

# **webMethods EntireX**

## **Administration under IBM i**

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## Administration of EntireX under IBM i

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<i>Administering the EntireX RPC Server in the IBM i administration documentation</i>	General Rules and Conventions, Setting the Broker and Server Parameters for the RPC Server, Starting the RPC Server, Stopping the RPC Server and Principles of Calling a Server Application.
<i>Administration of Broker Stubs under IBM i</i>	Using the Broker Stub with Natural RPC, Using the Security Exit and Tracing.
<i>Natural RPC Server Configuration for the IDL Extractor for Natural in the IBM i administration documentation</i>	This document describes how to configure the Natural RPC Server when using the IDL Extractor for Natural.

## Related Literature

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- *Installing EntireX Broker Stubs under IBM i*
- *Creating an RPG User Application under IBM i under Broker ACI for RPG in the Developer's Kit documentation*
- *Creating a C User Application under IBM i under Broker ACI for C in the Developer's Kit documentation*
- *Creating a COBOL User Application under IBM i under Broker ACI for COBOL in the Developer's Kit documentation*
- *Component Return Codes in EntireX under Error Messages and Codes*
- *Using the C Wrapper*
- *Using the COBOL Wrapper*
- *Using EntireX RPC for RPG under IBM i*
- *Using EntireX RPC for CL under IBM i*

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# 1 Administering the EntireX RPC Server under IBM i

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The EntireX RPC Server under IBM i enables you to call programs as servers, using ILE (Integrated Language Environment).

## General Rules and Conventions

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The following rules apply to all server and client applications written in C under IBM i.

- Only ILE (Integrated Language Environment) program objects are supported.

The EntireX RPC Server does not support OPM (Original Program Model) and EPM (Extended Program Model) objects.

- The servers run in a multithreaded environment. Therefore your application server programs must be thread-safe. This implies that all commands and subprograms accessed in your servers must allow multithreads.
- When linking servers, the binding parameter `ACTGRP(*CALLER)` must be specified. This guarantees that a server application runs in the same activation group as the calling RPC server. Before processing a server program, the RPC Server verifies if the application was bound with `ACTGRP(*CALLER)`. If not, the RPC Server rejects the call and sends a message to the system operator.
- The IBM i terms “bind” or “binding” are equivalent to the terms “link” or “linking” in the current manual.
- Under IBM i, the term “service program” for a `*SRVPGM` program is equivalent to “shared library” under UNIX.



**Caution:** When you compile ILE programs, do *not* use the PDM source compiling option 14. Use only the ILE commands `CRTBNDxxx` or `CRTxxxMOD` with `CRTPGM`, where `xxx` denotes the source language such as CBL for COBOL, RPG or CL for command language.

## Locating and Calling the Target Server

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- [Types of Target Server](#)
- [Finding a Server Program](#)
- [Passing Parameters to the Server](#)

The library and program names that come from the client are used to locate the target server. This two-level IDL concept (library and program) has to be mapped in some way to the RPC Server environment.



## Types of Target Server

The RPC Server under IBM i supports target servers as:

### ■ ILE-C applications

The servers and their stubs are implemented as IBM i service programs of type \*SRCPGM, written according to *EntireX C Wrapper*. ILE-C applications have a two-level concept. The IDL library and program names that come from the client are mapped as follows:

- The library name is used to form the file names of the target server shared library/object and stub shared library/object
- The program name is used to form the entry point names for the target server shared library/object and stub shared library/object.

### ■ ILE-RPG, ILE-COBOL and/or ILE-CL applications

For these applications, the servers are called directly without any stubs. The IDL library and program names that come from the client for this type of target servers are mapped as follows:

- The library name is used to form the IBM i library name.
- The program name is used to form the IBM i program name, which is implemented as a bound program of type \*PGM.

Under IBM i, the RPC Server uses various methods to call the two kinds of server implementations, depending on the programming language you have used to develop your application. The next section describes how the RPC Server under IBM i distinguishes between the two implementations.

