webMethods EntireX

EntireX COBOL Wrapper

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EntireX COBOL Wrapper

EntireX COBOL Wrapper provides access to RPC-based components from COBOL applications. It enables you to develop both client and server applications.

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Using	Step-by-step guide on how to generate interactively and build (write, compile and link) clients and server applications with the COBOL Wrapper. Programming models for Micro Focus, batch, CICS and IMS COBOL RPC applications are introduced. This section contains the following subsections: ■ *Using the COBOL Wrapper for the Client Side* ■ *Using the COBOL Wrapper for the Server Side* ■ *Generate COBOL Source Files from Software AG IDL Files*
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IDL to COBOL Mapping	Describes the specific mapping of Software AG IDL data types, groups, arrays and structures to the COBOL programming language.
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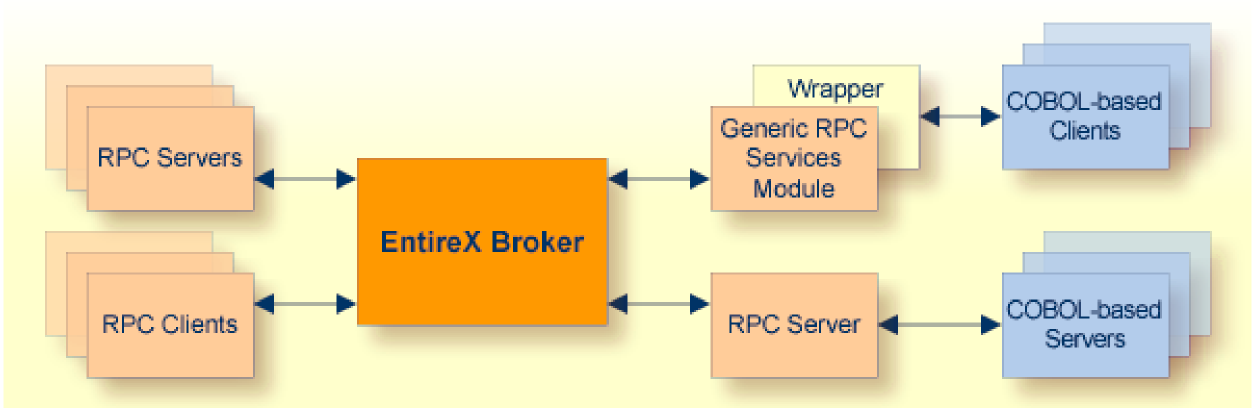
Server Mapping Deployment	This section describes the deployment of Software AG server mapping files.
Reference	Provides reference material for the COBOL Wrapper.

1 Introduction to the COBOL Wrapper

EntireX COBOL Wrapper provides access to RPC-based components from COBOL applications. It enables you to develop both client and server applications.

Description

The COBOL Wrapper provides access to RPC servers for COBOL client applications and access to COBOL servers for any RPC client. The COBOL Wrapper generation tools of the Workbench take as input a Software AG IDL file, which describes the interface of the RPC, and generate COBOL sources that implement the functions and data types of the interface.



The generated functions can be compiled with the COBOL compiler of your target platform.

The COBOL Wrapper works as follows:

- COBOL code is generated from the Software AG IDL file.
- Additonally for the client side, and depending on your target operating system and environment (e.g. Micro Focus, batch, CICS or IMS), a generic RPC services module is generated (see below).
- If required for the server side, a so-called server-side server mapping file (SVM) is created.
- The Software AG IDL Compiler and an appropriate template are used for the COBOL code generation.

Generic RPC Services Module

In order to minimize the amount of code generated for a specific IDL file, all service-type functionality that is not specific to a given IDL file required by the client interface object is generated in a generic RPC services module.

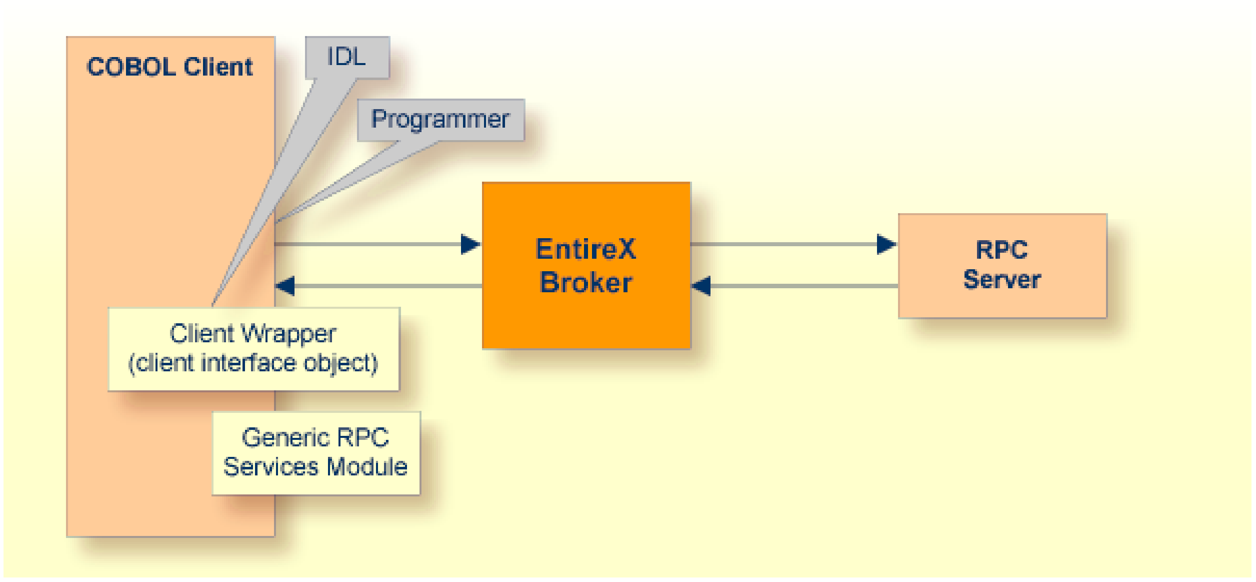
The generic RPC services module is used by RPC clients and contains the call to the broker stub, as well as other functions needed for RPC communication where an interface object is not needed, such as

- broker logon and logoff
- conversational support
- connecting RPC clients to RPC servers via the broker
- etc.

For more information, see *Generic RPC Services Modules*.

COBOL Client Applications

For a given IDL file, the Software AG IDL Compiler and a COBOL code generation template for clients are used to generate client interface objects and copybooks. The source code generated by the COBOL Wrapper can be compiled with your target COBOL compiler. Application developers use the generated generic RPC service module, the client interface object(s) and the copybooks to write COBOL applications that access RPC servers.

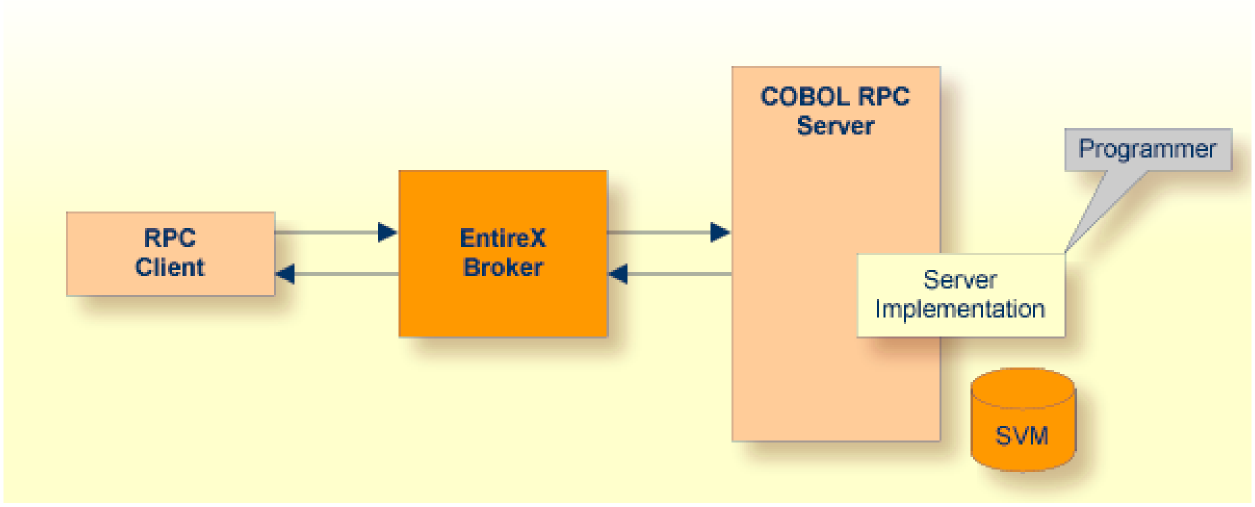

COBOL Client
IDL
Programmer
EntireX Broker
RPC Server
Client Wrapper (client interface object)
Generic RPC Services Module

For more information, see ***Using the COBOL Wrapper***.

COBOL Server Application

The Software AG IDL Compiler and a COBOL code generation template for servers are used to generate a server (skeleton) for a specific IDL. Additionally, depedending on the IDL data types and whether IDL program names are customized, a so-called server-side server-mapping file is created. See *When is an SVM File Required?* and *Server Mapping File (SVM)*.

Application developers use the generated server (skeleton) to write their own server code for each program in the IDL. The source code is compiled and linked with your target COBOL compiler. The server-side SVM file needs to be deployed to the EntireX RPC Server used, see *Server Mapping Deployment*.



For more information, see ***Using the COBOL Wrapper***.

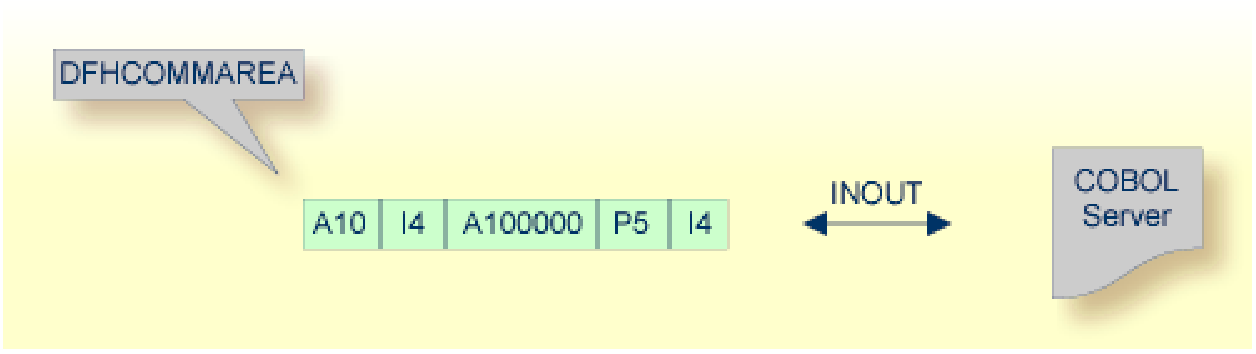
COBOL Server Interface Types

Depending on your requirements and generation settings, the COBOL Wrapper generates a server skeleton with one of the following interface types:

- CICS with DFHCOMMAREA Calling Convention
- CICS with Channel Container Calling Convention
- CICS with DFHCOMMAREA Large Buffer Interface
- Micro Focus with Standard Linkage Calling Convention
- Batch with Standard Linkage Calling Convention
- IMS BMP with Standard Linkage Calling Convention

CICS with DFHCOMMAREA Calling Convention

CICS programs using the standard DFHCOMMAREA for parameter passing.



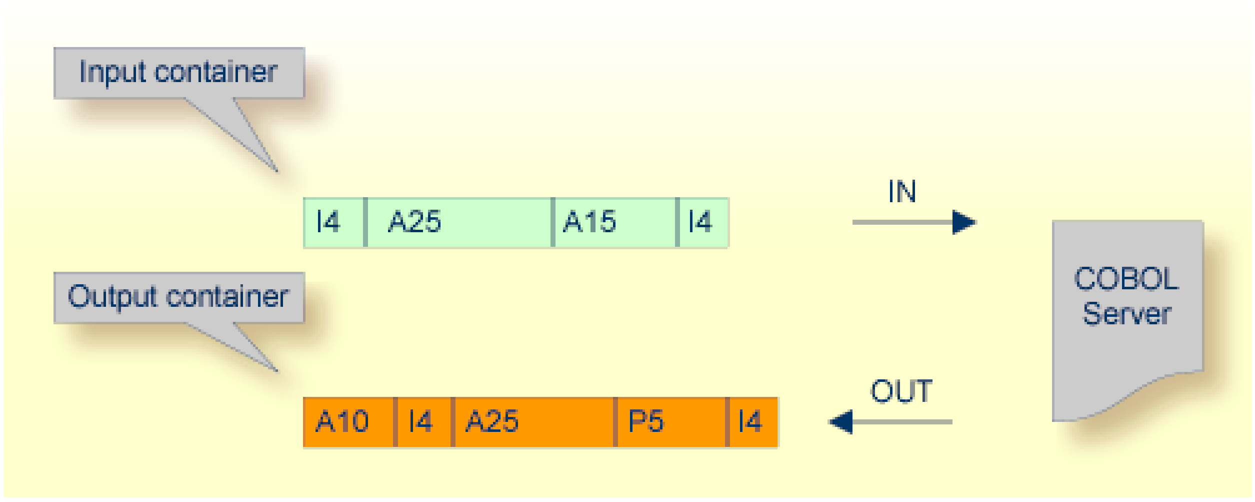
Technically, the generated COBOL server skeleton contains

- in the DFHCOMMAREA, the parameter structure

See *Server Interface Types* for more information on how to create COBOL servers with this interface type.

CICS with Channel Container Calling Convention

Channels and containers are IBM's approach to access more than 31 KB of data in CICS. There is no need for coding any channel container statements because all this is generated. Thus the programmer focus can be on the application logic.



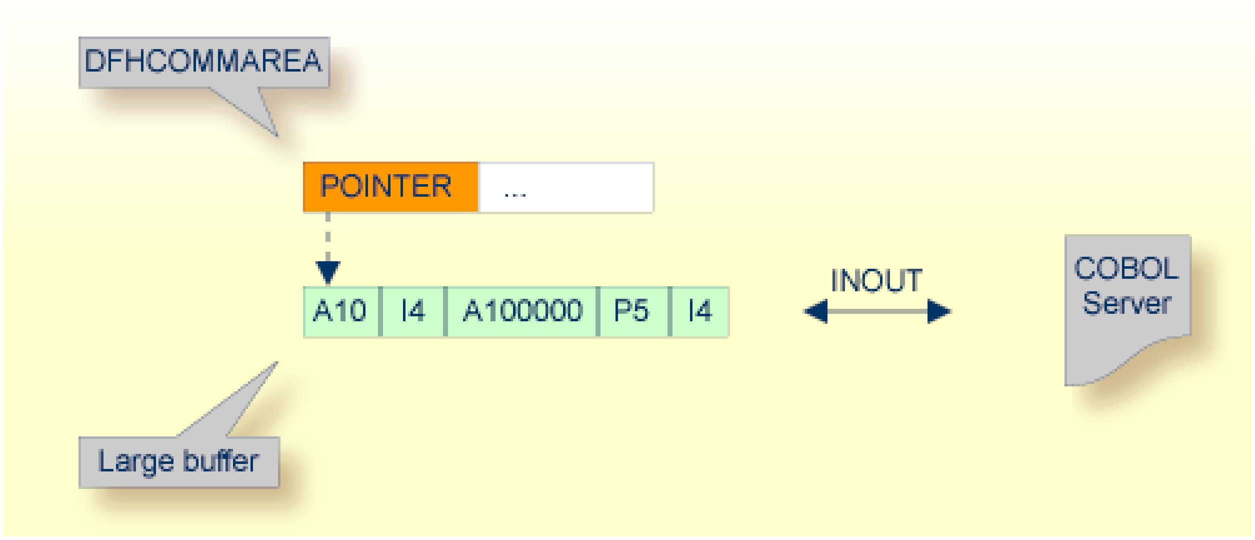
Technically, the generated COBOL server skeleton contains

- container layouts in the linkage section
- `EXEC CICS CONTAINER` statements for accessing the container on input and output

See *Server Interface Types* for more information on how to create COBOL servers with this interface type.

CICS with DFHCOMMAREA Large Buffer Interface

This type of program has a defined DFHCOMMAREA interface to access more than 31 KB of data in CICS. The interface is the same as the webMethods WMTLSRVR interface. This enables customers to use an easy and simple interface type to access more than 31 KB of data in CICS.



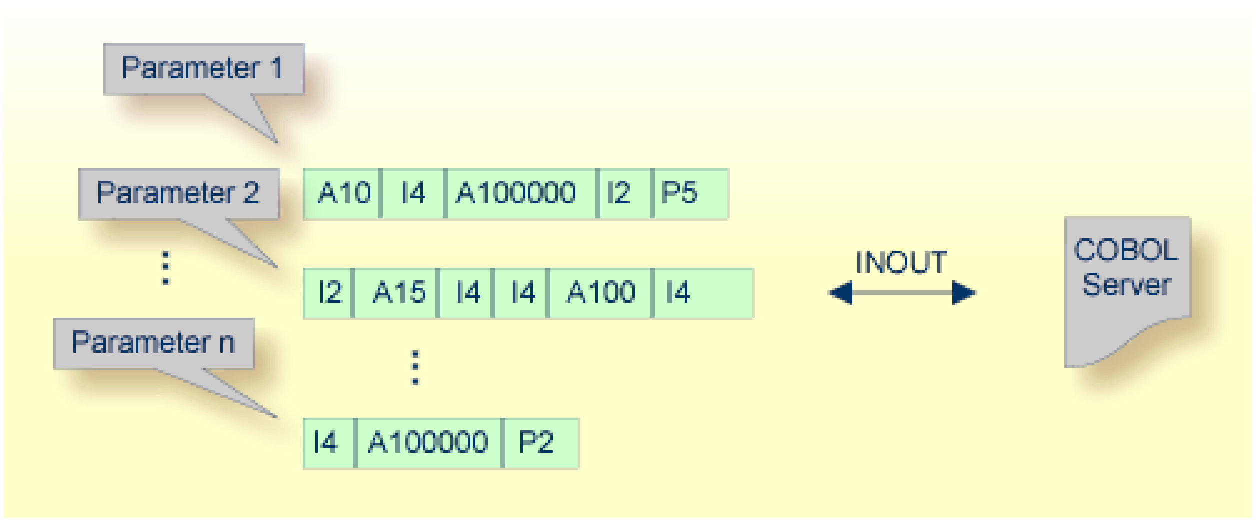
Technically,

- the generated server skeleton contains in the DFHCOMMAREA layout a *pointer* to a large buffer
- the parameter structure in the linkage section is accessed using COBOL's `SET ADDRESS` statement using the large buffer pointer

See ***Server Interface Types*** for more information on how to create COBOL servers with this interface type.

Micro Focus with Standard Linkage Calling Convention

Standard call interfaces with a given number of parameters are supported. Every parameter addresses a fixed COBOL structure.



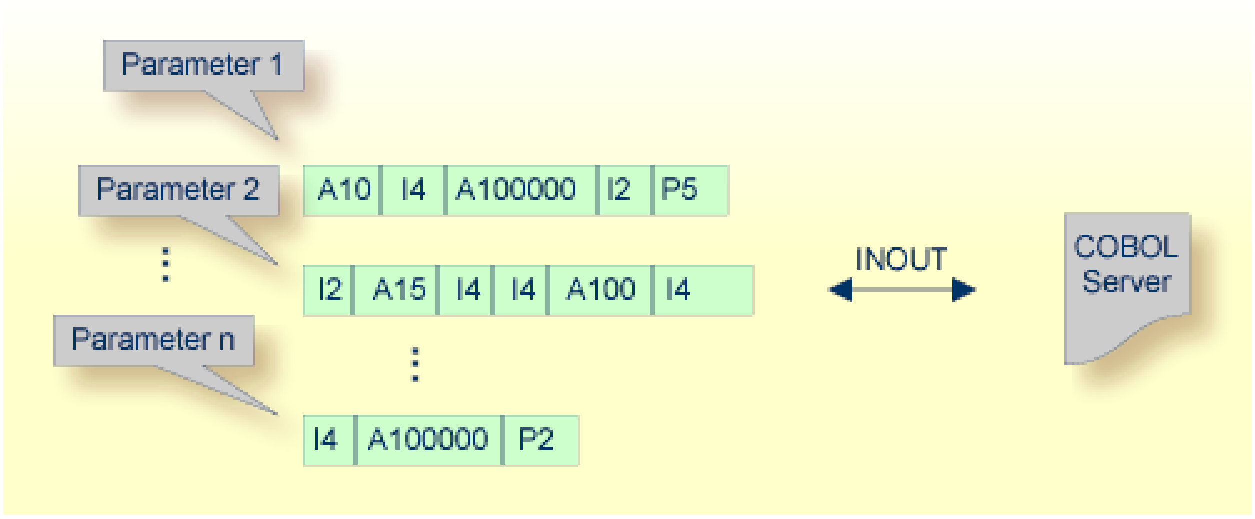
Technically, the generated COBOL server skeleton contains

- a parameter list `PROCEDURE DIVISION USING PARM1 PARM2 ... PARMn`
- the parameters in the linkage section as COBOL data items on level 1

See ***Server Interface Types*** for more information on how to create COBOL servers with this interface type.

Batch with Standard Linkage Calling Convention

Standard call interfaces with a given number of parameters are supported. Every parameter addresses a fixed COBOL structure.



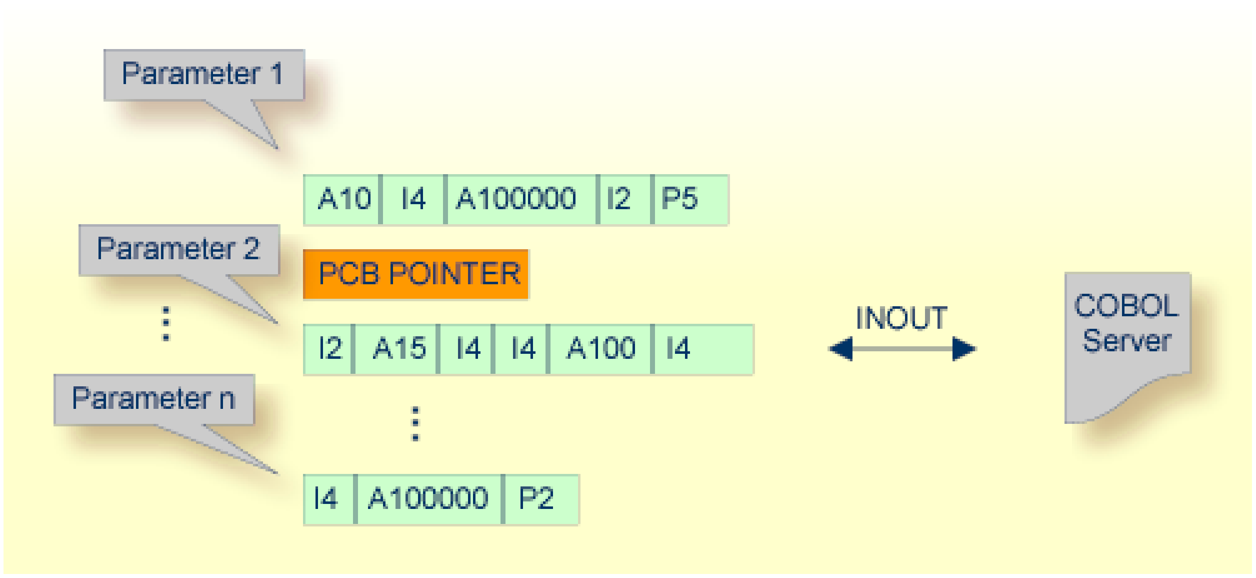
Technically, the generated COBOL server skeleton contains

- a parameter list `PROCEDURE DIVISION USING PARM1 PARM2 ... PARMn`
- the parameters in the linkage section as COBOL data items on level 1

See *Server Interface Types* for more information on how to create COBOL servers with this interface type.

IMS BMP with Standard Linkage Calling Convention

IMS batch message processing programs (BMP) with PCB parameters are directly supported.



Technically, the generated COBOL server skeleton contains

- IMS-specific PCB *pointers* within a parameter list.

See ***Server Interface Types*** for more information on how to create COBOL servers with this interface type.

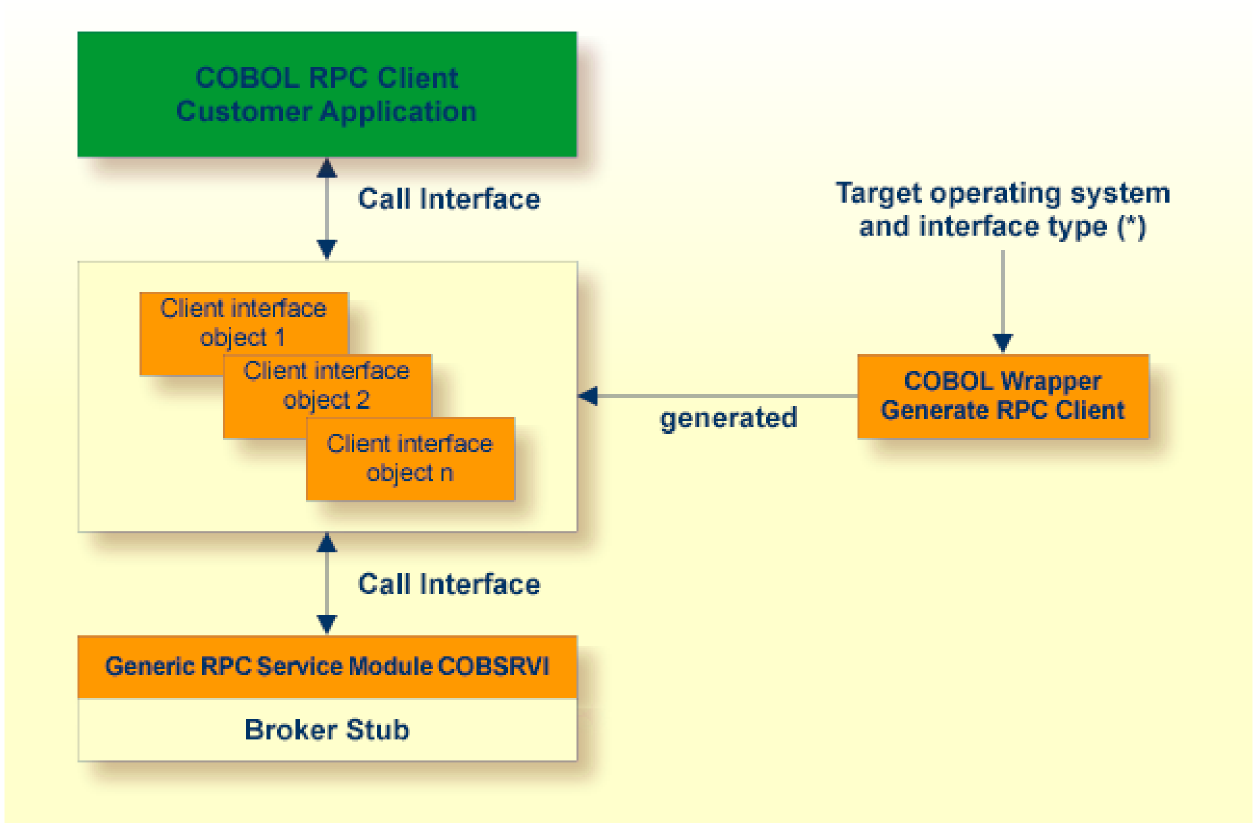
2 Using the COBOL Wrapper for the Client Side

The COBOL Wrapper provides access to RPC-based components from COBOL applications and enables users to develop both clients and servers. This section introduces the various possibilities for RPC-based client applications written in COBOL.

A step-by-step guide is provided in the section *Writing Applications with the COBOL Wrapper*. Read this section first before writing your first RPC client program.

Using the COBOL Wrapper for Micro Focus (UNIX and Windows)

This mode applies to UNIX and Windows.


COBOL RPC Client
Customer Application
Call Interface
Target operating system and interface type (*)
Client interface object 1
Client interface object 2
Client interface object n
generated
COBOL Wrapper
Generate RPC Client
Call Interface
Generic RPC Service Module COBSRVI
Broker Stub

(*) For the target operating systems and interface types, see *Generate COBOL Source Files from Software AG IDL Files*.

In this scenario, the COBOL RPC client customer application, every generated client interface object, generic RPC services module and the broker stub are linked together to an executable application.

Use the COBOL Wrapper for Micro Focus if you need to embed the client interface object into your application with a standard linkage calling convention.

To use the COBOL Wrapper for Micro Focus

1 Generate the client interface object(s) for the target operating system, for example "Windows", and use interface type "Micro Focus with standard linkage calling convention". See *Generate COBOL Source Files from Software AG IDL Files*. If required, generate the generic RPC service module COBSRVI too. See *Generate Generic RPC Service for Module COBSRVI* for information on when to generate this.

2 If necessary, use FTP to transfer the client interface object(s) and, if required, also the generic RPC service module COBSRVI to the target platform where you write your application.

3 Import the modules into your Micro Focus IDE. The file names of the generated copybooks (see *Using the Generated Copybooks*) are derived from the IDL program name or its alias if present. The file names are the same as the file names of the client interface objects. They are distinguished by their extension, ".cbl" for the client interface objects and ".cpy" for the copybooks. If you import the generated copybooks and client interface objects into your Micro Focus development environment, take care the copybooks are accessed correctly by the compiler and not confused with the client interface objects. This may happen if you copy the generated coybooks and the client interface objects into one directory. See your Micro Focus documentation for more information.

4 Write your COBOL RPC client application. See *Writing Applications with the COBOL Wrapper*, in particular the section *Using the RPC Communication Area with a Standard Call Interface*, and take into consideration the information given in *Software AG IDL to COBOL Mapping*.

5 Compile and link (bind) all modules together to an executable program:

- the generated client interface object(s)
- if required, the generic RPC service module COBSRVI
- your COBOL RPC client customer application

For target operating system **UNIX** (i.e. the modules are generated for UNIX):

- The broker library from the EntireX UNIX installation must be linked to your the application, e.g. by defining the symbol "broker" as a linker option and linking the module *broker.o* from the EntireX UNIX installation.
- See your Micro Focus documentation for more information.

For target operating system **Windows** (i.e. the modules are generated for Windows):

- no additional compiler directives and linker options are required

6 Make sure the broker stub module can be called dynamically.

Under UNIX:

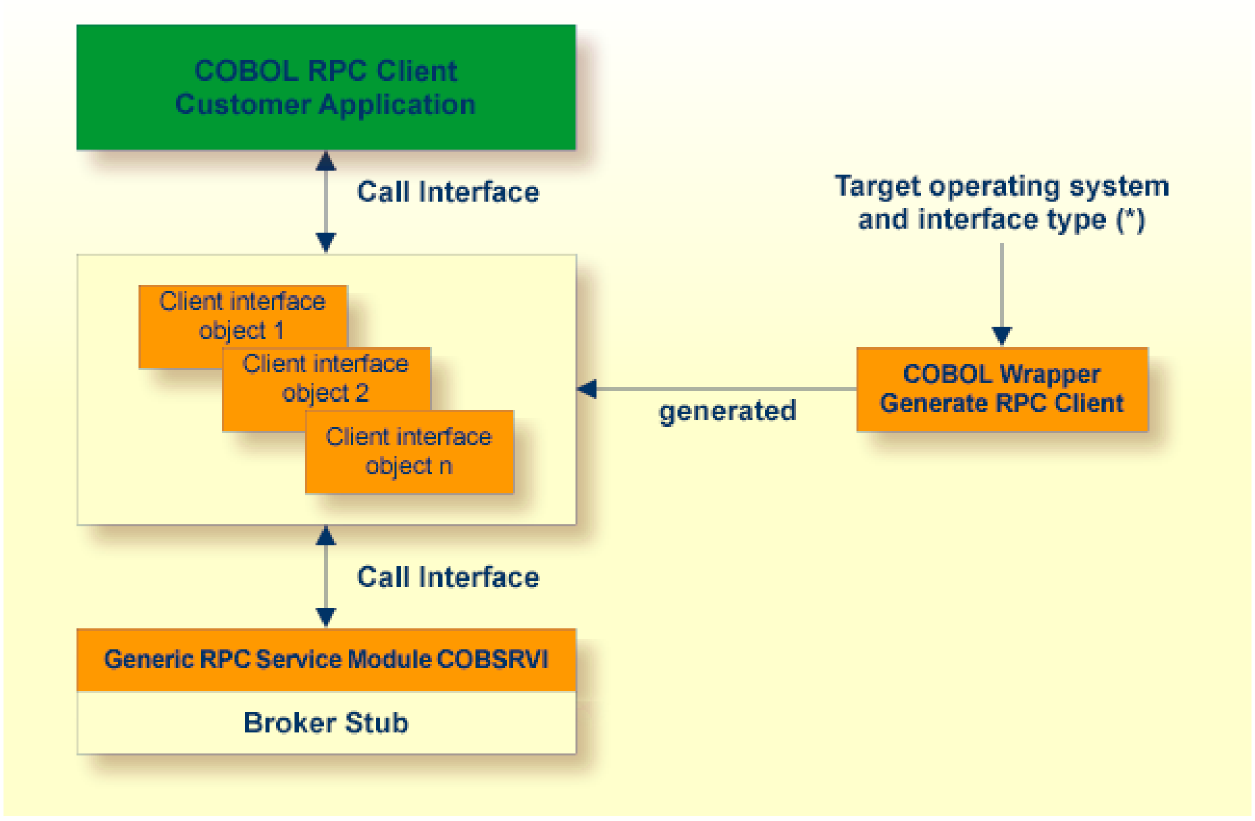
- The broker stub shared library or object *libbroker.so|sl* is accessible according to the rules of the UNIX system used, e.g. the directory of the library is defined in the `LD_LIBRARY_PATH` environment variable.

Under Windows:

- The broker stub DLL *broker.dll* is accessible, for example with the `PATH` environment variable.

Using the COBOL Wrapper for Batch (z/VSE, IBM i, BS2000/OSD and z/OS)

This mode applies to z/OS, BS2000/OSD, z/VSE and IBM i.



(*) For the target operating systems and interface types, see *Generate COBOL Source Files from Software AG IDL Files*.

In this scenario, the COBOL RPC client customer application, every generated client interface object, generic RPC services module and the broker stub are linked together to an executable application.

Use the COBOL Wrapper for batch if you need to embed the client interface object into your application with a standard linkage calling convention.

To use the COBOL Wrapper for batch

1. Generate the client interface object(s) for the target operating system, for example "z/OS", and use interface type "Batch with standard linkage calling convention". See *Generate COBOL Source Files from Software AG IDL Files*. If required, generate the generic RPC service module COBSRVI too. See *Generate Generic RPC Service for Module COBSRVI* for information on when to generate this.
2. If necessary, use FTP to transfer the client interface object(s) and, if required, also the generic RPC service module COBSRVI to the target platform where you write your application.
3. If you have generated the generic RPC service module, you may need to adapt the broker stub that supports the required transport (TCP, SSL, NET). See *Adapting the Used Broker Stub*.
4. Write your COBOL RPC client application. See *Writing Applications with the COBOL Wrapper*, in particular the section *Using the RPC Communication Area with a Standard Call Interface*, and take into consideration the information given in *Software AG IDL to COBOL Mapping*.
5. If necessary, use FTP to transfer the client interface object(s), if required the generic RPC service module COBSRVI,and your application to the target platform where you compile your application.
6. Using a COBOL compiler supported by COBOL Wrapper, compile:

   - the generated client interface object(s)
   - if required, the generic RPC service module COBSRVI
   - your COBOL RPC client customer application

   Take care the generated copybooks (see *Using the Generated Copybooks*) are accessed correctly by the compiler and not confused with the client interface objects, because the copybooks and client interface objects have identical file names. See your compiler documentation.

   Under **BS2000/OSD**:

   - The IDL types U or UV require a compiler that supports COBOL data type NATIONAL. See *BS2000/OSD Prerequisites* in the EntireX Release Notes for more information on supported compilers.

   Under **IBM i**:

   - Use the command CRTCBLMOD (create COBOL module) and compile all modules above to ILE modules.
   - Use the IBM i compiler command with the options shown below:

```
CRTCBLMOD
OPTION(*NOMONOPRC) EXTDSOPT(*NODFRWRT) LINKLIT(*PRC)
```

Under all **other platforms**:

- Use the standard COBOL compiler of the target platform.

7 Using the standard linker (binder) of the target platform, link (bind) the following programs:

- the generated client interface object(s)
- if required, the generic RPC service module COBSRVI
- if required, the broker stub
- your COBOL RPC client customer application

Under **IBM i**:

- Use the IBM i command `CRTPGM` to bind all compiled modules to an executable ILE program of type *PGM.
- To link the main program, use the following create program command with the options shown:

```
CRTPGM
   MODULE(*LIB/myapplication mystub1 mystub2 ..)
   BNDSRVPGM(EXX/EXA) ...
```

where `EXX` is the EntireX product library and `EXA` the broker stub.

Under **all other platforms**:

- Refer to your standard linker (binder) documentation.

8 Make sure that the correct broker stub module is used and, if linked (bound) dynamically, that it can be called dynamically.

Under **BS2000/OSD**:

- The broker stub module BKIMBTIA is located in the broker LMS load library.

Under **IBM i**:

- The broker stub EXA is located by default in the EntireX product library EXX.

Under **z/OS**:

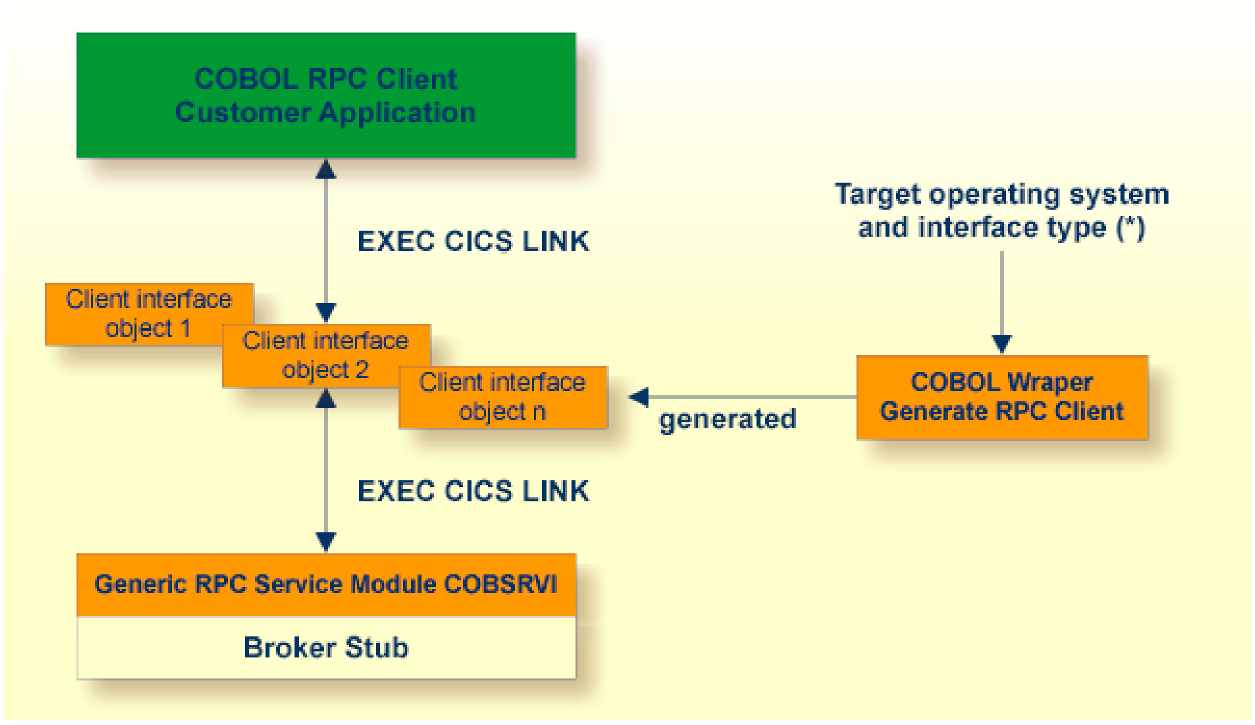
- See the broker installation documentation and use a broker stub for batch (for example BROKER) from the common load library EXX951.LOAD. See also *Administration of Broker Stubs under z/OS* in the z/OS administration documentation.

