 'hlq.DB2.DATA.XMIT' BINARY
  => OGET '/u/SG245342/mvs/cobol.source.xmit' 'hlq.COBSRC.XMIT' BINARY
  => OGET '/u/SG245342/mvs/cobol.copybook.xmit' 'hlq.COBCPY.XMIT' BINARY
  => OGET '/u/SG245342/mvs/dbrmlib.xmit' 'hlq.DBRMLIB.XMIT' BINARY
  => OGET '/u/SG245342/mvs/load.xmit' 'hlq.LOAD.XMIT' BINARY
  => OGET '/u/SG245342/mvs/dsnaoini' 'hlq.DSNAOINI'
  => OGET '/u/SG245342/mvs/db2.unload' 'hlq.DB2.UNLOAD'
  =>
  =>



   F1=Help     F3=Exit     F10=Actions  F12=Cancel
```

Note: Notice the binary option on the OGET command in case of xmit files. The dsnaoini and db2.unload files must not be copied in binary mode.

Use the TSO RECEIVE command to unpack the XMIT data sets. These data sets were compressed using TSO TRANSMIT OUTDATASET and must be received with TSO RECEIVE INDATASET.

Enter the command `TSO RECEIVE INDATASET('<data set name>')` for example, `TSO RECEIVE INDATASET('SG245342.DB2.DATA.XMIT')`.

TSO will now prompt you for the data set name to store the data set being received. If the hlq you are using for your installation is the same as your TSO PREFIX, then just press Enter to use the default values for receiving the data set.

If you are using a different hlq for the installation of the sample code, enter `DSN('hlq.DB2.DATA')`. A sample of the command is shown here.

```
   Menu  List  Mode  Functions  Utilities  Help
 ────────────────────────────────────────────────────────────
                          ISPF Command Shell
 Enter TSO or Workstation commands below:

 ===> RECEIVE INDATASET('SG245342.DB2.DATA.XMIT')