## Finding a Server Program

The RPC Server searches for a server in the following order:

### First Preference

The RPC Server first assumes that the server was developed in ILE-C. It therefore tries to run two service programs of type \*SRCPGM located in the library list of the user who submitted the RPC Server. The service programs represent the shared libraries of:

- the server stub, which is named by default *DMy\_shared\_library* and
- the server implementation, named by default *My\_shared\_library*, which contains the application functions.

*My\_shared\_library* corresponds to the library name in the IDL file. The program names specified in the IDL file are used to form the entry point names, e.g. *DALC* and *CALC*. They represent C functions in the server program. Based on the IDL layout, the sources of the stub and the server frame must be generated from templates using the *EntireX Workbench* function “Generate C Server” or the corresponding Software AG IDL Compiler command.

Generating C stubs and servers is described in detail under *Using the C Wrapper*. Extensions specific to IBM i are described under *Using the C Wrapper for the Server Side (z/OS, UNIX, Windows, BS2000/OSD, IBM i)*. You can find an example of a C application server under *Step 4: Verify the RPC Server using C* in the IBM i installation documentation.

To locate the target server, the library parameter is also used as a kind of search sequence. See [Possible Values for Libraries](#). The default for the library parameter is set to `PREFIX(D) - PREFIX()` to be compatible with server stubs and target servers written according to *EntireX C Wrapper*.

## Second Preference

If no appropriate server written in C can be found in the RPC Server job's library list, the RPC Server assumes that the server was developed in ILE-COBOL, ILE-RPG or ILE-CL. It tries to execute a stubless ILE program of type \*PGM, where

- the IBM i program name is derived from the IDL program name that comes from the client, and
- the IBM i library name is derived from the IDL library name that comes from the client. Changing the default setting `FIX() file` gives you control and independence over the library name that comes from the client. You can reroute the call to a target library of your choice (currently restricted to 8-character names) by setting the server parameter `Library=FIX(MyLib)` in the configuration file of the RPC Server. In this case, the library name sent with the client request is ignored.

See *Using EntireX RPC for CL under IBM i* for how to use RPC servers in RPG, *Using the COBOL Wrapper* on how to use RPC servers in COBOL and *Using EntireX RPC for CL under IBM i* for how to use RPC servers in CL.

You will find an IBM i example of a COBOL application server under *Step 3: Verify the RPC Server using COBOL* in the IBM i installation documentation.

If both access approaches fail, an error message is sent back to the client.

## Passing Parameters to the Server

The number of Level 01 parameters passed is predetermined by the client and the IDL definition. If this number does not match the number specified in the linkage section of your ILE server program, the operating system will reject the call.



**Note:** For stubless access to servers written in ILE-RPG, ILE-COBOL and ILE-CL, currently up to 16 level-01 parameters are supported. More parameters are ignored. Parameter fields of type floating point are not supported.

## Configuring the RPC Server

- [Configuration File Syntax](#)
- [Table of Server Parameters](#)
- [runoption](#)
- [Possible Values for Endworkers](#)
- [Possible Values for Libraries](#)

### Configuration File Syntax

- Comments must be on a separate line.
- Comment lines can begin with '\*', '/' and ';'.
- Empty lines are ignored.
- Headings in square brackets [*topic*] are ignored.
- Keywords are not case-sensitive.