Under **z/VSE**:

- See the broker installation documentation and use a broker stub for batch (for example BKIMB), see sublibrary EXX951.

Using the COBOL Wrapper for CICS with DFHCOMMAREA Calling Convention (z/OS and z/VSE)

This mode applies to z/OS and z/VSE.



(*) For the target platforms, see *Generate COBOL Source Files from Software AG IDL Files*.

In this scenario, the generic RPC services module and the broker stub are linked together to a CICS program. The COBOL RPC client customer application, every generated client interface object and the generic RPC services module together with the broker stub are installed each as separate individual CICS programs.

Use the COBOL Wrapper for CICS with DFHCOMMAREA calling convention in the following situations:

- You want to have an `EXEC CICS LINK` DFHCOMMAREA interface to your client interface object(s).
- The restriction of the COMMAREA length suits your purposes. Because the RPC communication area is also transferred in the COMMAREA, the effective length that can be used for IDL data is shorter than the CICS COMMAREA length. Nearly 31 KB can be used for IDL data.

- You wish to separate the generic RPC service module and the broker stub from the client interface object(s).
- You require a program link to the client interface object(s).

To use the COBOL Wrapper for CICS with DFHCOMMAREA calling convention

1. Generate the client interface object for the target operating system, for example "z/OS", and use interface type "CICS with DFCOMMAREA calling convention". See ***Generate COBOL Source Files from Software AG IDL Files***. If required, generate the generic RPC service module COBSRVI too. See ***Generate Generic RPC Service for Module COBSRVI*** for information on when to generate this.
2. If necessary, use FTP to transfer the client interface object(s) and, if required, also the generic RPC service module COBSRVI to the target platform where you write your application.
3. If you have generated the generic RPC service module and you plan to (re)install it within CICS, you may need to adapt the broker stub that supports the required transport (TCP, SSL, NET). See ***Adapting the Used Broker Stub***.
4. Write your COBOL RPC client application. See ***Writing Applications with the COBOL Wrapper***, in particular the section ***Using the RPC Communication Area with*** `EXEC CICS LINK`, and take into consideration the information given in ***Software AG IDL to COBOL Mapping***.
5. If necessary, use FTP to transfer the client interface object(s), if required the generic RPC service module COBSRVI,and your application to the target platform where you compile your application.
6. Using the CICS translator for COBOL provided with your CICS installation and a COBOL compiler supported by the COBOL Wrapper, translate and compile:

   - the generated client interface object(s)
   - if required, the generic RPC service module COBSRVI
   - your COBOL RPC client customer application.

   Take care the generated copybooks (see ***Using the Generated Copybooks***) are accessed correctly by the compiler and not confused with the client interface objects, because the copybooks and client interface objects have identical file names. See your compiler documentation.
7. Using the standard linker (binder) of the target platform, link (bind) the following programs to separate CICS programs:

   - every generated client interface object to a CICS program
   - if required, the generic RPC service module COBSRVI together with a broker stub
   - your COBOL RPC client customer application.

8. Install every client interface object, if required the CICS RPC service module COBSRVI and your COBOL RPC client customer application as separate CICS programs.

9 Make sure the correct broker stub is used and can be called dynamically by the CICS generic RPC service module COBSRVIC.

Under **z/OS**:

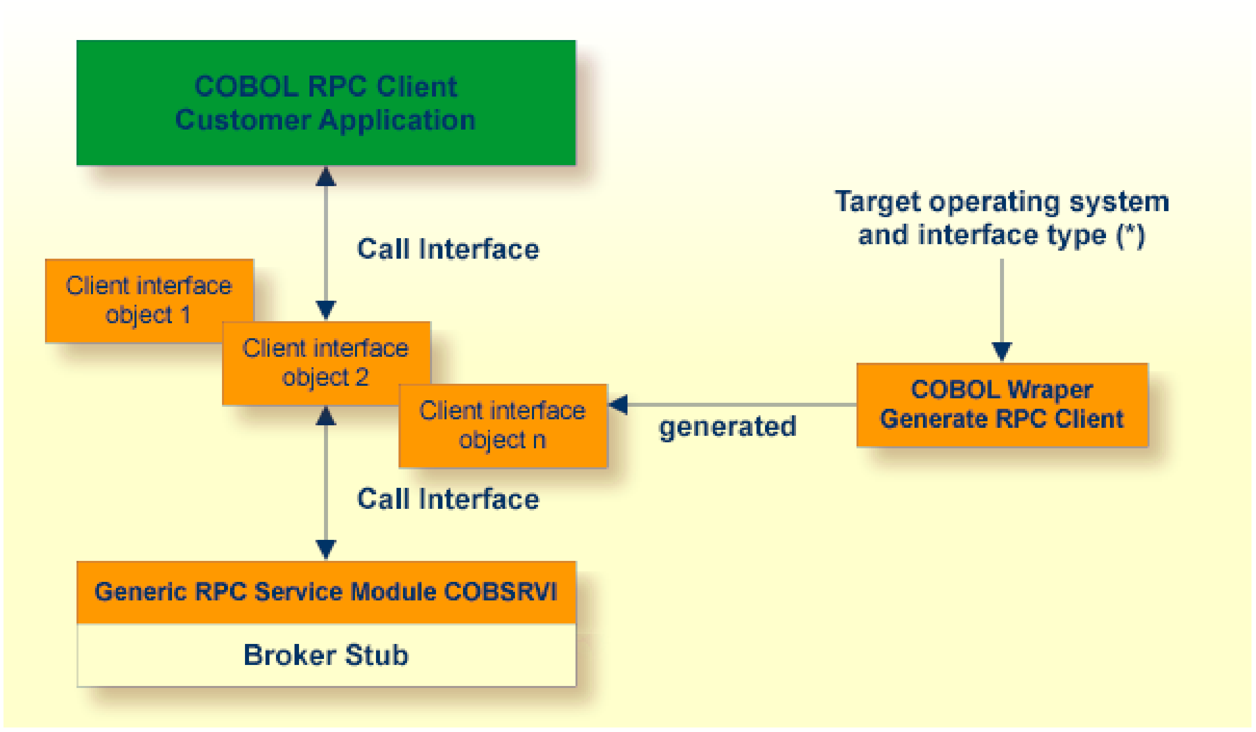
- See the broker installation documentation and use a broker stub for CICS (for example CICSETB) from the common load library EXX951.LOAD. See also *Administration of Broker Stubs under z/OS* in the z/OS administration documentation.

Under **z/VSE**:

- See the broker installation documentation and use a broker stub for CICS (for example BKIMC), see sublibrary EXX951.

Using the COBOL Wrapper for CICS with Call Interfaces (z/OS and z/VSE)

This mode applies to z/OS and z/VSE.



(*) For the target operating systems and interface types, see *Generate COBOL Source Files from Software AG IDL Files*.

The COBOL Wrapper can be used with a call interface, even in CICS. This means you can build an application where the COBOL RPC client customer application, every generated client interface object, the generic RPC services module and the broker stub are linked together to an executable application, similar to the batch scenario. See *Using the COBOL Wrapper for Batch (z/VSE, IBM i, BS2000/OSD and z/OS)*.

Using a call interface within CICS may be useful if

- the restriction of the COMMAREA length (about 31 KB) prevents you from using the *Using the COBOL Wrapper for CICS with DFHCOMMAREA Calling Convention (z/OS and z/VSE)* scenario (see above)
- you do *not* require a distributed program link (CICS DPL) to your client interface object(s)
- you prefer a call interface instead of `EXEC CICS LINK` to your client interface objects.

To use the COBOL Wrapper with a call interface within CICS

1. Generate the client interface object(s) for the target operating system, for example "z/OS", and use the interface type "CICS with standard calling convention". See *Generate COBOL Source Files from Software AG IDL Files*. If required, generate the generic RPC service module COBSRVI too. See *Generate Generic RPC Service for Module COBSRVI* for information on when to generate this.
2. If necessary, use FTP to transfer the client interface object(s) and, if required, also the generic RPC service module COBSRVI to the target platform where you write your application.
3. If you have generated the generic RPC service module, you may need to adapt the broker stub that supports the required transport (TCP, SSL, NET). See *Adapting the Used Broker Stub*.
4. Write your COBOL RPC client application. See *Writing Applications with the COBOL Wrapper*, in particular the section *Using the RPC Communication Area with a Standard Call Interface*, and take into consideration the information given in *Software AG IDL to COBOL Mapping*.
5. If necessary, use FTP to transfer the client interface object(s), if required the generic RPC service module COBSRVI, and your application to the target platform where you compile your application.
6. Using the CICS translator for COBOL provided with your CICS installation and a COBOL compiler supported by the COBOL Wrapper, translate and compile:

   - the generated client interface object(s)
   - if required, the generic RPC service module COBSRVI
   - your COBOL RPC client customer application

   Take care the generated copybooks (see *Using the Generated Copybooks*) are accessed correctly by the compiler and not confused with the client interface objects, because the copybooks and client interface objects have identical file names. See your compiler documentation.
7. Using the standard linker (binder) of the target platform, link (bind) all translated and compiled modules, and, if required, the broker stub, together to a CICS program, using the standard linker (binder) of the target platform.
8. Install the program within CICS.
9. Make sure the correct broker stub is used and can be called dynamically by the generic RPC service module COBSRVI.

   Under **z/OS**:

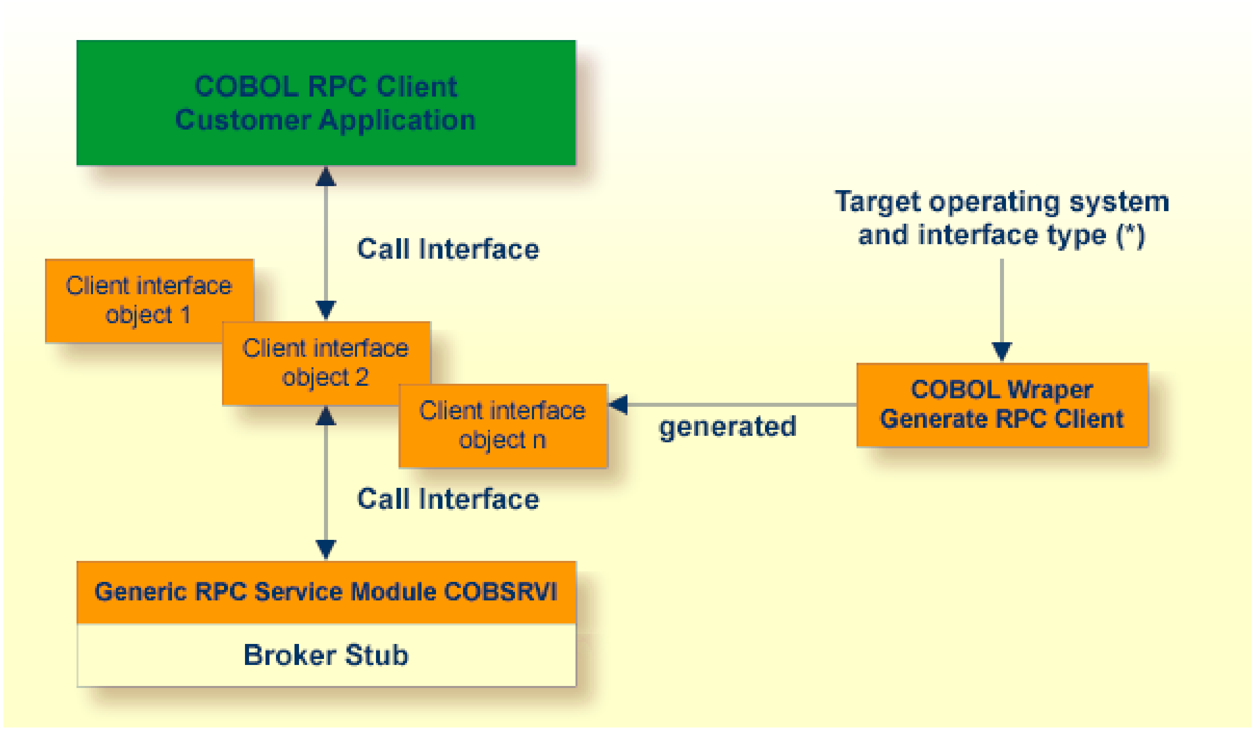
   - See the broker installation documentation and use a broker stub for CICS (for example CICSETB) from the common load library EXX951.LOAD. See also *Administration of Broker Stubs under z/OS* in the z/OS administration documentation.

Under **z/VSE**:

- See the broker installation documentation and use a broker stub for CICS (for example BKIMC), see sublibrary EXX951.

Using the COBOL Wrapper for IDMS/DC with Call Interfaces (z/OS)

This mode applies to z/OS.



(*) For the target operating systems and interface types, see *Generate COBOL Source Files from Software AG IDL Files*.

The COBOL Wrapper can be used with a call interface in IDMS/DC. This means you can build an application where the COBOL RPC client customer application, every generated client interface object, the generic RPC services module and the broker stub are linked together to an executable application, similar to the batch scenario. See *Using the COBOL Wrapper for Batch (z/VSE, IBM i, BS2000/OSD and z/OS)*.

To use the COBOL Wrapper with a call interface within IDMS/DC

1 Generate the client interface object(s) for the target operating system "z/OS", and use the interface type "IDMS/DC with standard calling convention". See *Generate COBOL Source Files from Software AG IDL Files*. If required, generate the generic RPC service module COBSRVI too. See *Generate Generic RPC Service for Module COBSRVI* for information on when to generate this.

2 If necessary, use FTP to transfer the client interface object(s) and, if required, also the generic RPC service module COBSRVI to the target platform where you write your application.

3 If you have generated the generic RPC service module, you may need to adapt the broker stub that supports the required transport (TCP, SSL, NET). See *Adapting the Used Broker Stub*.

4 Write your COBOL RPC client application. See *Writing Applications with the COBOL Wrapper*, in particular the section *Using the RPC Communication Area with a Standard Call Interface*, and take into consideration the information given in *Software AG IDL to COBOL Mapping*.

5 If necessary, use FTP to transfer the client interface object(s), if required the generic RPC service module COBSRVI, and your application to the target platform where you compile your application.

6 Using the IDMS/DC translator for COBOL provided with your IDMS/DC installation and a COBOL compiler supported by the COBOL Wrapper, translate and compile:

- the generated client interface object(s)
- if required, the generic RPC service module COBSRVI
- your COBOL RPC client customer application

Take care the generated copybooks (see *Using the Generated Copybooks*) are accessed correctly by the compiler and not confused with the client interface objects, because the copybooks and client interface objects have identical file names. See your compiler documentation.

7 Using the standard linker (binder) of the target platform, link (bind) all translated and compiled modules, and, if required, the broker stub, together to a IDMS/DC program, using the standard linker (binder) of the target platform.

8 Install the program within IDMS/DC.

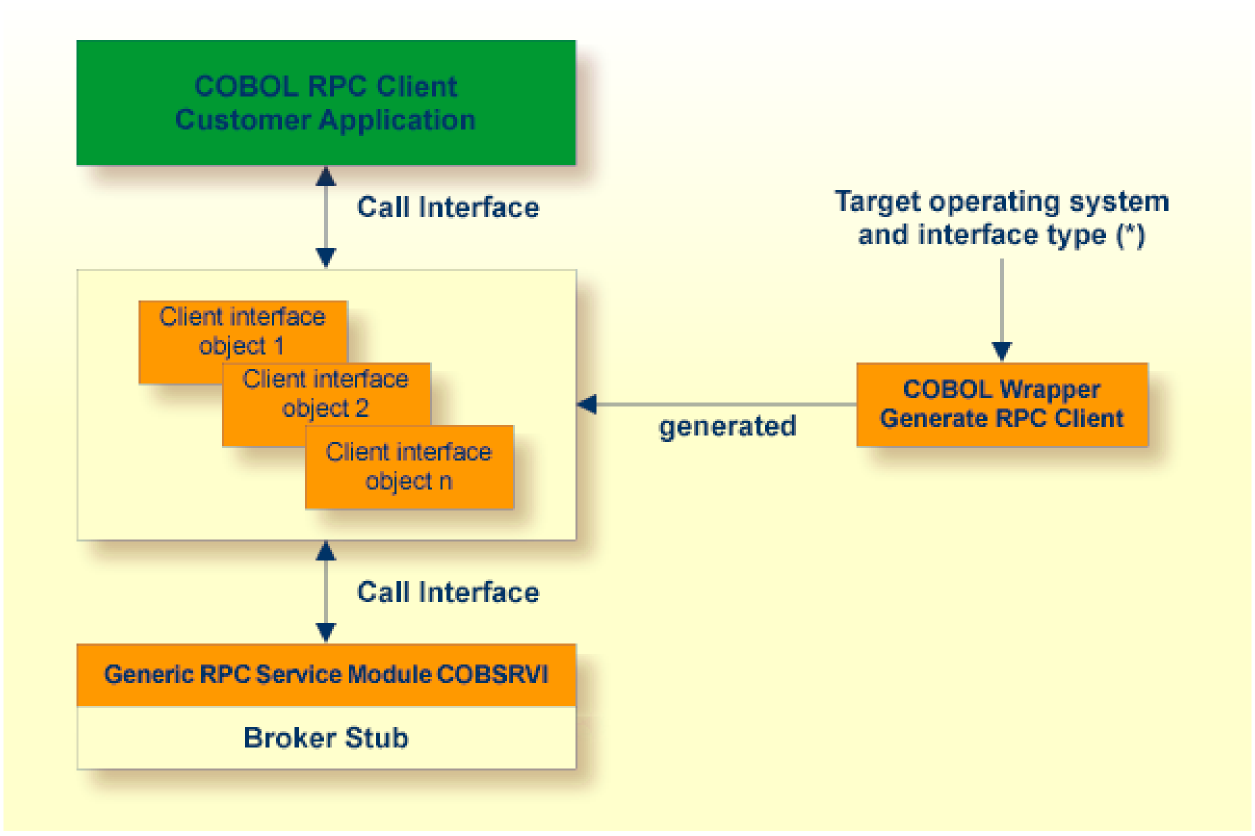
9 Make sure the correct broker stub is used and can be called dynamically by the generic RPC service module COBSRVI.

Under **z/OS**:

- See the broker installation documentation and use a broker stub for IDMS/DC (for example IDMSETB) from the common load library EXX951.LOAD. See also *Administration of Broker Stubs under z/OS* in the z/OS administration documentation.

Using the COBOL Wrapper for IMS (z/OS)

This mode applies to z/OS IMS modes BMP and MPP.


COBOL RPC Client Customer Application
Call Interface
Target operating system and interface type (*)
Client interface object 1
Client interface object 2
Client interface object n
generated
COBOL Wrapper Generate RPC Client
Call Interface
Generic RPC Service Module COBSRVI
Broker Stub

(*) For the target operating systems and interface types, see *Generate COBOL Source Files from Software AG IDL Files*.

In this scenario, the COBOL RPC client customer application, every generated client interface object, the generic RPC services module and the broker stub are linked together to an executable application.

Use the COBOL Wrapper for IMS if

- you need to embed the client interface object into your IMS BMP or IMS MPP application with a standard linkage calling convention.

To use the COBOL Wrapper for IMS

1 Generate the client interface object(s) for the target operating system "z/OS" and use the interface type "IMS BMP with standard linkage calling convention" or "IMS MMP with standard linkage calling convention". See *Generate COBOL Source Files from Software AG IDL Files*. See *Generate Generic RPC Service for Module COBSRVI* for information on when to generate this.

2 If necessary, use FTP to transfer the client interface object(s) and, if required, also the generic RPC service module COBSRVI to the target platform where you write your application.

3 If you have generated the generic RPC service module, you may need to adapt the broker stub that supports the required transport (TCP, SSL, NET). See *Adapting the Used Broker Stub*.

4 Write your COBOL RPC client application. See *Writing Applications with the COBOL Wrapper*, in particular the section *Using the RPC Communication Area with a Standard Call Interface*, and take into consideration the information given in *Software AG IDL to COBOL Mapping*.

5 If necessary, use FTP to transfer the client interface object(s), if required the generic RPC service module COBSRVI, and your application to the target platform where you translate and compile your application.

6 Using a COBOL compiler supported by the COBOL Wrapper, compile:

   - the generated client interface object(s)
   - if required, the generic RPC service module COBSRVI
   - your COBOL RPC client customer application.

   Take care the generated copybooks (see *Using the Generated Copybooks*) are accessed correctly by the compiler and not confused with the client interface objects, because the copybooks and client interface objects have identical file names. Do not assign the data set with the client interface objects prior in sequence to the copybooks to SYSLIB. See your compiler documentation.

7 Link (bind) all compiled modules and, if required, the broker stub, together to an executable program, using the standard linker (binder) of the target platform.

8 Make sure the correct broker stub is used and can be called dynamically. In the common load library EXX951.LOAD you can find broker stubs that can be used for

   - IMS BMP (for example BROKER)
   - IMS MPP (for example MPPETB)

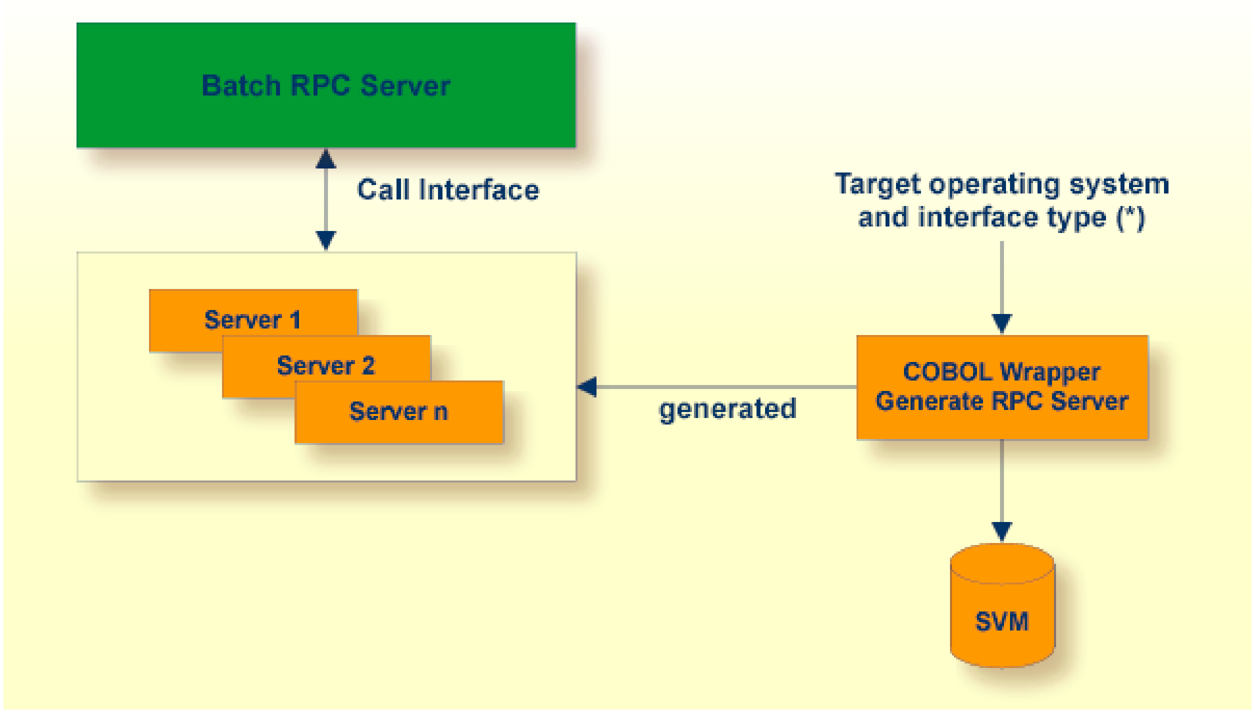
   See *Administration of Broker Stubs under z/OS* in the z/OS administration documentation.

3 Using the COBOL Wrapper for the Server Side

The COBOL Wrapper provides access to RPC-based components from COBOL applications and enables users to develop both clients and server. This section introduces the various possibilities for RPC-based server applications written in COBOL and covers the following sections:

Using the COBOL Wrapper for Micro Focus (UNIX and Windows)

This mode applies to UNIX and Windows.


Batch RPC Server
Call Interface
Target operating system and interface type (*)
Server 1
Server 2
Server n
generated
COBOL Wrapper Generate RPC Server
SVM

(*) For the target operating systems and interface types, see *Generate COBOL Source Files from Software AG IDL Files*.

The Micro Focus RPC server sets up all of your server's parameters dynamically in the format required. Your server is called dynamically using standard call interfaces.

Use the COBOL Wrapperfor Micro Focus to build servers for the Micro Focus RPC server.

To use the COBOL Wrapper for Micro Focus

1 Generate a server (skeleton(s)) for the target operating system, for example "Windows", and use interface type "Micro Focus with standard linkage calling convention". See *Generate COBOL Source Files from Software AG IDL Files* for details.

2 If a server mapping file (SVM file) is required, deploy it to the Micro Focus RPC Server, see *Server Mapping Deployment*.

3 If necessary, use FTP to transfer the server (skeleton(s)) to the target platform where you write your server.

4 Import the modules into your Micro Focus IDE.

5 Use the generated server (skeleton(s)) and complete it by applying your application logic. Note the information given in ***Software AG IDL to COBOL Mapping***.

6 Compile and - if the format requires it - link (bind) and package your server(s) to one of the following formats:

- Micro Focus intermediate code (int) or generated code (gnt). These formats can also be packaged into a Micro Focus library file (lbr). In this case the `program-name` (see `program-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation) given in the IDL file must match the library file name. The `library-name` (`library-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation) given in the IDL file is ignored and not used.
- Under Windows to a DLL, and under UNIX to a shared library (so/sl). The `library-name` (`library-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation) given in the IDL file must match the executables file name, and the `program-name` (see `program-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation) given in the IDL file must match an entry point.

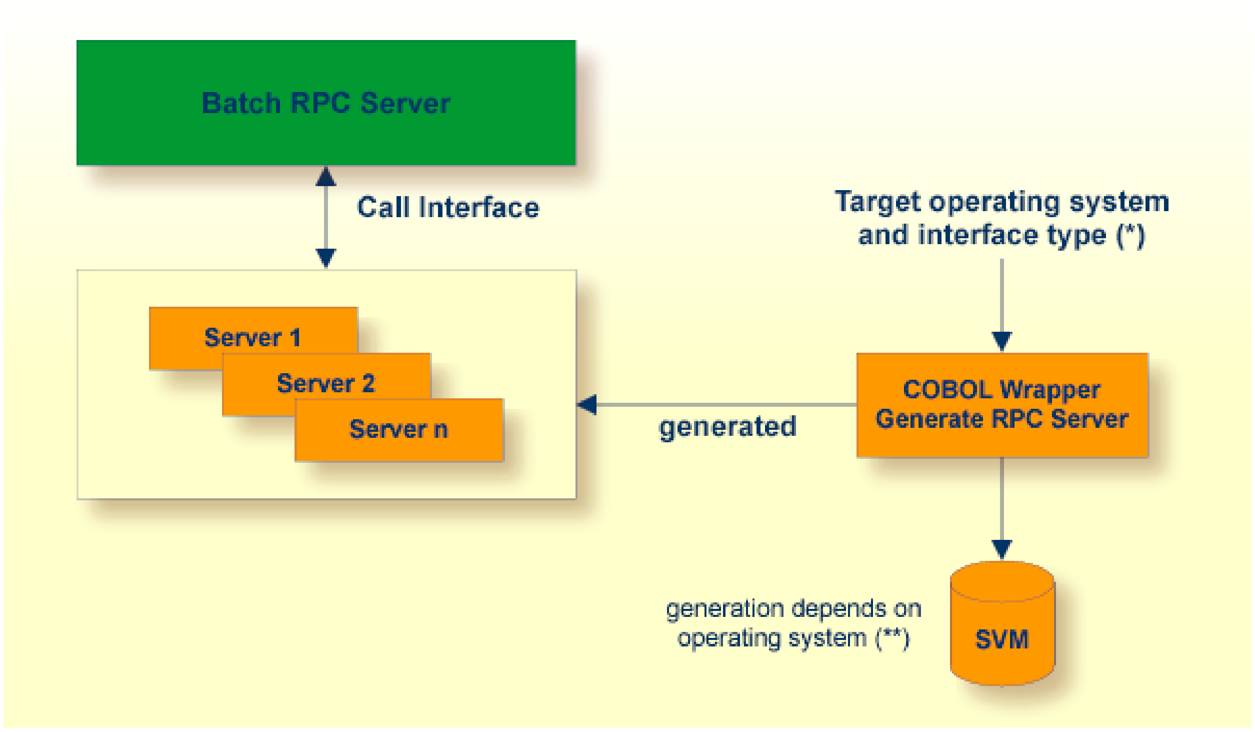
7 Provide your server to the Micro Focus RPC server.

- Make sure your server(s) are accessible by the Micro Focus RPC server:
  - under UNIX, for example with the `LD_LIBRARY_PATH` environment variable
  - under Windows, for example with the `PATH` environment variable.
- If an SVM file is used, its location can be identified by a concatenation of the `program-name` and the `library-name` given in the IDL. See `program-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation and `library-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation.

  Example: If a client performs an RPC request that is based on the IDL program name CALC and the IDL library name EXAMPLE, the RPC server will dynamically try to locate logically the SVM file EXAMPLECALC and execute program CALC. If no corresponding program can be found, the access will fail.

Using the COBOL Wrapper for Batch (z/OS, IBM i, BS2000/OSD and z/VSE)

This mode applies to z/OS, IBM i, BS2000/OSD and z/VSE.


Batch RPC Server
Call Interface
Target operating system and interface type (*)
Server 1
Server 2
Server n
generated
COBOL Wrapper Generate RPC Server
generation depends on operating system (**)
SVM

(*) For the target operating systems and interface types, see *Generate COBOL Source Files from Software AG IDL Files*.

(**) Currently an SVM file is generated for operating systems z/OS and z/VSE.

In batch mode, the RPC server sets up all of your server's parameters dynamically in the format required. Your server is called dynamically using standard call interfaces.

Use the COBOL Wrapper for batch to build servers for the Batch RPC server.

To use the COBOL Wrapper for batch

1. Generate a server (skeleton(s)) for the target operating system, for example "z/OS", and use interface type "Batch with standard linkage calling convention". See *Generate COBOL Source Files from Software AG IDL Files* for details.
2. If an SVM file is required, deploy it to the Batch RPC Server, see *Server Mapping Deployment*.
3. If necessary, use FTP to transfer the server (skeleton(s)) to the target platform where you write your server.

4 Use the generated server (skeleton(s)) and complete it by applying your application logic. Note the information given in *Software AG IDL to COBOL Mapping*.

Under **IBM i** , consider multithreading issues:

- Your server has to be implemented as an ILE COBOL program of type *PGM.
- The RPC server is running in a multithreaded environment. Therefore your server must be thread-safe. This implies that all commands and subprograms accessed in your servers must allow multithreads.
- Please note that some COBOL statements do not support multithreads. Using statements that are not thread-safe (e.g. `STOP RUN`) can result in the RPC server ending abnormally. Therefore the server programs have to be terminated with a thread-safe statement, for example `EXIT PROGRAM`. For details, see the IBM documentation *Language Restrictions under THREAD and Preparing ILE COBOL Programs for Multithreading*.

5 If necessary, use FTP to transfer your server to the target platform where you compile your server.

6 Use a COBOL compiler supported by the COBOL Wrapper to compile your server.

Under **BS2000/OSD,**

- the IDL types U or UV require a compiler that supports COBOL data type NATIONAL. See *BS2000/OSD Prerequisites* in the EntireX Release Notes for more information on supported compilers.
- compile them as OM or LLM modules.

Under **IBM i,**

- use the IBM i command `CRTCBLMOD` (create bound COBOL module).
- as an alternative, you can compile and bind in one step, see the next step below.

Under all **other platforms,**

- use the standard COBOL compiler of the target platform.

7 Link (bind) your server to an executable program. Give the resulting server program the same name as the `program-name` in the IDL file. See `program-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation.

Under **BS2000/OSD**:

- There is no need to link the server modules with the BS2000/OSD Common Runtime Environment (CRTE). The CRTE is included in the server's BLSLIB chain and loaded dynamically. If this is needed for any reason, the CRTE must be linked as a subsystem. All entries must be hidden to prevent duplicates. Linking the CRTE statically will consume resourses and slow down the load time of the server modules.

Under **IBM i**:

- Bind it as a dynamically callable program of type *PGM using the command `CRTPGM`.
- As an alternative to compiling with `CRTCBLMOD` (see step above) and binding with `CRTPGM` separately, you can compile and bind in one step with the command `CRTBNDCBL`.
- When linking/binding servers, the CRTPGM parameter `ACTGRP (*CALLER)` must be specified. This guarantees that the server application runs in the same activation group as the calling RPC server.

Under all **other platforms**

- Use the standard linker (binder) of the target platform.

8 Provide your server to the Batch RPC Server.

Under **IBM i**

- Put the server into a library whose name corresponds to the library name in the IDL file (see `library-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation).
- If you put the server program into a library other than the library name given in the IDL (e.g. *MyLib*), you must tell this to the RPC server, using the server parameter `Library=Fix(MyLib)`. In this case, the library name sent with the client request is ignored.

  Example: If a client performs an RPC request that is based on the IDL program name CALC in the IDL library EXAMPLE, the remote RPC server will dynamically try to execute the ILE program CALC in the IBM i library EXAMPLE. If no corresponding program can be found, the access will fail.

Under all **other platforms**

- Add the server to the Batch RPC Server STEPLIB chain.
- If you are using an SVM file:
  - A concatenation of the `program-name` and the `library-name` given in the IDL is used to locate the SVM file. See `program-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation and `library-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation.

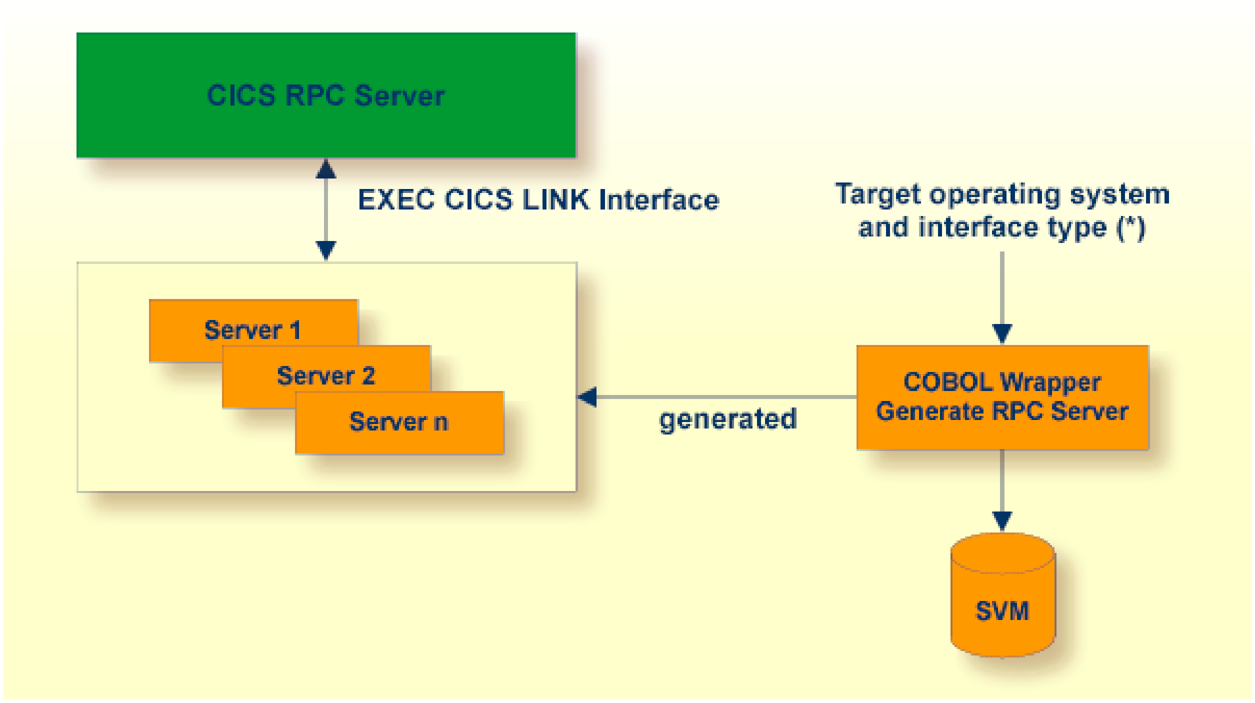
    Example: If a client performs an RPC request that is based on the IDL program name CALC and the IDL library name EXAMPLE, the RPC server will dynamically try to locate logically the SVM file EXAMPLECALC and execute program CALC. If no corresponding program can be found, the access will fail.

- If an SVM file is not used (e.g. it is not required or the server is generated with an earlier version of EntireX without support for server mapping):
  - The library name (see `library-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation) given in the IDL is ignored.

    Example: If a client performs an RPC request that is based on the IDL program name CALC, the RPC server will dynamically try to execute a program CALC. If no corresponding program can be found, the access will fail.

Using the COBOL Wrapper for CICS with DFHCOMMAREA Calling Convention (z/OS and z/VSE)

This mode applies to z/OS and z/VSE.


CICS RPC Server
EXEC CICS LINK Interface
Target operating system and interface type (*)
Server 1
Server 2
Server n
generated
COBOL Wrapper Generate RPC Server
SVM

(*) For the target operating systems and interface types, see *Generate COBOL Source Files from Software AG IDL Files*.

In CICS, the RPC server sets up all of your server's parameters dynamically in the format required. Your server is called using `EXEC CICS LINK`.

Use the COBOL Wrapper for CICS with DFHCOMMAREA calling convention if

- you want to have a standard `EXEC CICS LINK` DFHCOMMAREA interface to your server
- you require a distributed program link (CICS DPL) to your server
- the DFHCOMMAREA length restriction (31 KB) suits your needs, otherwise consider the following interface types:
  - *Using the COBOL Wrapper for CICS with Channel Container Calling Convention (z/OS)*
  - *Using the COBOL Wrapper for CICS with DFHCOMMAREA Large Buffer Interface (z/OS and z/VSE)*

To use the COBOL Wrapper for CICS with DFHCOMMAREA calling convention

1. Generate the server (skeleton) for the target operating system, for example "z/OS", and use interface type "CICS with DFHCOMMAREA calling convention". See ***Generate COBOL Source Files from Software AG IDL Files***.
2. If an SVM file is required, it has to be provided. For the CICS RPC Server or CICS ECI RPC Server this is done by deployment, see *Server Mapping Deployment*. For the webMethods EntireX Adapter, it is picked up automatically when the adapter connection is generated.
3. If necessary, use FTP to transfer the server (skeleton(s)) to the target platform where you write your server.
4. Use the generated server (skeleton(s)) and complete it by applying your application logic. Note the information given in ***Software AG IDL to COBOL Mapping***.
5. If necessary, use FTP to transfer your server to the target platform where you compile your server.
6. Using the CICS translator for COBOL provided with your CICS installation and a COBOL compiler supported by the COBOL Wrapper, translate and compile your server.
7. Link (bind) the server to an executable program, using the standard linker (binder) of the target platform. Give your server a CICS program name that is the same as the `program-name` in the IDL file. See `program-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation.
8. Provide your server(s) to the CICS RPC server, EntireX Adapter, or CICS ECI RPC server:
   - Install your server(s) as separate CICS program(s).
   - If you are using an SVM file :
     - A concatenation of the `program-name` and the `library-name` given in the IDL is used to locate the SVM file. See `program-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation and `library-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation.