 Place cursor on choice and press enter to Retrieve command

 =>
 =>
 =>
 =>
 =>
 =>
 =>
 =>
 INMR901I Dataset SG245342.DB2.DATA from RCONWAY on WTSC58
 INMR906A Enter restore parameters or 'DELETE' or 'END' +
DSN('SG245342.DB2.DATA')
 F1=Help     F3=Exit     F10=Actions  F12=Cancel
```

Note: Repeat this command for every xmit data set. The dsnaoini and db2.unload files must not be received, as they are not in TSO TRANSMIT OUTDATA format.

1.3.4 Configuring the Environment

In this section we describe the steps to perform in order to be able to use the samples in your WebSphere Application Server. It is assumed that your HTTP Server and the WebSphere Application Server supporting servlets are up and running on your system. However, we give you some key additions that must be made to your configuration files.

1.3.4.1 Configuring the WebSphere Application Server

In order to run the samples, you need to make some updates in the httpd.conf, httpd.envvars and jvm.properties files and the started procedure.

1. Updates to your httpd.conf file:

   `/u/SG245342/config/webas/httpd.conf` is a sample httpd.conf file that we used for the development and testing of the samples. It contains additional PASS statements that must be added to your Webserver's httpd.conf file.

2. Updates to your httpd.envvars file:

   `/u/SG245342/config/webas/httpd.envvars` is a sample httpd.envvars file and contains paths that need to be added to your Webserver's httpd.envvars file.

3. Updates to your jvm.properties file:

   `/u/SG245342/config/webas/jvm.properties` is a sample jvm.properties file and contains paths that need to be added to your Webserver's jvm.properties file.

   The minimum to be included on top of your default WebAS class libraries in your ncf.jvm.classpath directive are the following class libraries:

   - `/usr/lpp/java16/J1.1/lib/classes.zip`

     This contains the JDK 1.1.6 classes.

   - `/usr/lpp/db2/db2510/classes/db2jdbcclasses.zip`

     This is required for JDBC access to DB2 on OS/390.

   - `/usr/lpp/db2/db2510/classes/db2sqljclasses.zip`

     This is required for SQLJ access to DB2 on OS/390.

   - `/u/SG245342/java`

     This directory contains the Java sample classes.

     Note: In case you decided to use another subdirectory for the sample package, you need to use that name.

- `/usr/lpp/JRIO/recordio-vsam.zip`, `/usr/lpp/JRIO/recordio.zip` and `/usr/lpp/JRIO/recordio-nonvsam.zip`

  In these directories, you must have installed the JRIO classes downloadable from URL: `http://www.ibm.com/s390/java`

- `/usr/lpp/jgCICS/JGate/classes`

  This directory contains the CICS Gateway for Java classes.

Note: The names of the directories may be different on your system.

The minimum to be included on top of your default WebAS executables libraries in your ncf.jvm.libpath directive are the following:

- `/usr/lpp/java16/J1.1/lib` and `/usr/lpp/java16/J1.1/lib/mvs/native_threads`

  These directories contain the JDK DLLs.

- `/usr/lpp/db2/db2510/lib`

  This directory contains the native drivers for JDBC.

- `/usr/lpp/jgCICS/JGate/bin/mvs`

  This directory contains the DLLs of the CICS Gateway for Java.

- `/usr/lpp/JRIO`

  This directory contains the DLLs for MVS dataset access from Java.

The ncf.jvm.path directive should contain the DLLs of the JDK 1.1.6 as well.

1.3.4.2 SG245342.ini File

In `/u/SG245342/config` there is a file called SG245342.ini. This file is critical for the operation of the samples. All Java servlets read this file in order to retrieve environment variables. This file needs to be in the root directory of your Webserver. This directory is normally the same directory as where you have the httpd.conf file.

Important

You need to edit the SG245342.ini file to reflect your environment.

1.3.4.3 Configuring DB2

It is beyond the scope of this section to discuss how to install and configure DB2 on your system, but there are some key prerequisites to running the Java and JSP demos.

  1. DB2 prerequisite customization.

a. Install and customize DB2 CLI support. See *DB2 for OS/390 Call Level Interface Guide and Reference*, SC26-8959 for instructions.

b. Install and customize DB2 JDBC support. See the JDBC README file for more information.

c. Install and customize DB2 SQLJ support. See the SQLJ README file for more information.

2. Load the DB2 database with sample data.

   Run job DB2LOAD in your unpacked JCL data set. Before running, modify the JCL to conform to your local standards.

3. Rebind the SQLJ samples and the CICS/COBOL sample.

   Jobs BINDAPP and BINMANC in your unpacked JCL data set are provided for this purpose.

4. Copy the sample DSNAOCLI file from `/u/SG245342/mvs/dsnaoini` to an MVS sequential data set, as follows:

```
   Menu  List  Mode  Functions  Utilities  Help
 ----------------------------------------------------------------------
                             ISPF Command Shell
 Enter TSO or Workstation commands below:

  ===> OGET '/u/SG245342/mvs/dsnaoini' 'hlq.DSNAOINI'

```

5. Customize this data set by filling in your DB2 subsystem identifier and CLI planname. Add this data set to your Webserver's started procedure with the following DD name:

```
     //DSNAOINI DD DSN=hlq.DSNAOINI,DISP=SHR
```

6. Allocate DB2 libraries to the Webserver's procedure. Add a STEPLIB or JOBLIB to the Webserver's procedure with the following data sets, or add them to the system link list concatenation:

```
     hlq.SDSNEXIT
     hlq.SDSNLOAD
```

1.3.4.4 Configuring CICS

A few of the supplied samples in this package require CICS and the CICS Java Gateway to be customized. It is beyond the scope of this section to discuss how to install and configure CICS and the CICS Java Gateway on your system, but there are some key prerequisites to running the demos with CICS.

1. Install and initialize the External CICS Interface (EXCI).

   The CICS Java Gateway requires that the External CICS Interface (EXCI) be customized. EXCI is available with CICS/ESA version 4.1 and all subsequent versions of CICS/ESA. The use of the EXCI interface is documented in *CICS TS for OS/390 V1R2 CICS Internet and External Interfaces Guide*, SC33-1944. This publication describes the operation of the EXCI sample programs, as well as the installation steps required to use the interface. EXCI must be installed and initialized before you can use the samples.

2. Add Language Environment/370 support for CICS.

   The COBOL sample programs have been linked with the COBOL runtime library stubs that are shipped with Language Environment (LE). See *CICS Transaction Server for OS/390 V1R2 CICS System Definition Guide*, SC33-1682 for complete information on how to install Language Environment/370 support for CICS.

3. Add the CICS sample application data set to your CICS procedure. The data set in which you unpacked the LOADS can be added to the DFHRPL concatenation as follows:

   ```
   //STEPLIB  DD DSN=CICSTS12.SDFHAUTH,DISP=SHR
   //         DD DSN=SYS1.CSSLIB,DISP=SHR
   //         DD DSN=CEE.SCEECICS,DISP=SHR
   //DFHRPL   DD DSN=CICSTS12.SDFHLOAD,DISP=SHR
   //         DD DSN=SYS1.CSSLIB,DISP=SHR
   //         DD DSN=CEE.SCEERUN,DISP=SHR
   //         DD DSN=CEE.SCEECICS,DISP=SHR
   //         DD DSN=hlq.LOAD,DISP=SHR
   ```

4. Data set hlq.JCL contains an assembler module called DFHCNV. This module is responsible for codepage conversion of the passed CICS COMMAREA. Each program called from "outside" needs to have an entry in DFHCNV. The example in hlq.JCL needs to be linked. You need to restart your CICS region or just refresh this particular program in order to activate your new version.

5. Add PROGRAM and TRANSACTION definitions.

   In order to use the CICS application programs that are supplied in hlq.LOAD, you have to define them to CICS. Run job hlq.JCL(ADDDEFS) to add PROGRAM and TRANSACTION definitions for the supplied CICS application programs.

6. Add a STEPLIB or JOBLIB to the WebSphere Application Server for OS/390 procedure with the following data set, or add it to the system link list concatenation:

```
hlq.SDFHEXCI
```

7. Configure the CICS Attachment Facility.

   The sample CICS transactions that are supplied on the CD-ROM access data in a DB2 database. The CICS Attachment facility needs to be configured. See *DB2 for OS/390 V5 Installation Guide*, GC26-8970 for more information on how to configure this attachment.

8. Reinitialize the WebSphere Application Server for OS/390.

   You will need to stop and start WebAS to make the changes effective.

1.3.4.5 Configuring the VSAM Sample

In order to make the VSAM sample work, you have to define a VSAM cluster and load it with data. Job DEFVSAM in data set hlq.JCL takes care of the following:

1. Deleting any existing VSAM cluster with the same name

2. Defining a new cluster

3. Copying a flat file with input data into the VSAM file

   Note: The data provided is an unload of the DB2 manufacturer table.

4. Printing the contents of the file

1.3.5 MVS Datasets on the CD-ROM

Once you have unpacked the MVS datasets, you will find the following helpful datasets:

hlq.JCL   This dataset contains JCL for the samples. All jobs need to be modified before they can run. The instructions are in the JCL. The following jobs are provided:

> **ADDDEFS**   This job adds the definitions for the COBOL/CICS sample transactions in CICS.
>
> **BINDAPP**   This job binds an application that uses static SQL to access DB2. Running this job is mandatory to be able to run an SQLJ program.
>
> **BINDMANC** Running this job is mandatory to be able to run the CICS samples on this CD-ROM.
>
> **DB2LOAD**   This job defines the DB2 table and loads its contents for the samples.

	DEFVSAM	This job defines a VSAM cluster and copies a flat file with records into it.
	DFHCNV	This is a sample job to assemble the DFHCNV for CICS.
	EXECEXCI	This job can be run to test the EXCI connection to your CICS system.
	MANUFA*	These jobs are required to pre-compile, compile, link-edit and bind the COBOL/CICS transactions.
	TIMEZONE	This job compiles the COBOL source of the TIMEZONE program.
hlq.LOAD		This library contains the CICS LOADS for the samples.
hlq.DB2.DATA		This dataset contains a member with the DDL for the DB2 sample database.
hlq.DBRMLIB		This library contains DBRMs of the sample programs that use static SQL.
hlq.COBSRC		This library contains the source of the COBOL programs used in the CICS samples.
hlq.COBCPY		This library contains the source of the COBOL copybooks used in the CICS transactions.
hlq.DSNAOINI		This data set contains the DB2 CLI initialization file.
hlq.DB2.UNLOAD		This data set contains "flat" output from the DB2 manufacturer table. This file ought to be used to load the VSAM file.

1.3.6 Using the Samples

Once you have installed the samples, as described in Section 1.3.4, "Configuring the Environment" on page 7, and you have all the prerequisite subsystems running, you will be able to point to the html front page of the sample package with your browser, as follows:

```
<tcp/ip address>:<portnumber>
```

Important

You have to make sure that in your `httpd.conf` file, you point to the `index.html` file in the html directory of the sample package.

Appendix A. Special Notices

This publication is intended to help:

- Information Technology Architects understand how Network Computing applications can be deployed using Webserver and Java support on OS/390.

- Application Programmers to develop Java components for OS/390 and create solutions for connecting existing data and applications on OS/390 with Java components in an NC environment.

- Systems Programmers to set up the required infrastructure on OS/390 to use Lotus Domino Go Webserver Release 5.0, servlets, Java Server Pages, Java applications and Java connectors to OS/390 subsystems.

The information in this publication is not intended as the specification of any programming interfaces that are provided by Java, VisualAge for Java, Java Database Connectivity (JDBC), SQLJ, CICS Gateway for Java, IMS TCP/IP OTMA Connectivity, MQSeries Client for Java and Java Server Pages.

References in this publication to IBM products, programs or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM product, program, or service is not intended to state or imply that only IBM's product, program, or service may be used. Any functionally equivalent program that does not infringe any of IBM's intellectual property rights may be used instead of the IBM product, program or service.

Information in this book was developed in conjunction with use of the equipment specified, and is limited in application to those specific hardware and software products and levels.

IBM may have patents or pending patent applications covering subject matter in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to the IBM Director of Licensing, IBM Corporation, North Castle Drive, Armonk, NY 10504-1785.

Licensees of this program who wish to have information about it for the purpose of enabling: (i) the exchange of information between independently created programs and other programs (including this one) and (ii) the mutual use of the information which has been exchanged, should contact IBM Corporation, Dept. 600A, Mail Drop 1329, Somers, NY 10589 USA.

Such information may be available, subject to appropriate terms and conditions, including in some cases, payment of a fee.

The information contained in this document has not been submitted to any formal IBM test and is distributed AS IS. The information about non-IBM ("vendor") products in this manual has been supplied by the vendor and IBM assumes no responsibility for its accuracy or completeness. The use of this information or the implementation of any of these techniques is a customer responsibility and depends on the customer's ability to evaluate and integrate them into the customer's operational environment. While each item may have been reviewed by IBM for accuracy in a specific situation, there is no guarantee that the same or similar results will be obtained elsewhere. Customers attempting to adapt these techniques to their own environments do so at their own risk.

Any pointers in this publication to external Web sites are provided for convenience only and do not in any manner serve as an endorsement of these Web sites.

The following document contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples contain the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

The following terms are trademarks of the International Business Machines Corporation in the United States and/or other countries:

CICS®	DB2®
IBM®	IMS
Language Environment®	MQ
MQSeries®	MVS® (logo)
OS/390	RACF
S/390®	VisualAge®

The following terms are trademarks of other companies:

C-bus is a trademark of Corollary, Inc.

Java, HotJava, JavaBeans, JDK, JDBC and Solaris are trademarks of Sun Microsystems, Incorporated.

Microsoft, Windows, Windows NT, and the Windows 95 logo are trademarks or registered trademarks of Microsoft Corporation.

UNIX is a registered trademark in the United States and other countries licensed exclusively through X/Open Company Limited.

Other company, product, and service names may be trademarks or service marks of others.

Appendix B. Related Publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this redbook.

B.1 International Technical Support Organization Publications

For information on ordering these ITSO publications see "How to Get ITSO Redbooks" on page 19.

- *Programming with VisualAge for Java Version 2*, SG24-5264

- *Integrating Java with Existing Data and Applications on OS/390*, SG24-5142

- *Enterprise Web Serving with the Lotus Domino Go Webserver for OS/390*, SG24-2074

- *OS/390 TCP/IP OpenEdition Implementation Guide*, SG24-2141

B.2 Redbooks on CD-ROMs

Redbooks are also available on the following CD-ROMs:

CD-ROM Title	Collection Kit Number
System/390 Redbooks Collection	SK2T-2177
Networking and Systems Management Redbooks Collection	SK2T-6022
Transaction Processing and Data Management Redbook	SK2T-8038
Lotus Redbooks Collection	SK2T-8039
Tivoli Redbooks Collection	SK2T-8044
AS/400 Redbooks Collection	SK2T-2849
RS/6000 Redbooks Collection (HTML, BkMgr)	SK2T-8040
RS/6000 Redbooks Collection (PostScript)	SK2T-8041
RS/6000 Redbooks Collection (PDF Format)	SK2T-8043
Application Development Redbooks Collection	SK2T-8037

B.3 Other Publications

These publications are also relevant as further information sources:

- *IBM HTTP Server for OS/390 Planning*, SC31-8690

- *Domino Go Webserver 5.0 for OS/390: Webmaster's Guide*, SC31-8691

- *Domino Go Webserver 5.0 for OS/390: Messages*, SC31-8692

- *OS/390 V2R6.0 Planning for Installation*, GC28-1726

- *OS/390 V2R6.0 NFS Customization and Operation*, SC26-7253

- *OS/390 V2R4.0 MVS Programming: Resource Recovery*, GC28-1739

- *OS/390 V2R6.0 NFS User's Guide*, SC26-7254

- *OS/390 Release 6 Domino Go Webserver 5.0 Web Programming Guide*, SC34-4743 (available softcopy only)

- *TCP/IP OpenEdition User's Guide*, GC31-8305

- *DB2 for OS/390 V5 Call Level Interface Guide and Reference*, SC26-8959

- *DB2 for OS/390 V5 Command Reference*, SC26-8960

- *DB2 for OS/390 Version 5 Application Programming Guide and Reference for Java*, SC26-9547

- *Quick Beginnings Windows NT, Documentation for TXSeries V4.2*, GC33-1879

- *CICS Family: Communicating from CICS on System/390*, SC33-1697

- *CICS TS for OS/390 V1R2 CICS Internet and External Interfaces Guide*, SC33-1944

- *Software Development: Processes and Performance/ The WebSphere Application Server Architecture Guide*, G321-5680

- *Open Edition MVS User's Guide*, SC23-3013

- *IMS/ESA Customization Guide*, SC26-8020

B.4 External Publications

- *Java Secrets*, by Elliotte Rusty Harold. Published by IDG Books Worldwide Inc, 1997, California. ISBN 0-7645-8008-8.

- *Essential JNI, Java Native Interface*, by Rob Gordon. Published by Prentice Hall, 1998, New Jersey. ISBN 0-13-679895-0.

- *Design Patterns: Elements of Reusable Object-Oriented Software*, by Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, Grady Booch. Published by Addison-Wesley. ISBN 0-20-163361-2.

- *Java servlets*, by Karl Moss. Published by McGraw-Hill, 1998. ISBN 0-07-913779-2.

How to Get ITSO Redbooks

This section explains how both customers and IBM employees can find out about ITSO redbooks, redpieces, and CD-ROMs. A form for ordering books and CD-ROMs by fax or e-mail is also provided.