### Table of Server Parameters

Configuration File Parameter Syntax (UNIX, Windows, IBM i)	Value	Req. Opt.	Description	Notes
<code>brokerid=localhost</code>	string	R	Broker ID used by the server.	Corresponds to the BROKER-ID field of the Broker ACI control block.
<code>class=RPC</code>	case-sensitive, up to 32 characters	R	Server class used by the server.	Corresponds to the SERVER-CLASS field of the Broker ACI control block.
<code>codepage=</code>		O	This field exposes the Broker ACI field LOCALE-STRING as a parameter to users of the RPC server.	See <i>Using Internationalization under Writing Applications: Client and Server</i> in the EntireX Broker ACI Programming documentation.
<code>compresslevel=0</code>	0-9 or Y   N	O	Enforce compression when data is transferred between broker and server.	See <i>Data Compression in EntireX Broker</i> .
<code>encryptionlevel=0</code>		O		Deprecated. For encrypted transport we strongly recommend using the Secure Sockets Layer/Transport Layer Security protocol. See

Configuration File Parameter Syntax (UNIX, Windows, IBM i)	Value	Req. Opt.	Description	Notes
				<i>SSL/TLS and Certificates with EntireX.</i>
<u>etb_apivers= 0</u>	<i>n</i>	O	Determines the Broker API to use.	Corresponds to the API-VERSION field of the Broker ACI control block. We recommend either not configuring the API Version or setting it to 0. This allows the EntireX Broker and the EntireX RPC server to autodetect the best API version to use. For compatibility with older Brokers, the API version can be set manually.
<u>logon=YES</u>	<u>YES</u>   NO	O	YES executes the Broker functions LOGON/LOGOFF. NO does not.	Specify NO for compatibility with EntireX Broker prior to Version 4.1.1.
<u>servername=SRV1</u>	case-sensitive, up to 32 characters	R	Server Name used by the server.	Corresponds to the SERVER-NAME field of the Broker ACI control block.
<u>service=CALLNAT</u>	case-sensitive, up to 32 characters	R	Service used by the server.	Corresponds to the SERVICE field of the Broker ACI control block.
<u>smhport=0</u>	any digit within range 0 to 99999	O	If greater than zero, starts the RPC server with a separate SMH communication task and listen port <smhport> to the local TCP/IP system.	
<u>ssl_file=</u>		O	Set the SSL parameters.	See <a href="#">Using SSL/TLS with the RPC Server</a> .
<u>timeout=60</u>	<i>n</i>	O	Timeout in seconds, used by the server to wait for Broker requests.	Corresponds to the WAIT field in the Broker ACI control block. See also <a href="#">Scalability of the RPC Server</a> .
<u>userid=ERX-SRV</u>	case-sensitive, up to 32 characters	R	Used to identify the server to the broker.	Corresponds to the USER-ID field of the Broker ACI control block.
<u>password=</u>	case-sensitive, up to 32 characters	O	Password for Broker logon.	Corresponds to the PASSWORD field of the Broker ACI control block.

Configuration File Parameter Syntax (UNIX, Windows, IBM i)	Value	Req. Opt.	Description	Notes
<code>kernelsecurity = level</code>	Y yes   N no   U user	O	Dynamic enablement if EntireX security is active.	Corresponds to the KERNELSECURITY field of the Broker ACI control block.
<code>endworkers=timeout</code>	See <a href="#">Possible Values for Endworkers</a>	O	Defines the behavior of worker tasks on completion of client requests.	See <a href="#">Scalability of the RPC Server</a> .
<code>minworkers= 1</code>	<i>n</i>	O	Minimum number of parallel worker threads started.	
<code>maxworkers=10</code>	<i>n</i>	O	Maximum number of parallel worker threads started.	
<code>tracelevel=None</code>	None   Standard   Advanced   Support	O	Select the trace level for this server.	See <a href="#">Activating Tracing for the RPC Server</a> .
<code>tracedest=</code>		O	The name of the destination file for trace output.	
<code>traceoption=</code>	None   STUBLOG   NOTRUNC	O	Additional trace option if trace is active.  None No additional trace options.  STUBLOG If <code>tracelevel</code> is Advanced or Support, the trace additionally activates the broker stub log.  NOTRUNC Normally if a data buffer larger than 8 KB is traced, the buffer trace is truncated. Set this option to write the full amount of data without truncation.  <b>Note:</b> This can increase the amount of trace output data dramatically if you transfer large data buffers.	