       Example: If a client performs an RPC request that is based on the IDL program name CALC and the IDL library EXAMPLE, the RPC server will dynamically try to locate logically the SVM file EXAMPLECALC and execute program CALC. If no corresponding program can be found, the access will fail.
   - If an SVM file is not used, for example it is not required or the server is generated with a previous version of EntireX without support for server mapping:
     - The library name (see `library-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation) given in the IDL is ignored.

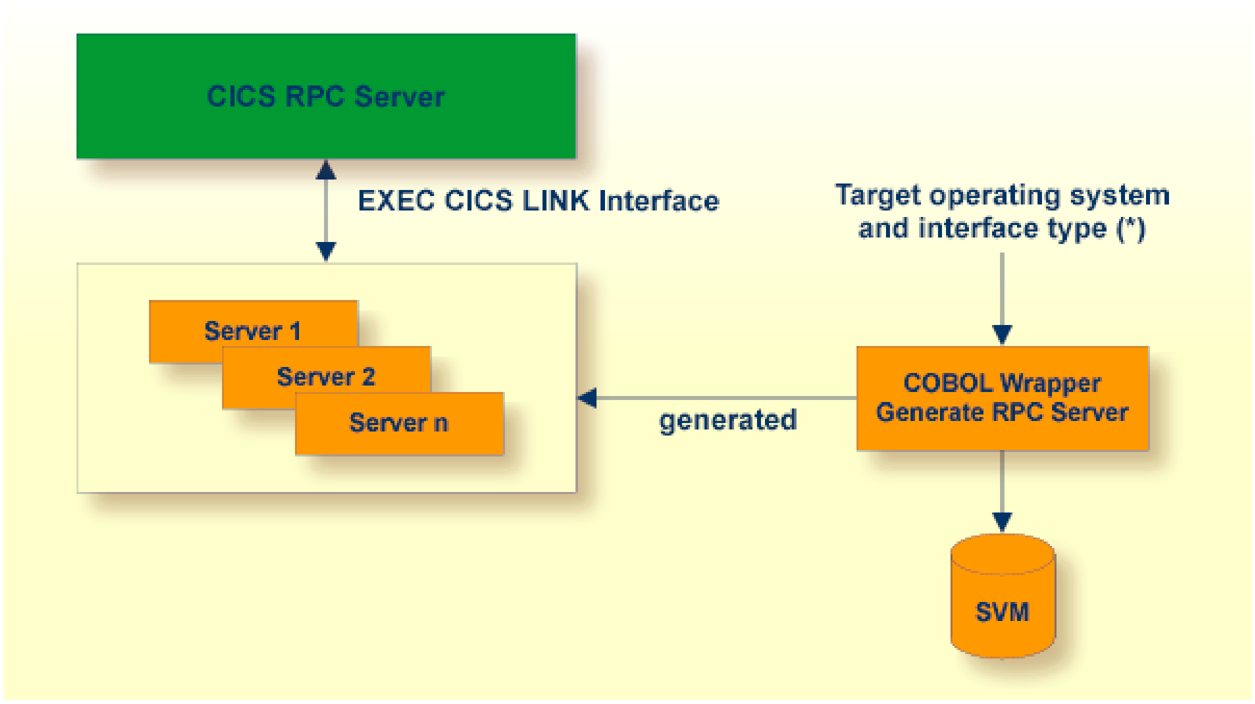
       Example: If a client performs an RPC request that is based on the IDL program name CALC, the RPC server will dynamically try to execute a program CALC. If no corresponding program can be found, the access will fail.

Using the COBOL Wrapper for CICS with Channel Container Calling Convention (z/OS)

This section covers the following topics:

Introduction

This mode applies to z/OS.


CICS RPC Server
EXEC CICS LINK Interface
Target operating system and interface type (*)
Server 1
Server 2
Server n
generated
COBOL Wrapper Generate RPC Server
SVM

(*) For the target operating systems and interface types, see *Generate COBOL Source Files from Software AG IDL Files*.

In CICS, the RPC server sets up all of your server's parameters dynamically in the format required. Your server is called using `EXEC CICS LINK` passing the container(s) in the defined channel to your server. See ***Channel Name***.

Use the COBOL Wrapper for CICS with channel container calling convention if

- you require more than 31 KB of data to transfer to your server
- your IDL complies with CICS channel container IDL rules (see below). If your IDL does not match these rules, consider the interface type ***Using the COBOL Wrapper for CICS with DFH-COMMAREA Large Buffer Interface (z/OS and z/VSE)*** to implement your server.
- you want to have a standard CICS channel container interface to your server
- you require a distributed program link (CICS DPL) to your server.

CICS Channel Container IDL Rules

The following rules apply to CICS channel container IDL:

- A container is described with an IDL structure. See `structure-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation.
- The container name is the name of the IDL structure. A maximum of 16 characters are allowed by CICS for container names.
- IDL programs reference IDL structures only. No other parameters may be referenced.
- Multiple containers can be defined, see ***Example 3: Multiple Containers***.
- A variable number of containers can be defined using one-dimensional IDL unbounded arrays with maximum (see `array-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation). See also ***Example 4: Variable Number of Containers (Direction Out Only)***.

Restrictions

- IDL unbounded arrays (i.e. variable containers) for direction `IN` and `INOUT` are not supported.
- Two and three-dimensional IDL unbounded arrays are not supported.

Example 1: Same Container for Direction In and Out

This example uses the same container for input and output. The container name is "CALC".

```
Library 'EXAMPLE' Is
  Program 'CONCALC' Is
   Define Data Parameter
    1 Container       ('CALC')        InOut
   End-Define

  Struct 'CALC' Is
   Define Data Parameter
    1 Operation       (A1)
    1 Operand_1       (I4)
    1 Operand_2       (I4)
    1 Function_Result (I4)
   End-Define
```

Example 2: Different Container for Direction In and Out

This example uses separate containers for input and output.

```
Library 'DFHCON' Is
 Program 'TWOC' Is /* Two Container - Separate for Input and Output
   Define Data Parameter
    1 ContainerIn   ('CONTAINER1')  In
    1 ContainerOut  ('CONTAINER2')  Out
   End-Define
Struct 'CONTAINER1' Is
  Define Data Parameter
   1 Just-Occupied-Space (A39000) /* 39K
   1 Request             (A1000/5) /* 5K
  End-Define
Struct 'CONTAINER2' Is
  Define Data Parameter
    1 Just-Occupied-Space (A49000) /* 49K
    1 Reply               (A250)
  End-Define
```

See IDL program `TWOC` under ***Advanced CICS Channel Container RPC Server Example - `DFHCON`***.

Example 3: Multiple Containers

This example shows how more than one container is used per direction. Each container has its own structure layout.

```
Library 'DFHCON' Is
  Program 'MULTIC' Is
   Define Data Parameter
    1 InContainer1     ('INCONTAINER1')  In
    1 InContainer2     ('INCONTAINER2')  In
    1 InContainer3     ('INCONTAINER3')  In
    ...

    1 OutContainer1    ('OUTCONTAINER1') Out
    1 OutContainer2    ('OUTCONTAINER2') Out
    1 OutContainer3    ('OUTCONTAINER3') Out
    ...

   End-Define

  Struct 'INCONTAINER1' Is ...
  Struct 'INCONTAINER2' Is ...
  Struct 'INCONTAINER3' Is ...
  ...

  Struct 'OUTCONTAINER1' Is ...
  Struct 'OUTCONTAINER1' Is ...
  Struct 'OUTCONTAINER1' Is ...
  ...
```

Example 4: Variable Number of Containers (Direction Out Only)

This example shows how to specify a range of containers. At runtime, the called RPC server creates a variable number of containers from this range. Each container created has the same structure layout and a container name that is formed from the structure name as prefix and the structure index as suffix. In this example:

- `MULTIPLE` container names are `MULTIPLE0001` thru `MULTIPLE9999`.
- `OPTIONAL` container name is `OPTIONAL1`.

Note: Make sure IDL observes the 16-character length restriction for container names given by CICS.

```
Library 'DFHCON' Is
  Program 'VARC' Is
   Define Data Parameter
    1 Input            ('INPUT')          In
    1 Multiple         ('MULTIPLE'/V9999) Out /* 0 thru 9999 times
    1 Optional         ('OPTIONAL'/V1)    Out /* 0 or 1 times
   End-Define

  Struct 'INPUT' Is ...
  Struct 'MULTIPLE' Is ...
  Struct 'OPTIONAL' Is ...
```

Steps

To use the COBOL Wrapper for CICS with channel container calling convention

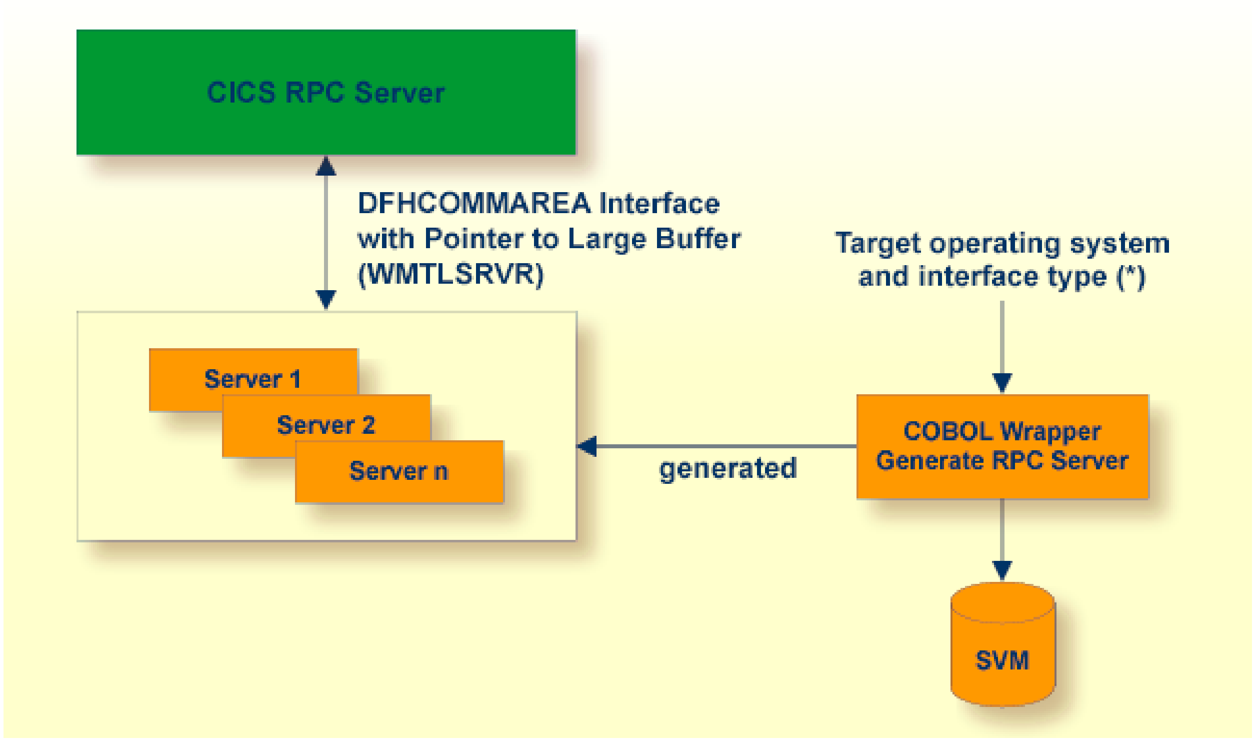
1. Generate the server (skeleton(s)) for the target operating system, for example "z/OS", and use interface type "CICS with channel container calling convention". See ***Generate COBOL Source Files from Software AG IDL Files***.
2. Deploy the SVM file to the CICS RPC server. See *Server Mapping Deployment*.
3. If necessary, use FTP to transfer the server (skeleton(s)) to the target platform where you write your server.
4. Use the generated server (skeleton(s)) and complete it by applying your application logic. Note the information given in ***Software AG IDL to COBOL Mapping***.
5. If necessary, use FTP to transfer your server to the target platform where you compile your server.
6. Using the CICS translator for COBOL provided with your CICS installation and a COBOL compiler supported by the COBOL Wrapper, translate and compile your server.
7. Link (bind) the server to an executable program, using the standard linker (binder) of the target platform. Give your server a CICS program name that is the same as the `program-name` in the IDL file (see `program-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation).
8. Provide your server(s) to the CICS RPC server.

   - Install your server(s) as separate CICS program(s).
   - An SVM file is required for calling a CICS channel container. A concatenation of the `program-name` and the `library-name` given in the IDL is used to locate the SVM file. See `program-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation and `library-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation.

     Example: If a client performs an RPC request that is based on the IDL program name CALC and IDL library EXAMPLE, the RPC server will dynamically try to locate logically the SVM file EXAMPLECALC and execute program CALC. If no corresponding program can be found, the access will fail.
   - The RPC server uses channel name "EntireXChannel" to call the server program.

Using the COBOL Wrapper for CICS with DFHCOMMAREA Large Buffer Interface (z/OS and z/VSE)

This mode applies to z/OS and z/VSE.



(*) For the target operating systems and interface types, see *Generate COBOL Source Files from Software AG IDL Files*.

In CICS, the RPC server sets up all your server's parameters dynamically in the format required. Your server is called by `EXEC CICS LINK`. Within the DFHCOMMAREA, pointers are passed to a large input/output buffer.

Use the COBOL Wrapper for CICS with DFHCOMMAREA large buffer interface in the following situations:

- You need to migrate COBOL programs implemented with webMethods WMTLSRVR interface to the CICS RPC server.
- You require more than 31 KB of data to transfer to your server.
- You cannot use the channel container calling convention because your IDL does not match the applicable rules; see *CICS Channel Container IDL Rules* under Using the COBOL Wrapper for

CICS with Channel Container Calling Convention (z/OS). There are no IDL restrictions for this interface type - every IDL can be used.

- You prefer this interface type rather than the channel container interface type.
- You do *not* require a distributed program link (CICS DPL) to your server.

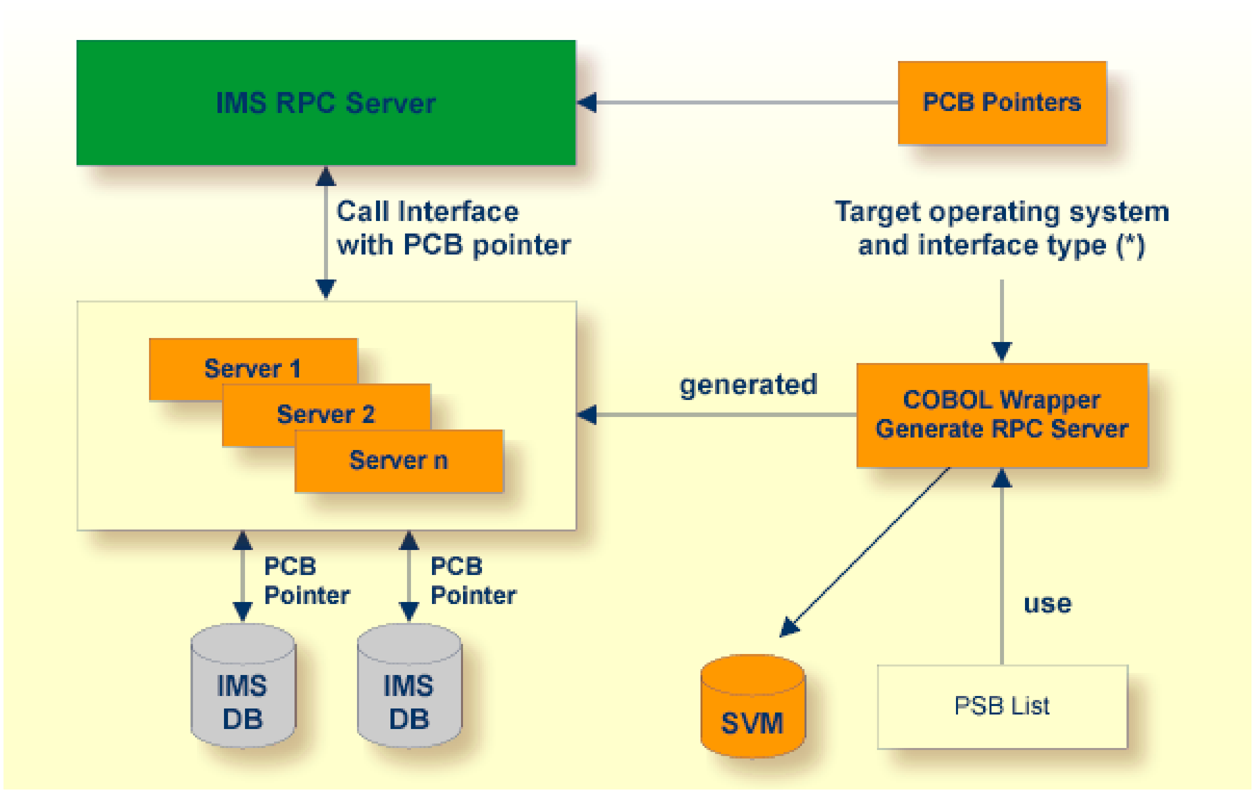
To use the COBOL Wrapper for CICS with large buffer interface

1. Generate the server (skeleton(s)) for the target operating system, for example "z/OS", and use interface type "CICS with DFHCOMMAREA large buffer interface". See ***Generate COBOL Source Files from Software AG IDL Files***.
2. Deploy the SVM file to the CICS RPC server. See *Server Mapping Deployment*.
3. If necessary, use FTP to transfer the server (skeleton(s)) to the target platform where you write your server.
4. Use the generated server (skeleton(s)) and complete it by applying your application logic. Note the information given in ***Software AG IDL to COBOL Mapping***.
5. If necessary, use FTP to transfer your server to the target platform where you compile your server.
6. Using the CICS translator for COBOL provided with your CICS installation and a COBOL compiler supported by the COBOL Wrapper, translate and compile your server.
7. Link (bind) the server to an executable program, using the standard linker (binder) of the target platform. Give your server a CICS program name the same as the `program-name` in the IDL file. See `program-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation.
8. Provide your server(s) to the CICS RPC server.
   - Install your server(s) as separate CICS program(s).
   - An SVM file is required for calling CICS with DFHCOMMAREA large buffer interface programs. A concatenation of the `program-name` and the `library-name` given in the IDL is used to locate the SVM file. See `program-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation and `library-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation.

     Example: If a client performs an RPC request that is based on the IDL program name CALC and an IDL library EXAMPLE, the RPC server will dynamically try to locate logically the SVM file EXAMPLECALC and execute program CALC. If no corresponding program can be found, the access will fail.

Using the COBOL Wrapper for IMS BMP (z/OS)

This mode applies to z/OS IMS mode BMP.


IMS RPC Server
PCB Pointers
Call Interface with PCB pointer
Target operating system and interface type (*)
Server 1
Server 2
Server n
generated
COBOL Wrapper Generate RPC Server
PCB Pointer
PCB Pointer
use
IMS DB
IMS DB
SVM
PSB List

(*)For the target operating systems and interface types, see *Generate COBOL Source Files from Software AG IDL Files*.

In IMS BMP, the IMS RPC server sets up all of your server's parameters dynamically in the format required. Your server is called dynamically using standard call interfaces. IMS-specific PCB pointers can be provided as parameters in the linkage section.

Use the COBOL Wrapper for IMS BMP if you need to

- access IMS BMP programs with standard linkage calling convention
- access IMS databases through IMS PCB pointers and to pass them via parameters in the linkage section
- access the IMS PCB pointer IOPCB, for example to print data or to start an asynchronous transaction
- use the COBOL/ DLI interface module “CBLTDLI” which requires PCB pointers in its interface.

If PCB pointers have to be provided as parameters in the COBOL linkage section of your server, your IDL must comply with the IMS PCB Pointer IDL rules listed below. If no PCB pointers are required, the rules can be skipped.

IMS PCB Pointer IDL Rules

- An IMS PSB list contains the PCB pointers of your environment:
  - The IMS PSB list is a text file and can be created with any text editor.
  - Only one PCB pointer is listed per line.
  - The PCB pointer `IOPCB` is always the first pointer in the IMS PSB list.
  - The PCB pointers (except `IOPCB`) match the related PSB generation for your server.
  - The PCB pointers listed match the PCB pointers provided at runtime to the IMS RPC server (including `IOPCB`) in number and sequence.
  - The IMS PSB list is assigned in the IDL properties, see ***Generate COBOL Source Files from Software AG IDL Files*** or IDL ***Generation Settings - Preferences***. Example:

    ```
    IOPCB
    DBPCB
    ```

- PCB pointers are described in the IDL as parameters. Thus they can be accessed in your server as any other parameter. Additionally, the following is required:
  - IDL parameters that are PCB pointers are marked with the attribute `IMS` (see `attribute-list` under *Software AG IDL Grammar* in the *IDL Editor* documentation).
  - IDL parameters that are PCB pointers must match a PCB pointer listed in the IMS PSB list, otherwise the IMS RPC server does not pass them as PCB pointers at runtime. This results in unexpected behavior. Example:

    ```
    Library 'IMSDB' Is
       Program ' IMSDB' Is
          Define Data Parameter
          1 IN-COMMAND          (A3)   IN /* ADD, DEL, DIS
          1 IO-DATA                    IN OUT
            2 IO-LAST-NAME      (A10)
            2 IO-FIRST-NAME     (A10)
            2 IO-EXTENSION      (A10)
            2 IO-ZIP-CODE       (A07)
          1 DBPCB                      IN IMS /* this is a PCB pointer
            2 DBNAME            (A8)
            2 SEG-LEVEL-NO      (A2)
            2 DBSTATUS          (A2)
            2 FILLER1           (A20)
          1 OUT-MESSAGE         (A40)  OUT
          End-Define
    ```

To use the COBOL Wrapper for IMS BMP

1. Generate the server (skeleton(s)) for the target operating system "z/OS", use interface type "IMS BMP with standard linkage calling convention". If PCB pointers should be provided as COBOL linkage section parameters for your server, set the IMS PSB list; otherwise omit the IMS PSB list. See ***Generate COBOL Source Files from Software AG IDL Files***.
2. If an SVM file is required, deploy it to the IMS RPC server, see *Server Mapping Deployment*.
3. If necessary, use FTP to transfer the server (skeleton(s)) to the target platform where you write your server.
4. Use the generated server (skeleton(s)) and complete it by applying your application logic. You can use the IMS-specific PCB pointers in your server as usual. Note the information given in ***Software AG IDL to COBOL Mapping***.
5. If necessary, use FTP to transfer your server to the target platform where you compile your server.
6. Using a COBOL compiler supported by the COBOL Wrapper, compile your server.
7. Link (bind) the server to an executable program, using the standard linker (binder) of the target program.
   - Give the resulting server program the same name as the program in the IDL file (see `program-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation).
8. Provide the server to the IMS RPC server.
   - Add the server to the IMS RPC server STEPLIB chain.
   - If you are using an SVM file:
     - A concatenation of the `program-name` and the `library-name` given in the IDL is used to locate the SVM file. See `program-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation and `library-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation.

       Example: If a client performs an RPC request that is based on the IDL program name CALC and the IDL library name EXAMPLE, the RPC server will dynamically try to locate logically the SVM file EXAMPLECALC and execute program CALC. If no corresponding program can be found, the access will fail.
   - If an SVM file is not used (e.g. it is not required or the RPC server is generated with an earlier version of EntireX without server mapping support:
     - With the standard configuration for the RPC server, the library name (see `library-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation) given in the IDL is ignored. You can change this behavior for the RPC server with the server parameter `Library`.

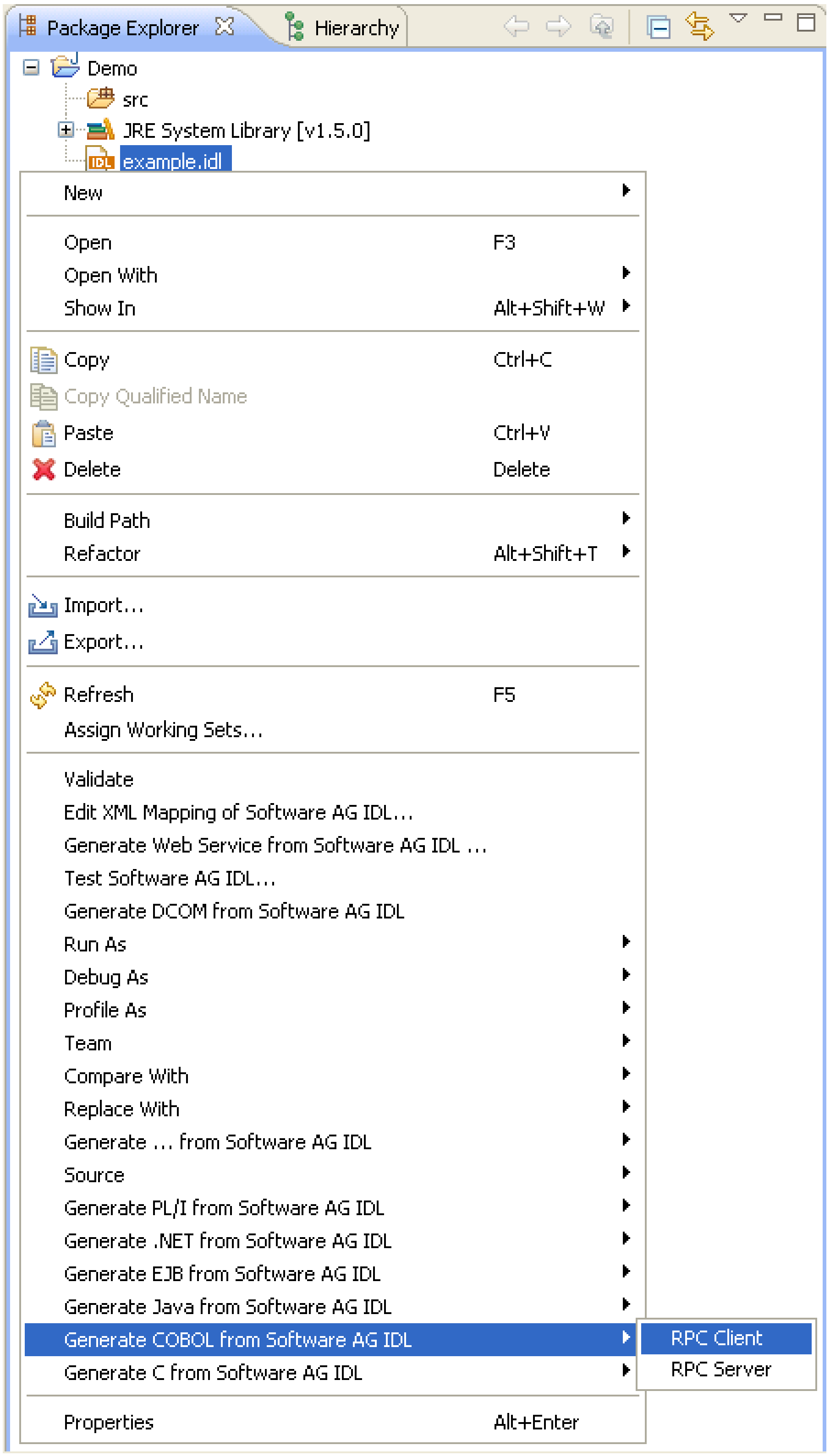
Example: If a client performs an RPC request that is based on the IDL program name CALC, the RPC server will dynamically try to execute a program CALC. If no corresponding program can be found, the access will fail.

4 Generate COBOL Source Files from Software AG IDL Files

This chapter describes how to generate COBOL source files from Software AG IDL files. It covers the following topics:

Select an IDL File and Generate RPC Client or RPC Server

From the context menu, choose **Generate COBOL from Software AG IDL** > **RPC Client** and **RPC Server** to generate the COBOL source files.


Package Explorer
Hierarchy
Demo
src
JRE System Library [v1.5.0]
example.idl
New
Open F3
Open With
Show In Alt+Shift+W
Copy Ctrl+C
Copy Qualified Name
Paste Ctrl+V
Delete Delete
Build Path
Refactor Alt+Shift+T
Import...
Export...
Refresh F5
Assign Working Sets...
Validate
Edit XML Mapping of Software AG IDL...
Generate Web Service from Software AG IDL ...
Test Software AG IDL...
Generate DCOM from Software AG IDL
Run As
Debug As
Profile As
Team
Compare With
Replace With
Generate ... from Software AG IDL
Source
Generate PL/I from Software AG IDL
Generate .NET from Software AG IDL
Generate EJB from Software AG IDL
Generate Java from Software AG IDL
Generate COBOL from Software AG IDL
Generate C from Software AG IDL
Properties Alt+Enter
RPC Client
RPC Server

Note: In command-line mode, use command `-cobol:client` or `-cobol:server`. See *Using the COBOL Wrapper in Command-line Mode*. Note that existing files will always be overwritten.

Results for **RPC client**:

- The folders *client* and *include* are created as subfolders to the **IDL-Specific Output Folder** defined in the *Generation Settings - Properties*.
- The *client* folder contains the client interface objects, and optionally the generic RPC service module. See *Generic RPC Services Modules*.
- The folder *include* containes the associated copybooks, the RPC communication area copybook `ERXCOMM` and optionally the copybooks `COBINIT` and `COBEXIT`.

Notes:

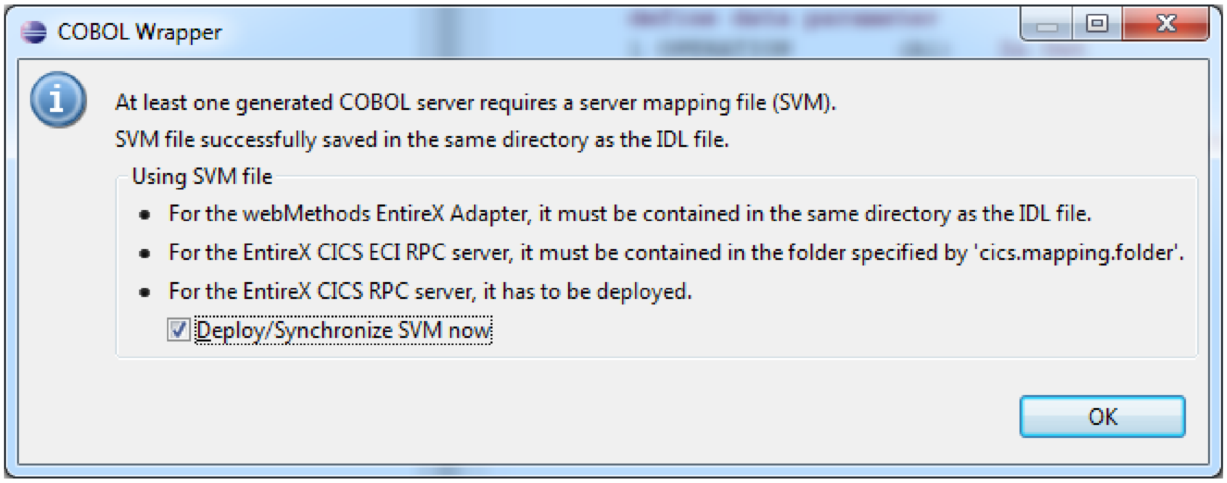
1. The generic RPC service module `COBSRVI` is only generated if the option **Generate Generic RPC Service Module COBSRVI** is set, see *Generate Generic RPC Service for Module COBSRVI*.
2. For further information on the purpose and usage of associated copybooks, see *Using the Generated Copybooks*.
3. For further information on the purpose and usage of the RPC communication area copybook `ERXCOMM`, see *Using the RPC Communication Area*.
4. The copybooks `COBINIT` and `COBEXIT` are only generated if **Copybook** has been selected as *RPC Communication Area*.

Results for **RPC server**:

- The folder *server* is created as a subfolder to the **IDL-Specific Output Folder** defined in the *Generation Settings - Properties*. It contains the RPC server implementation skeletons.

  Caution: Take care not to overwrite an existing server implementation with a server skeleton. We recommend moving your server implementation to a different folder.

- If an SVM file was generated, you are promted with instructions on how to provide it to the server:



At least one generated COBOL server requires a server mapping file (SVM).
SVM file successfully saved in the same directory as the IDL file.

Using SVM file

- For the webMethods EntireX Adapter, it must be contained in the same directory as the IDL file.
- For the EntireX CICS ECI RPC server, it must be contained in the folder specified by 'cics.mapping.folder'.
- For the EntireX CICS RPC server, it has to be deployed.

[✓] Deploy/Synchronize SVM now

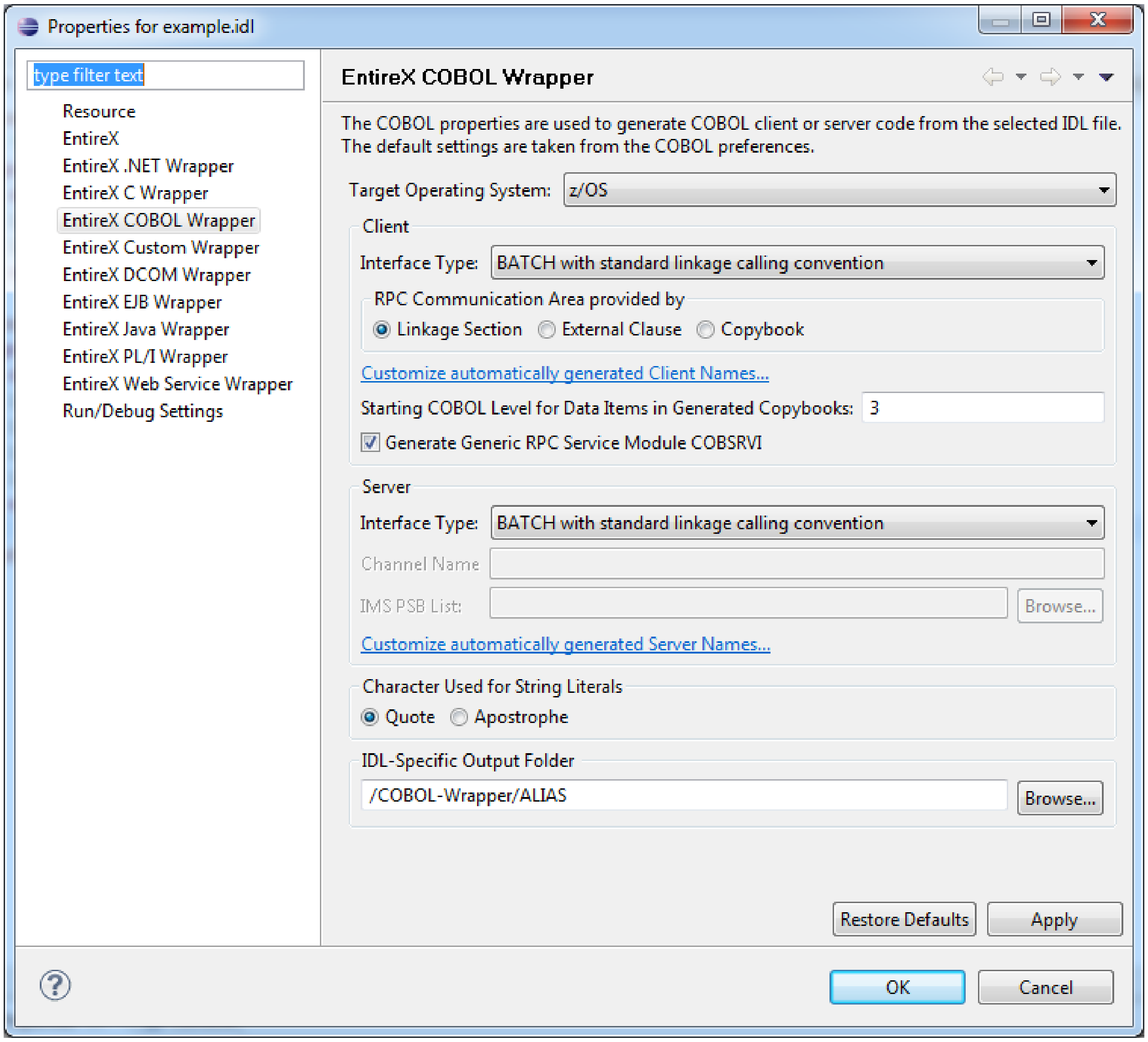
- For RPC servers, you have to deploy it either by using a wizard or a manual approach, depending on the specific RPC server used. See *Server Mapping Deployment*.
- For the EntireX Adapter, it is picked up automatically together with the IDL file when the adapter connection is generated. For further information, see the latest version of the EntireX Adapter under *https://empower.softwareag.com/Products/Documentation/default.asp*.

Generation Settings - Properties

- Channel Name

Introduction

To set properities for COBOL Wrapper generation, use the **Properties** wizzard of the IDL file. The target operating system (**Target OS**) and the **Interface Type** are essential. They determine if other parameters such as **RPC Communication Area provided by** can be set or have to remain fixed. The parameter **IDL-Specific Output** defines the location to store the source file subfolders. Whether file extensions are generated or not depends on the operating system (**Target OS**).



The COBOL properties are used to generate COBOL client or server code from the selected IDL file. The default settings are taken from the COBOL preferences.

Target Operating System: z/OS

Client
Interface Type: BATCH with standard linkage calling convention
RPC Communication Area provided by: [✓ Linkage Section] External Clause Copybook
Starting COBOL Level for Data Items in Generated Copybooks: 3
[✓] Generate Generic RPC Service Module COBSRVI

Server
Interface Type: BATCH with standard linkage calling convention
Channel Name
IMS PSB List:

Character Used for String Literals: [✓ Quote] Apostrophe

IDL-Specific Output Folder: /COBOL-Wrapper/ALIAS

In the following, we give a detailed description of the properties that need to be set for each type of generation:

- **For client and server generation:**
  - *Target Operating System*
  - *Characters Used for String Literals*
  - *IDL-Specific Output Folder*
- **For client generation only:**
  - *Client Interface Types*
  - *Customize Automatically Generated Client Names*
  - *Starting COBOL Level for Data Items in Generated Copybooks*
  - *RPC Communication Area*
  - *Generate Generic RPC Service for Module COBSRVI*
- **For server generation only:**
  - *Server Interface Types*
  - *Customize Automatically Generated Server Names*
  - *IMS PSB List*
  - *Channel Name*

Target Operating System

Select the target operating system for which COBOL code is to be generated. See *Platform Coverage* in the EntireX Release Notes for a full list of supported operating system versions.

Value	Description
z/OS	IBM z/OS operating system.
z/VSE	IBM z/VSE operating system.
BS2000	Fujitsu Siemens BS2000/OSD operating system.
IBM i	IBM IBM i operating system.
Windows	Microsoft Windows operating system.
UNIX	UNIX operating system.

Characters Used for String Literals

With this option you can specify how string literals are specified in the generated COBOL code. See your COBOL compiler documentation for information on how string literals are enclosed.

Value	Description
Quote	String literals will be enclosed in double quotes in the generated COBOL code.
Apostrophe	String literals will be enclosed in apostrophes (single quotes) in the generated COBOL code.

IDL-Specific Output Folder

This field specifies the folder where the COBOL files will be stored, by default in the same folder as the IDL file. For a non-default location, enter another folder name or choose **Browse...**.