- **Redbooks Web Site** `http://www.redbooks.ibm.com/`

  Search for, view, download or order hardcopy/CD-ROMs redbooks from the redbooks Web site. Also read redpieces and download additional materials (code samples or diskette/CD-ROM images) from this redbooks site.

  Redpieces are redbooks in progress; not all redbooks become redpieces and sometimes just a few chapters will be published this way. The intent is to get the information out much quicker than the formal publishing process allows.

- **E-mail Orders**

  Send orders via e-mail including information from the redbook fax order form to:

In United States:	e-mail address: usib6fpl@ibmmail.com
Outside North America:	Contact information is in the "How to Order" section at this site: http://www.elink.ibmlink.ibm.com/pbl/pbl/

- **Telephone Orders**

United States (toll free)	1-800-879-2755
Canada (toll free)	1-800-IBM-4YOU
Outside North America	Country coordinator phone number is in the "How to Order" section at this site: http://www.elink.ibmlink.ibm.com/pbl/pbl/

- **Fax Orders**

United States (toll free)	1-800-445-9269
Canada	1-403-267-4455
Outside North America	Fax phone number is in the "How to Order" section at this site: http://www.elink.ibmlink.ibm.com/pbl/pbl/

This information was current at the time of publication, but is continually subject to change. The latest information for customers may be found at `http://www.redbooks.ibm.com/` and for IBM employees at `http://w3.itso.ibm.com/`.

IBM Intranet for Employees

IBM employees may register for information on workshops, residencies, and redbooks by accessing the IBM Intranet Web site at `http://w3.itso.ibm.com/` and clicking the ITSO Mailing List button. Look in the Materials repository for workshops, presentations, papers, and Web pages developed and written by the ITSO technical professionals; click the Additional Materials button. Employees may also view redbook, residency and workshop announcements at `http://inews.ibm.com/`.

IBM Redbook Fax Order Form

Please send me the following:

Title	Order Number	Quantity

First name _____ Last name _____

Company _____

Address _____

City _____ Postal code _____ Country _____

Telephone number _____ Telefax number _____ VAT number _____

☐ Invoice to customer number _____

☐ Credit card number _____

Credit card expiration date _____ Card issued to _____ Signature _____

We accept American Express, Diners, Eurocard, Master Card, and Visa. Payment by credit card not available in all countries. Signature mandatory for credit card payment.

ITSO Redbook Evaluation

e-business Application Solutions on OS/390 Using Java: Samples
SG24-5365-00

Your feedback is very important to help us maintain the quality of ITSO redbooks. **Please complete this questionnaire and Fax it to: USA International Access Code + 1 914 432 8264 or:**

- Use the online evaluation form found at http://www.redbooks.ibm.com
- Send your comments in an Internet note to redbook@us.ibm.com

Which of the following best describes you?
__**Customer**   __**Business Partner**   __**Solution Developer**   __**IBM employee**
__**None of the above**

Please rate your overall satisfaction with this book using the scale:
(1 = very good, 2 = good, 3 = average, 4 = poor, 5 = very poor)

Overall Satisfaction   _____

Please answer the following questions:

Was this redbook published in time for your needs?   Yes_____ No_____

If no, please explain:
_____

_____

_____

_____

What other redbooks would you like to see published?
_____

_____

_____

Comments/Suggestions: **(THANK YOU FOR YOUR FEEDBACK!)**
_____

_____

_____

_____

_____

_____

e-business Application Solutions on OS/390 Using Java: Samples

SG24-5365-00

IBM