Configuration File Parameter Syntax (UNIX, Windows, IBM i)	Value	Req. Opt.	Description	Notes
			Example:	
<code>library=</code>	<code>library = PREFIX(D) - PREFIX()</code>	O	Specifies criteria to locate target servers and any stubs.	See <a href="#">Possible Values for Libraries</a> and <a href="#">Locating and Calling the Target Server</a> .
<code>restartcycles=15</code>	<i>n</i>	O	Number of restart cycles the RPC Server will try to connect to the Broker. A restart cycle will be repeated every 60 seconds. When the number of cycles is reached and a connection to the Broker is not possible, the RPC Server stops.	This may occur when the RPC Server is started prior to the Broker or when the Broker is shut down before the RPC Server is shut down.
<code>runoption=</code>		O	Provides EntireX RPC Server with additional information when calling target servers without stubs. Default: <code>runoption=</code> <code>P_SIGNED</code> <code>N_SIGNED</code> <code>DIRECT_CALL</code>	

### runoption

The runoptions are important for EntireX RPC Servers when the servers are called directly without server stubs, that is on z/VSE Batch, z/OS IMS, CICS, IBM i platforms or with a callable RPC server. When there is no server stub information, it is not known how to align and unmarshal to the target data type (and marshal the data back). With the `runoption` parameter, it is possible to provide the EntireX RPC Server with such information.

The runoptions are normally set to meet the platform's requirements. In most cases it should not be necessary to modify them.

Keyword	Description
<code>I2_ALIGNED</code> <code>NOT_I2_ALIGNED</code>	Aligns Integer (medium) data types. See <i>Mapping of Software AG IDL Data Type I2</i> to your target programming language COBOL   RPG.
<code>I4_ALIGNED</code> <code>NOT_I4_ALIGNED</code>	Aligns Integer (large) data types. See <i>Mapping of Software AG IDL Data Type I4</i> to your target programming language COBOL   RPG.
<code>F4_ALIGNED</code> <code>NOT_F4_ALIGNED</code>	Aligns Floating point (small) data types. See <i>Mapping of Software AG IDL Data Type F4</i> to your target programming language COBOL   RPG.
<code>F8_ALIGNED</code> <code>NOT_F8_ALIGNED</code>	Aligns Floating point (large) data types. See <i>Mapping of Software AG IDL Data Type F8</i> to your target programming language COBOL   RPG.

Keyword	Description
P_SIGNED NOT_P_SIGNED	Treats Packed decimal data types as signed packed. See <i>Mapping of Software AG IDL Data Type P number1 [. number2 ]</i> to your target programming language COBOL   RPG.
N_SIGNED NOT_N_SIGNED	Treats Unpacked decimal data types as signed numeric. See <i>Mapping of Software AG IDL Data Type N number1 [. number2 ]</i> to your target programming language COBOL   RPG.
COBOL_TIME NOT_COBOL_TIME	Maps Time and Date data types to the COBOL format PIC 9(21). See <i>Mapping of Software AG IDL Data Type T</i> to your target programming language COBOL   RPG.
DIRECT_CALL NOT_DIRECT_CALL	Forces calling server directly without server stub.
C_STRING NOT_C_STRING	Provides string variables (A) in C style: The string is guaranteed to be limited with a terminating byte, thus the size is increased. For example, A10 will be mapped to a maximum of 11 bytes.
NUMERIC_DOUBLE NON_NUMERIC_DOUBLE	Maps numeric data types (N, P) to double.

The `runoption` keyword can be issued multiple times:

### Possible Values for Endworkers

The server is able to adjust the number of worker threads to the current number of client requests. This is configured with the parameter `endworkers` and several others. See [Scalability of the RPC Server](#) for information on how the various parameters work together and what combinations can be specified.