Client Interface Types

Interface Type	Target Operating System	Description	RPC Communication Area Usage
CICS with DFHCOMMAREA calling convention	z/OS, z/VSE	Use this option if you want to build a CICS RPC client application that calls the client interface object(s) with the DFHCOMMAREA interface. Follow the steps under *Using the COBOL Wrapper for CICS with DFHCOMMAREA Calling Convention (z/OS and z/VSE)*.	The RPC communication area is passed as described in *Using the RPC Communication Area with `EXEC CICS LINK`*. See also *RPC Communication Area*.
CICS with standard linkage calling convention	z/OS, z/VSE	Use this option if you want to build a CICS RPC client application that calls the client interface object(s) with a standard linkage interface. Follow the steps under *Using the COBOL Wrapper for CICS with Call Interfaces (z/OS and z/VSE)*.	The RPC communication area is passed with one of the options as described in *Using the RPC Communication Area with a Standard Call Interface*. See also *RPC Communication Area*.
Batch with standard linkage calling convention	z/OS, z/VSE, BS2000/OSD, IBM i	Use this option if you want to build a batch RPC client application that calls the client interface object(s) with a standard linkage interface. Follow the steps under *Using the COBOL Wrapper for Batch (z/VSE, IBM i, BS2000/OSD and z/OS)*.	
IMS BMP with standard linkage calling convention	z/OS	Use this option if you want to build an IMS RPC client application that calls the client interface object(s) with a standard linkage interface for IMS BMP mode. Follow the steps under *Using the COBOL Wrapper for IMS (z/OS)*.	

Interface Type	Target Operating System	Description	RPC Communication Area Usage
IMS MPP with standard linkage calling convention	z/OS	Use this option if you want to build an IMS RPC client application that calls the client interface object(s) with a standard linkage interface for IMS MPP mode. Follow the steps under ***Using the COBOL Wrapper for IMS (z/OS)***.	
IDMS/DC with standard linkage calling convention	z/OS	Use this option if you want to build an IDMS/DC client application that calls the client interface object(s) with a standard linkage interface for IDMS/DC. Follow the steps under ***Using the COBOL Wrapper for IDMS/DC with Call Interfaces (z/OS)***.	
Micro Focus with standard linkage calling convention	UNIX, Windows	Use this option if you want to build a Micro Focus client application that calls the client interface object(s) with a standard linkage interface. Follow the steps under ***Using the COBOL Wrapper for Micro Focus (UNIX and Windows)***.	

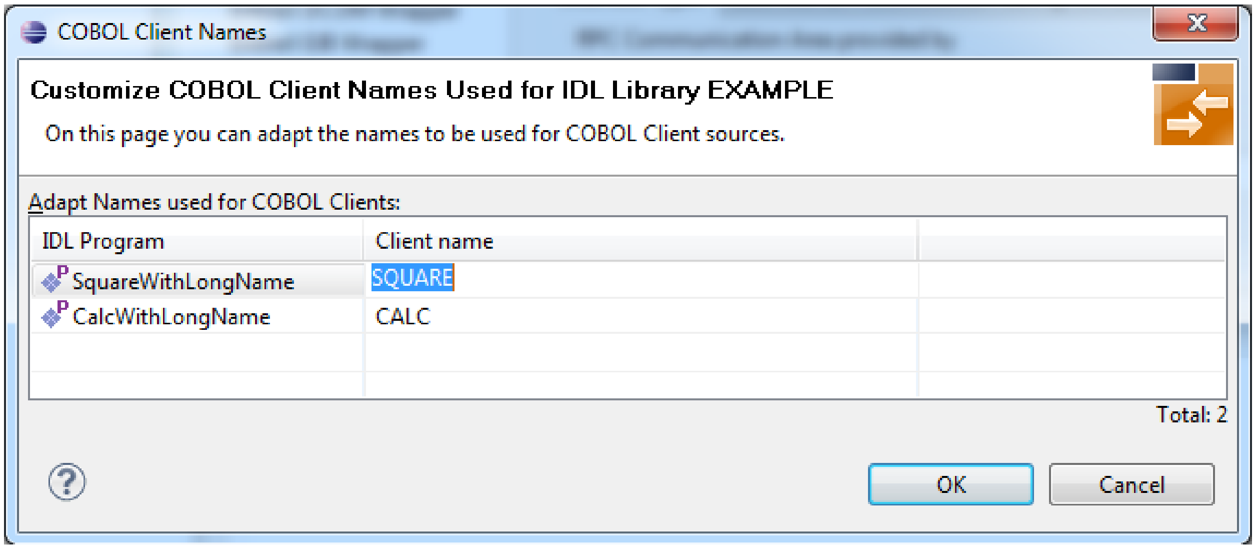
Customize Automatically Generated Client Names

If you open the link **Customize automatically generated Client Names** on the **Properties** page you can adapt the names for the COBOL client interface objects (subprograms). When you call the page the first time, COBOL names are suggested based on the IDL program (`program-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation) or IDL program alias names. The page varies, depending on whether the target COBOL environment supports long COBOL names or not:

- z/OS and z/VSE
- IBM i
- UNIX and Windows with Micro Focus
- BS2000/OSD

z/OS and z/VSE

Max. 8 characters (short names) are supported as COBOL names:



Customize COBOL Client Names Used for IDL Library EXAMPLE

On this page you can adapt the names to be used for COBOL Client sources.

Adapt Names used for COBOL Clients:

IDL Program	Client name
SquareWithLongName	SQUARE
CalcWithLongName	CALC

Total: 2

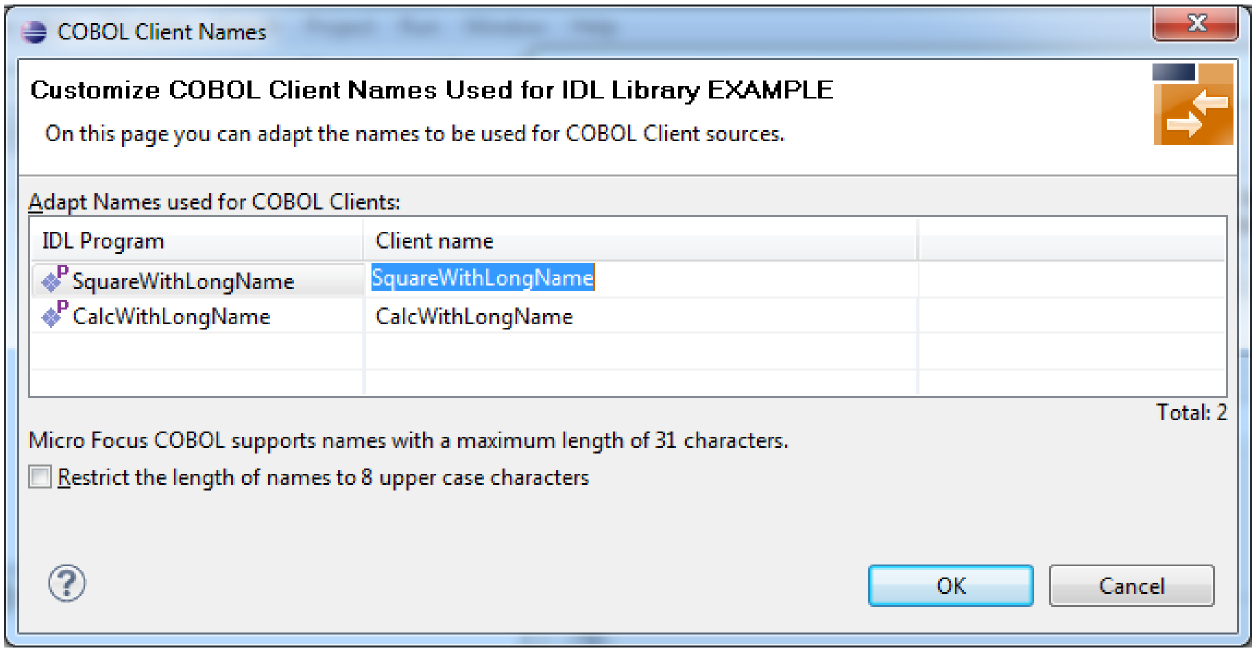
Note: If your IDL file contains more than one IDL library, the additional column **IDL Library** is displayed.

IBM i

Customization of client names for IBM i is the same as for z/OS and z/VSE. See *z/OS and z/VSE*.

UNIX and Windows with Micro Focus

Max. 31 characters are supported as COBOL names. By default, names are generated with a maximum of 8 characters (short names).



Customize COBOL Client Names Used for IDL Library EXAMPLE

On this page you can adapt the names to be used for COBOL Client sources.

Adapt Names used for COBOL Clients:

IDL Program	Client name
SquareWithLongName	SquareWithLongName
CalcWithLongName	CalcWithLongName

Total: 2

Micro Focus COBOL supports names with a maximum length of 31 characters.

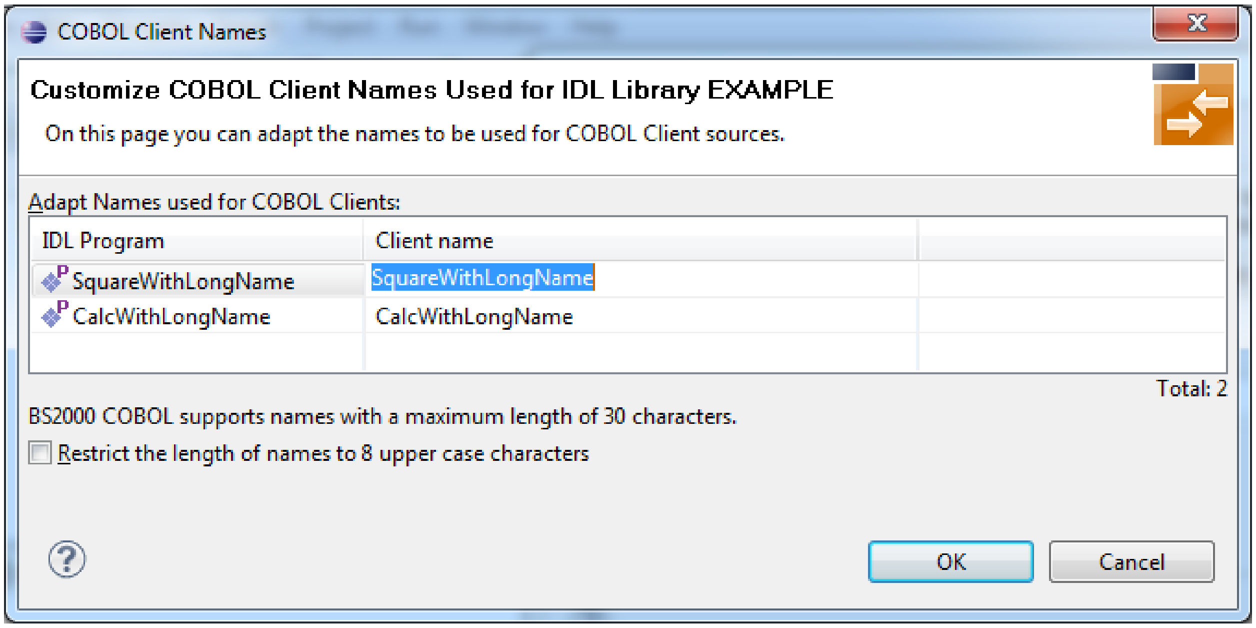
☐ Restrict the length of names to 8 upper case characters

Notes:

1. If your IDL file contains more than one IDL library, the additional column **IDL Library** is displayed.
2. With the check box **Restrict the length of names to 8 characters** you can flip between short names and long names. Both sorts of names (short and long) are stored in the property file. For generation you have to decide if short or long names are to be used.

BS2000/OSD

Max. 30 characters are supported as COBOL names. By default, names are generated with a maximum of 8 characters (short names).



Customize COBOL Client Names Used for IDL Library EXAMPLE

On this page you can adapt the names to be used for COBOL Client sources.

Adapt Names used for COBOL Clients:

IDL Program	Client name
SquareWithLongName	SquareWithLongName
CalcWithLongName	CalcWithLongName

Total: 2

BS2000 COBOL supports names with a maximum length of 30 characters.

☐ Restrict the length of names to 8 upper case characters

Notes:

1. If your IDL file contains more than one IDL library, the additional column **IDL Library** is displayed.
2. With the check box **Restrict the length of names to 8 characters** you can flip between short names and long names. Both sorts of names (short and long) are stored in the property file. For generation you have to decide if short or long names are to be used.

Starting COBOL Level for Data Items in Generated Copybooks

With this option you can specify the starting COBOL level used in the generated copybooks for COBOL data items.

See ***Using the Generated Copybooks*** for syntax examples.

Specify a valid COBOL level in the range 1-49. The COBOL programming language maximum of 49 subtracted by the specified level must provide enough levels to hold all IDL levels. Note that IDL types may consume more than one COBOL level, for example:

- IDL unboundend groups require a COBOL level for every dimension. If they are defined on IDL level 1, an extra COBOL level is required
- IDL unbounded arrays require a COBOL level for every dimension plus one extra COBOL level
- some basic (scalar) IDL data types need extra COBOL levels

Notes:

1. Do not specifiy a level too deep because you may exceed the COBOL programming language maximum of 49 and the generated copybook cannot be compiled.
2. For compatibility with ***Client and Server Examples for z/OS CICS***, the level must be 3 or above.
3. For compatibility with all other delivered examples, the level must be 2 or above.

RPC Communication Area

The RPC communication area is used to specify parameters that are needed to communicate with the broker and are not specific to client interface objects. These are for example the broker ID, client parameters such as `userID` and `password` and the server address such as *`class/servername/service`* etc.

Value	Description
`External Clause`	The RPC communication area is provided as a global area to the RPC client application and the generated client interface object(s). For more information, see option `External Clause` under ***Using the RPC Communication Area with a Standard Call Interface***. The COBOL external clause is an extension to COBOL 85 standards and might not be supported by every COBOL compiler. Check your COBOL compiler documentation.
`Linkage Section`	The RPC communication area is provided via an additional parameter between your RPC client application and the generated client interface object(s). For more information, see option `Linkage Section` under ***Using the RPC Communication Area with a Standard Call Interface*** and ***Using the RPC Communication Area with `EXEC CICS LINK`***.
`Copybook`	The RPC communication area is provided inside the generated client interface object(s). It is not visible in the RPC client application. Default values are retrieved from EntireX workbench preferences or IDL-specific properties and can be overwritten in the copybook

Value	Description
	`COBINIT` (see folder *include*). For more information, see option `Copybook` under ***Using the RPC Communication Area with a Standard Call Interface***.

Generate Generic RPC Service for Module COBSRVI

The generic RPC service module COBSRVI is generated in the folder *client*. See ***Generic RPC Services Modules***. Use this option to control the generation of this module.

If you are using the COBOL Wrapper for the first time:

- *Clear* this option for interface type "CICS with DFHCOMMAREA calling convention". The generic RPC server module will not be generated, which will speed up generation time. The generic RPC server module is not needed because it is already installed with your z/OS and z/VSE mainframe installation.
- *Check* this option for all other interface types to generate the generic RPC server module.

If you are an experienced user of the COBOL Wrapper:

- *Clear* this option if you can reuse the generic RPC server module from a previous COBOL Wrapper project. This will speed up generation time. It is important that ***Target Operating System***, ***Client Interface Types*** and ***Characters Used for String Literals*** are the same.
- *Check* this option if you need an update of the generic RPC server module because of a newer COBOL Wrapper version (Eclipse update without mainframe installation) to generate the generic RPC server module.

Customize Automatically Generated Server Names

If you open the link **Customize automatically generated Server Names** on the properties page you can, adapt the names for the COBOL server (subprograms). When you call the page the first time, COBOL names are suggested based on the IDL program (`program-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation) or IDL program alias names. For further details on customizing names for the server side, see the platform-specific section under *Customize Automatically Generated Client Names*; the information here also applies to server names:

- ***z/OS and z/VSE***
- ***UNIX and Windows with Micro Focus***
- ***BS2000/OSD***

Note: Customization of server names is not supported under IBM i.

If the server names (automatically generated or customized) differ from the IDL program names, a server-side server mapping (SVM) file is required. It is generated during generation of RPC server and has to be used in subsequent steps (deployed to an EntireX RPC Server or wrapped into an EntireX Adapter). See *Select an IDL File and Generate RPC Client or RPC Server* under *Generate COBOL Source Files from Software AG IDL Files*.

Server Interface Types

Interface Type	Target Operating System	Description
CICS with DFHCOMMAREA calling convention	z/OS, z/VSE	Use this option if you want to build a CICS RPC server application with a DFHCOMMAREA interface. Follow the steps under *Using the COBOL Wrapper for CICS with DFHCOMMAREA Calling Convention (z/OS and z/VSE)*.
CICS with Channel Container calling convention	z/OS	Use this option if you want to build a CICS RPC server application with a channel container interface. To specify a channel name, see *Channel Name*. Follow the steps under *Using the COBOL Wrapper for CICS with Channel Container Calling Convention (z/OS)*.
CICS with DFHCOMMAREA large buffer interface	z/OS, z/VSE	Use this option if you want to build a CICS RPC server application with a large buffer interface. Follow the steps under *Using the COBOL Wrapper for CICS with DFHCOMMAREA Large Buffer Interface (z/OS and z/VSE)*.
Batch with standard linkage calling convention	z/OS, z/VSE, BS2000/OSD, IBM i	Use this option if you want to build a batch RPC server application. Follow the steps under *Using the COBOL Wrapper for Batch (z/OS, IBM i, BS2000/OSD and z/VSE)*.
IMS BMP with standard linkage calling convention	z/OS	Use this option if you want to build an IMS RPC server application for IMS BMP mode (no MPP) with standard call interfaces. If your server uses PCB pointers, see *IMS PSB List* below. Follow the steps under *Using the COBOL Wrapper for IMS BMP (z/OS)*.
Micro Focus with standard linkage calling convention	UNIX, Windows	Use this option if you want to build a Micro Focus RPC server application with standard linkage interface(s). Follow the steps under *Using the COBOL Wrapper for Micro Focus (UNIX and Windows)*.

IMS PSB List

IMS PSB List applies to the server interface type “IMS BMP with standard linkage calling convention” only. If your server uses PCB pointers and requires that they are passed through the linkage section, an IMS PSB list is required. Your IDL must comply with the rules under *IMS PCB Pointer IDL Rules*. If no PCB pointers are required, omit the IMS PSB list. See *Server Interface Types* for more information.

Channel Name

Channel Name applies to the server interface type "CICS with Channel Container calling convention" only.

If a channel name is specified, the server is

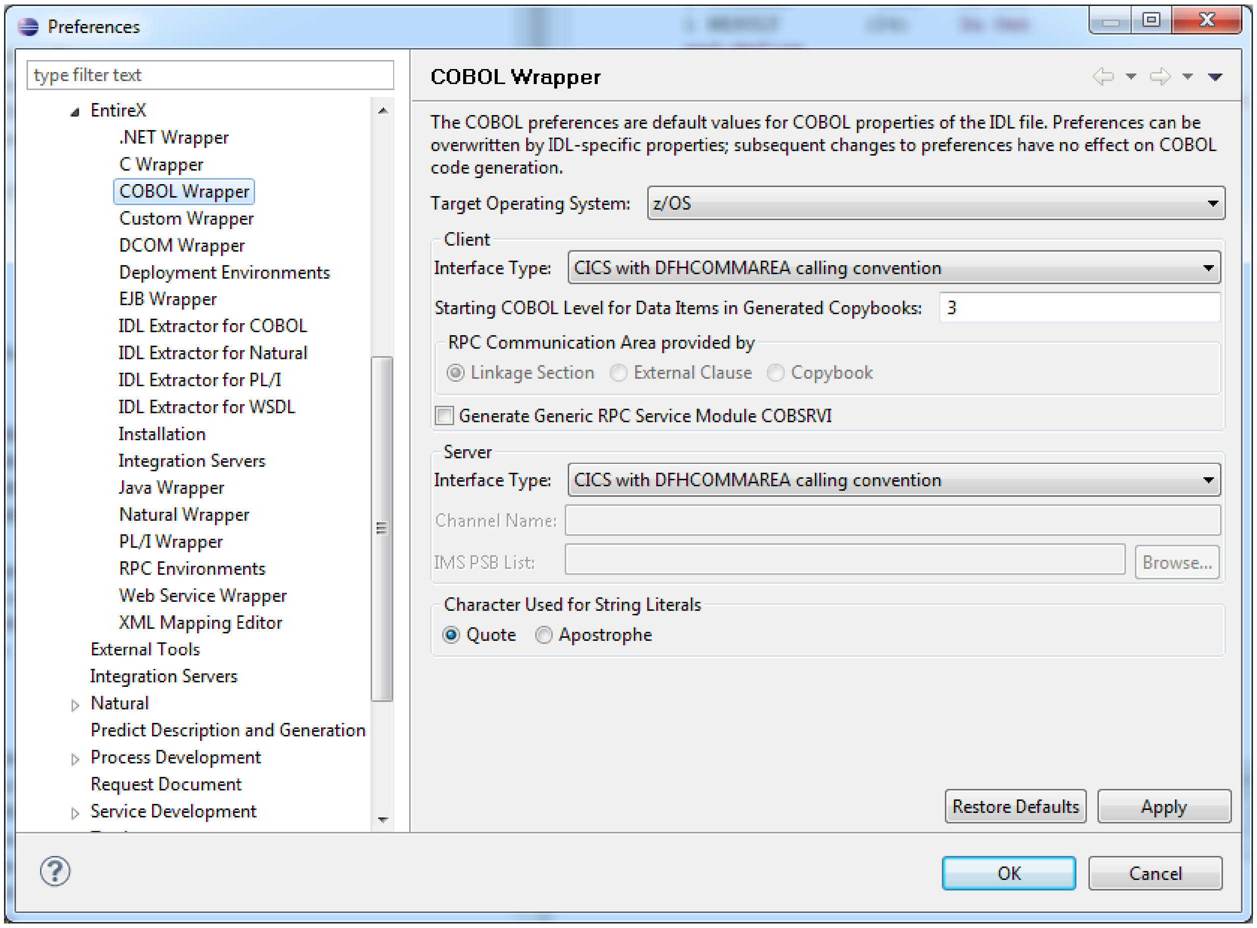
- called with the given channel name
- generated with COBOL code to check for channel name validity.

If no channel name is specified, the server is

- called with the "EntireXChannel" channel name
- generated without COBOL code to check for channel name validity.

Your IDL must comply with the rules described under ***CICS Channel Container IDL Rules***. See ***Server Interface Types*** for more information.

Generation Settings - Preferences



Preferences

type filter text

- EntireX
  - .NET Wrapper
  - C Wrapper
  - COBOL Wrapper
  - Custom Wrapper
  - DCOM Wrapper
  - Deployment Environments
  - EJB Wrapper
  - IDL Extractor for COBOL
  - IDL Extractor for Natural
  - IDL Extractor for PL/I
  - IDL Extractor for WSDL
  - Installation
  - Integration Servers
  - Java Wrapper
  - Natural Wrapper
  - PL/I Wrapper
  - RPC Environments
  - Web Service Wrapper
  - XML Mapping Editor
- External Tools
- Integration Servers
- Natural
- Predict Description and Generation
- Process Development
- Request Document
- Service Development

COBOL Wrapper

The COBOL preferences are default values for COBOL properties of the IDL file. Preferences can be overwritten by IDL-specific properties; subsequent changes to preferences have no effect on COBOL code generation.

Target Operating System: z/OS

Client

Interface Type: CICS with DFHCOMMAREA calling convention

Starting COBOL Level for Data Items in Generated Copybooks: 3

RPC Communication Area provided by

[✓ Linkage Section] External Clause Copybook

☐ Generate Generic RPC Service Module COBSRVI

Server

Interface Type: CICS with DFHCOMMAREA calling convention

Channel Name:

IMS PSB List:

Character Used for String Literals

[✓ Quote] Apostrophe

The workspace defaults for the target operating system, interface types for clients and server etc. are set in the **Preferences** page of the COBOL Wrapper. For a description, see *Generation Settings - Properties*.

5 Using the COBOL Wrapper in Command-line Mode

Commands are available to generate a COBOL RPC client or COBOL RPC server from a specified IDL file.

See also *Server Mapping Deployment in Command-line Mode*.

Command-line Options

- Generate a COBOL RPC Client from IDL File
- Generate a COBOL RPC Server from IDL File

See *Using the EntireX Workbench in Command-line Mode* for the general command-line syntax.

Generate a COBOL RPC Client from IDL File

To generate a COBOL RPC client from the specified IDL file, use the following command with options in table below:

```
-cobol:client
```

Option	Description
`-comm`	The RPC communication area. Valid values: EXTERNAL, LINKAGE, COPYBOOK. See ***RPC Communication Area*** for more information. EXTERNAL *External Clause* LINKAGE *Linkage Section* COPYBOOK *Copybook* For possible combinations with `-target` and `-interface` option, see below.
`-folder`	Folder where the COBOL files will be stored.
`-help`	Display this usage message.
`-interface`	Interface type, either DFHCOMMAREA or LINKAGE. For possible combinations with `-target` and `-comm` option, see below.
`-literal`	Enclose string literals in quotes or apostrophes. Valid values: QUOTE, APOST. See ***Characters Used for String Literals*** for more information.
`-target`	Target operating system and environment, one of BATCH_ZOS, BATCH_VSE, BATCH_BS2000, BATCH_I5OS, CICS_ZOS, CICS_VSE, IMS_MPP, IMS_BMP, IDMS_ZOS, MICROFOCUS_WINDOWS or MICROFOCUS_UNIX. See ***Client Interface Types*** for more information. For possible combinations with the `-interface` and `-comm` option.

Option	Description			
	-target	**-interface**	**-comm**	**Usage for**
	CICS_ZOS	DFHCOMMAREA	LINKAGE	CICS with DFHCOMMAREA calling convention for z/OS.
		LINKAGE	LINKAGE EXTERNAL COPYBOOK	CICS with standard linkage calling convention for z/OS.
	CICS_VSE	DFHCOMMAREA	LINKAGE	CICS with DFHCOMMAREA calling convention for z/VSE.
		LINKAGE	LINKAGE EXTERNAL	CICS with standard linkage calling convention for z/VSE.
	BATCH_VSE	LINKAGE	LINKAGE EXTERNAL	Batch with standard linkage calling convention for z/VSE.
	BATCH_BS2000	LINKAGE	LINKAGE EXTERNAL	Batch with standard linkage calling convention for BS2000/OSD.
	BATCH_I5OS	LINKAGE	LINKAGE EXTERNAL	Batch with standard linkage calling convention for IBM i.
	BATCH_ZOS	LINKAGE	LINKAGE EXTERNAL	Batch with standard linkage calling convention for z/OS.
	IMS_BMP	LINKAGE	LINKAGE EXTERNAL COPYBOOK	IMS BMP with standard linkage calling convention for z/OS.
	IMS_MPP	LINKAGE	LINKAGE EXTERNAL COPYBOOK	IMS MPP with standard linkage calling convention for z/OS.
	IDMS_ZOS	LINKAGE	LINKAGE EXTERNAL COPYBOOK	IDMS_ZOS with standard linkage calling convention for z/OS.
	MICROFOCUS_WINDOWS	LINKAGE	LINKAGE EXTERNAL COPYBOOK	Micro Focus with standard calling

Option	Description

-target	-interface	-comm	Usage for
			convention for Windows.
MICROFOCUS_UNIX	LINKAGE	LINKAGE EXTERNAL COPYBOOK	Micro Focus with standard calling convention for various UNIX operating systems.

Option	Description
`-copybooklevel`	Define the begining level for COBOL data items in generated copybooks, see *Starting COBOL Level for Data Items in Generated Copybooks*. Valid values: 1-49.
`-rpcservice`	Option to generate the generic RPC service module COBSRVI. See *Generate Generic RPC Service for Module COBSRVI*. Valid values: TRUE - Generate generic RPC service module. FALSE - Do not generate the generic RPC service module.

Generate a COBOL RPC Server from IDL File

To generate a COBOL RPC server from the specified IDL file, use the following command with options in table below:

```
-cobol:server
```

Option	Description
`-channel`	A CICS channel name can be provided for the interface type 'CICS with Channel Container calling convention'. See *Using the COBOL Wrapper for CICS with Channel Container Calling Convention (z/OS)*. See also *Channel Name*.
`-folder`	Folder where the COBOL files will be stored.
`-help`	Display this usage message.
`-interface`	Interface type, one of DFHCOMMAREA, DFHLBUFFER, DFHCHANNEL or LINKAGE. See table below for possible combinations.
`-literal`	Enclose string literals in quotes or apostrophes. See *Characters Used for String Literals*.
`-target`	Target operating system and environment. For possible combinations with option `-interface`, see below and also *Server Interface Types*.

-target	-interface	Usage for
CICS_ZOS	DFHCOMMAREA	CICS with DFHCOMMAREA calling convention for z/OS.
	DFHLBUFFER	CICS with DFHCOMMAREA large buffer interface for z/OS.
	DFHCHANNEL	CICS with Channel Container calling convention for z/OS.

Option	Description		
	-target	**-interface**	**Usage for**
	CICS_VSE	DFHCOMMAREA	CICS with DFHCOMMAREA calling convention for z/VSE.
		DFHLBUFFER	CICS with DFHCOMMAREA large buffer interface for z/VSE.
	BATCH_VSE	LINKAGE	Batch with standard linkage calling convention for z/VSE.
	BATCH_BS2000	LINKAGE	Batch with standard linkage calling convention for BS2000/OSD.
	BATCH_I5OS	LINKAGE	Batch with standard linkage calling convention for IBM i.
	BATCH_ZOS	LINKAGE	Batch with standard linkage calling convention for z/OS.
	IMS_BMP	LINKAGE	IMS BMP with standard linkage calling convention for z/OS. This target may require a PSBLIST. See below.
	MICROFOCUS_WINDOWS	LINKAGE	Micro Focus with standard linkage calling convention for Windows.
	MICROFOCUS_UNIX	LINKAGE	Micro Focus with standard linkage calling convention for various UNIX operating systems.
`-psblist`	An IMS PSB list containing IMS PCB pointers can be provided for the server interface type *IMS BMP with standard linkage calling convention*. See ***Using the COBOL Wrapper for IMS BMP (z/OS)*** for scenarios on PCB pointer usage. See also ***IMS PSB List***.		

Example Generating an RPC Client

```
<workbench> -cobol:client /Demo/example.idl -target CICS_ZOS
```

where <`workbench`> is a placeholder for the actual Workbench starter as described under *Using the EntireX Workbench in Command-line Mode*.

The name of the IDL file includes the project name. In the example, the project *Demo* is used. If the IDL file name describes a file inside the Eclipse workspace, the name is case-sensitive.

If the first part of the IDL file name is not a project name in the current workspace, the IDL file name is used as a relative (based on the IDL file) or absolute file name in the file system. Thus, the IDL files do not need to be part of an Eclipse project.

If you do not specify a folder (option `-folder`), the generated COBOL source files (client interface objects and the client declarations) will be stored in parallel to the IDL file, in the generated subfolders *client* and *include*, e.g. *Demo/client* and *Demo/include*.

Example Generating an RPC Server

```
<workbench> -cobol:server /Demo/example.idl -target CICS_ZOS
```

where <`workbench`> is a placeholder for the actual Workbench starter as described under *Using the EntireX Workbench in Command-line Mode*.

The generated COBOL source files (server (skeletons))

- will be stored in parallel to the IDL file, in the generated subfolder *server*, e.g. *Demo/server*.
- will overwrite existing files from a previous command-line mode generation.

Caution: Take care not to overwrite an existing server implementation with a server skeleton. We recommend you to move your server implementation to a different folder.

Further Examples

Windows

Example 1

```
<workbench> -cobol:client C:\Temp\example.idl -folder src -target CICS_ZOS
```

Uses the IDL file *C:\Temp\example.idl* and generates the COBOL source files to the subfolder *src* of the IDL file. Slashes and backslashes are permitted in the file name. Output to standard output:

```
Using workspace file:\C:\myWorkspace\.
Run COBOL client wrapper with C:/Temp/example.idl and target CICS_ZOS.
Processing IDL file C:/Temp/example.idl
Store COBOL Source (1/2): C:\Temp\src/include/CALC
Store COBOL Source (2/2): C:\Temp\src/client/CALC
Exit value: 0
```

Example 2

```
<workbench> -cobol:client C:\Temp\*idl -folder C:\Temp\src -target CICS_ZOS
```

Generates COBOL source files for all IDL files in *C:\Temp*.

Example 3

```
<workbench> -cobol:client /Demo/example.idl -target CICS_ZOS
```

Uses the IDL file */Demo/example.idl* and generates the COBOL source files in parallel to the IDL file, here to the project */Demo*.

Example 4

```
<workbench> -cobol:client -help
```

or

```
<workbench> -help -cobol:client
```

Both calls result in displaying a short help for the COBOL client wrapper.

Linux

Example 1

```
<workbench> -cobol:client /Demo/example.idl -folder src -target CICS_ZOS
```

If the project *Demo* exists in the workspace and *example.idl* exists in this project, this file is used. Otherwise, */Demo/example.idl* is used from file system. The generated output will be stored in */Demo/src*, the subfolder of */Demo*.

Example 2

```
<workbench> -cobol:client /Demo/*.idl -folder src -target CICS_ZOS
```

Generates COBOL client interface objects for all IDL files in project *Demo* (or in folder */Demo* if the project does not exist). The generated files are in */Demo/src*.

Example 3

```
<workbench> -cobol:client -help
```

or

```
<workbench> -help -cobol:client
```

Both calls result in displaying a short help for the COBOL client wrapper.

6 Software AG IDL to COBOL Mapping

This chapter describes the specific mapping of Software AG IDL data types, groups, arrays and structures to the COBOL programming language. Please note also the remarks and hints on the IDL data types valid for all language bindings found under *Software AG IDL File* in the IDL Editor documentation.

Mapping IDL Data Types to COBOL Data Types

In the table below, the following metasymbols and informal terms are used for the IDL.

- The metasymbols"[" and "]" surround optional lexical entities.
- The informal term `number` (or in some cases `number1`. `number2`) is a sequence of numeric characters, for example 123.

Software AG IDL	Description	COBOL Data Type	Note	Client Support	Server Support
`Anumber`	Alphanumeric	`PIC X(number)`		x	x
`AV`	Alphanumeric variable length	not supported			
`AV[number]`	Alphanumeric variable length with maximum length	`PIC X(number)`		x	x
`B number`	Binary	`PIC X(number)`	12	x	x
`BV`	Binary variable length	not supported			
`BV[number]`	Binary variable length with maximum length	`PIC X(number)`	12	x	x
`D`	Date	`PIC 9(8)`	1	x	x
`F4`	Floating point (small)	`USAGE COMP-1`	4	x	x
`F8`	Floating point (large)	`USAGE COMP-2`	4	x	x
I1	Integer (small)	`PIC S9(2) COMP-5`	10	x	x
		`PIC X`	9,13	x	x
I2	Integer (medium)	`PIC S9(4) COMP-5`	10	x	x
		`PIC S9(4) BINARY`	11,13	x	x
I4	Integer (large)	`PIC S9(9) COMP-5`	10	x	x

Software AG IDL	Description	COBOL Data Type	Note	Client Support	Serv Sup
		`PIC S9(9) BINARY`	11,13	x	x
K*number*	Kanji	`PIC G(`*number*`/2) DISPLAY-1`	5	x	x
`KV`	Kanji variable length	not supported			
`KV[`*number*`]`	Kanji variable length with maximum length	`PIC G(`*number*`/2 DISPLAY-1)`	5	x	x
`L`	Logical	`PIC X`	6,7	x	x
N*number1*[.*number2*]	Unpacked decimal	`PIC S9(`*number1*`) [V(`*number2*`)]`	2	x	x
NU *number1* [.*number2*]	Unpacked decimal unsigned	`PIC 9(`*number1*`) [V(`*number2*`)]`	2	x	x
P *number1*[.*number2*]	Packed decimal	`PIC S9(`*number1*`) [V(`*number2*`)] PACKED-DECIMAL`	2	x	x
PU *number1* [.*number2*]	Packed decimal unsigned	`PIC 9(`*number1*`) [V(`*number2*`)] PACKED-DECIMAL`	2	x	x
`T`	Time	`PIC 9(15)`	3	x	x
U*number*	Unicode	`PIC N(`*number*`) NATIONAL`	8	x	x
`UV`	Unicode variable length	not supported			
UV*number*	Unicode variable length with maximum length	`PIC N(`*number*`) NATIONAL`	8	x	x

See also the hints and restrictions under *Software AG IDL File* in the IDL Editor documentation valid for all language bindings.

Notes:

1. The date corresponds to the format PIC 9(8). The value contained has the form `YYYYMMDD`. This form corresponds to COBOL `DATE` functions. This is an IBM extension of COBOL85 standard.
2. Depending on your COBOL compiler and settings, the number of digits may be restricted, which means that *number1*+ *number2* must be less than or equal to 18. Please note the number of digits after the decimal point. See *IDL Data Types* under *Software AG IDL File* in the IDL Editor documentation.

To enable range values with more than 18 digits, depending on the operating system, the following compiler directive (option) is generated into the client interface objects and server skeletons if more than 18 digits are defined in the IDL.

Under **z/OS** and **z/VSE**:

- The compiler option `ARITH(EXTEND)`.

Under all other operating systems or compilers:

- No compiler option. Refer to your COBOL compiler documentation to see whether compiler directives or options exist.

3. The time corresponds to the format `PIC 9(15)`. The value contained has the form `YYYYMMDDHHIISST`. This form corresponds to COBOL `DATE/TIME` functions.
4. When floating-point data types are used, rounding errors can occur, so that the values of senders and receivers might differ slightly.
5. The length for IDL data type is given in bytes. For COBOL the length is in DBCS characters (2 bytes). IDL data type `K` is not supported under BS2000/OSD because Fujitsu Siemens compilers do not support DBCS.
6. To inspect the Boolean value of a data item of IDL type Logical, you can specify PIC X followed by condition names (similar code is generated for scalar logical IDL types):

```
level-number data-name PIC X.
88           data-name-false value X'00'.
88           data-name-true  value X'01' thru X'FF'.
```

Under **IBM i,**

The `SYMBOLIC CHARACTERS` clause in the `SPECIAL-NAMES` paragraph is not supported. The following COBOL statements demonstrate how you can define alternatively a character, named `HEX-00`, with a value of hexadecimal zero to be used for comparison:

```
WORKING-STORAGE SECTION.
01  HEX-00-B           PIC 9(4) BINARY VALUE 0.
01  HEX-00-H REDEFINES HEX-00-B.
   02  FILLER         PIC X.
   02  HEX-00         PIC X.
```

7. To set the Boolean value of a Logical data item, specify the following hexadecimal values in a one-byte data field (e.g. defined as `PIC X`.):
   - Case False: `Move X'00' to` *`data-name`*.
   - Case True: `Move X'01' to` *`data-name`*.
8. The length is given in Unicode code units following the Unicode standard UTF-16.

Under **z/OS and IBM Compiler:**

- Unicode requires the IBM Enterprise compiler.
- Unicode is represented in UTF-16 big-endian format (CCSID 1200).

Under **BS2000/OSD:**

- Unicode requires a compiler that supports COBOL data type NATIONAL. See *BS2000/OSD Prerequisites* in the EntireX Release Notes.
- Unicode is represented in UTF-16 big-endian format.

Under **Micro Focus** (UNIX and Windows):

- Set the compiler directive `NSYMBOL"NATIONAL"`.
- **For clients**
  Unicode can be represented in UTF-16 big-endian format (compiler directive `UNICODE(PORTABLE)`) or machine-dependent endianness UTF-16 big or little endian (compiler directive `UNICODE(NATIVE)`).
- **For servers**
  Unicode can be represented in UTF-16 machine-dependent endianness (big or little endian) format only. `UNICODE(PORTABLE)` is not supported.