Value	Explanation
N	<p><b>Never</b></p> <p>The number of worker threads is fixed. No additional worker threads are started. <code>minworkers</code> determines the number of workers started.</p>
T	<p><b>Timeout is used</b></p> <p>The number of worker threads ranges between the <code>minworkers</code> and <code>maxworkers</code> settings, depending on the number of currently active client requests. Until <code>maxworkers</code> has been reached, the server tries to maintain enough free worker threads to accept all incoming clients.</p> <p>The server stops all worker threads not used in the time specified by the <code>timeout</code> server parameter (see <code>timeout</code>), except for the number of workers specified in <code>minworkers</code>.</p>
I	<p><b>Immediately</b></p> <p>The number of worker threads ranges between the <code>minworkers</code> and <code>maxworkers</code> settings, depending on the number of client requests currently active. Until <code>maxworkers</code> has been reached, the server tries to maintain enough free worker threads to accept all incoming clients.</p> <p>The server stops a thread immediately as soon as it has finished its conversation. When the number of active workers falls below the number of workers specified in <code>minworkers</code>, a new thread will be started.</p>

### Possible Values for Libraries

The library parameter defines how the RPC Server locates the target server and any stubs on the platform.

The following coding rules apply to the library parameter:

- Up to five library entries can be specified as a sequence.
- Library entries are separated by a hyphen “-”.
- Library entries are used from left to right by the RPC Server.

The meaningful combinations vary per platform and the type of target server:

Operating System	Type of Target Server	Configuration	Description
IBM i	Target servers in ILE COBOL compatible with <i>Mapping IDL Data Types to COBOL Data Types</i> in the COBOL Wrapper documentation or Target servers ILE RPG compatible with <i>Software AG IDL to RPG Mapping</i> under <i>Using EntireX RPC for RPG under IBM i</i> or Target servers ILE CL compatible with <i>Software AG IDL to CL Mapping</i> under <i>Using EntireX RPC for CL under IBM i</i> .	FIX( <i>library</i> ) F( <i>library</i> )	The library sent with the client request is ignored. The configured library <i>library</i> is used to locate the target server.
UNIX Windows IBM i	Target servers and their stubs compatible with EntireX C Wrapper.	FIX() or F()  FIX( <i>library</i> ) or F( <i>library</i> )  PREFIX() or P()  PREFIX( <i>prefix</i> ) or P( <i>prefix</i> )	The library name sent with the client request is ignored. The program name sent with the client request is used to locate the target server.  The library sent with the client request is ignored. The configured library <i>library</i> is used to locate the target server and any stubs on the platform.  The library name sent with the client request is used to locate the target server and any stubs on the platform.  The library name sent with the client request is prefixed with the value in “ <i>prefix</i> ” before locating the target server and any stubs on the platform.



Example: `library = PREFIX(D) - PREFIX()`

The default for the `library` parameter is set to satisfy the environment specifics best. Under normal circumstances it is not necessary to change the `library` parameter.

For an explanation of the approach to locating the target server on your platform, see [Locating and Calling the Target Server](#).

## Scalability of the RPC Server

- [Parameters](#)
- [Configuration Examples](#)
- [Suggested Configuration on First Usage](#)

### Parameters

The RPC server can be configured to adjust the number of worker threads to the current number of client requests. When more clients are active, more worker threads are needed to achieve the best throughput. Depending on the configuration, worker threads are started on demand and stopped as soon as they are no longer needed.

This mechanism can be configured with the following parameters:

EntireX RPC Server under operating system:	Configuration	endworkers	minworkers	maxworkers	timeout
UNIX Windows IBM i	Fixed number of workers.	Never.	Determines the number of workers started.	Unused.	Not used with this configuration.
UNIX Windows IBM i	Scaling number of workers between <code>minworkers</code> and <code>maxworkers</code> without any idle time.	Immediately.	Determines the minimum number of workers started.	The upper limit of workers started.	Not used with this configuration.
UNIX Windows IBM i	Scaling number of workers between <code>minworkers</code> and <code>maxworkers</code> with configurable idle time.	Timeout.			The idle time for workers can be configured, i.e. a worker is stopped when, for the period defined by <code>timeout</code> , no client request has to be served and the minimum number of

EntireX RPC Server under operating system:	Configuration	endworkers	minworkers	maxworkers	timeout
					workers has not been reached.

### Configuration Examples

- [Configuration 1: Medium Lifespan of Worker Threads](#)
- [Configuration 2: Shortest Lifespan of Worker Threads](#)
- [Configuration 3: Fixed Number of Workers](#)

#### Configuration 1: Medium Lifespan of Worker Threads

- `endworkers=T (timeout)`
- `timeout=600`
- `minworkers=1`
- `maxworkers=10`

The `endworkers` parameter determines the condition under which a worker will be stopped. The value is the period of time specified by the parameter `timeout` (600 seconds, i.e. 10 minutes). Active workers will be stopped if no client requests arrive within the timeout period, except for the number of threads specified in `minworkers`.

`Minworkers` specifies the minimum number of workers that must be available to handle incoming client requests. The server is started (manually) and the first worker (`minworkers=1`) waits for client requests. When the first client request arrives, a second worker is started. This ensures that there will be at least one free worker (`minworkers=1`) to handle the next incoming client request.

When the first client request has been worked off (in conversational mode when the conversation has been ended, and in non-conversational mode when the request has been answered), there will be two workers active. For the next incoming client request (second request) no additional worker will be started because the second worker is still free. A third worker will only be started if a third client request arrives before the second request has been finished, in which case there will be three active workers, and so on.

The `maxworkers` parameter specifies the maximum number of active worker tasks permitted (default is 10).

### Configuration 2: Shortest Lifespan of Worker Threads

- `endworkers=I` (immediately)
- `timeout=600`
- `minworkers=1`
- `maxworkers=10`

In this example the `endworkers` parameter has been set to "I" (immediately). This setting will stop worker threads immediately when client requests are completed, except for the number of threads specified in `minworkers`. All other behavior is the same as for [Configuration 1: Medium Lifespan of Worker Threads](#).

### Configuration 3: Fixed Number of Workers

- `endworkers=N` (never)
- `timeout=600`
- `minworkers=10`
- `maxworkers=`

This configuration determines a fixed number of workers. The `maxworkers` parameter is ignored and the `endworkers` parameter is set to "N" (never). All worker threads are started immediately with the server and will never stop. This method is useful in minimizing system resources.

### Suggested Configuration on First Usage

When you first start using EntireX RPC Server, we suggest the following settings for scaling the server.

`Endworkers=T` (timeout) and a low value for `minworkers` is suggested (e.g. `minworkers=2`). The `maxworkers` setting depends on the expected maximum number of clients active in parallel (e.g. `maxworkers=10`). The `timeout` parameter can be set e.g. to 2 minutes i.e. `timeout=120`.

## Using Internationalization with the RPC Server

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It is assumed that you have read the document *Internationalization with EntireX* and are familiar with the various internationalization approaches described there.

The RPC Server itself does not convert your application data (contained in RPC IDL type A, K, AV and KV fields) received from the broker before giving them to your server application. Conversion or translation is done by the broker according to the codepage the RPC Server tells the broker.

The RPC Server running under IBM i

- does not, by default, send a codepage to the broker as part of the locale string.
- assumes that the broker's locale string defaults match. See *Broker's Locale String Defaults* under *Locale String Mapping* in the internationalization documentation. If they do not match, you will have to provide the codepage explicitly.

With the parameter codepage you can

- provide (override) a codepage in the locale string sent to the broker. If a codepage is provided it must follow the rules described under *Locale String Mapping* in the internationalization documentation.
- force a locale string to be sent if communicating with broker version 7.1.x and below.

The codepage the RPC Server tells the broker must be a codepage supported by the broker, depending on the internationalization approach.