Under all other operating systems or compilers:

- Refer to your COBOL compiler documentation.

9. COBOL for operating systems z/OS, z/VSE, BS2000/OSD and IBM i does not have a corresponding data type for a compatible I1 mapping. The mapping to COBOL `PIC X` data type should be seen as a `FILLER` variable. If including an I1 data type into the interface is required, it is your responsibility as application developer to process the content of this parameter provided (during receive) and expected (during send) correctly. Negative values are given as the two's complement binary number.
10. Supported for Micro Focus COBOL for operating systems UNIX and Windows only.
11. The value range for COBOL data type `BINARY` on z/OS, z/VSE, BS2000/OSD and IBM i depends on the COBOL compiler settings:
    - With COBOL 85 standard, the mapped COBOL data type `BINARY` is more restrictive than the IDL data types I2 and I4. See *IDL Data Types* under *Software AG IDL File* in the IDL Editor documentation. This means that COBOL RPC clients cannot send (and COBOL RPC servers cannot return) the full value range defined by the IDL types I2 and I4. On the other hand, COBOL RPC clients and COBOL RPC servers may receive a value range (from a non-COBOL RPC partner) outside of the value range of your COBOL data type.
    - *Without* COBOL 85 standard, the value range of the COBOL data type `BINARY` depends on the binary field size, thus matches the IDL data type exactly. In this case, there are no restriction regarding value ranges.
    - To match the value range of IDL type I2 and I4 exactly, depending on the operating system, the following compiler directive (option) is generated into the client interface objects and server skeletons:

Under **z/OS** and **z/VSE**:

- the IBM compiler option `TRUNC(BIN)`

Under all other operating systems or compilers:

- refer to your COBOL compiler documentation to see whether compiler directives or options exist.

12. COBOL does not have a corresponding data type for a compatible `B`/`BV` mapping. Thus the mapping is to COBOL `PIC X` data type. EntireX RPC transports the (binary) data as it is: no character translation or conversion will be performed.
13. Supported for operating systems z/OS, z/VSE, BS2000/OSD and IBM i only.

Mapping Library Name and Alias

Client Side

The IDL library name as specified in the IDL file (there is no 8-character limitation) is sent from a client to the server. Special characters are not replaced. The library alias is neither sent to the server nor used for other purposes on the COBOL client side.

Server Side

If you are using a so-called server-side server mapping file the target RPC server (COBOL subprogram) is located with the help of this file. See *Server Mapping File (SVM)* and *Locating and Calling the Target Server* in the platform-specific administration or RPC server documentation.

If you are *not* using an SVM file, the IDL library name as specified in the IDL file is ignored.

Mapping Program Name and Alias

Client Side

The IDL program name as specified in the IDL file (there is no 8-character limitation) is sent from a client to the server. Special characters are not replaced. The program alias is not sent to the server, but during wrapping it is used to derive the suggestion for the source file names of the client interface objects (COBOL subprograms, copybooks) instead of using the IDL program names, see ***Customize Automatically Generated Client Names***.

Server Side

If you are using a so-called server-side server mapping file, the target RPC server (COBOL subprogram) is located with the help of this file. See *Server Mapping File (SVM)* and *Locating and Calling the Target Server* in the platform-specific administration or RPC server documentation. This provides the following advantages:

- IDL program names do not have to match the target RPC server (COBOL subprogram) names.
- Target RPC server names (COBOL subprogram) can be customized during wrapping, see ***Customize Automatically Generated Client Names***) or during the extraction process in the COBOL Mapping Editor. See *The Software AG IDL Tree Pane*).
- IDL program names are not limited to 8 characters.

The SVM file is generated either during wrapping (see *Using the Natural Wrapper for the Client Side*) or during extraction (see *IDL Extractor for COBOL*). It is wrapped into the RPC client components and the relevant information is sent from a client to the server. Therefore it is important to generate or extract the target COBOL RPC (COBOL subprogram) server first, before creating any RPC client component.

If you are *not* using an SVM file, the target RPC server (COBOL subprogram) must match the IDL program name. In this case:

- The length of the IDL program names is limited by your COBOL system (often 8 characters).
- The set of allowed characters for IDL program names is restricted by your COBOL system and the underlying file system.

It is your responsibility as application developer to ensure that these requirements are met.

Mapping Parameter Names

The parameter names, as given in the `parameter-data-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation of the IDL file, are mapped to fields within the `LINKAGE` section of the generated COBOL client interface objects and COBOL server skeletons.

When building fields within the `LINKAGE` section, the special characters '#', '$', '&', '+', '-', '.', '/', '@' and '_', allowed within names of parameters, are mapped to the character hyphen '-' valid for COBOL names. Example:

`HU$GO` results in `HU-GO`

Trailing and preceding special characters are also removed. Example:

`#HUGO$` results in `HUGO`

Subsequent special characters are replaced by one hyphen. Example:

`HU$#$GO` results in `HU-GO`

If the parameter name starts with a digit, e.g. '`1`', it is prefixed with the character '`P`'. Example:

`1HUGO` results in `P1HUGO`

Mapping Fixed and Unbounded Arrays

Client and Server Side

- Fixed arrays within the IDL file are mapped to fixed COBOL tables. See the `array-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation for the syntax on how to describe fixed arrays within the IDL file and refer to `fixed-bound-array-index`.
- For clients on all operating systems, and for servers on the operating systems z/OS, BS2000/OSD, z/VSE, UNIX and Windows for Micro Focus COBOL, IDL unbounded arrays with a maximum are mapped to COBOL tables with the `DEPENDING ON` clause. See *Tables with Variable Size - `DEPENDING ON` Clause* under *COBOL to IDL Mapping* in the IDL Extractor for COBOL documentation. Note the following:
  - The `from-value` in the IDL file does not mean a minimum number of occurrences which have to be always in the COBOL table, like the `from-value` of the COBOL `DEPENDING ON` clause. Both are semantically different. The `from-value` in the IDL file is used to calculate the maximum size of the array by `idl-upper-bound` minus `idl-lower-bound`. See the syntax of unbounded arrays in the IDL file, section `array-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation.
  - The `from-value` of the `DEPENDING ON` clause is always mapped to 1.
  - ODO objects for justification of the number of occurrences are generated into the client interface objects and server skeletons.
  - When a 2/3 dimensional unbounded array is received from a partner, all vectors of the second dimension must have the same length, i.e. the array forms a rectangle. The same applies to the third dimension (all vectors must have the same length), the array forms a cuboid. If these rules are violated, unexpected behavior occurs.
  - Sending a 2/3 dimensional unbounded array to a partner violating the rule above is not possible: COBOL does not allow you to set vector lengths differently.
- For servers on the operating system IBM i, IDL unbounded arrays with a maximum are mapped to fixed COBOL tables. On the reply, the number of occurrences is determined by `NULL` value contents. Occurrences with null values are not sent back to the calling RPC client.
- Unbounded arrays without a maximum are *not* supported.

Mapping Groups and Periodic Groups

Client and Server Side

- Groups within the IDL file are mapped to COBOL structures using level numbers. See the `group-parameter-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation for the syntax on how to describe groups within the IDL file.
- For clients on all operating systems and for servers on the operating systems z/OS, BS2000/OSD, z/VSE, UNIX and Windows for Micro Focus COBOL, IDL with unbounded groups with a maximum:
  - the same applies as for unbounded arrays, see ***Mapping Fixed and Unbounded Arrays***
  - if unbounded groups are nested, and depending on your target COBOL compiler,
    - they may not be supported (e.g. BS2000/OSD).
    - there is a restriction on the number of indices. Most COBOL compiler support 7 indices as a maximum.

      The EntireX Workbench generates the COBOL interface objects and server (skeletons) without considering restrictions of the target COBOL compiler. See your COBOL compiler documentation for possibilities to work round the restrictions, for example using compiler switches or compiler options.
- For server on the operating system IBM i, Software AG IDL unbounded groups with a maximum are mapped to fixed COBOL tables. On the reply the number of occurrences is determined by NULL value contents. Occurrences with null values are not sent back to the calling RPC client.
- Unbounded groups without a maximum are not supported.

Mapping Structures

Client and Server Side

Structures within the IDL file are dissolved at the location where they are used. They are mapped to COBOL structures like groups. See the `structure-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation for the syntax on how to describe structures within the IDL file.

Mapping the Direction Attributes IN, OUT, INOUT

The IDL syntax allows you to define parameters as `IN` parameters, `OUT` parameters, or `IN OUT` parameters (which is the default if nothing is specified). See the `attribute-list` under *Software AG IDL Grammar* in the *IDL Editor* documentation for the syntax on how to describe attributes within the IDL file and refer to `direction-attribute`.

Client Side

This direction specification is reflected in the generated COBOL interface object as follows:

- Direction attributes do not change the COBOL call interface because parameters are always treated as “called by reference”.
- Usage of direction attributes may be useful to reduce data traffic between RPC client and RPC server.
- Parameters with the `IN` attribute are sent from the RPC client to the RPC server.
- Parameters with the `OUT` attribute are sent from the RPC server to the RPC client.
- Parameters with the `IN` and `OUT` attribute are sent from the RPC client to the RPC server and then back to the RPC client.

Note that only the direction information of the top-level fields (level 1) is relevant. Group fields always inherit the specification from their parent. A different specification is ignored.

See the `attribute-list` under *Software AG IDL Grammar* in the *IDL Editor* documentation for the syntax on how to describe attributes within the IDL file and refer to `direction-attribute`.

Server Side

If you are using an SVM file, the RPC server considers the direction attribute found in the SVM file.

If your RPC server is generated with a previous version of EntireX without an SVM file, the RPC server considers the direction attribute sent from any RPC client, for example Java, DCOM, C, COBOL, .NET, XML and PL/I.

Mapping the ALIGNED Attribute

See the `attribute-list` under *Software AG IDL Grammar* in the *IDL Editor* documentation for the syntax on how to describe attributes within the IDL file and refer to `direction-attribute`.

Client and Server Side

This attribute corresponds to the `SYNCHRONIZED` clause. If it is specified, data will be mapped according to the following rules:

Software AG IDL	COBOL Data Type	Alignment	Notes
`F4`	`USAGE COMP-1 SYNC`	+4	1
`F8`	`USAGE COMP-2 SYNC`	+8	1
`I2`	`PIC S9(4) BINARY SYNC`	+2	1
`I4`	`PIC S9(8) BINARY SYNC`	+4	1

Notes:

1. On IBM i, specify the compiler option `*SYNC` in the commands `CRTCBLMOD` or `CRTBNDCBL` for the usage of the `SYNCHRONIZED` clause.

Calling Servers as Procedures or Functions

Client and Server Side

The COBOL 85 standard does not support a concept of functions like the programming languages C or PL/I. Any Software AG IDL program definition is mapped to a COBOL program. See ***Mapping Program Name and Alias***.

7 Writing Standard Call Interface Clients

This chapter describes in six steps how to write your first COBOL RPC client program.

The following steps describe how to write a COBOL client program for the client scenarios: ***Micro Focus*** | ***Batch*** | ***CICS*** | ***IMS*** . We recommend reading them first before writing your first RPC client program and following them if appropriate.

The example given here does not use function calls as described under ***Using Broker Logon and Logoff***. It demonstrates an implicit broker logon (because no broker logon/logoff calls are implemented), where it is required to switch on the `AUTOLOGON` feature in the broker attribute file.

Step 1: Declare and Initialize the RPC Communication Area

The RPC communication area (see ***Using the RPC Communication Area***) is your interface (API) to the ***Generic RPC Services Modules***. Declare and initialize the communication area in your RPC client program as follows:

```
* Declare RPC communication area
 01 ERX-COMMUNICATION-AREA EXTERNAL.
    COPY ERXCOMM.

* Initialize RPC communication area
 INITIALIZE ERX-COMMUNICATION-AREA.
 MOVE "2000" to COMM-VERSION.
```

The example given here uses option `External Clause` to access the RPC communication area. See ***Using the RPC Communication Area with a Standard Call Interface***. For further options to access the RPC communication area, see ***RPC Communication Area***.

Step 2: Declare the Data Structures for RPC Stubs

For every program definition of the IDL file, the COBOL Wrapper generates a copybook with the description of the customer's interface data as a COBOL structure. For ease of use you can include these structures into your RPC client program. See ***Using the Generated Copybooks***.

However, as an alternative, you can use your own customer data structures. In this case the COBOL data types and structures must match the interfaces of the generated client interface objects, otherwise unpredictable results may occur.

```
* Declare customer data to generated RPC Stubs
 01 CALC-AREA.
    10 PARAMETER.
       15 OPERATOR                  PIC X.
       15 OPERAND1                  PIC S9(9) BINARY.
       15 OPERAND2                  PIC S9(9) BINARY.
       15 RESULT                    PIC S9(9) BINARY.
```

Step 3: Required Settings in the RPC Communication Area

The following settings to the RPC communication area are required as a minimum to use the COBOL Wrapper. These settings have to be applied in your RPC client program. It is not possible to generate any defaults into the client interface objects.

```
* assign the broker to talk with ...
 MOVE "localhost:1971" to COMM-ETB-BROKER-ID.
* assign the server to talk with ...
 MOVE "RPC"            to COMM-ETB-SERVER-CLASS.
 MOVE "SRV1"           to COMM-ETB-SERVER-NAME.
 MOVE "CALLNAT"        to COMM-ETB-SERVICE-NAME.
* assign the user id to the broker ...
 MOVE "ERXUSER"        to COMM-USERID.
 MOVE "PASSWORD"       to COMM-PASSWORD.
```

Step 4: Optional Settings in the RPC Communication Area

Here you specify optional settings to the RPC communication area used by the COBOL Wrapper, for example:

```
 MOVE "EXAMPLE"        to COMM-LIBRARY.
 MOVE "00000300"       to COMM-ETB-WAIT.
```

For implicit broker logon, if required in your environment, the client password can be given here. It is provided then through the client interface objects, see also ***Using Broker Logon and Logoff***.

Step 5: Issue the RPC Request

Issue the RPC request with a standard COBOL program call:

```
CALL "CALC" USING  OPERATOR OPERAND1 OPERAND2 RESULT.
```

Step 6: Examine the Error Code

When the RPC reply is received, check that the call was successful:

```
IF COMM-RETURN-CODE IS = ZERO
   Perform success-handling
ELSE
   Perform error-handling
END-IF.
```

The field `COMM-RETURN-CODE` in the RPC communication area contains the error provided by the COBOL Wrapper. For the error messages returned, see *Error Messages and Codes*.

8 Using the RPC Communication Area

The RPC communication area is not relevant for servers.

Purpose of the RPC Communication Area

The RPC communication area is mainly used to specify parameters that are needed to communicate with the broker and are not specific to client interface objects. In this way it defines a context for PRC clients. Its purpose, among others, is

- to assign the `COMM-ETB-BROKER-ID` and server name, see `COMM-ETB-SERVER-CLASS`, `COMM-ETB-SERVER-NAME` and `COMM-ETB-SERVICE-NAME`
- to assign the broker's `COMM-ETB-USER-ID` and `COMM-ETB-TOKEN`
- for use with conversational RPC (see ***Using Conversational RPC***) to hold, for example, the conversation ID, see `COMM-ETB-CONV-ID`
- for use with EntireX Security to hold the broker's `COMM-ETB-PASSWORD`, `COMM-ETB-SECURITY-TOKEN` and others
- to keep the results of the last RPC request, for example the error code

The RPC communication area is also the API to the generic RPC services, for example:

- Log on to broker and log off from broker. See ***Using Broker Logon and Logoff***.
- Open conversation, close conversation and close conversation with commit. See ***Using Conversational RPC***.
- When using reliable RPC function calls, do reliable RPC commit, do reliable RPC rollback, get reliable status. See ***Reliable RPC for COBOL Wrapper***.
- Create a Natural Security token. See ***Using the COBOL Wrapper with Natural Security and Impersonation***.

From a COBOL point of view, the RPC communication area is the copybook `ERXCOMM`. It is generated in the folder *include* for RPC client generation, see ***Generate COBOL Source Files from Software AG IDL Files***.

The layout of the RPC communication area is described in section ***The RPC Communication Area (Reference)***.

Using the RPC Communication Area with a Standard Call Interface

The COBOL Wrapper allows the RPC communication to be used in the following ways:

- Option External Clause
- Option Linkage Section
- Option Copybook

Option External Clause

With the RPC communication area option `External Clause` under ***RPC Communication Area***, the RPC communication area is passed using the COBOL External clause to the client interface objects. Note that this is an extension to COBOL 85 standards, which might not be supported by every compiler.

The RPC communication area is allocated (declared) in the COBOL client application. The client interface objects are statically linked (it is not possible to call them dynamically) to the COBOL client application.

This kind of RPC communication area usage applies to the scenarios ***Micro Focus*** | ***Batch*** | ***CICS*** | ***IMS*** .

Examples

For examples on how the option `External Clause` is used, see ***Step 1: Declare and Initialize the RPC Communication Area*** and ***Step 5: Issue the RPC Request*** in ***Writing Standard Call Interface Clients***.

Option Linkage Section

With the RPC communication area option `Linkage Section` under ***RPC Communication Area***, the client interface objects are generated to pass the RPC communication area with an additional parameter to the client interface objects.

The RPC communication area is allocated (declared) in the COBOL client application in the working storage section. The client interface objects can be statically linked or called dynamically. For IBM compilers, refer to documentation on the DYNAM compiler option; for other compilers, to your compiler documentation.

This kind of RPC communication area usage applies to the scenarios ***Micro Focus*** | ***Batch*** | ***CICS*** | ***IMS***.

Example

The example given below will pass the RPC communication area via the COBOL Linkage section to the client interface objects. It differs in two steps from the example in *Writing Standard Call Interface Clients* (which uses option `External Clause`):

Step 1 has no `EXTERNAL` attribute.

```
 01 ERX-COMMUNICATION-AREA.
     COPY ERXCOMM.
* Initialize RPC communication area
 INITIALIZE ERX-COMMUNICATION-AREA.
 MOVE "2000" TO COMM-VERSION.
```

Step 5 will include the RPC communication area as an extra parameter.

```
 CALL "CALC" USING  OPERATOR
                    OPERAND1
                    OPERAND2
                    FUNCTION-RESULT
                    ERX-COMMUNICATION-AREA
   ON EXCEPTION
*      Perform error-handling
   NOT ON EXCEPTION
      IF RETURN-CODE = ZERO
*        Perform success-handling
      ELSE
*        Perform error-handling
      END-IF
 END-CALL.
```

With this example the client interface objects are generated, for example for target platform "z/OS", client interface type "Batch with standard linkage calling convention" and RPC communication area "Linkage Section". See *Generate COBOL Source Files from Software AG IDL Files*.

Option Copybook

With the RPC communication area option `Copybook` under *RPC Communication Area*, the client interface objects are generated with an RPC communication area in their working storage section.

The RPC communication area is not visible in the client application – it is local to the client interface objects. The client interface objects can be statically linked or called dynamically. For IBM compilers, refer to documentation on the DYNAM compiler option and for other compilers to your compiler documentation.

This kind of RPC communication area usage is available in z/OS operating system and Micro Focus environments. Refer to the scenarios *Micro Focus* | *Batch* | *CICS* | *IMS* .

Example

The example given below defines the RPC communication area inside of the client interface objects. Two steps are different from the example in ***Writing Standard Call Interface Clients*** (which uses option `External Clause`):

Step 1: Declare and Initialize the RPC Communication Area: Declare and initialize the RPC communication area

This step is obsolete in the client application and is omitted there. Default values for the RPC communication area are retrieved from EntireX workbench preferences or IDL-specific properties. If required, those default values can be overwritten in the ***`COBINIT` Copybook***.

Step 6: Examine the Error Code: Examine the error code

Because the RPC communication area is not used for data exchange between the client application and the client interface objects, the `COMM-RETURN-CODE` field in the RPC communication area cannot be checked directly upon return from RPC calls. Therefore, the COBOL mechanism `RETURN-CODE` special register is used to provide errors from client interface objects to the client application. For IBM compilers, errors can be adapted in the copybook `COBEXIT` (see folder *include*).

After the RPC reply has been received, you can check if the call was successful using the `RETURN-CODE` special register:

```
 IF RETURN-CODE IS = ZERO
*    Perform success-handling
 ELSE
*    Perform error-handling
 END-IF.
```

Using the RPC Communication Area with EXEC CICS LINK

The RPC communication area is allocated (declared) in the COBOL client application and passed via a parameter in the DFHCOMMAREA to the client interface objects.

This kind of RPC communication area usage aplies to the scenario ***Using the COBOL Wrapper for CICS with DFHCOMMAREA Calling Convention (z/OS and z/VSE)***.

Example

Two steps are different from the example in *Writing a COBOL RPC Client Application* See ***Writing Standard Call Interface Clients***.

Step 1 contains the application interface as well as the RPC communication area within one area:

```
01  CALC-AREA.
  05 OPERATOR                   PIC X.
  05 OPERAND1                   PIC S9(8) COMP.
  05 OPERAND2                   PIC S9(8) COMP.
  05 RESULT                     PIC S9(8) COMP.
  05 ERX-COMMUNICATION-AREA.
  COPY ERXCOMM.
* Initialize RPC communication area
 INITIALIZE ERX-COMMUNICATION-AREA.
 MOVE "2000" TO COMM-VERSION.
```

Step 5 uses *EXEC CICS LINK interface*:

```
 MOVE LENGTH OF CALC-AREA TO COMLEN.
 EXEC CICS LINK PROGRAM("CALC") COMMAREA(CALC-AREA)
           LENGTH(COMLEN) RESP(WORKRESP)
 END-EXEC.
 IF WORKRESP = DFHRESP(NORMAL)
    IF (COMM-RETURN-CODE = 0) THEN
*       Perform success-handling
    ELSE
*       Perform error-handling
    END-IF
 ELSE
*    Perform error-handling
 END-IF.
```

With this example, the client interface objects are generated e.g. for target platform "z/OS", client interface type "CICS with DFHCOMMAREA Calling Convention", and RPC communication area "Linkage Section". See ***Generate COBOL Source Files from Software AG IDL Files***.

9 Using the Generated Copybooks

IDL Interface Copybooks

The IDL interface copybooks (see folder *include*) are the API of the COBOL client application using client interface objects. We recommend you generate the IDL interface copybooks with a starting level greater than one. See ***Starting COBOL Level for Data Items in Generated Copybooks***. This allows you to

- embed (include) the generated copybook into other existing COBOL structures:

```
1 MYGROUP.
  10 . . .
  10 . . .
  10 MYIDL.
  COPY MYIDL.
```

- specify usage clauses such as `EXTERNAL`, `GLOBAL` etc. to the IDL:

```
1 MYIDL1 GLOBAL.
  COPY MYIDL1.
```

- use multiple generated copybooks with duplicate parameter names on IDL level 1 in the same COBOL program:

```
1 MYIDL1.
  COPY MYIDL1.
1 MYIDL2.
  COPY MYIDL2.
```

If the IDL contains IDL unbounded arrays, the copybook starting level is ignored; the level used is always "1".

COBINIT Copybook

The `COBINIT` copybook (see folder *include*) is generated if option `Copybook` for ***RPC Communication Area*** is selected. Its purpose is to set communication parameters such as `COMM-ETB-BROKER-ID`, `COMM-ETB-SERVER-NAME` etc. into the RPC Communication Area. See ***The RPC Communication Area (Reference)***. If the counterpart of your RPC client application is a Natural RPC server running with Natural Security, or an RPC server running with impersonation (see *Impersonation* in the respective RPC Server documentation), the security token can be generated. See ***Using the COBOL Wrapper with Natural Security and Impersonation***.

COBEXIT Copybook

The `COBEXIT` copybook (see folder *include*) is generated if option `Copybook` for ***RPC Communication Area*** is selected. Its purpose is to check and map error codes. COBOL statements that have been commented out are generated into the copybook as an example.

10 Using Broker Logon and Logoff

This chapter explains how clients built with the COBOL Wrapper use explicit broker logon and logoff functions.

It is assumed that you are familiar with the concepts of explicit and implicit broker logon. To use explicit broker logon and logoff you need the following components:

- the *Generic RPC Services Modules* are provided to log on to and log off from the broker
- the *The RPC Communication Area (Reference)*

To log on to the Broker

1 Log on to the broker with the function Logon `LO` provided by the generic RPC services module.

In the scenarios *Micro Focus*, *Batch*, *CICS* and *IMS* with the *Call Interface*:

```
...
* Broker Logon
 MOVE "2000" TO COMM-VERSION.
 MOVE "LO"   TO COMM-FUNCTION.
* Set broker user ID in RPC Communication Area
 MOVE "COB-USER"  TO COMM-ETB-USER-ID.
*  Call the broker
 CALL "COBSRVI" USING ERX-COMMUNICATION-AREA
 ON EXCEPTION
 ...
 NOT ON EXCEPTION
 ...
 END-CALL.
* begin of application logic
 ...
```

Or:

In the scenario ***Using the COBOL Wrapper for CICS with DFHCOMMAREA Calling Convention (z/OS and z/VSE)*** with the *EXEC CICS LINK Interface*:

```
...
* Broker Logon
 MOVE "2000" TO COMM-VERSION.
 MOVE "LO"   TO COMM-FUNCTION.
* Set broker user ID in RPC Communication Area
 MOVE "COB-USER"  TO COMM-ETB-USER-ID.
* Call the broker
 EXEC CICS LINK PROGRAM  ("COBSRVI")
                RESP     (CICS-RESP1)
                RESP2    (CICS-RESP2)
                COMMAREA (ERX-COMMUNICATION-AREA)
                LENGTH   (LENGTH OF ERX-COMMUNICATION-AREA)
 END-EXEC.
 IF WORKRESP = DFHRESP(NORMAL)
    IF (COMM-RETURN-CODE = 0) THEN
*       Perform success-handling
    ELSE
*       Perform error-handling
    END-IF
 ELSE
*    Perform error-handling
 END-IF.
* begin of application logic
...
```

2 Issue your RPC requests as without using explicit logon and logoff.

Notes:

1. The logon call is the first call to the broker, before any RPC call.
2. The `COMM-ETB-USER-ID` field (and the `COMM-ETB-TOKEN` field, where provided) must not change from logon, through all calls of client interface objects, until final logoff.
3. If EntireX Security is to be used, see ***Using the COBOL Wrapper with EntireX Security***.

To log off from the Broker

- Log off from the broker with the function Logoff `LF` provided by the generic RPC services module with the *Call Interface*

```
...
* end of application logic including calls to generated interface objects
* Broker Logoff
 MOVE "2000" TO COMM-VERSION.
 MOVE "LF"   TO COMM-FUNCTION.
* Call the broker
 CALL "COBSRVI" USING ERX-COMMUNICATION-AREA
 ON EXCEPTION
 . . .
 NOT ON EXCEPTION
 . . .
 END-CALL.
 ...
```

Or:

with the `EXEC CICS LINK` Interface (see *Logon* above).

The logoff call should be issued as soon as RPC communication is no longer needed.

11 Using Conversational RPC

This chapter explains how clients built with the COBOL Wrapper use conversational RPC.

RPC conversations are supported when communicating with an RPC server. It is further assumed that you are familiar with the concepts of conversational RPC and non-conversational RPC. To use conversational RPC, you need the following components:

- the ***Generic RPC Services Modules*** are provided to open, close or abort conversations;
- the ***The RPC Communication Area (Reference)***

To use conversational RPC

1 Open a conversation with the function Open Conversation `OC` provided by the generic RPC services module.

In the scenarios ***Micro Focus***, ***Batch CICS*** and ***IMS*** with the *Call Interface*:

```
MOVE "2000" TO COMM-VERSION.
MOVE "OC"   TO COMM-FUNCTION.
CALL "COBSRVI" USING ERX-COMMUNICATION-AREA
ON EXCEPTION
. . .
NOT ON EXCEPTION
. . .
END-CALL.
```

Or:

In the scenario ***Using the COBOL Wrapper for CICS with DFHCOMMAREA Calling Convention (z/OS and z/VSE)*** with the *EXEC CICS LINK Interface*:

```
 MOVE "2000" TO COMM-VERSION.
 MOVE "OC"   TO COMM-FUNCTION.
 EXEC CICS LINK PROGRAM  ("COBSRVI")
                RESP     (CICS-RESP1)
                RESP2    (CICS-RESP2)
                COMMAREA (ERX-COMMUNICATION-AREA)
                LENGTH   (LENGTH OF ERX-COMMUNICATION-AREA)
 END-EXEC.
 IF WORKRESP = DFHRESP(NORMAL)
    IF (COMM-RETURN-CODE = 0) THEN
*       Perform success-handling
    ELSE
*       Perform error-handling
    END-IF
 ELSE
*    Perform error-handling
 END-IF.
```

2 Issue your RPC requests as within non-conversational mode using the generated client interface objects. Different client interface objects can participate in the same RPC conversation.

To abort conversational RPC communication

- Abort an unsuccessful RPC conversation with the function Close Conversation `CB` provided by the generic RPC services module

  In the scenarios ***Micro Focus***, ***Batch***, ***CICS*** and ***IMS*** with the *Call Interface*:

```
 MOVE "2000" TO COMM-VERSION.
 MOVE "CB"   TO COMM-FUNCTION.
 CALL "COBSRVI" USING ERX-COMMUNICATION-AREA
 ON EXCEPTION
 . . .
 NOT ON EXCEPTION
 . . .
 END-CALL.
```

  Or:

  In the scenario ***Using the COBOL Wrapper for CICS with DFHCOMMAREA Calling Convention (z/OS and z/VSE)*** with *the EXEC CICS LINK Interface*:

```
 MOVE "2000" TO COMM-VERSION.
 MOVE "CB"   TO COMM-FUNCTION.
 EXEC CICS LINK PROGRAM  ("COBSRVI")
               RESP     (CICS-RESP1)
               RESP2    (CICS-RESP2)
               COMMAREA (ERX-COMMUNICATION-AREA)
               LENGTH   (LENGTH OF ERX-COMMUNICATION-AREA)
 END-EXEC.
 IF WORKRESP = DFHRESP(NORMAL)
    IF (COMM-RETURN-CODE = 0) THEN
*        Perform success-handling
    ELSE
*        Perform error-handling
    END-IF
 ELSE
*     Perform error-handling
 END-IF.
```

To close and commit a conversational RPC communication

- Close the RPC conversation successfully with the function Close Conversation and Commit `CE` provided by the generic RPC services module

  In the scenarios ***Micro Focus***, ***Batch***, ***CICS*** and ***IMS*** with the *Call Interface*:

```
 MOVE "2000" TO COMM-VERSION.
 MOVE "CE"   TO COMM-FUNCTION.
 CALL "COBSRVI" USING ERX-COMMUNICATION-AREA
 ON EXCEPTION
 . . .
 NOT ON EXCEPTION
 . . .
 END-CALL.
```

  Or:

  In the scenario ***Using the COBOL Wrapper for CICS with DFHCOMMAREA Calling Convention (z/OS and z/VSE)*** with *the EXEC CICS LINK Interface*:

```
 MOVE "2000" TO COMM-VERSION.
 MOVE "CE"   TO COMM-FUNCTION.
 EXEC CICS LINK PROGRAM  ("COBSRVI")
               RESP     (CICS-RESP1)
               RESP2    (CICS-RESP2)
               COMMAREA (ERX-COMMUNICATION-AREA)
               LENGTH   (LENGTH OF ERX-COMMUNICATION-AREA)
 END-EXEC.
 IF WORKRESP = DFHRESP(NORMAL)
    IF (COMM-RETURN-CODE = 0) THEN
```

```
*       Perform success-handling
    ELSE
*       Perform error-handling
    END-IF
 ELSE
*    Perform error-handling
 END-IF.
```

12 Using the COBOL Wrapper with Natural Security and Impersonation

This chapter explains how clients built with the COBOL Wrapper can communicate with Natural RPC Servers running under Natural Security and RPC servers running with impersonation. See *Impersonation* in the respective RPC Server documentation.

This chapter assumes that you are familiar with the concepts of Natural Security and impersonation. To communicate with such a server you will need the following components:

- the ***Generic RPC Services Modules***, which are provided to create and get a security token,
- the ***RPC Communication Area***

To authenticate against Natural Security or impersonated RPC server

1 Specify a user ID, password and optional Natural library in the RPC communication area:

```
*  Client information :                  bytes 101-300
    10 COMM-USERID.
              15 COMM-USERID1      PIC X(8).
              15 COMM-USERID2      PIC X(8).
    10 COMM-PASSWORD               PIC X(8).
    10 COMM-LIBRARY                PIC X(8).
    10 COMM-SECURITY-TOKEN-LENGTH  PIC 9(4) BINARY.
    10 COMM-SECURITY-TOKEN         PIC X(100).
    10 FILLER                      PIC X(66).
```

2 Create a security token with the function Create Security Token `CT` provided by the generic RPC services module.

In the scenarios ***Micro Focus***, ***Batch***, ***CICS*** and ***IMS*** with the *Call Interface*:

- For ***RPC Communication Area*** setting `Linkage` and `External`:

```
  MOVE "2000" TO COMM-VERSION.
  MOVE "CT"   TO COMM-FUNCTION.
* Set user ID and password in RPC Communication Area
  MOVE "NAT-USER"  TO COMM-USERID.
  MOVE "NAT-PWD"   TO COMM-PASSWORD.
* Additional for Natural Security set library in RPC Communication Area
  MOVE "NAT-LIB"   TO COMM-LIBRARY.
  CALL "COBSRVI" USING ERX-COMMUNICATION-AREA
  ON EXCEPTION
  . . .
  NOT ON EXCEPTION
  . . .
  END-CALL.
```

- For ***RPC Communication Area*** setting `Copybook`. Add the following COBOL Statements to the `COBINIT` copybook:

```
MOVE "CT"   TO COMM-FUNCTION.
 * Set user ID and password in RPC Communication Area
MOVE "NAT-USER"  TO COMM-USERID.
MOVE "NAT-PWD"   TO COMM-PASSWORD.
 * Additional for Natural Security set library in RPC Communication Area
MOVE "NAT-LIB"   TO COMM-LIBRARY.
CALL "COBSRVI" USING ERX-COMMUNICATION-AREA
```

  See also ***Using the Generated Copybooks***.

Or:

In the scenario ***Using the COBOL Wrapper for CICS with DFHCOMMAREA Calling Convention (z/OS and z/VSE)*** with *the EXEC CICS LINK Interface*:

```
MOVE "2000" TO COMM-VERSION.
MOVE "CT"   TO COMM-FUNCTION.
* Set user ID and password in RPC Communication Area
MOVE "NAT-USER"  TO COMM-USERID.
MOVE "NAT-PWD"   TO COMM-PASSWORD.
* Additional for Natural Security set library in RPC Communication Area
MOVE "NAT-LIB"   TO COMM-LIBRARY.
EXEC CICS LINK PROGRAM  ("COBSRVI")
               RESP     (CICS-RESP1)
               RESP2    (CICS-RESP2)
               COMMAREA (ERX-COMMUNICATION-AREA)
               LENGTH   (LENGTH OF ERX-COMMUNICATION-AREA)
END-EXEC.
IF WORKRESP = DFHRESP(NORMAL)
   IF (COMM-RETURN-CODE = 0) THEN
*       Perform success-handling
    ELSE
*       Perform error-handling
```

```
    END-IF
ELSE
*    Perform error-handling
END-IF.
```

After successful return from the generic RPC services module, the security fields in the RPC communication area are properly set, so they can be used in subsequent RPC requests to a secure RPC server, such as:

- Natural RPC server running with Natural Security
- RPC server running with impersonation. See *Impersonation* in the respective RPC Server documentation.

13 Returning Application Errors from a Server to a Client

Application error codes enable the RPC server to return customer-invented errors back to the RPC client in a standardized way without defining an error code field in the IDL.

Returning Application Errors from a Server under z/OS Batch to a Client

The `RETURN-CODE` special register (an IBM extension to the COBOL programming language) is used by your RPC server to report an error.

Upon return, the value contained in the `RETURN-CODE` special register is detected by the Batch RPC server and sent back to the RPC client instead of the application's data.

For IBM compilers the `RETURN-CODE` special register has the implicit definition:

```
RETURN-CODE GLOBAL PICTURE S9(4) USAGE BINARY VALUE ZERO
```

Special registers are reserved words that name storage areas generated by the compiler. Their primary use is to store information produced through specific COBOL features. Each such storage area has a fixed name, and must not be defined within the program. See your compiler documentation for more information.

The following rules apply to application error codes:

- The value range for application errors is 1-9999. No other values are allowed.
- On the RPC client side, the error is prefixed with the error class 1002 “Application User Error” and presented as error 1002*nnnn*.
- No application data is sent back to the RPC client in case of an error.
- It is not possible to return an error text to the RPC client.

  Example

```
. . .
        IF error occurred THEN
               MOVE <error-number> TO RETURN-CODE
               GO TO MAIN-EXIT
        END-IF.
        . . .

   MAIN-EXIT.
       EXIT PROGRAM.
END PROGRAM RETCODE.
```

Note: To enable this feature, configure the Batch RPC server with `RETURN_CODE=YES`.

Returning Application Errors from a Server under z/OS CICS to a Client

Using EXEC CICS ABEND ABCODE

This approach applies to the following CICS scenarios:

- *Using the COBOL Wrapper for CICS with DFHCOMMAREA Calling Convention (z/OS and z/VSE)*
- *Using the COBOL Wrapper for CICS with Channel Container Calling Convention (z/OS)*
- *Using the COBOL Wrapper for CICS with DFHCOMMAREA Large Buffer Interface (z/OS and z/VSE)*

The CICS feature `EXEC CICS ABEND ABCODE(`*`myabend`*`)` may be used to indicate application error codes. According to IBM CICS standards, `ABEND` codes starting with the letter A are reserved for CICS itself and should not be used in your RPC server.

The CICS RPC Server follows these IBM CICS standards and sends back the RPC protocol message

1. 10010018 `Abnormal termination during program execution`. This is returned when an `ABEND` code starting with the letter "A" is received from CICS, which is a CICS `ABEND`.
2. 10010045 `CICS ABEND` *`myabend`* `was issued`. This is returned when an `ABEND` code starting with a letter other than "A" is received from CICS, which is an application error situation forced by your RPC server.

Using RETURN-CODE Special Register

This approach applies to the following CICS scenarios:

- *Using the COBOL Wrapper for CICS with DFHCOMMAREA Calling Convention (z/OS and z/VSE)*
- *Using the COBOL Wrapper for CICS with DFHCOMMAREA Large Buffer Interface (z/OS and z/VSE)*

CICS applications that use the DFHCOMMAREA as communication area (`EXEC CICS LINK` applications) may return error codes if the LINKed application has a C main entry and if this application is running in the same CICS (non-DPL program) as the CICS RPC Server. Under these circumstances, IBM's Language Environment for C provides the application return code to `EIBRESP2`, where it can be detected by the CICS RPC Server.

The following provided modules need to be linked to your application.

- `ERXRCSRV`, a C main module that calls the intermediate COBOL subroutine `RCCALL` and catches the error from your RPC server and provides it to the CICS RPC Server. This module is available as source in the source data set EXP951.SRCE as well as precompiled in the load data set EXP951.LD00, so a C compiler is not needed.

- `RCCALL`, a COBOL subroutine calling your RPC server. This module is available as source in the CICS example server data set EXP951.DVCO.

A step-by-step description is given below, but for ease of use we recommend using the job `RCIGY`. See below.

To set up *your server* to be able to return application errors manually

1 Change the `CALL` statement of the `RCCALL` program below which your RPC server is called instead of “MyCobol” below

```
 IDENTIFICATION DIVISION.
   PROGRAM-ID.    RCCALL.

****************************************************************
*
*  CICS RPC Server
*
*  Returning Application Errors from RPC Server to RPC Client
*
*  This program calls your target COBOL Server.
*
*  For further information and explanation refer to
*  - "Writing Applications with the COBOL Wrapper"
*  in the delivered documentation.
*
*  $Revision: n.n $
*
*
*  Copyright (C) 1997 - 20nn Software AG, Darmstadt, Germany
*  and/or Software AG USA, Inc., Reston, VA, United States of
*  America, and/or their licensors.
*
****************************************************************

 ENVIRONMENT DIVISION.

 DATA DIVISION.
   WORKING-STORAGE SECTION.

   LINKAGE SECTION.

   01 DFHCOMMAREA.
      10 DFHCOMM-DUMMY                  PIC X.

 PROCEDURE DIVISION USING DFHCOMMAREA.
```

```
MAIN SECTION.
     CALL "my-cobol" USING DFHEIBLK DFHCOMMAREA.

MAIN-EXIT.
     EXIT PROGRAM.

END PROGRAM RCCALL.
```

2 In your RPC server, do not use `EXEC CICS RETURN`, because this prevents the return of the application error code to the CICS RPC server. If you are using a COBOL RPC server generated with the COBOL Wrapper, comment out or remove this line.

3 Compile the `RCCALL` program with a COBOL compiler supported by the COBOL Wrapper.

4 Link the compiled `RCCALL` program, the delivered `ERXRCSRV` module and your RPC server together to a CICS program to be called by the CICS RPC Server. See also ***Using the COBOL Wrapper for the Server Side*** for supported CICS scenarios.

To set up your server to be able to return application errors using job `RCIGY`

- Execute `RCIGY` as provided in the CICS example source data set EXP951.DVCO.

  This enhanced job will

  1. modify `RCCALL` as needed (step 1 from the manual approach, see above),
  2. add the modified `RCCALL` code to your COBOL input source (step 2 from the manual approach, see above),
  3. linkedits with `ERXRCSRV` (step 3 from the manual approach, see above).

Returning Application Errors from a Server under z/OS IMS to a Client

Follow the rules under ***Returning Application Errors from a Server under z/OS Batch to a Client*** and ***Using the COBOL Wrapper for IMS BMP (z/OS)***.

Note: To enable this feature, configure the IMS RPC server with `RETURN_CODE=YES`.

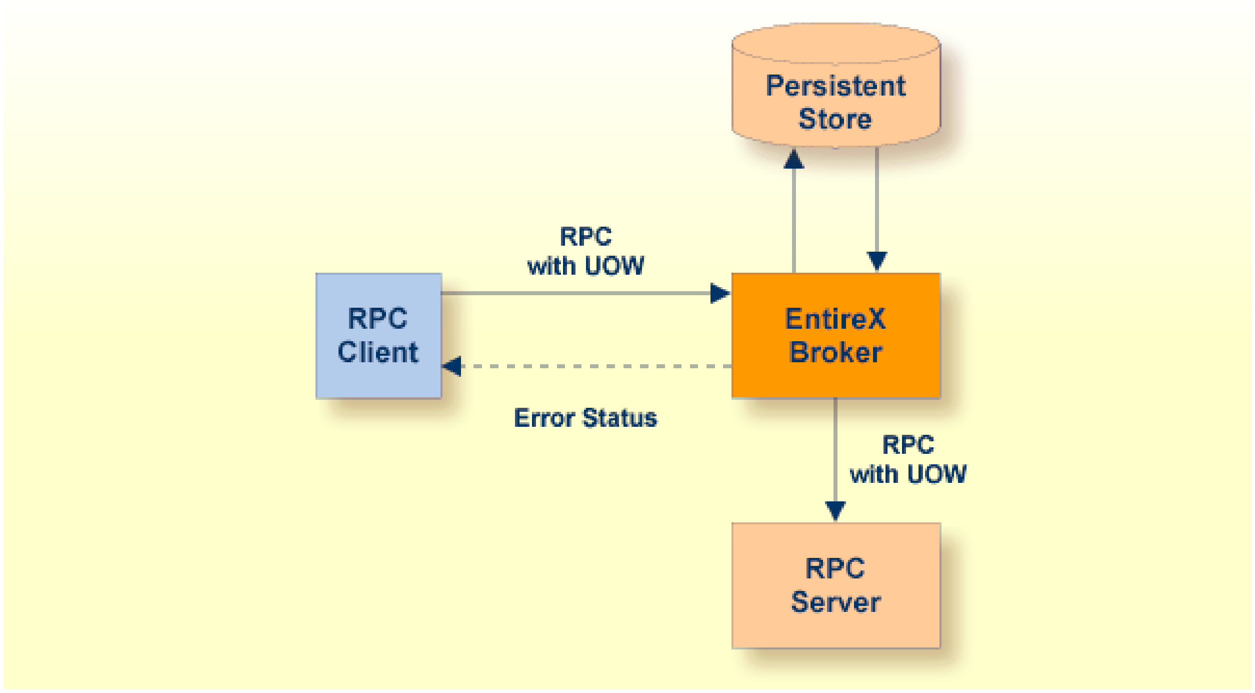
14 Reliable RPC for COBOL Wrapper

Introduction to Reliable RPC

In the architecture of modern e-business applications (such as SOA), loosely coupled systems are becoming more and more important. Reliable messaging is one important technology for this type of system.

Reliable RPC is the EntireX implementation of a reliable messaging system. It combines EntireX RPC technology and persistence, which is implemented with units of work (UOWs).

- Reliable RPC allows asynchronous calls ("fire and forget")
- Reliable RPC is supported by most EntireX wrappers
- Reliable RPC messages are stored in the Broker's persistent store until a server is available
- Reliable RPC clients are able to request the status of the messages they have sent



Reliable RPC is used to send messages to a persisted Broker service. The messages are described by an IDL program that contains only `IN` parameters. The client interface object and the server interface object are generated from this IDL file, using the EntireX COBOL Wrapper.

Reliable RPC is enabled at runtime. The client has to set one of two different modes before issuing a reliable RPC request:

- `AUTO_COMMIT`
- `CLIENT_COMMIT`

While AUTO_COMMIT commits each RPC message implicitly after sending it, a series of RPC messages sent in a unit of work (UOW) can be committed or rolled back explicitly using CLIENT_COMMIT mode.

The server is implemented and configured in the same way as for normal RPC.

Writing a Client

The following steps describe how to write a COBOL reliable RPC client program with the scenario ***Using the COBOL Wrapper for CICS with DFHCOMMAREA Calling Convention (z/OS and z/VSE)*** and Linkage access to RPC communication.

Reliable RPC requires an explicit broker logon. See ***Using Broker Logon and Logoff***.

Step 1: Declare the Data Structures for RPC Client Interface Objects

For every program definition in the Software AG IDL file, the templates will generate a copybook file that describes the customer data of the interface as a COBOL structure. For ease of use, the copybook can be embedded into the RPC client program.

However, if more appropriate, customer data structures can be used. In this case the COBOL data types and structures must match the interfaces of the generated client interface objects, otherwise unpredictable results will occur.

```
* Declare the customer data of the generated RPC interface
 01 SENDMAIL.
    02 SM-COMA.
       03 SM-TOADDRESS          PIC  X(60).
       03 SM-SUBJECT            PIC  X(20).
       03 SM-TEXT               PIC X(100).
```

Step 2: Declare and Initialize the RPC Communication Area

The RPC communication area must be declared and initialized in your RPC client program as follows:

```
* Declare RPC communication area
 02 ERX-COMMUNICATION-AREA.
    COPY ERXCOMM.
 . . . . . .

* Initialize RPC communication area
 INITIALIZE ERX-COMMUNICATION-AREA.
 MOVE "2000"           to COMM-VERSION.
```

Step 3: Required Settings in the RPC Communication Area

The following settings to the RPC communication area are required as a minimum to use the COBOL Wrapper. These settings have to be applied in your RPC client program. It is not possible to generate any defaults into your client interface objects:

```
* assign the broker to talk with
 MOVE "localhost:1971" to COMM-ETB-BROKER-ID.

* assign the server to talk with
 MOVE "RPC"            to COMM-ETB-SERVER-CLASS.
 MOVE "SRV1"           to COMM-ETB-SERVER-NAME.
 MOVE "CALLNAT"        to COMM-ETB-SERVICE-NAME.
* assign the user ID for Broker logon
 MOVE "ERXUSER"        to COMM-USERID.
 MOVE "PASSWORD"       to COMM-PASSWORD.
```

Step 4a: Perform a Broker Logon

```
MOVE "LO" TO COMM-FUNCTION.
EXEC CICS LINK
  PROGRAM  ("COBSRVI")
  COMMAREA (ERX-COMMUNICATION-AREA)
  LENGTH   (LENGTH OF ERX-COMMUNICATION-AREA)
  RESP     (CICS-RESP1)
  RESP2    (CICS-RESP2)
END-EXEC.
```

Step 4b: Examine the Error Code

Check whether the logon call was successful or not.

Step 5: Enable Reliable RPC with CLIENT_COMMIT

Before reliable RPC can be used, the reliable state must be set to either `ERX_RELIABLE_CLIENT_COMMIT` or `ERX_RELIABLE_AUTO_COMMIT`.

- "C" - `CLIENT_COMMIT`
- "A" - `AUTO_COMMIT`

```
* Set the reliable RPC mode
 MOVE "C" TO COMM-RELIABLE-STATE.
```

Step 6a: Send the RPC Message

The RPC message is sent using the `EXEC CICS LINK` interface.

```
* Send the RPC message
 MOVE DFHRESP(NORMAL) TO CICS-RESP1.
 MOVE DFHRESP(NORMAL) TO CICS-RESP2.
 MOVE ZEROES           TO COMM-RETURN-CODE.
 EXEC CICS LINK
   PROGRAM  ("SENDMAIL")
   RESP     (CICS-RESP1)
   RESP2    (CICS-RESP2)
   COMMAREA (SENDMAIL)
   LENGTH   (LENGTH OF SENDMAIL)
 END-EXEC.
```

Step 6b: Examine the Error Code

When the RPC message is returned, it needs to be checked whether it was successful or not:

```
 IF COMM-RETURN-CODE IS = ZERO
    Perform success-handling
 ELSE
    Perform error-handling
 END-IF.
```

The field COMM-RETURN-CODE in the RPC communication area contains the error provided by the COBOL Wrapper. For the error messages returned, see *Error Messages and Codes*.

Note: After successful call (Step 6a) the `UOWID` is available in the RPC communication area field `COMM-ETB-UOW-ID`. See ***The RPC Communication Area (Reference)***.

Step 7a: Check the Reliable RPC Message Status

To determine that reliable RPC messages are delivered, the reliable RPC message status can be queried. See *Understanding UOW Status* under *Using Persistence and Units of Work* in the general administration documentation and *Broker UOW Status Transition* under *Concepts of Persistent Messaging* in the general administration documentation for more information.

```
MOVE DFHRESP(NORMAL) TO CICS-RESP1.
MOVE DFHRESP(NORMAL) TO CICS-RESP2.
MOVE "RS" TO COMM-FUNCTION.
MOVE ZEROES TO COMM-RETURN-CODE.
EXEC CICS LINK
  PROGRAM  ("COBSRVI")
  RESP     (CICS-RESP1)
  RESP2    (CICS-RESP2)
  COMMAREA (ERX-COMMUNICATION-AREA)
  LENGTH   (LENGTH OF ERX-COMMUNICATION-AREA)
END-EXEC.
```

Note: After successful call the UOW status is available in the RPC communication area field `COMM-RELIABLE-STATUS`. See *The RPC Communication Area (Reference)*.

Step 7b: Examine the Error Code

Check whether the check status call was successful or not.

Step 8: Send a Second RPC Message

Send a second reliable RPC message. See **Step 6a** and **Step 6b**.

Step 9: Check the Reliable RPC Message Status

Check the reliable RPC message before the commit call. See **Step 7a** and **Step 7b**.

Step 10a: Commit both Reliable RPC Messages

Now both reliable RPC messages are committed. This will deliver all reliable RPC messages to the server if it is available.

```
MOVE DFHRESP(NORMAL) TO CICS-RESP1.
MOVE DFHRESP(NORMAL) TO CICS-RESP2.
MOVE "RC" TO COMM-FUNCTION.
MOVE ZEROES TO COMM-RETURN-CODE.
EXEC CICS LINK
  PROGRAM  ("COBSRVI")
  RESP     (CICS-RESP1)
  RESP2    (CICS-RESP2)
  COMMAREA (ERX-COMMUNICATION-AREA)
  LENGTH   (LENGTH OF ERX-COMMUNICATION-AREA)
END-EXEC.
```

Step 10b: Examine the Error Code

Check whether the commit call was successful or not.

Step 11: Send a Third RPC Message

Send a third reliable RPC message. See **Step 5a** and **Step 5b**.

Step 12: Check the Reliable RPC Message Status

Check the reliable RPC message before the rollback call. See **Step 6**.

Step 13a: Roll Back the Third RPC Message

Roll back the current reliable RPC message.

```
MOVE DFHRESP(NORMAL) TO CICS-RESP1.
MOVE DFHRESP(NORMAL) TO CICS-RESP2.
MOVE "RR" TO COMM-FUNCTION.
MOVE ZEROES TO COMM-RETURN-CODE.
EXEC CICS LINK
  PROGRAM  ("COBSRVI")
  RESP     (CICS-RESP1)
  RESP2    (CICS-RESP2)
  COMMAREA (ERX-COMMUNICATION-AREA)
  LENGTH   (LENGTH OF ERX-COMMUNICATION-AREA)
END-EXEC.
```

Step 13b: Examine the Error Code

When the rollback call is returned, check whether it was successful or not. If the rollback call failed, an explicit EOC needs to be sent:

```
MOVE DFHRESP(NORMAL) TO CICS-RESP1.
MOVE DFHRESP(NORMAL) TO CICS-RESP2.
MOVE "RS" TO COMM-FUNCTION.
MOVE ZEROES TO COMM-RETURN-CODE.
EXEC CICS LINK
  PROGRAM  ("COBSRVI")
  RESP     (CICS-RESP1)
  RESP2    (CICS-RESP2)
  COMMAREA (ERX-COMMUNICATION-AREA)
  LENGTH   (LENGTH OF ERX-COMMUNICATION-AREA)
END-EXEC.
```

Step 14a: Perform a Broker Logoff

```
MOVE "LF" TO COMM-FUNCTION.
EXEC CICS LINK
  PROGRAM  ("COBSRVI")
  COMMAREA (ERX-COMMUNICATION-AREA)
  LENGTH   (LENGTH OF ERX-COMMUNICATION-AREA)
  RESP     (CICS-RESP1)
  RESP2    (CICS-RESP2)
END-EXEC.
```

Step 14b: Examine the Error Code

Check whether the logoff call was successful or not.

Writing a Server

There are no server-side methods for reliable RPC. The server does not send back a message to the client. The server can run deferred, thus client and server do not necessarily run at the same time. If the server fails, it returns an error code greater than zero. This causes the transaction (unit of work inside the Broker) to be cancelled, and the error code is written to the user status field of the unit of work. For writing reliable RPC servers, see ***Using the COBOL Wrapper for the Server Side***.

To execute a reliable RPC service with an RPC server:

- the parameter `logon` must be set to "`YES`", see
  - *Configuring the RPC Server* under *Administering the Batch RPC Server*
  - *Configuring the RPC Server* under *Administering the EntireX RPC Server under z/OS IMS*
  - *Configuring the RPC Server* under *Administering the Micro Focus RPC Server*
  - *Configuring the BS2000/OSD Batch RPC Server* under *Administering the BS2000/OSD Batch RPC Server*
- the parameter `LOGN` must be set to "`YES`", see *Configuring the RPC Server*.

Broker Configuration

A Broker configuration with `PSTORE` is recommended. This enables the Broker to store the messages for more than one Broker session. These messages are still available after Broker restart. The attributes `STORE`, `PSTORE`, and `PSTORE-TYPE` in the Broker attribute file can be used to configure this feature. The lifetime of the messages and the status information can be configured with the attributes `UWTIME` and `UWSTAT-LIFETIME`. Other attributes such as `MAX-MESSAGES-IN-UOW`, `MAX-UOWS` and `MAX-UOW-MESSAGE-LENGTH` may be used in addition to configure the units of work. See *Broker Attributes* in the administration documentation.

The result of the generic RPC function call "RS" - get reliable status depends on the configuration of the unit of work status lifetime in the EntireX Broker configuration. See `COMM-FUNCTION`. If the status is not stored longer than the message, the function call returns the error code 00780305 (`no matching UOW found`).

15 Server Mapping Deployment

A server mapping file (SVM) enables the RPC server to correctly support special COBOL syntax such as `REDEFINE`s, `JUSTIFIED`, `SYNCHRONIZE` and `OCCURS DEPENDING ON` clauses, `LEVEL-88` fields, etc. If one of these elements is used, the EntireX Workbench automatically extracts an SVM file in addition to the IDL (interface definition language), or an SVM file is generated by the COBOL Wrapper for a server skeleton. The SVM file is used at runtime to marshal and unmarshal the RPC data stream.

To make an SVM file available at runtime for the RPC server used, it has to be deployed. See *Handling SVM Files* in the respective sections of the documentation. As another prerequisite, the RPC server or EntireX Adapter must support the interface type of the COBOL server. This chapter covers the following topics:

Compatibility between Interface Type and RPC Server

To call a server successfully, the RPC server used must support the interface type of the COBOL server. In this context, there are two scenarios, where you need to select an appropriate interface type:

- Scenario I: Calling an existing COBOL server (BS2000/OSD | Micro Focus):

  within extraction stettings, see *Step 4: Define the Extraction Settings and Start Extraction* in the IDL Extractor for COBOL documentation.
- Scenario II: Writing a new COBOL server (BS2000/OSD | Micro Focus):

  within the COBOL Wrapper IDL properties, see ***Server Interface Types***.

The table below gives an overview of possible combinations of an interface type and a supporting RPC server:

	Supported by										
			RPC Server								
			z/OS			**UNIX/Windows**			**BS2000/ OSD**	**z/VSE**	
Interface Type	**Wrapper**	**Extractor**	**CICS**	**Batch**	**IMS**	**ECI**	**Micro Focus**	**IMS Connect**	**Batch**	**CICS**	**Batch**
CICS with DFHCOMMAREA calling convention	yes	yes	x			x				x	
CICS with DFHCOMMAREA large buffer interface	yes	yes	x							x	
CICS with Channel Container calling convention	yes	yes	x								
Batch with standard linkage calling convention	yes	yes		x	x				x		x
Micro Focus with standard linkage calling convention	yes	yes					x				
IMS BMP with standard linkage calling convention	yes	yes			x						
IMS MPP message interface (IMS Connect)	no	yes						x			

Deploying a Server Mapping File

To deploy a server mapping, you can either use a wizard or copy the file manually to a target container. The approach depends on the RPC server used. For instance, not all RPC servers support both deployment by using a wizard and manual deployment. The table below gives an overview of supported approaches for available RPC servers and the webMethods EntireX Adapter for Integration Server, and provides further instructions for various forms of manual deployment:

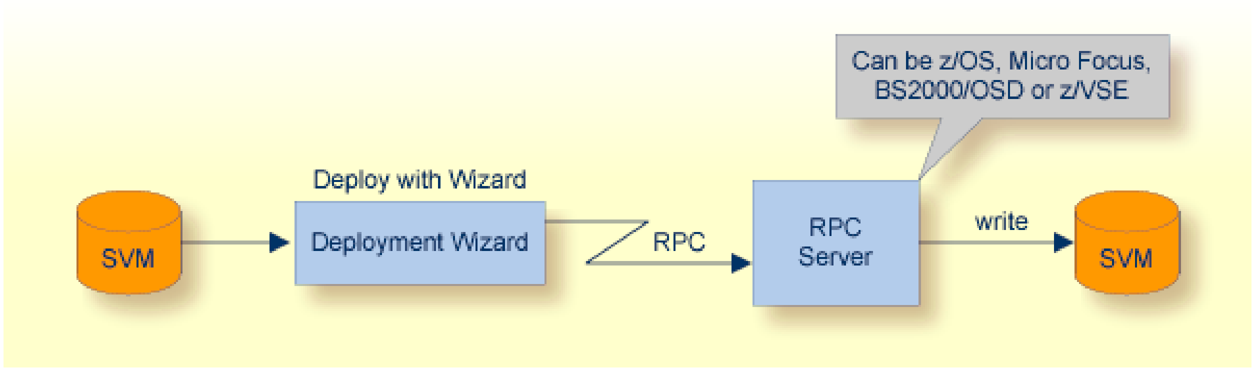
RPC Server	Wizard	Manual Deployment
CICS ECI RPC server (Windows and UNIX)	No	Copy the SVM file to the folder specified by `cics.mapping.folder`. See *Configuring the CICS ECI Side*.
CICS RPC server (z/OS)	**Yes**	Use FTP and IDCAMS. See ***Server Mapping Deployment to z/OS, using FTP and IDCAMS***.
Batch RPC server (z/OS)	**Yes**	Use FTP and IDCAMS. See ***Server Mapping Deployment to z/OS, using FTP and IDCAMS***.
Batch RPC server (BS2000/OSD)	**Yes**	No
Micro Focus RPC server (Windows and UNIX)	**Yes**	No
IMS Connect RPC server (Windows and UNIX)	No	Copy the SVM file to the folder specified by `property ims.mapping.folder`. See *Configuring the IMS Connect Side* in the IMS Connect RPC Server documentation.
IMS RPC server (z/OS)	**Yes**	Use FTP and IDCAMS. See ***Server Mapping Deployment to z/OS, using FTP and IDCAMS***.
webMethods EntireX Adapter for Integration Server	No	No. Do not change the location of the generated SVM file. It has to be kept in the same folder as the IDL file and will be picked up automatically together with the IDL file when an adapter connection for IMS Connect or CICS ECI is generated. For more information, see the EntireX Adapter documentation under *webMethods > Mainframe Integration* on the **Software AG Product Documentation** website.

The remainder of this section focuses on the major approaches:

- Server Mapping Deployment Wizard
- Server Mapping Deployment Wizard Preferences
- Server Mapping Deployment in Command-line Mode

- Server Mapping Deployment to z/OS, using FTP and IDCAMS

Server Mapping Deployment Wizard



Deploying with the wizard requires an active RPC server. Also, the Deployment Service of the RPC server must be properly configured. See the platform-specific documentation for more information:

- z/OS, see *Deployment Service* in the respective RPC server documentation.
- UNIX or Windows for Micro Focus COBOL, see *Deployment Service* in the Micro Focus RPC Server .
- BS2000/OSD, see *Deployment Service* in the BS2000/OSD Batch RPC Server documentation.
- z/VSE, see the separate 7.2.3 documentation.

Caution: The codepage (locale string) of the RPC server used during deployment must be the same as the one used with running RPC clients issuing RPC requests.

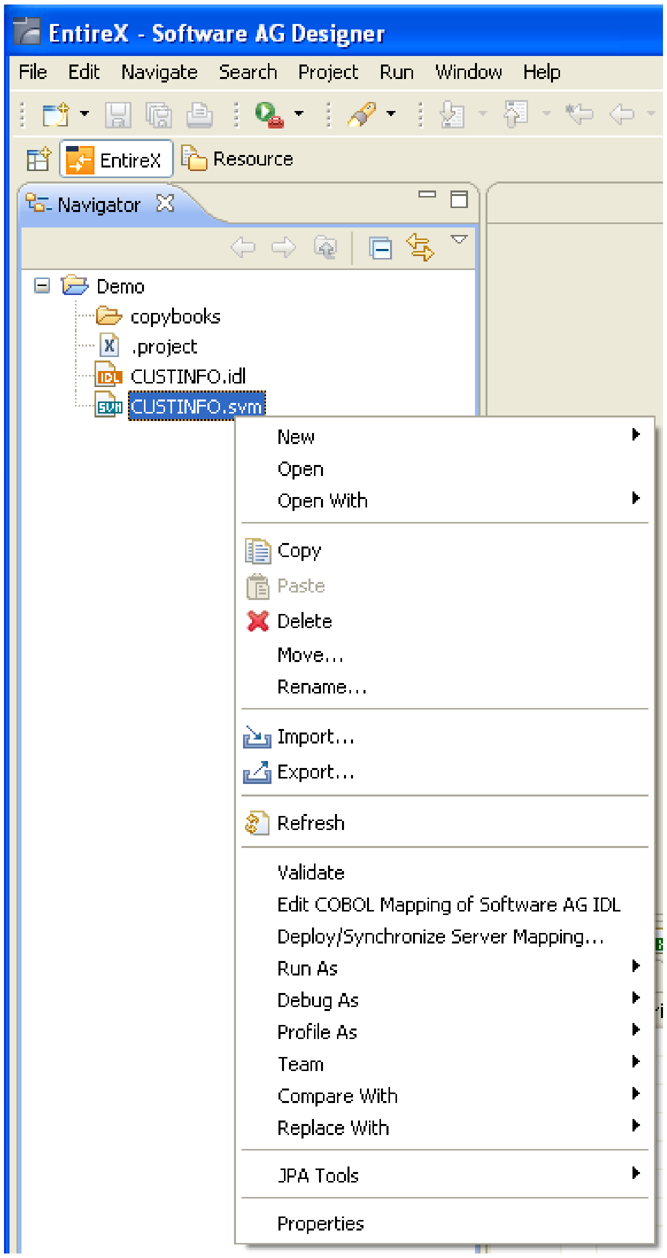
To deploy a server mapping with the wizard, follow the steps below:

- Step 1: Start the Wizard
- Step 2a: Create a New Deployment Environment
- Step 2b: Define the Connection to the Deployment Service and Deploy

- Step 3: Select an Existing Deployment Environment and Deploy

Step 1: Start the Wizard

To start the server mapping deployment wizard, select an SVM file and choose **Deploy/Synchronize Server Mapping...** from the context menu.

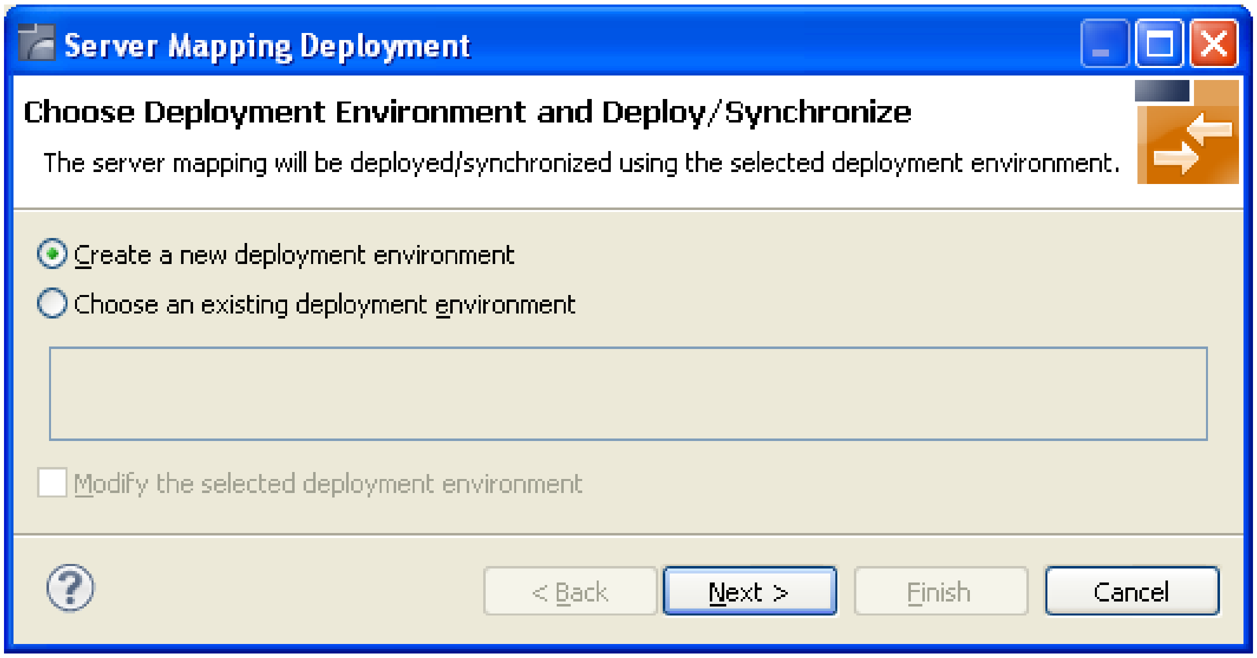


To continue, press **Next** together with one of the following choices:

- If you enter the server mapping deployment wizard the first time with no predefined deployment environment preferences (see *IDL Extractor for COBOL Preferences* in the IDL Extractor for COBOL documentation), continue with ***Step 2a: Create a New Deployment Environment*** below.
- If deployment environments are already defined, you may also continue with ***Step 3: Select an Existing Deployment Environment and Deploy*** below.

Step 2a: Create a New Deployment Environment

If no deployment environments are defined, you only have the option to create a new deployment environment.


Server Mapping Deployment
Choose Deployment Environment and Deploy/Synchronize
< Back
Next >
Finish
Cancel

The server mapping will be deployed/synchronized using the selected deployment environment.

[✓ Create a new deployment environment]
Choose an existing deployment environment

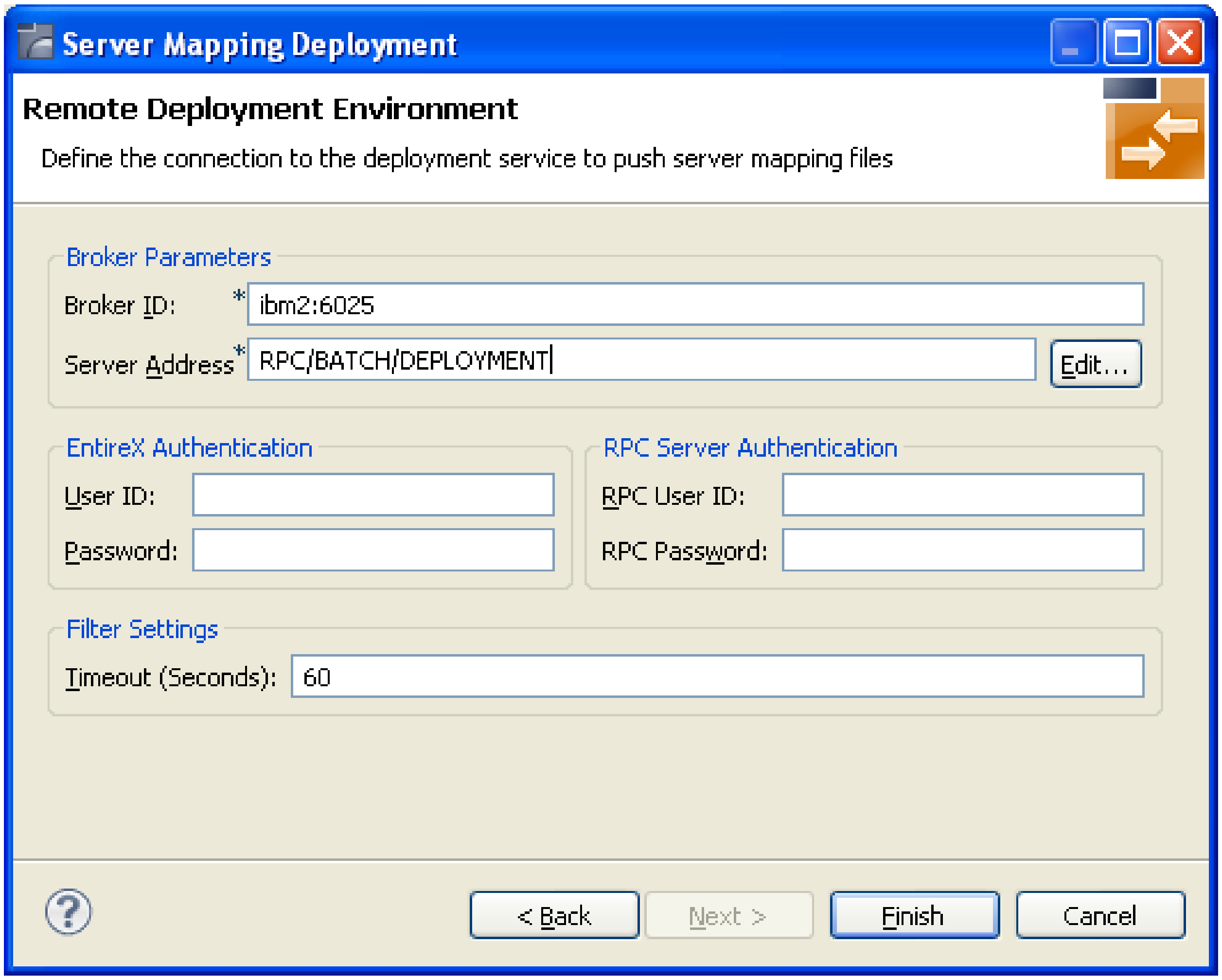
☐ Modify the selected deployment environment

To proceed:

1. Select **Create a new deployment environment**.
2. Press **Next** and continue with ***Step 2b: Define the Connection to the Deployment Service and Deploy***.

Step 2b: Define the Connection to the Deployment Service and Deploy

Use this page to define a connection to the deployment service of the RPC server.



Server Mapping Deployment

Remote Deployment Environment

Define the connection to the deployment service to push server mapping files

Broker Parameters

Broker ID: *	ibm2:6025
Server Address *	RPC/BATCH/DEPLOYMENT

EntireX Authentication

User ID:	
Password:	

RPC Server Authentication

RPC User ID:	
RPC Password:	

Filter Settings

Timeout (Seconds):	60

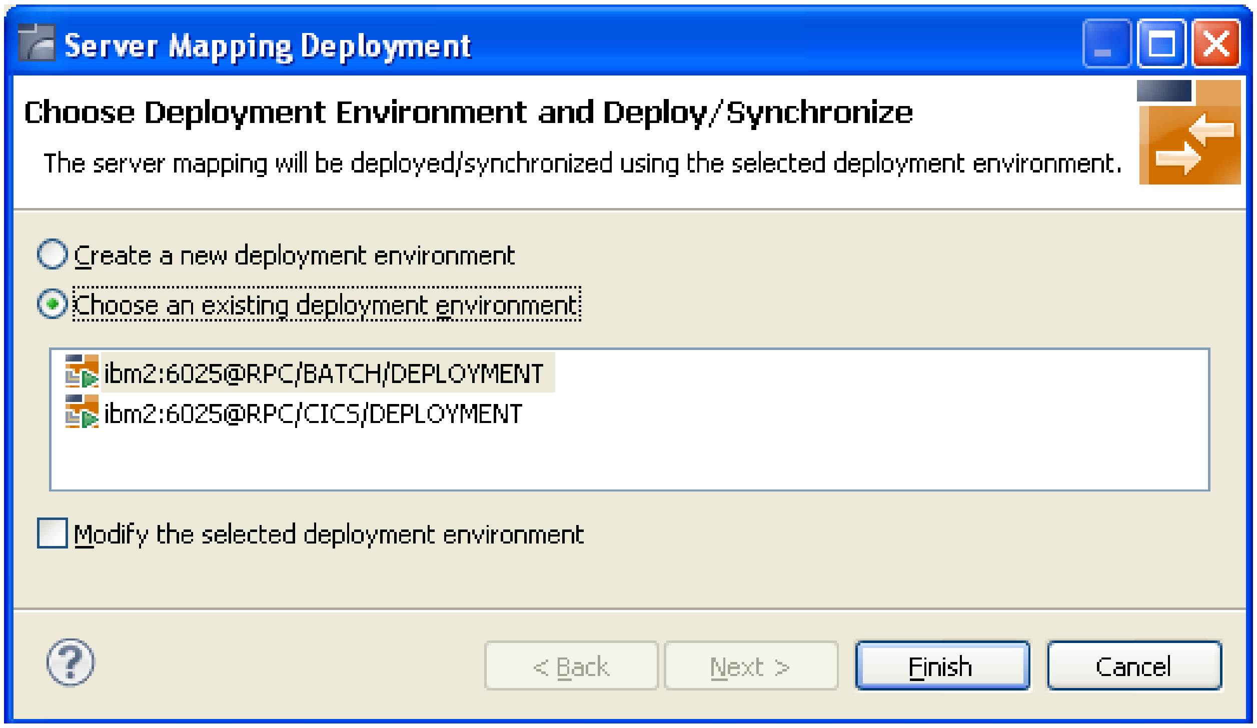
Enter the required fields:

1. **Broker Parameters** Broker ID and Server Address, which will have the default format. The last part (broker service) of the server address must always be "DEPLOYMENT".
2. The **EntireX Authentication** parameters describe the settings for the broker. These parameters apply if the *broker* is running with EntireX Security. See *Which EntireX Security Solution*.
3. The **RPC Server Authentication** parameters describe the settings for the RPC server. These parameters apply if the *RPC server* is running with security, for example a Natural RPC Server running with Natural Security.
4. The given Timeout value must be in the range from 1 to 9999 seconds (default: 60).

Press **Finish** to deploy. Deployment of the server mapping is successful if the wizard ends. No confirmation message is given.

Step 3: Select an Existing Deployment Environment and Deploy

Use this page to select the deployment environment (i.e. the RPC server) to which you want to deploy.


Server Mapping Deployment

Choose Deployment Environment and Deploy/Synchronize

The server mapping will be deployed/synchronized using the selected deployment environment.

Create a new deployment environment [✓ Choose an existing deployment environment]

ibm2:6025@RPC/BATCH/DEPLOYMENT

ibm2:6025@RPC/CICS/DEPLOYMENT

☐ Modify the selected deployment environment

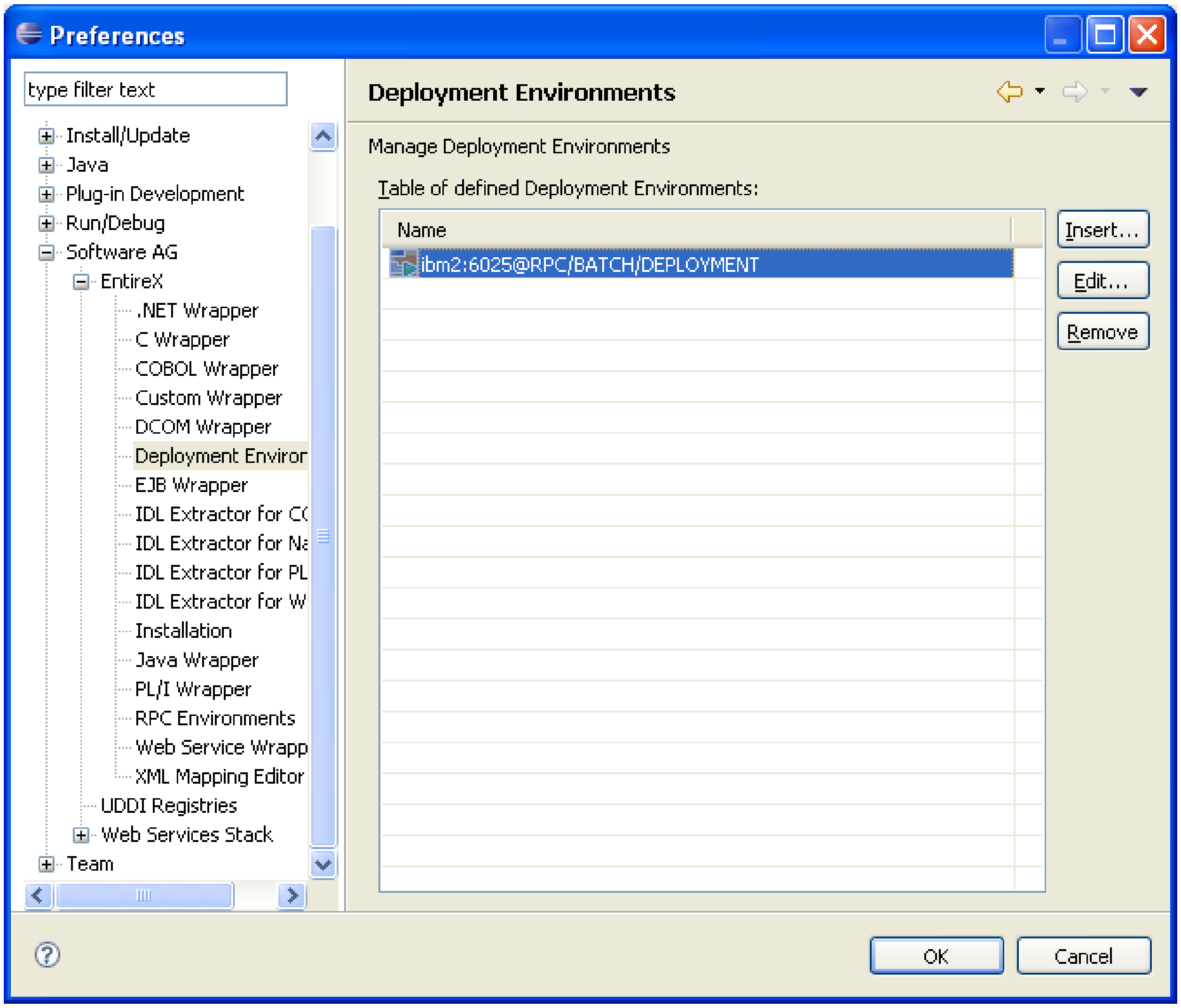
Check the option **Choose an existing deployment environment** and select a deployment environment from the list. Press **Finish** to deploy. Deployment is successful if the wizard ends. No confirmation message is given.