## Using SSL/TLS with the RPC Server

---

This function is not currently supported on this platform.

## Starting the RPC Server

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 **Important:** The EntireX RPC Server under IBM i can only be started as a batch job for multi-threading reasons. You must use the SBMJOB parameter ALWMLTTHD=\*YES to allow multiple threads. Ensure that the subsystem you are submitting to the RPC server allows multiple threads. Use the command WRKJOB to verify the relevant job description.

### ➤ To start the RPC Server

- 1 Ensure that the EntireX product library EXX is in your library list.
- 2 Create a startup procedure that submits the RPC Server to batch. The RPC Server is called XSERVER (of type \*PGM) and is usually located in the EntireX product library EXX.

The following startup procedure shows the sample procedure STR\_RPCSRV that is delivered in the library EXAMPLE:

```

PGM
/*-----*/
/* Example start procedure for the EntireX RPC Server.          */
/*-----*/
/* Make sure that the RPC Server PGM and the configuration file */
/* would be found in the library list.                          */
/*-----*/
      DCL      VAR(&NULL)   TYPE(*CHAR) LEN(2)  +
          VALUE(X'0000')
      DCL      VAR(&PARM1)  TYPE(*CHAR) LEN(40) +
          VALUE('CFG=*LIBL/QCLSRC(SERVER_CFG)')
      DCL      VAR(&PARM2)  TYPE(*CHAR) LEN(4)  VALUE('-S')
/*-----*/
/* C-Language binding requires each command-line parameter to be */
/* terminated with a NULL character                               */
/*-----*/
      CHGVAR   VAR(&PARM1)  VALUE(&PARM1 *TCAT &NULL)
      CHGVAR   VAR(&PARM2)  VALUE(&PARM2 *TCAT &NULL)
/*-----*/
SBMJOB  CMD(CALL PGM(*LIBL/XSERVER) +
          PARM(&PARM1 &PARM2)) +
          JOB(RPCSERVER) ALWMLTTHD(*YES)
      SNDPGMMSG MSG('EntireX RPC Server job submitted to +
          batch') MSGTYPE(*COMP)
ENDPGM

```

One or two parameters are passed to the RPC server:

- Parameter 1 specifies the RPC server configuration file (for details see the next step), and
- The optional parameter 2 “-S”, which runs the server in silent mode, that is: no terminal input will be required (e.g. acknowledge error messages). This is recommended for background jobs.



**Note:** C programming conventions require that each parameter must be terminated with a two-byte hexadecimal zero (variable &NULL in the procedure sample).

### 3 Create/adjust the RPC server configuration file.

The IBM i configuration file is derived from the file used for RPC Servers under UNIX. A sample data set is provided in the text member EXAMPLE/QCLSRC(RPCSRV\_CFG) delivered with the IBM i installation kit. Edit the individual parameters as described in [Configuring the RPC Server](#). (For the keywords for the server parameter runoption see [runoption](#))

Most important are the `BrokerID=localhost:1971` of the remote Broker with which you want to register your server, and the `ServerName=SRV1` that identifies your service.

Some parameters are not supported under IBM i (see the comment line in the text member referring to this).

- 4 Run the startup procedure. Make sure that the configuration file is available in your library list. When the RPC server is up and running, a corresponding entry should appear in the Active Jobs list that can be verified with command `WRKACTJOB`. If you use the sample procedure described above, the server will be named `RPCSERVER` as specified in the `SBMJOB` parameter `JOB`.

## Stopping the RPC Server

---

### ➤ To stop the EntireX RPC server

- Use one of the System Management Hub functions `Deregister a Service` or `Deregister a Server`. This ensures that deregistration from the Broker is correct.

See also *EntireX RPC Server Return Codes* under *Error Messages and Codes*.