Server Mapping Deployment Wizard Preferences

In the preferences for the server mapping deployment wizard you define deployment environments, a connection to the Deployment Service of the RPC server. See *Deployment Service* in the respective RPC server documentation. The following sections are offered:

- Create a new Deployment Environment
- Edit an Existing Deployment Environment
- Remove an Existing Deployment Environment

The deployment environment is managed from the deployment environment **Preferences** page. The deployment environments can be created, edited and removed. The deployment environment will be used for the selection lists in the *Server Mapping Deployment Wizard*. To manage these deployment environments, open the **Preferences** page:



Deployment Environments

Manage Deployment Environments

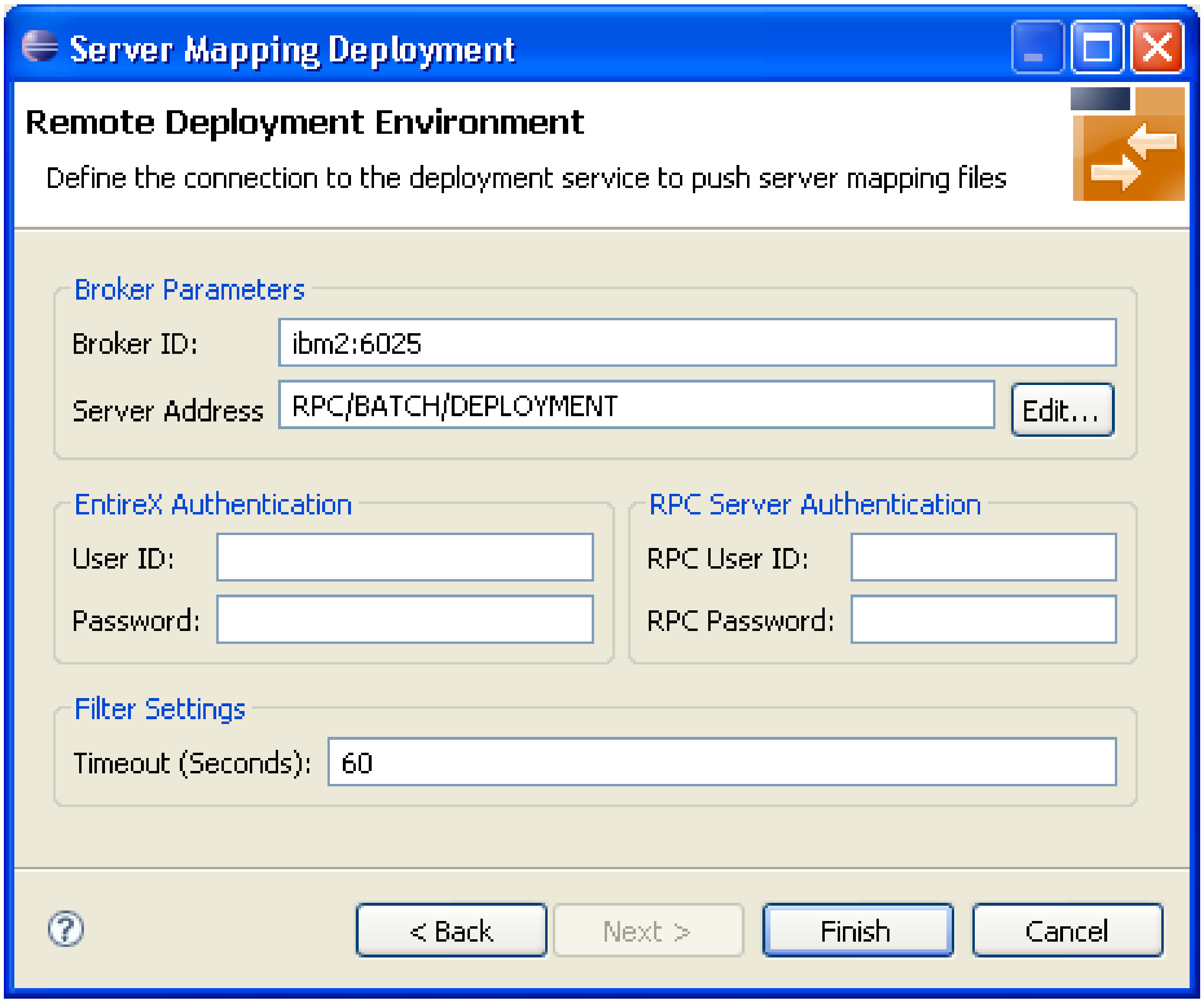
Table of defined Deployment Environments:

Name
ibm2:6025@RPC/BATCH/DEPLOYMENT

Create a new Deployment Environment

To create a new deployment environment

- Press **Insert**.



Remote Deployment Environment

Define the connection to the deployment service to push server mapping files

Broker Parameters

Broker ID: ibm2:6025

Server Address RPC/BATCH/DEPLOYMENT

EntireX Authentication

User ID:

Password:

RPC Server Authentication

RPC User ID:

RPC Password:

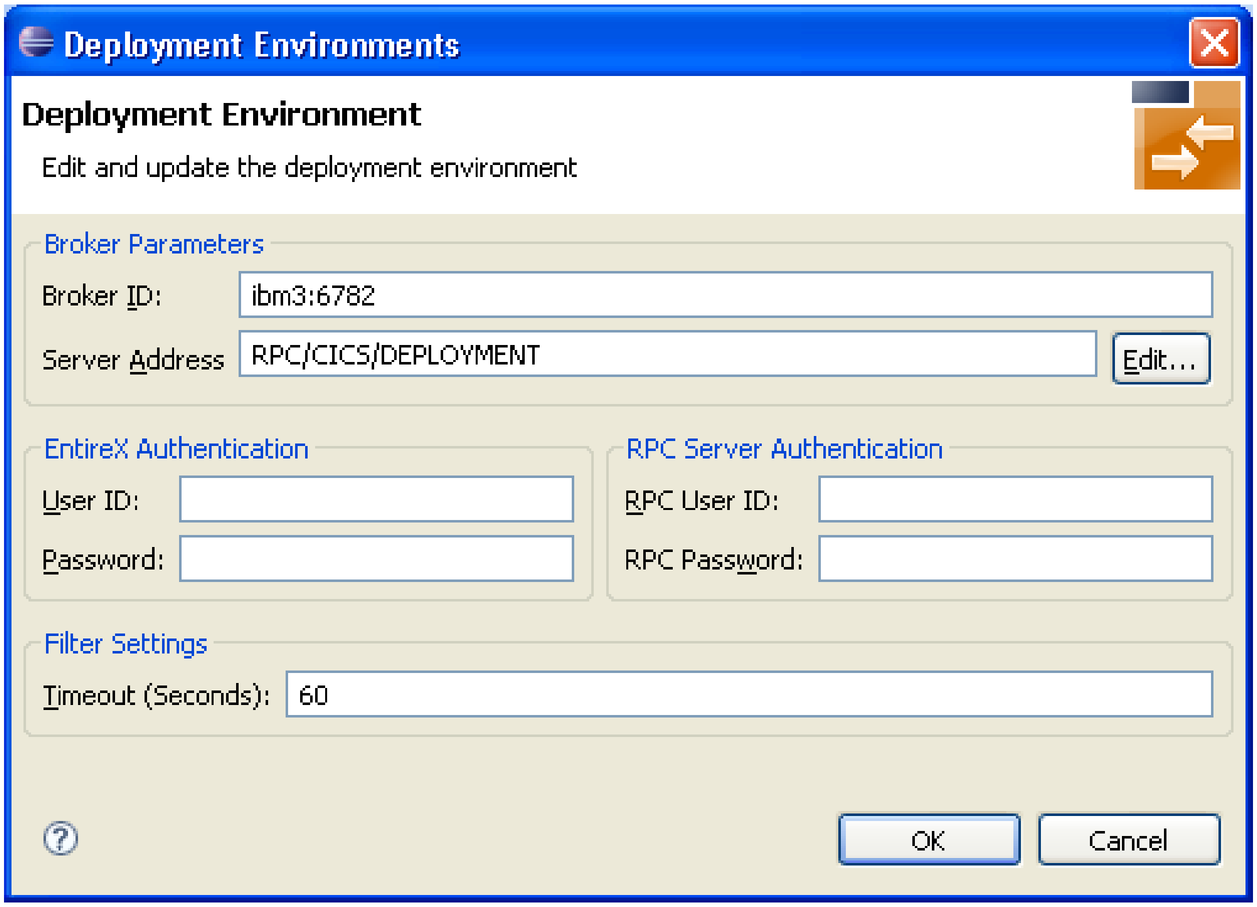
Filter Settings

Timeout (Seconds): 60

Edit an Existing Deployment Environment

To edit an existing deployment environment

- Select the table row and press **Edit**. If multiple entries are selected, the first entry is used.



Deployment Environments

Deployment Environment

Edit and update the deployment environment

Broker Parameters

Broker ID:	ibm3:6782
Server Address	RPC/CICS/DEPLOYMENT

EntireX Authentication

User ID:	
Password:	

RPC Server Authentication

RPC User ID:	
RPC Password:	

Filter Settings

Timeout (Seconds):	60

For more information on the input fields on this page, see *Step 2b: Define the Connection to the Deployment Service and Deploy* under *Server Mapping Deployment Wizard*.

Remove an Existing Deployment Environment

To remove an existing deployment environment

- Select the table row and press **Remove**. Multiple selections are possible.

Server Mapping Deployment in Command-line Mode

The command `-deploy:cobol` is provided to deploy server mapping files (SVMs) using the EntireX Workbench in command-line mode. See *Using the EntireX Workbench in Command-line Mode* for general information.

To undeploy previously deployed server mapping entries on the server side, remove the SVM file and execute the command `-deploy:cobol` with the IDL file only.

Command-line Options

Task	Command	Option	Description
Deploy SVM files.	`-deploy:cobol`	`-environment`	Target environment. Name of the COBOL deployment environment or an RPC server description.
		`-brokeruser`	User used for broker authentication (optional).
		`-brokerpassword`	Password used for broker authentication (optional).
		`-rpcuser`	User used for RPC server authentication (optional).
		`-rpcpassword`	Password used for RPC server authentication (optional).

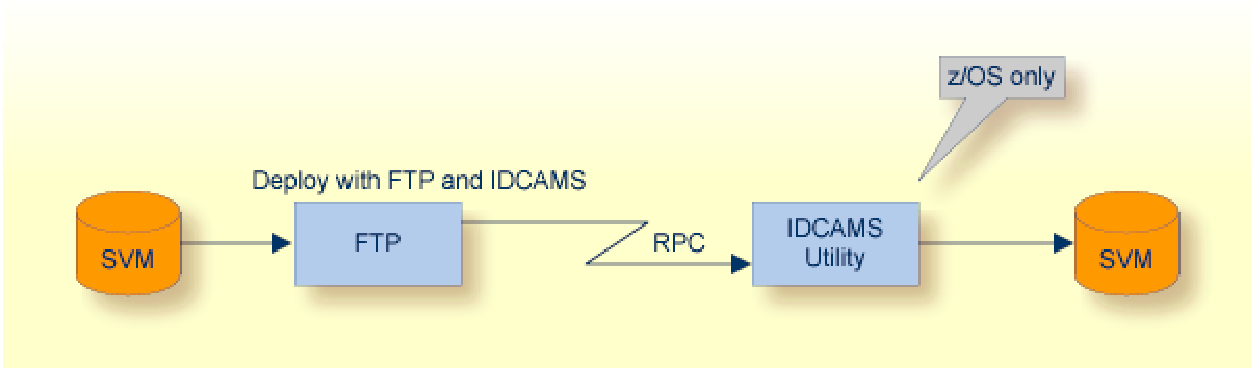
Note: Run the command from the directory containing the IDL file and the corresponding SVM file. If no SVM file is found, the previously deployed server mapping entries related to the IDL file will be removed on the server side (undeployed).

Example

```
-deploy:cobol /SVMDeployTests/idls/basicodo.idl  /SVMDeployTests/idls/basicdt.idl ↩
/SVMDeployTests/idls/basicarr.idl
 -environment ibm2:3980@RPC/RPCALL/DEPLOYMENT
 -brokeruser EXXUSR1
 -brokerpassword EXX$PWD1
```

Server Mapping Deployment to z/OS, using FTP and IDCAMS

This approach is available for z/OS only.



To deploy a server mapping using FTP and IDCAMS

1 Allocate a target sequential file on mainframe with the following specifications for `DCB`:

```
DCB=(DSORG=PS,RECFM=V,LRECL=16384,BLKSIZE=16388)
```

2 Allow write access and usage of IDCAMS tools to the VSAM file mentioned above.

3 Transfer the SVM file to the target host, using FTP. You have to switch to text mode and the codepage of the FTP service must be the same as the codepage (locale string) of the RPC server used.

4 Install the server mapping into the VSAM SVM cluster with the IDCAMS job below.

Note: If you omit the keyword REPLACE or define NOREPLACE in the SYSIN data stream instead, existing server mappings are not overwritten. This protects SVM records from being overwritten by duplicates.

```
//EXPSVMR  JOB (,,,999),ENTIREX,NOTIFY=&SYSUID,MSGLEVEL=(1,1),
//             CLASS=K,MSGCLASS=X,REGION=0M,COND=(0,LT)
//*-----------------------------------------------------*
//* FILL THE SVM VSAM CLUSTER                            *
//*-----------------------------------------------------*
//IMPORT   EXEC PGM=IDCAMS
//RECORDS  DD DISP=SHR,DSN=EXP.SVM.TARGET.SEQ.RECORDS
//SVM      DD DISP=SHR,DSN=EXP.SVM.KSDS
//SYSPRINT DD SYSOUT=*
//SYSIN    DD *
  REPRO -
    REPLACE -
    INFILE(RECORDS) -
    OUTFILE(SVM)
```

16 Using the COBOL Wrapper with EntireX Security

This chapter explains how clients built with the COBOL Wrapper use EntireX Security.

To use EntireX Security you need the following components:

- *Generic RPC Services Modules*
- *The RPC Communication Area (Reference)*

To use EntireX Security

1. Set the `COMM-ETB-PASSWORD` and set `COMM-KERNEL-SECURITY` to "Y". See *The RPC Communication Area (Reference)*.
2. Log on to the broker with the function Logon `LO` provided by the generic RPC services module as described under *Using Broker Logon and Logoff*.

   - In the scenarios *Micro Focus (UNIX and Windows)*, *Batch*, *CICS with Call Interfaces* and *IMS* in the COBOL Wrapper documentation with the *Call Interface*:

     ```
      ...
     * Broker Logon
      MOVE "2000" TO COMM-VERSION.
      MOVE "LO"   TO COMM-FUNCTION.

     * Set Broker userid in RPC Communication Area
      MOVE "COB-USER"  TO COMM-ETB-USERID.

     * Set Broker password/kernelsecurity to use EntireX Security
      MOVE "COB-PASS"  TO COMM-ETB-PASSWORD.
      MOVE "Y"         TO COMM-KERNEL-SECURITY.

     * Call the broker
      CALL "COBSRVI" USING ERX-COMMUNICATION-AREA
      ON EXCEPTION
     ```

```
 ...
 NOT ON EXCEPTION
 ...
 END-CALL.
* begin of application logic
 ...
```

- In the scenario ***Using the COBOL Wrapper for CICS with DFHCOMMAREA Calling Convention (z/OS and z/VSE)*** with the `EXEC CICS LINK` interface:

```
 ...
* Broker Logon
 MOVE "2000" TO COMM-VERSION.
 MOVE "LO"   TO COMM-FUNCTION.

* Set Broker userid in RPC Communication Area
 MOVE "COB-USER"  TO COMM-ETB-USERID.

* Set Broker password/kernelsecurity to use EntireX Security
 MOVE "COB-PASS"  TO COMM-ETB-PASSWORD.
 MOVE "Y"         TO COMM-KERNEL-SECURITY.

* Call the broker
 EXEC CICS LINK PROGRAM  ("COBSRVI")
                RESP     (CICS-RESP1)
                RESP2    (CICS-RESP2)
                COMMAREA (ERX-COMMUNICATION-AREA)
                LENGTH   (LENGTH OF ERX-COMMUNICATION-AREA)
 END-EXEC.
 IF WORKRESP = DFHRESP(NORMAL)
    IF (COMM-RETURN-CODE = 0) THEN
*       Perform success-handling
    ELSE
*       Perform error-handling
    END-IF
 ELSE
*    Perform error-handling
 END-IF.

* begin of application logic
 ...
```

3 Issue your RPC requests as without using an explicit logon and logoff.

4 For logoff, see ***Using Broker Logon and Logoff***.

17 Client and Server Examples for Micro Focus (UNIX and Windows)

This chapter describes the examples provided for the COBOL Wrapper for Micro Focus. All examples here can be found in the EntireX directory *examples/RPC* under UNIX and Windows.

Basic RPC Client Examples - CALC, SQUARE

For Micro Focus environments, the CALC and SQUARE clients are built with COBOL Wrapper "Micro Focus with standard linkage calling convention" interface type. See ***Client Interface Types*** for more information.

Name	Type	Description	Notes
CALCCLT.cbl	COBOL source code	A client application calling the remote procedure (RPC service) CALC, with associated *example.idl*.	1
SQRECLT.cbl	COBOL source code	A client application calling the remote procedure (RPC service) SQUARE, with associated *example.idl*.	1

Notes:

1. Application built according to the client-side build instructions under ***Using the COBOL Wrapper for Micro Focus (UNIX and Windows)***.

For more information, see the readme file in EntireX directory *examples/RPC/basic/example/CobolClient/MicroFocus* under UNIX or Windows.

Basic RPC Server Examples - CALC, SQUARE

For Micro Focus environments, the CALC and SQUARE servers are built with COBOL Wrapper "Micro Focus with standard linkage calling convention" interface type. See ***Server Interface Types*** for more information.

Name	Type	Description	Notes
CALC.cbl	COBOL source code	A server application providing the remote procedure CALC (RPC service), with associated *example.idl*.	1
SQUARE.cbl	COBOL source code	A server application providing the remote procedure SQUARE (RPC service), with associated *example.idl*.	1

Notes:

1. Application built according to the server-side build instructions under ***Using the COBOL Wrapper for Micro Focus (UNIX and Windows)***.

For more information, see the readme file in EntireX directory *examples/RPC/basic/example/CobolServer/MicroFocus* under UNIX or Windows.

Reliable RPC Client Example - SENDMAIL

For Micro Focus environments, the SENDMAIL client is built with COBOL Wrapper "Micro Focus with standard linkage calling convention" interface type. See *Client Interface Types* for more information.

Name	type	Description	Notes
SENDCLT.cbl	COBOL source code	A client application calling the reliable remote procedure (RPC service), SENDMAIL, with associated *mail.idl*.	1

Notes:

1. Application built according to the client-side build instructions under *Using the COBOL Wrapper for Micro Focus (UNIX and Windows)* See also *Reliable RPC for COBOL Wrapper*.

For more information see the readme file in EntireX directory *examples/RPC/reliable/CobolClient/MicroFocus* under UNIX or Windows.

Reliable RPC Server Example - SENDMAIL

For Micro Focus environments, the SENDMAIL server is built with COBOL Wrapper "Micro Focus with standard linkage calling convention" interface type. See *Server Interface Types* for more information.

Name	Type	Description	Notes
SENDCLT.cbl	COBOL source code	a server application providing the reliable remote procedure (RPC service) SENDMAIL, with associated *mail.idl*.	1

Notes:

1. Application built according to the client-side build instructions under *Using the COBOL Wrapper for the Client Side*. See also *Reliable RPC for COBOL Wrapper*.

For more information see the readme file in EntireX directory *examples/RPC/reliable/CobolServer/MicroFocus* under UNIX or Windows.

18 Client and Server Examples for z/OS Batch

This chapter describes the examples provided for the COBOL Wrapper for z/OS Batch. All examples here can be found in the EntireX directory *examples/RPC* under UNIX and Windows. They are also available for z/OS, if this is installed. See *Extract the EntireX RPC Examples from their Container Data Set* in the z/OS installation documentation.

Basic RPC Client Examples - CALC, SQUARE

This section covers the following examples:

- CALC Client
- SQUARE Client

CALC Client

For z/OS Batch, the CALC client is built with COBOL Wrapper "Batch with standard linkage calling convention" interface type. See ***Client Interface Types*** for more information.

Name	Type	Data Set	Description	Notes
CALC	COBOL source code	EXP951.CCCO	Client interface object for IDL program CALC.	1
CALCCLT	COBOL source code	EXP951.CCCO	A client application calling the remote procedure (RPC service) CALC, with associated *example.idl*.	2
CALCIGY	JCL	EXP951.CCCO	Job (JCL) to build the RPC client CALCCLT.	3
CALCRUN	JCL	EXP951.CCCO	Job (JCL) to execute the RPC client CALCCLT.	3
CALC	COBOL copybook	EXP951.CICO	Client interface object copybook for IDL program CALC.	1

Notes:

1. Under z/OS, client interface objects are delivered with the installation; under UNIX and Windows, generate these objects with the EntireX Workbench.
2. Application built according to the client-side build instructions, see ***Using the COBOL Wrapper for Batch (z/VSE, IBM i, BS2000/OSD and z/OS)***.
3. Adapt the JCL to your needs.

For more information refer to the readme file in EntireX directory *examples/RPC/basic/example/CobolClient/zosBatch* under UNIX or Windows.

SQUARE Client

For batch under operating system z/OS, the SQUARE client is built with COBOL Wrapper "Batch with standard linkage calling convention" interface type. See ***Client Interface Types*** for more information.

Name	Type	Data Set	Description	Notes
SQRECLT	COBOL source code	EXP951.CCCO	A client application calling the remote procedure (RPC service) SQUARE, with associated *example.idl*.	1
SQREIGY	JCL	EXP951.CCCO	Job (JCL) to build the RPC client SQRECLT.	2
SQRERUN	JCL	EXP951.CCCO	Job (JCL) to execute the RPC client SQRECLT.	2
SQUARE	COBOL source code	EXP951.CCCO	Client interface object for IDL program SQUARE.	3
SQUARE	COBOL copybook	EXP951.CICO	Client interface object copybook for IDL program SQUARE.	3

Notes:

1. Application built according to the client-side build instructions, see ***Using the COBOL Wrapper for Batch (z/VSE, IBM i, BS2000/OSD and z/OS)***.
2. Adapt the JCL to your needs.
3. Under z/OS, client interface objects are delivered with the installation; under UNIX and Windows, generate these objects with the EntireX Workbench.

For more information, see the readme file in EntireX directory *examples/RPC/basic/example/CobolClient/zosBatch* under UNIX or Windows.

Basic RPC Server Examples - CALC, SQUARE

This section covers the following examples:

- CALC Server

- SQUARE Server

CALC Server

For batch under operating system z/OS, the CALC server is built with COBOL Wrapper "Batch with standard linkage calling convention" interface type. See *Server Interface Types* for more information.

Name	Type	Data Set	Description	Notes
CALC	COBOL source code	EXP951.CVCO	A server application providing the remote procedure CALC (RPC service), with associated *example.idl*.	1
CALCIGY	JCL	EXP951.CVCO	Job (JCL) to build the remote procedure CALC (RPC service).	2

Notes:

1. Application built according to the server-side build instructions, see ***Using the COBOL Wrapper for Batch (z/OS, IBM i, BS2000/OSD and z/VSE)***.
2. Adapt the JCL to your needs.

For more information, refer to the readme file in EntireX directory *examples/RPC/basic/example/CobolServer/zosBatch* under UNIX or Windows.

SQUARE Server

For batch on operating system z/OS, the SQUARE server is built with COBOL Wrapper "Batch with standard linkage calling convention" interface type. See *Client Interface Types* for more information.

Name	Type	Data Set	Description	Notes
SQREIGY	JCL	EXP951.CVCO	Job (JCL) to build the remote procedure SQUARE (RPC service)	2
SQUARE	COBOL source code	EXP951.CVCO	a server application providing the remote procedure SQUARE (RPC service), with associated *example.idl*	1

Notes:

1. Application built according to the server-side build instructions, see ***Using the COBOL Wrapper for Batch (z/VSE, IBM i, BS2000/OSD and z/OS)***.
2. Adapt the JCL to your needs.

For more information, refer to the readme file in EntireX directory *examples/RPC/basic/example/CobolServer/zosBatch* under UNIX or Windows.

Reliable RPC Client Example - SENDMAIL

For batch on operating system z/OS, the SENDMAIL client is built with COBOL Wrapper "Batch with standard linkage calling convention" interface type. See *Client Interface Types* for more information.

Name	Type	Data Set	Description	Notes
SENDCLT	COBOL source code	EXP951.CCCO	A client application calling the reliable remote procedure (RPC service), SENDMAIL, with associated *mail.idl*.	1
SENDIGY	JCL	EXP951.CCCO	Job (JCL) to build the RPC client SENDCLT.	2
SENDMAIL	COBOL source code	EXP951.CCCO	Client interface object for IDL program SENDMAIL.	3
SENDRUN	JCL	EXP951.CCCO	Job (JCL) to execute the RPC client SENDCLT.	2
SENDMAIL	COBOL copybook	EXP951.CICO	Client interface object copybook for IDL program SENDMAIL.	3

Notes:

1. Application built according to the client-side build instructions, see ***Using the COBOL Wrapper for Batch (z/VSE, IBM i, BS2000/OSD and z/OS)***. See also ***Reliable RPC for COBOL Wrapper***.
2. Adapt the JCL to your needs.
3. Under z/OS, client interface objects are delivered with the installation; under UNIX and Windows, generate these objects with the EntireX Workbench.

For more information, refer to the readme file in EntireX directory *examples/RPC/reliable/CobolClient/zosBatch* under UNIX or Windows.

Reliable RPC Server Example - SENDMAIL

For batch on operating system z/OS, the SENDMAIL server is built with COBOL Wrapper "Batch with standard linkage calling convention" interface type. See *Client Interface Types* for more information.

Name	Type	Data Set	Description	Notes
SENDIGY	JCL	EXP951.CVCO	Job (JCL) to build the remote procedure SENDMAIL(RPC service).	1
SENDMAIL	COBOL source code	EXP951.CVCO	A server application providing the reliable remote procedure (RPC service) SENDMAIL, with associated *mail.idl*.	2

Notes:

1. Adapt the JCL to your needs.
2. Application built according to the server-side build instructions, see ***Using the COBOL Wrapper for Batch (z/OS, IBM i, BS2000/OSD and z/VSE)***. See also ***Reliable RPC for COBOL Wrapper***.

For more information, refer to the readme file in EntireX directory *examples/RPC/reliable/CobolServer/zosBatch* under UNIX or Windows.

19 Client and Server Examples for z/OS CICS

This chapter describes the examples provided for the COBOL Wrapper for z/OS CICS. All examples here can be found in the EntireX directory *examples/RPC* under UNIX and Windows. They are also available for z/OS, if this is installed. See *Extract the EntireX RPC Examples from their Container Data Set* in the z/OS installation documentation.

Basic RPC Client Examples - CALC, SQUARE

This section covers the following examples:

- CALC Client using DFHCOMMAREA
- CALC Client using Call Interface
- SQUARE Client using DFHCOMMAREA
- SQUARE Client using Call Interface

CALC Client using DFHCOMMAREA

For CICS under operating system z/OS, the following CALC client is implemented with interface type "CICS with DFHCOMMAREA calling convention". See ***Client Interface Types*** for more information.

Name	Type	Data Set	Description	Notes
CALC1DFH	CICS CSD	EXP951.DCCO	CSD Definition for RPC client CALC1CLT.	
CALC1IGY	JCL	EXP951.DCCO	Job (JCL) to build the RPC client CALC1CLT.	2
CALC1MAP	CICS Map	EXP951.DCCO	CICS Map definition for RPC client and CALC1CLT.	
CALC1	COBOL source code	EXP951.DCCO	Client interface object for IDL program CALC1, alias of CALC.	1
CALC1CLT	COBOL source code	EXP951.DCCO	An RPC client application calling the remote procedure (RPC service) CALC.	3
CALC1MAP	COBOL copybook	EXP951.DICO	Description of input and output fields of map CALC1MAP.	
CALC1	COBOL copybook	EXP951.DICO	Client interface object copybook for IDL program CALC1, alias of CALC.	1

Notes:

1. Under z/OS, client interface objects are delivered with the installation; under UNIX and Windows, generate these objects with the EntireX Workbench.
2. Adapt the JCL to your needs.
3. Application

a. built according to the client-side build instructions, see ***Using the COBOL Wrapper for CICS with DFHCOMMAREA Calling Convention (z/OS and z/VSE)***.

b. associated with IDL file *exampleWithPgmAlias.idl*, delivered under UNIX and Windows in EntireX directory *examples/RPC/basic/example/CobolClient/zosCICS/DFHCOMMAREA*.

c. client interface object name CALC1 different from remote procedure name CALC (RPC service).

d. CALC1CLT and client interface objects CALC1 installed as separate CICS programs.

For more information, refer to the readme file in EntireX directory *examples/RPC/basic/example/CobolClient/zosCICS/DFHCOMMAREA* under UNIX or Windows.

CALC Client using Call Interface

For CICS under operating system z/OS, the following CALC client is implemented with interface type "CICS with standard linkage calling convention". See ***Client Interface Types*** for more information.

Name	Type	Data Set	Description	Notes
CALC	COBOL source code	EXP951.DCCO	Client interface object for IDL program CALC.	1
CALCCLT	COBOL source code	EXP951.DCCO	An RPC client application calling the remote procedure (RPC service) CALC.	2
CALCDFH	CICS CSD	EXP951.DCCO	CSD Definition for RPC client CALCCLT.	
CALCIGY	JCL	EXP951.DCCO	Job (JCL) to build the RPC client CALCCLT.	3
CALCMAP	CICS Map	EXP951.DCCO	CICS Map definition for RPC client CALCCLT.	
CALC	COBOL copybook	EXP951.DICO	Client interface object copybook for IDL program CALC.	1
CALCMAP	COBOL copybook	EXP951.DICO	Description of input and output fields of map CALCMAP.	

Notes:

1. Under z/OS, client interface objects are delivered with the installation; under UNIX and Windows, generate these objects with the EntireX Workbench.

2. Application

   a. built according to the client-side build instructions, see ***Using the COBOL Wrapper for CICS with Call Interfaces (z/OS and z/VSE)***

   b. associated with IDL file *example.idl*

   c. CALCCLT uses CICS Map definition CALCMAP

   d. CALCCLT and client interface object CALC are linked together

   e. CALCCLT installed as single CICS program

3. Adapt the JCL to your needs.

For more information, refer to the readme file in EntireX directory *examples/RPC/basic/example/CobolClient/zosCICS/Callinterface* under UNIX or Windows.

SQUARE Client using DFHCOMMAREA

For CICS on operating system z/OS, the following SQUARE client is implemented with interface type "CICS with DFHCOMMAREA calling convention". See ***Client Interface Types*** for more information.

Name	Type	Data Set	Description	Notes
SQRE1DFH	CICS CSD	EXP951.DCCO	CSD Definition for RPC client SQRE1CLT.	
SQREI1GY	JCL	EXP951.DCCO	Job (JCL) to build the RPC client SQRE1CLT.	2
SQRE1MAP	CICS Map	EXP951.DCCO	CICS Map definition for RPC clients SQRE1CLT.	
SQRE1	COBOL source code	EXP951.DCCO	Client interface object for IDL program SQRE1, alias of SQUARE.	1
SQRE1CLT	COBOL source code	EXP951.DCCO	An RPC client application calling the remote procedure (RPC service) SQUARE.	3
SQRE1MAP	COBOL copybook	EXP951.DICO	Description of input and output fields of map SQRE1MAP.	
SQRE1	COBOL copybook	EXP951.DICO	Client interface object copybook for IDL program SQRE1, alias of SQUARE.	1

Notes:

1. Under z/OS, client interface objects are delivered with the installation; under UNIX and Windows, generate these objects with the EntireX Workbench.
2. Adapt the JCL to your needs.
3. Application
   a. built according to the client-side build instructions, see ***Using the COBOL Wrapper for CICS with DFHCOMMAREA Calling Convention (z/OS and z/VSE)***.
   b. associated with IDL *exampleWithPgmAlias.idl*.
   c. client interface object name SQRE1 different from remote procedure name SQUARE (RPC service).
   d. SQRE1CLT and client interface object SQRE1 installed as separate CICS programs.

For more information, refer to the readme file in EntireX directory *examples/RPC/basic/example/CobolClient/zosCICS/DFHCOMMAREA* under UNIX or Windows.

SQUARE Client using Call Interface

For CICS on operating system z/OS, the following SQUARE client is implemented with interface type "CICS with standard linkage calling convention". See *Client Interface Types* for more information.

Name	Type	Data Set	Description	Notes
SQRECLT	COBOL source code	EXP951.DCCO	An RPC client application calling the remote procedure (RPC service) SQUARE.	2
SQREDFH	CICS CSD	EXP951.DCCO	CSD Definition for RPC client SQRECLT.	
SQREIGY	JCL	EXP951.DCCO	Job (JCL) to build the RPC client SQRECLT.	3
SQREMAP	CICS Map	EXP951.DCCO	CICS Map definition for RPC client SQRECLT.	
SQUARE	COBOL source code	EXP951.DCCO	Client interface object for IDL program SQUARE.	1
SQREMAP	COBOL copybook	EXP951.DICO	Description of input and output fields of map SQREMAP.	
SQUARE	COBOL copybook	EXP951.DICO	Client interface object copybook for IDL program SQUARE.	1

Notes:

1. Under z/OS, client interface objects are delivered with the installation; under UNIX and Windows, generate these objects with the EntireX Workbench.
2. Application
   a. built according to the client-side build instructions, see *Using the COBOL Wrapper for CICS with Call Interfaces (z/OS and z/VSE)*.
   b. associated with IDL file *example.idl*.
   c. SQRECLT uses CICS Map definition SQREMAP.
   d. SQRECLT and client interface object SQUARE are linked together.
   e. SQRECLT installed as single CICS program.
3. Adapt the JCL to your needs.

For more information, refer to the readme file in EntireX directory *examples/RPC/basic/example/CobolClient/zosCICS/CallInterface* under UNIX or Windows.

Basic RPC Server Examples - CALC, SQUARE

This section covers the following examples:

- CALC Server
- SQUARE Server

CALC Server

For CICS under operating system z/OS, the CALC server is built with COBOL Wrapper "CICS with DFHCOMMAREA calling convention" interface type. See ***Server Interface Types*** for more information.

Name	Type	Data Set	Description	Notes
CALC	COBOL source code	EXP951.DVCO	A server application providing the remote procedure CALC (RPC service), with associated *example.idl*.	1
CALCDFH	CICS CSD	EXP951.DVCO	CSD Definition for remote procedure CALC (RPC service).	
CALCIGY	JCL	EXP951.DVCO	Job (JCL) to build the remote procedure CALC (RPC service).	2

Notes:

1. Application built according to the server-side build instructions, see ***Using the COBOL Wrapper for CICS with DFHCOMMAREA Calling Convention (z/OS and z/VSE)***.
2. Adapt the JCL to your needs.

For more information, refer to the readme file in EntireX directory *examples/RPC/basic/example/CobolServer/zosCICS* under UNIX or Windows.

SQUARE Server

For CICS under operating system z/OS, the SQUARE server is built with COBOL Wrapper "CICS with DFHCOMMAREA calling convention" interface type. See ***Client Interface Types*** for more information.

Name	Type	Data Set	Description	Notes
SQREDFH	CICS CSD	EXP951.DVCO	CSD Definition for remote procedure SQUARE (RPC service).	
SQREIGY	JCL	EXP951.DVCO	Job (JCL) to build the remote procedure SQUARE (RPC service).	2
SQUARE	COBOL source code	EXP951.DVCO	A server application providing the remote procedure SQUARE (RPC service), with associated *example.idl*.	1

Notes:

1. Application built according to the server-side build instructions, see ***Using the COBOL Wrapper for CICS with DFHCOMMAREA Calling Convention (z/OS and z/VSE)***.
2. Adapt the JCL to your needs.

For more information, refer to the readme file in EntireX directory *examples/RPC/basic/example/CobolServer/zosCICS* under UNIX or Windows.

Reliable RPC Client Examples - SENDMAIL

- SENDMAIL Client using DFHCOMMAREA
- SENDMAIL Client using Call Interface

SENDMAIL Client using DFHCOMMAREA

For CICS under operating system z/OS, the following CALC client is implemented with interface type "CICS with DFHCOMMAREA calling convention". See ***Client Interface Types*** for more information.

Name	Type	Data Set	Description	Notes
SEND1DFH	CICS CSD	EXP951.DCCO	CSD Definition for RPC client SEND1CLT.	
SEND1IGY	JCL	EXP951.DCCO	Job (JCL) to build the RPC client SEND1CLT.	1
SEND1MAP	CICS Map	EXP951.DCCO	CICS Map definition for RPC client SEND1CLT.	
SEND1	COBOL source code	EXP951.DCCO	Client interface object for IDL program SEND1, alias of SENDMAIL.	2
SEND1CLT	COBOL source code	EXP951.DCCO	An RPC client application calling the reliable remote procedure (RPC service) SEND1, alias of SENDMAIL.	3
SEND1MAP	COBOL copybook	EXP951.DICO	Description of input and output fields of map SEND1MAP.	
SEND1	COBOL copybook	EXP951.DICO	Client interface object copybook for IDL program SEND1, alias of SENDMAIL.	2

Notes:

1. Adapt the JCL to your needs.
2. Under z/OS, client interface objects are delivered with the installation; under UNIX and Windows, generate these objects with the EntireX Workbench.
3. Application
   a. built according to the client-side build instructions, see ***Using the COBOL Wrapper for CICS with DFHCOMMAREA Calling Convention (z/OS and z/VSE)***. See also ***Reliable RPC for COBOL Wrapper***
   b. associated with IDL file *mailWithPgmAlias.idl*
   c. uses CICS Map definition SEND1MAP
   d. client interface object name SEND1 different from remote procedure name SENDMAIL (RPC service)
   e. SEND1CLT and client interface objects SEND1 installed as separate CICS programs.

For more information, refer to the readme file in EntireX directory *examples/RPC/reliable/CobolClient/zosCICS/DFHCOMMAREA* under UNIX or Windows.

SENDMAIL Client using Call Interface

For CICS under operating system z/OS, the following CALC client is implemented with interface type "CICS with standard linkage calling convention". See ***Server Interface Types*** for more information.

Name	Type	Data Set	Description	Notes
SENDCLT	COBOL source code	EXP951.DCCO	An RPC client application calling the reliable remote procedure (RPC service) SENDMAIL.	1
SENDDFH	CICS CSD	EXP951.DCCO	CSD Definition for RPC client SENDCLT.	
SENDIGY	JCL	EXP951.DCCO	Job (JCL) to build the RPC client SENDCLT.	2
SENDMAIL	COBOL source code	EXP951.DCCO	Client interface object for IDL program SENDMAIL.	3
SENDMAP	CICS Map	EXP951.DCCO	CICS Map definition for RPC client SENDCLT.	
SENDMAIL	COBOL copybook	EXP951.DICO	Client interface object copybook for IDL program SENDMAIL.	3
SENDMAP	COBOL copybook	EXP951.DICO	Description of input and output fields of map SENDMAP.	

Notes:

1. Application

a. built according to the client-side build instructions, see ***Using the COBOL Wrapper for CICS with Call Interfaces (z/OS and z/VSE)***. See also ***Reliable RPC for COBOL Wrapper***
b. associated with IDL file *mail.idl*
c. uses CICS map definition SENDMAP
d. SENDCLT and client interface object SENDMAIL are linked together
e. installed as single CICS program.

2. Adapt the JCL to your needs.
3. Under z/OS, client interface objects are delivered with the installation; under UNIX and Windows, generate these objects with the EntireX Workbench.

For more information, refer to the readme file in EntireX directory *examples/RPC/reliable/CobolClient/zosCICS/CallInterface* under UNIX or Windows.

Reliable RPC Server Example - SENDMAIL

For CICS on operating system z/OS, the SENDMAIL server is built with COBOL Wrapper "CICS with DFHCOMMAREA calling convention" interface type. See ***Server Interface Types*** for more information.

Name	Type	Data Set	Description	Notes
SENDDFH	CICS CSD	EXP951.DVCO	CSD Definition for remote procedure SENDMAIL (RPC service).	
SENDIGY	JCL	EXP951.DVCO	Job (JCL) to build remote procedure SENDMAIL (RPC service).	1
SENDMAIL	COBOL source code	EXP951.DVCO	a server application providing the reliable remote procedure SENDMAIL (RPC service), with associated *mail.idl*.	2

Notes:

1. Application built according to the server-side build instructions. See ***Using the COBOL Wrapper for CICS with DFHCOMMAREA Calling Convention (z/OS and z/VSE)***. See also ***Reliable RPC for COBOL Wrapper***.
2. Adapt the JCL to your needs.

For more information, refer to the readme file in EntireX directory *examples/RPC/reliable/CobolServer/zosCICS* under UNIX or Windows.

Advanced CICS Channel Container RPC Server Example - DFHCON

For CICS on operating system z/OS, the TWOC server is built with COBOL Wrapper "CICS with Channel Container calling convention" interface type. See *Server Interface Types* for more information.

Name	Type	Data Set	Description	Notes
TWOC	COBOL source code	EXP951.DVCO	A server application providing the remote procedure TWOC (RPC service), with associated *CICSChannelContainer.idl*.	1
TWOCDFH	CICS CSD	EXP951.DVCO	CSD Definition for remote procedure TWOC (RPC service).	
TWOCIGY	JCL	EXP951.DVCO	Job (JCL) to build remote procedure TWOC (RPC service).	2

1. Application built according to the server-side build instructions. See *Using the COBOL Wrapper for CICS with Channel Container Calling Convention (z/OS)*.
2. Adapt the JCL to your needs.

For more information, see the readme file in EntireX directory *examples/RPC/advanced/CICSgreater32K/ChannelContainer/CobolServer/zosCICS* under UNIX or Windows.

Advanced CICS Large Buffer RPC Server Example - DFHLBUF

For CICS on operating system z/OS, the LBUF server is built with COBOL Wrapper "CICS with DFHCOMMAREA large buffer interface" interface type. See *Server Interface Types* for more information.

Name	Type	Data Set	Description	Notes
LBUF	COBOL source code	EXP951.DVCO	A server application providing the remote procedure LBUF (RPC service), with associated *CICSLargeBuffer.idl*.	1
LBUFDFH	CICS CSD	EXP951.DVCO	CSD Definition for remote procedure LBUF (RPC service).	
LBUFIGY	JCL	EXP951.DVCO	Job (JCL) to build remote procedure LBUF (RPC service).	2

Notes:

1. Application built according to the server-side build instructions. See ***Using the COBOL Wrapper for CICS with DFHCOMMAREA Large Buffer Interface (z/OS and z/VSE)***.
2. Adapt the JCL to your needs.

For more information, refer to the readme file in EntireX directory *examples/RPC/advanced/CICSgreater32K/LargeBuffer/CobolServer/zosCICS* under UNIX or Windows.

20 Client and Server Examples for z/OS IMS BMP

No special IMS BMP examples are delivered.

The delivered *client* examples for z/OS batch can be used as a basis for use in BMP mode, but they have to be adapted.

The delivered *server* examples for z/OS batch can also be used in BMP mode. See ***Client and Server Examples for z/OS Batch***. Using IMS PCB pointers to access IMS databases in this context is described in ***IMS PCB Pointer IDL Rules*** under ***Using the COBOL Wrapper for IMS BMP (z/OS)***.

21 Server Examples for z/OS IMS MPP

This chapter describes examples provided for COBOL on operating system z/OS with the TP system IMS for an MP region. All examples here can be found in the EntireX directory *examples/RPC* under UNIX and Windows. They are also available for z/OS if installed. See *Extract the EntireX RPC Examples from their Container Data Set* in the z/OS installation documentation. This document covers the following topics:

CALC Server

The CALC server is an IMS message processing program (MPP) for the TP system IMS under operating system z/OS. It is accessible with IMS Connect using *IMS Connect RPC Server* or the *EntireX Adapter*.

Name	Type	Data Set	Description	Notes
CALC	COBOL source code	EXP951.MVCO	A server application providing the remote procedure CALC (RPC service) with associated *example.idl*.	
CALCIGY	JCL	EXP951.MVCO	Job (JCL) to build the remote procedure CALC (RPC service).	1
CALCSTG	IMS definition	EXP951.MVCO	IMS first stage generation definition for TNCALCP transaction.	1

Notes:

1. Adapt the JCL to your needs.

For more information, refer to the readme file in EntireX directory *examples/RPC/basic/example/CobolServer/zosIMSMPP* under UNIX or Windows.

SQUARE Server

The SQUARE server is an IMS message processing program (MPP) for the TP system IMS under operating system z/OS. It is accessible with IMS Connect using the *IMS Connect RPC Server* or the *EntireX Adapter*.

Name	Type	Data Set	Description	Notes
SQUARE	COBOL source code	EXP951.MVCO	A server application providing the remote procedure SQUARE (RPC service), with associated *example.idl*.	
SQREIGY	JCL	EXP951.MVCO	Job (JCL) to build the remote procedure SQUARE (RPC service).	1
SQRESTG	IMS definition	EXP951.MVCO	IMS first stage generation definition for TNSQREP transaction.	1

Notes:

1. Adapt the JCL to your needs.

For more information, refer to the readme file in EntireX directory *examples/RPC/basic/example/CobolServer/zosIMSMPP* under UNIX or Windows.

22 Client and Server Examples for BS2000/OSD

This chapter describes the examples provided for the COBOL Wrapper for BS2000/OSD.

Overview of Client and Server Examples for BS2000/OSD

The following examples are delivered for BS2000/OSD:

- CALC Example
- SQUARE Example
- SENDMAIL Reliable RPC Example
- Notes

All examples here can be found in the EntireX directory *examples/RPC* under UNIX and Windows. If EntireX is installed under BS2000/OSD, the examples are also available on this platform.

CALC Example

Client

Element	Type	LMS Library	Comment	Notes
CREATE-CALC-CLIENT	J	EXP951.COBC	S-procedure to generate the CALC COBOL sample client application. It makes use of `RUN-COBOL-COMPILER` and `BIND-CALC-CLIENT`.	2
BIND-CALC-CLIENT	J	EXP951.COBC	S-procedure to bind the CALC COBOL sample client application.	
RUN-COBOL-COMPILER	J	EXP951.COBC	S-procedure to run the COBOL2000 / COBOL85 compiler.	2
RUN-CALC-CLIENT	J	EXP951.COBC	S-procedure to run the CALC COBOL sample client application.	
CALCCLT.COB	S	EXP951.COBC	Main program source of the CALC COBOL example.	1
CALC.COB	S	EXP951.COBC	COBOL RPC client interface object.	1
CALC	S	EXP951.COBC	COBOL RPC interface copybook.	1
COBSRVI.COB	S	EXP951.COBC	Generic RPC service.	1
ERXCOMM	S	EXP951.COBC	Layout of the RPC communication area. See *The RPC Communication Area (Reference)*.	1
CLIENT-ADAPARM	S	EXP951.COBC	Adabas ADALNK `IDTNAME` parameter required when using the NET transport method. It is shared by all clients.	
CLIENT-INPARM-CALC	S	EXP951.COBC	CALC client input parameters.	

Server

Element	Type	LMS Library	Comment	Notes
CREATE-CALC-SERVER	J	EXP951.COBS	S-procedure to generate the CALC COBOL example server. It makes use of `RUN-COBOL-COMPILER`.	2
RUN-COBOL-COMPILER	J	EXP951.COBS	S-procedure to run the COBOL2000 / COBOL85 compiler.	2
CALC.COB	S	EXP951.COBS	Server program source of CALC COBOL example.	1

SQUARE Example

Client

Element	Type	LMS Library	Comment	Notes
CREATE-SQUARE-CLIENT	J	EXP951.COBC	S-procedure to generate the `SQUARE` COBOL sample client application. It uses `RUN-COBOL-COMPILER` and `BIND-SQUARE-CLIENT`.	2
BIND-SQUARE-CLIENT	J	EXP951.COBC	S-procedure to bind the `SQUARE` COBOL sample client application.	
RUN-COBOL-COMPILER	J	EXP951.COBC	S-procedure to run the COBOL2000 / COBOL85 compiler.	2
RUN-SQUARE-CLIENT	J	EXP951.COBC	S-procedure to run the `SQUARE` COBOL sample client application.	
SQRECLT.COB	S	EXP951.COBC	Main program source of `SQUARE` COBOL example.	1
SQUARE.COB	S	EXP951.COBC	COBOL RPC client interface object.	1
SQUARE	S	EXP951.COBC	COBOL RPC interface copybook.	1
COBSRVI.COB	S	EXP951.COBC	Generic RPC service.	1
ERXCOMM	S	EXP951.COBC	Layout of the RPC communication area. See *The RPC Communication Area (Reference)*.	1
CLIENT-ADAPARM	S	EXP951.COBC	Adabas ADALNK `IDTNAME` parameter required when using the NET transport method. It is shared by all clients	
CLIENT-INPARM-SQUARE	S	EXP951.COBC	`SQUARE` client input parameters.	

Server

Element	Type	LMS Library	Comment	Notes
CREATE-SQUARE-SERVER	J	EXP951.COBS	S-procedure to generate the `SQUARE` COBOL sample server. It uses `RUN-COBOL-COMPILER`.	2
RUN-COBOL-COMPILER	J	EXP951.COBS	S-procedure to run the COBOL2000 / COBOL85 compiler.	2
SQUARE.COB	S	EXP951.COBS	Server program source of the `SQUARE` COBOL example.	1

SENDMAIL Reliable RPC Example

Client

Element	Type	LMS Library	Comment	Notes
CREATE-MAIL-CLIENT	J	EXP951.COBC	S-procedure to generate the `SENDMAIL` reliable RPC COBOL sample client application. It uses `RUN-COBOL-COMPILER` and `BIND-MAIL-CLIENT`.	2
BIND-MAIL-CLIENT	J	EXP951.COBC	S-procedure to bind the `SENDMAIL` reliable RPC COBOL sample client application.	
RUN-COBOL-COMPILER	J	EXP951.COBC	S-procedure to run the COBOL2000 / COBOL85 compiler.	2
RUN-MAIL-CLIENT	J	EXP951.COBC	S-procedure to run the `SENDMAIL` reliable RPC COBOL sample client application.	
MAILCLT.COB	S	EXP951.COBC	Main program source of the `SENDMAIL` reliable RPC COBOL example.	1
SENDMAIL.COB	S	EXP951.COBC	COBOL RPC client interface object.	1
SENDMAIL	S	EXP951.COBC	COBOL RPC interface copybook.	1
COBSRVI.COB	S	EXP951.COBC	Generic RPC service.	1
ERXCOMM	S	EXP951.COBC	Layout of the RPC communication area. See *The RPC Communication Area (Reference)*.	1
CLIENT-ADAPARM	S	EXP951.COBC	Adabas ADALNK `IDTNAME` parameter required when using the NET transport method. It is shared by all clients.	
CLIENT-INPARM-MAIL	S	EXP951.COBC	SENDMAIL reliable RPC client input parameters.	

Server

Element	Type	LMS Library	Comment	Notes
CREATE-MAIL-SERVER	J	EXP951.COBS	S-procedure to generate the `SENDMAIL` reliable RPC COBOL sample server. It makes use of `RUN-COBOL-COMPILER`.	2
RUN-COBOL-COMPILER	J	EXP951.COBS	S-procedure to run the COBOL2000 / COBOL85 compiler.	2
SENDMAIL.COB	S	EXP951.COBS	Server program source of the `SENDMAIL` reliable RPC COBOL example.	1

Notes

1. When compiling the COBOL client and server sample source programs, the compiler may issue warnings depending on the compiler used. These warnings can be ignored.
2. The default configuration expects a COBOL2000 environment. Depending on your installation it might be necessary to change the `COMPILER` parameter within the parameter declaration section of the procedures. The delivered procedures support both COBOL2000 and COBOL85 syntax.

Creating the Sample COBOL Client Programs

To create the `CALC`, `SQUARE` and `SENDMAIL` clients, parametrize S-procedures `CREATE-CALC-CLIENT`, `CREATE-SQUARE-CLIENT` and `CREATE-MAIL-CLIENT` in `EXP951.COBC` and choose the compiler installed on your system.

For more details, see also see the procedure headers in the delivered job control.

Enter the following commands:

Procedure Parameter	Description	Default
EXP-COB-CLT	COBOL client examples library	EXP951.COBC
COMPILER	The COBOL compiler to be used: COBOL2000 or COBOL85	COBOL2000

For more details, see also see the procedure headers in the delivered job control.

Enter the following commands:

```
/CALL-PROCEDURE *LIB(LIB=EXP951.COBC,ELE=CREATE-CALC-CLIENT)
/CALL-PROCEDURE *LIB(LIB=EXP951.COBC,ELE=CREATE-SQUARE-CLIENT)
/CALL-PROCEDURE *LIB(LIB=EXP951.COBC,ELE=CREATE-MAIL-CLIENT)
```

These procedures call the COBOL compiler and binder to generate corresponding L-elements stored in the EXP-COB-CLT library (the default is EXP951.COBC).

Creating the Sample COBOL Server Programs

To create the `CALC`, `SQUARE` and `SENDMAIL` server programs, parametrize S-procedures `CREATE-CALC-SERVER`, `CREATE-SQUARE-SERVER` and `CREATE-MAIL-SERVER` in `EXP951.COBS` and choose the compiler installed on your system.

Procedure Parameter	Description	Default
EXP-SRV-LIB	COBOL server examples library	EXP951.COBS
COMPILER	The COBOL compiler to be used: COBOL2000 or COBOL85	COBOL2000

For more details, see also see the procedure headers in the delivered job control.

Enter the following commands:

```
/CALL-PROCEDURE *LIB(LIB=EXP951.COBS,ELE=CREATE-CALC-SERVER)
/CALL-PROCEDURE *LIB(LIB=EXP951.COBS,ELE=CREATE-SQUARE-SERVER)
/CALL-PROCEDURE *LIB(LIB=EXP951.COBS,ELE=CREATE-MAIL-SERVER)
```

These procedures call the COBOL Compiler to generate three corresponding object modules stored as R-elements in EXP-SRV-LIB (the default is EXP951.COBS).

There is no need to link the object modules with the BS2000/OSD Common Runtime Environment (CRTE) library. The CRTE is loaded once dynamically in the corresponding worker task of the RPC server where the server program is executed.

Running the Sample COBOL Client Programs

Running the `CALC` client is described below. Running the `SQUARE` and the `SENDMAIL` clients is similar.

To run the `CALC` client

1 Adapt S-element CLIENT-INPARM-CALC in EXP951.COBC.

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*             Example CALC Client Input Parameter                  *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
BROKERID <ipaddr>:<port>:TCP                                       *
* BROKERID ETB<nnnnn>::NET                                         *
* USERID   <userid>                                                *
* PASSWORD <password>                                              *
CLASS    RPC                                                       *
SERVER   SRV1                                                      *
SERVICE  CALLNAT                                                   *
LOGON                                                              *
CALC     + 00012345 00067890                                       *
CALC     - 00067890 00012345                                       *
CALC     * 00001234 00005678                                       *
CALC     / 00005678 00001234                                       *
CALC     % 00005678 00001234                                       *
LOGOFF                                                             *
END
```

Set up `BROKERID` in one of two formats, depending on the transport method:

- **TCP Transport Method**
  <*ip*>:<*port*>:TCP

where	*ip*	is the address or DNS host name,
	port	is the port number that EntireX Broker is listening on, and
	TCP	is the protocol name.

- **NET Transport Method**
  ETB<*nnnnn*>::NET

where	*nnnnn*	is the ID under which EntireX Broker is connected to the Adabas ID table and
	NET	is the protocol name.

2 Adapt S-element CLIENT-ADAPARM.

If "NET" is chosen as transport method, specify the name of the ID table to which the broker is connected:

```
ADALNK IDTNAME=ADAxxxxx
```

where *xxxxx* is any uppercase value.

This parameter is shared between all sample clients.

3 Make sure the RPC server runs as COBOL RPC server (refer to the RPC-CONFIG S-element in library EXP951.JOBS) and library EXP951.COBS is included as `PROGRAM-LIB` in the start up procedure `START-RPC-SERVER`.

4 Enter the following command to run the `CALC` COBOL example client:

```
/CALL-PROCEDURE *LIB(LIB=EXP951.COBC,ELE=RUN-CALC-CLIENT)



CALCCLT : START
OPEN  IN: -------- : <00>
        : BROKERID : ETB001
        : CLASS    : RPC
        : SERVER   : SRV1
        : SERVICE  : CALLNAT
CALCCLT : BROKER LOGON.
CALC called successfully: 000012345 + 000067890 = 000080235
CALC called successfully: 000067890 - 000012345 = 000055545
CALC called successfully: 000001234 * 000005678 = 007006652
CALC called successfully: 000005678 / 000001234 = 000000004
CALC called successfully: 000005678 % 000001234 = 000000742
CALCCLT : BROKER LOGOFF.
CLOSE IN: -------- : <00>
CALCCLT : LEAVE
```

23 Client and Server Examples for IBM i

This chapter describes the examples provided for the COBOL Wrapper for z/OS Batch.

Overview of Client and Server Examples for IBM i

The following examples are delivered for IBM i in the library EXAMPLE of the Developer's Kit for IBM i.

Module	Source file	Windows File Name	Description	Notes
CALCMENU	QCBLLESRC	- *not delivered here* -	COBOL client display file (source)	1
CALCMAIN	QCBLLESRC	- *not delivered here* -	COBOL client dialog program (source)	1
CCALC	QCBLLESRC	- *not delivered here* -	client interface object (generated)	1
RPCSRVI	QCBLLESRC	- *not delivered here* -	generic RPC service module	1
CALC	QCBLLESRC	- *not delivered here* -	RPC server calc (source)	2

Module

The name of the delivered module.

Source file

The name of the source file where the modules are delivered.

Windows File Name

IBM i examples are not delivered in the Windows installation

Description

The purpose of the module

Notes:

1. The client application is built by the source members: CALCMENU, CALCMAIN, CCALC and RPCSRVI. You can find the associated IDL file *example.idl* in the Windows installation.
2. The server application.

Installing and Running the Client Examples for IBM i

To run the client examples for IBM i

1. The EntireX product library EXX must be in your library list. It contains the Broker ACI service program EXA.
2. Confirm that the broker and the RPC server are active.
3. Start the client application CALCCLIENT that you built, see ***Using the COBOL Wrapper for Batch (z/VSE, IBM i, BS2000/OSD and z/OS)***.
4. A menu similar to the following will be displayed:

```
Calculator Menu
-----------------------------------------------------

Operation:    +         (type + - * / to calculate or
                         type .       to terminate)
Operand 1:    _____

Operand 2:    _____

Result:  ___________


Broker-ID: localhost:1971    Server: SRV1
```

Specify the ID of the remote Broker and the name of the server that provides the CALC program. Specify the numbers you want to compute and press ENTER. If the Broker connection fails, you will get an appropriate error message.

Installing and Running the Server Examples for IBM i

To install and run the server examples for IBM i

1. For IBM i, the delivered program CALC in QCBLLESRC source file must be provided to the RPC server under IBM i.
2. Confirm that the broker is active.
3. Start the RPC server under IBM i.

24 Client and Server Examples for z/VSE Batch

Overview of Client and Server Examples for z/VSE Batch

The following examples are delivered for z/VSE Batch, where "File" refers to the name of the delivered file, "sublibrary" to the version (v), release (r) and service pack (s) :

File	Sublibrary	Description	Notes
CALCCLT.J	EXP951	JCL to compile the calc client example.	1, 2
RUNCLT.J	EXP951	JCL for running the calc client example.	1, 2
CALCCLT.C	EXP951	Calc client example (source).	2
CCALC.C	EXP951	Calc client interface objects (generated).	2
CALCCLT.PHASE	EXP951	Calc client example (executable).	2
BCOBCALC.J	EXP951	CALC server compile and LNKEDT JCL.	1, 3
BCOBCALC.C	EXP951	CALC sample server source.	3,6
CALC.PHASE	EXP951	CALC sample server executable.	3,6
BCOBHELO.J	EXP951	HELLO server compile and LNKEDT JCL.	1, 4
BCOBHELO.C	EXP951	HELLO sample server source.	4,6
HELLO.PHASE	EXP951	HELLO sample server executable.	4,6
BCOBPOWR.J	EXP951	POWER server compile and LNKEDT JCL.	1, 5
BCOBPOWR.C	EXP951	POWER sample server source.	5,6
POWER.PHASE	EXP951	POWER sample server executable.	5,6

Notes:

1. Adapt the JCL to your needs.
2. The CALCLT client example is built with the source CALCCLT.C, the generated calc client interface object CCALC and its copybook. It is delivered as executable CALCCLT.PHASE ready for use. It is built according to the client-side build instructions.
3. The RPC server BCOBCALC.C is delivered as executable *CALC.PHASE* ready for use. You can compile and link the example with job `BCOBCALC.J`.
4. The RPC server BCOBHELO.C is delivered as executable *HELLO.PHASE* ready for use. You can compile and link the example with job `BCOBHELO.J`.
5. The RPC server BCOBPOWR.C is delivered as executable *POWER.PHASE* ready for use. You can compile and link the example with job `BCOBPOWR.J`.
6. The server is built according to the server-side build instructions. See ***Using the COBOL Wrapper for Batch (z/VSE, IBM i, BS2000/OSD and z/OS)*** for more information.

Run the Client Examples for z/VSE Batch

To install and run the client examples for batch

1. Confirm that the broker and the RPC server are active.
2. Use the delivered JCL RUNCLT.J in sublibrary EXP951. Adapt the JCL to your needs.

Installing and Running the Server Examples for z/VSE Batch

To install and run the server examples for batch

1. If necessary, include the sublibrary in which the server programs reside into your RPC server LIBDEF chain.
2. Confirm that the broker is active.
3. Start the Batch RPC server.

25 Server Examples for z/VSE CICS

Overview Server Examples for z/VSE CICS

The following examples are delivered for z/VSE Batch, where “File” refers to the name of the delivered file, “sublibrary” to the version (v), release (r) and service pack (s) :

File	Sublibrary	Description	Notes
CCOBCALC.J	EXP951	CICS COBOL precompile, COBOL compile and LNKEDT JCL	1, 2
CCOBCALC.C	EXP951	CALC sample server source	2, 5
CCOBHELO.J	EXP951	CICS COBOL precompile, COBOL compile and LNKEDT JCL	1, 3
CCOBHELO.C	EXP951	HELLO sample server source	3, 5
CCOBPOWR.J	EXP951	CICS COBOL precompile, COBOL compile and LNKEDT JCL	1, 4
CCOBPOWR.C	EXP951	POWER sample server source	4, 5

Notes:

1. Adapt the JCL to your needs.
2. The RPC server CCOBCALC.C and CCOBHELO.C source is compiled and linked with the job `CCOBCALC.J`.
3. The RPC server CCOBPOWR.C source is compiled and linked with the job `CCOBPOWR.J`.
4. The RPC server CCOBPOWR.J source is compiled and linked with the job `CCOBPOWR.J`.
5. The example is built according to the server-side build instructions. See ***Using the COBOL Wrapper for CICS with DFHCOMMAREA Calling Convention (z/OS and z/VSE)***.

Installing and Running the Server Examples for z/VSE CICS

To install and run the server examples for CICS

As a prerequisite, the phases CALC, POWER and HELLO need to be defined to you CICS environment.

1 Build the CICS server program phases CALC, POWER and HELLO.

Caution: Be aware that the delivered CALC, POWER and HELLO phases for use in batch can be overwritten.

Note: See *Update the CICS Tables* under *Installing the EntireX RPC Servers under z/OS* in the z/OS installation documentation.

2 Confirm that the broker is active.

3 Start the CICS RPC Server.

26 COBOL Wrapper Reference

The RPC Communication Area (Reference)

The RPC communication area is used to specify parameters that are needed to communicate with the broker and are not specific to client interface objects. These are, for example, the Broker ID, client parameters such as user ID, password and the server address such as class/servername/service etc. See the table below for a complete listing.

Notes:

1. See below the table for an explanation of column headings.
2. The RPC communication area is provided with the generated copybook `ERXCOMM` in the folder *include* for RPC client generation. See ***Generate COBOL Source Files from Software AG IDL Files***.
3. See section ***Using the RPC Communication Area*** for the usage of the RPC communication area.

RPC Communication Area Field	Explanation	Opt/ Req Auto	In/ Out	Notes
`ERXCOMM-HEADER`	Label.	-	-	-
`COMM-REQUEST`	Label.	-	-	-
`COMM-VERSION`	Version of RPC communication area. Possible values: 2000.	R	I	-
`COMM-FUNCTION`	`LO` - log on to the Broker	O	I	1
	`LF` - log off from the Broker			1
	`OC` - open conversation			3
	`CE` - close conversation with commit			3
	`CB` - close conversation with backout			3
	`CT` - create Natural Security token			4
	`RC` - do reliable RPC commit			6
	`RR` - do reliable RPC rollback			6
	`RS` - get reliable status			6
	`EC` - end of conversation			6
`COMM-RETURN-CODE`	Message class and message code returned by COBOL Wrapper.	-	O	-
`COMM-MESSAGE-TEXT-EX`	Message text provided by COBOL Wrapper (long versions).	-	O	-
`COMM-MESSAGE-TEXT`	Message text provided by COBOL Wrapper (short versions).	-	O	-
`ERXCOMM-AREA1`	Label.	-	-	-

RPC Communication Area Field	Explanation	Opt/ Req Auto	In/ Out	Notes
COMM-USERID	Label.	-	-	-
COMM-USERID1	User ID (8 characters) used for Natural Security tokens.	O	I	4
COMM-USERID2	User ID extension.	O	I	-
COMM-PASSWORD	Password used for Natural Security tokens.	O	I	4
COMM-LIBRARY	Library information used by Natural Security token.	O	I	4
COMM-SECURITY-TOKEN-LENGTH	Length of Natural Security token.	-	O	4
COMM-SECURITY-TOKEN	Natural Security token.	-	O	-
COMM-IN-CONVERSATION	Control variable internally used by generic RPC services and client interface objects. If set to Y, RPC requests will use COMM-ETB-CONV-ID for conversationality.	A	I/O	3
COMM-IN-ACTIVE-UOW	Control variable internally used by generic RPC services and client interface objects for reliable RPC. If set to Y, RPC requests will use COMM-ETB-UOW-ID for reliability.	A	I/O	6
COMM-RELIABLE-STATE	Control variable used by the application to determine whether standard RPC requests or reliable RPC messages are used. Valid values: ' ' (blank) normal RPC requests A reliable RPC in AUTO-COMMIT mode C reliable RPC in CLIENT-COMMIT mode	R	I/O	6
COMM-RELIABLE-STATUS	Result of a “get reliable status” call to generic RPC services, see field COMM-FUNCTION above. Values correspond to broker ACI field UOWSTATUS.		O	6
COMM-ETB-BROKER-ID	Corresponds to Broker ACI field BROKER-ID.	R	I	-
COMM-ETB-SERVER-CLASS	Corresponds to Broker ACI field SERVER-CLASS.	R	I	-
COMM-ETB-SERVER-NAME	Corresponds to Broker ACI field SERVER-NAME.	R	I	-
COMM-ETB-SERVICE-NAME	Corresponds to Broker ACI field SERVICE.	R	I	-
COMM-ETB-USER-ID	Corresponds to Broker ACI field USER-ID.	O	I	1,2
COMM-ETB-PASSWORD	Corresponds to Broker ACI field PASSWORD.	O	I	1,2
COMM-ETB-TOKEN	Corresponds to Broker ACI field TOKEN.	O	I/O	-
COMM-ETB-SECURITY-TOKEN	Corresponds to Broker ACI field SECURITY-TOKEN.	A	I/O	-
COMM-ETB-CONV-ID	Corresponds to Broker ACI field CONV-ID.	A	I/O	3
COMM-ETB-WAIT	Corresponds to Broker ACI field WAIT. Default: 60 seconds.	O	I	-
COMM-ETB-APIVERS	Corresponds to Broker ACI field API-VERSION. Default=4.	O	I	-
COMM-ETB-UOW-ID	Corresponds to Broker ACI field UOWID.	O	I/O	6

RPC Communication Area Field	Explanation	Opt/ Req Auto	In/ Out	Notes
`COMM-ETB-STORE`	Corresponds to Broker ACI field `STORE`.	A	I/O	6

RPC Communication Area field
Name of the filed in the RPC communication area.

Explanation
Explanation of the purpose of the field.

Req. Opt. Auto
Indicates for input fields whether they have to be given by the RPC application (required) or may be given by the user (optional). Fields marked with "Auto" are managed internally by the *Generic RPC Services Modules* themselves.

In Out
Indicates whether the field is an input field (to be given by the RPC application) or an output field (returned to your RPC application).

Notes:

1. See *Using Broker Logon and Logoff*.
2. Optional if broker does not require security, required if broker is secured.
3. RPC conversations are supported when communicating with an RPC server. For more information, see *Using Conversational RPC*.
4. Natural Security is only relevant if communicating with a Natural RPC server. See *Using the COBOL Wrapper with Natural Security and Impersonation*.
5. See *Reliable RPC for COBOL Wrapper*.

Generic RPC Services Modules

This section covers the following topics:

- Adapting the Used Broker Stub

Introduction

The generic RPC services module `COBSRVI` is required for RPC clients.

- It can be optionally generated during RPC client generation in the folder *client* in the container *folder*. Section ***Generate Generic RPC Service for Module COBSRVI*** under ***Generate COBOL Source Files from Software AG IDL Files*** explains how to generate the RPC service module `COBSRVI`.
- It contains functions needed for RPC communication where a client interface object(s) is not needed. Refer to the functions documented with the RPC communication area field `COMM-FUNCTION` under ***The RPC Communication Area (Reference)*** for a list of provided functions.
- It manages internal states held inside the RPC communication area for conversational RPC, reliable RPC etc. See ***The RPC Communication Area (Reference)***.
- From a COBOL programmer's point of view, it is always called with the COBOL program name `COBSRVI`, even for the delivered mainframe sources `COBSRVIB`, `COBSRVIC` and `COBSRVID`.
- It contains the call to the broker stub.

Generic RPC Services Modules Usage

The delivered modules on mainframe platforms are mainly for a quick demonstration of the delivered examples. The best approach is to use the modules generated by the EntireX Workbench, for the following reasons:

- The modules delivered on mainframe platforms may be out-of-date.
- You can set generation options, for example String Literal (see ***Characters Used for String Literals***), individually as required.

Environment	Scenarios	Source to be Used	Description	Installation Linkage Usage
z/OS and z/VSE	Batch. See ***Using the COBOL Wrapper for Batch (z/VSE, IBM i, BS2000/OSD and z/OS)***.	`COBSRVIB`	This module has a call interface to your COBOL RPC client application.	Linked to your client application or can be called dynamically.
	CICS with `DFHCOMMAREA` calling convention. See ***Using the COBOL Wrapper for CICS with DFHCOMMAREA Calling Convention (z/OS and z/VSE)***.	`COBSRVIC`	This module has an `EXEC CICS LINK` interface to your COBOL RPC client application.	Installed only once within CICS as a CICS program and shared by all COBOL RPC client applications.

Environment	Scenarios	Source to be Used	Description	Installation Linkage Usage
	CICS with call interfaces. See *Using the COBOL Wrapper for CICS with Call Interfaces (z/OS and z/VSE)*.	`COBSRVID`	This module has a call interface to your COBOL RPC client application.	Linked to your client application or can be called dynamically.
z/OS IMS	IMS. See *Using the COBOL Wrapper for IMS (z/OS)*.	`COBSRVIB`	This module has a call interface to your COBOL RPC client application.	Linked to your client application or can be called dynamically.
z/OS IDMS/DC	IDMS/DC with call interfaces. See *Using the COBOL Wrapper for IDMS/DC with Call Interfaces (z/OS)*.	Not delivered.	This module has a call interface to your COBOL RPC client application. Generate it with the EntireX Workbench.	Linked to your client application or can be called dynamically.
BS2000/OSD	Batch. See *Using the COBOL Wrapper for Batch (z/VSE, IBM i, BS2000/OSD and z/OS)*.	`COBSRVI`	This module has a call interface to your COBOL RPC client application.	Linked to your client application or can be called dynamically.
IBM i	Batch. See *Using the COBOL Wrapper for Batch (z/VSE, IBM i, BS2000/OSD and z/OS)*.	`RPCSRVI`	This module has a call interface to your COBOL RPC client application. Do not use this module; it is out of date. Generate it as `COBSRVI` with the EntireX Workbench.	Linked to your client application or can be called dynamically.

Delivered Modules for z/OS

Module	Data Set	Description	Notes
`COBSRVIB`	EXP951.SRCE	Batch generic RPC services with call interface.	2
`COBSRVIC`	EXP951.SRCE	CICS generic RPC services with `EXEC CICS LINK` interface.	2
`COBSRVID`	EXP951.SRCE	CICS generic RPC services with call interface.	2
`COBIGYIC`	EXP951.SRCE	JCL to compile the CICS generic RPC services module `COBSRVIC` with `EXEC CICS LINK` interface.	2
`ERXCOMM`	EXP951.INCL	RPC communication area.	1
`ERXRCSRV`	EXP951.SRCE	C main module for application errors.	3
`ERXRCSRV`	EXP951.LD00	Ready-to-use `ERXRCSRV` module for application errors.	3
`EXPCOBCL`	EXP951.JOBS	JCL to compile the CICS generic RPC service module `COBSRVIC` with `EXEC CICS LINK` interface.	2

Module
Name of the delivered module.

`vrs`
: Version, release and service pack.

EXP951.INCL
: Generic RPC include data set. The generic RPC include data set may be delivered as a patch with a different name EXP951.IN*nn*, where *nn* is the patch level number. Make sure you install the highest patch level available. The data set is required to `SYSLIB` input for the COBOL compiler.

EXP951.SRCE
: Generic RPC source data set. The generic RPC source data set may be delivered as a patch with a different name EXP951.S0*nn*, where *nn* is the patch level number. Make sure you install the highest patch level available. The data set is required to `SYSLIB` input for the COBOL compiler.

Notes:

1. See *The RPC Communication Area (Reference)*.
2. See *Generic RPC Services Modules Usage*.
3. See *Returning Application Errors from a Server under z/OS CICS to a Client*.

Delivered Modules for z/VSE

File	Sublibrary	Description	Notes
`ERXCOMM`	EXP951	RPC Communication area.	1
`COBSRVIB.C`	EXP951	Batch generic RPC services with call interface (source).	2, 3
`COBSRVIB.OBJ`	EXP951	Batch generic RPC services with call interface (object).	2, 3
`COBSRVIC.C`	EXP951	CICS generic RPC services with `EXEC CICS LINK` interface (source).	2, 3
`COBSRVIC.OBJ`	EXP951	CICS generic RPC services with `EXEC CICS LINK` interface (object).	2, 3
`COBSRVID.C`	EXP951	CICS generic RPC services with call interface (source).	2, 3
`COBSRVID.OBJ`	EXP951	CICS generic RPC services with call interface (object).	2, 3

File
: Name of the delivered file.

Sublibrary
: Name of the delivered sublibrary.

Description
: Purpose of the file.

Notes:

1. See *The RPC Communication Area (Reference)*.

2. See *Generic RPC Services Modules Usage*.
3. We recommend you use module `COBSRVI` generated by the EntireX Workbench instead of the modules `COBSRVIB`, `COBSRVIC` and `COBSRVID` delivered with your z/VSE installation. The reason for this is that the EntireX Workbench is updated much more frequently. Section *Generate Generic RPC Service for Module COBSRVI* under *Generate COBOL Source Files from Software AG IDL Files* explains how to generate the RPC service module.

Delivered Modules for BS2000/OSD

Module	Data Set	Description	Notes
`ERXCOMM`	EXP951.COBC	RPC communication area.	1
`COBSRVI.COB`	EXP951.COBC	Batch generic RPC services with call interface.	2, 3

Notes:

1. See *The RPC Communication Area (Reference)*.
2. See *Generic RPC Services Modules Usage*
3. We recommend you use module `COBSRVI` generated by the EntireX Workbench instead of the delivered module. The reason for this is that the EntireX Workbench is updated much more frequently. Section *Generate Generic RPC Service for Module COBSRVI* under *Generate COBOL Source Files from Software AG IDL Files* explains how to generate the RPC service module.

Delivered Modules for IBM i

Module	Source file	Description	Notes
`ERXCOMM`	`QCBLLESRC`	RPC communication area.	1
`RPCSRVI`	`QCBLLESRC`	Batch generic RPC services with call interface.	2, 3

Notes:

1. See *The RPC Communication Area (Reference)*.
2. See *Generic RPC Services Modules Usage*
3. Do not use module RPCSRVI delivered with your IBM i installation. It does not support all the features described here, for example reliable RPC. Use module COBSRVI generated by the EntireX Workbench instead. Section *Generate Generic RPC Service for Module COBSRVI* under *Generate COBOL Source Files from Software AG IDL Files* explains how to generate the RPC service module.

Adapting the Used Broker Stub

Because multiple broker stubs may be offered per operating system and environments, it may be necessary to adapt the COBSRVI module to the correct broker stub that supports the required transport (TCP, SSL, NET). To do this, modify the COBOL subprogram `DOBROKER` inside the `COBSRVI` source file with a broker stub that meets your requirements.

For availability and information on broker stubs, see *Administration of Broker Stubs* under z/OS | UNIX | Windows | BS2000/OSD | IBM i.

Caution: Do not make any modifications other than changing the broker stub name, and do not modify the COBOL subprogram `COBSRVI` inside the same COBSRVI program source. Unexpected behavior will occur.