## Troubleshooting

---

Follow the hints and recommendations given below if the RPC Server does not return the expected results:

- If the client process receives an EntireX error message, read the relevant explanation under *Error Messages and Codes*.
- Use the command `WRKACTJOB` to determine whether the `RPCSERVER` process is still up and running.
- If the `RPCSERVER` is still running, invoke the job with option 5 (work with ...) and select command 10 to display the job log. Examine the log for system messages and exceptions.
- If the `RPCSERVER` is no longer active, search for a printed job log in the spooler of the user that submitted the RPC server. Usually, the IBM i system uses the default name `QPJOBLOG` for the print file.
- For many exceptions, the RPC Server writes messages to the system operator. Use the command `WRKMSG MSGQ(*SYSOPR)` to query the operator's message queue.
- To monitor the traffic of the RPC Server and to detect problems, restart the RPC Server with tracing activated. To do so, provide a valid log file and enable the tracing with the parameters `TraceLevel` and `TraceDestination` in the RPC Server configuration file member. See [Activating Tracing for the RPC Server](#) for details.

## Activating Tracing for the RPC Server

### ➤ To switch on tracing for the RPC Server

- 1 In the RPC Server configuration file, set the parameters TraceLevel and TraceDestination. See [Table of Server Parameters](#).

See also [Starting the RPC Server](#) for information on how to specify the parameters in the RPC Server configuration file under IBM i.

- 2 Evaluate the return codes. See [Error Messages and Codes](#).

### Supported Trace Levels

Trace Level	Description
None	No tracing.
Standard	Traces the interface parameters.
Advanced	Traces the interface parameter, Broker calls and internal information needed for support.

### Trace Destination

#### ➤ To assign a valid log file to the RPC Server

- 1 Use program EXX/EXACRTLOG to create file LOG in the target library, which is usually your current library.
- 2 Specify the Trace Destination in the RPC Server configuration file. Trace destination is a generic name including environment variables, e.g., %TEMP%;@PID (process ID), @TID (thread ID), @RANGE[n,m], where m must be greater than n, range is from 0 - 999. Using the RANGE option under IBM i, you can specify the following syntax:

```
TraceDestination=MyLib/LOG(MyMember@RANGE[n-m])
```

where *MyLib* is the target library of the file LOG and *MyMember* is the prefix of the member name. Every time a new RPC Server session has been started, a new log member will be created in the log file.



**Note:** Under IBM i, a process ID (@PID) is assigned to a session and *not* changed during session lifetime.

- 3 When the RPC Server is up and running, use the command WRKACTJOB to verify that the server batch job has opened the log file successfully.

4 To evaluate the return codes, see *Error Messages and Codes*.

### Example

The following excerpt from an RPC server configuration file demonstrates the usage of the `Tracelevel` and the `Tracedestination`:

```
...  
Tracelevel=Support  
TraceDestination=*CURLIB/LOG(RPC@RANGE[1-100])  
...
```

When the RPC Server is first started, the member `RPC001` will be created in file `LOG`. The next time, `RPC002` will be created and so on.



## 2 Administration of Broker Stubs under IBM i

---

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## Using the Security Exit

When you start a Broker ACI application program, the ACI service program searches your library list for the Security Exit service `SECUEXIT`. If it is found, it will be used automatically.

### Using the Security Exit supplied by Software AG

In this delivery package, a Security Exit named `X_SECUEXIT` is provided by Software AG. However, this file does not match the required name `SECUEXIT`. So by default, the Broker ACI runs without using a Security Exit.

#### ➤ To use the Software AG-supplied Security Exit Program

- 1 Rename the \*SRVPGM-type program `X_SECUEXIT` to `SECUEXIT` and
- 2 Start your user application. The bound Broker ACI will find and use the exit.

For detailed information, see *Sample Security Exits for Broker Security*.

### Creating your own Security Exit Program

A user-supplied security exit must meet the following minimum requirements:

Entry points	<pre>etbueva etbupre</pre>
Service program exports	<pre>STRPGMEXP PGMLVL(*CURRENT) LVLCHK(*NO) EXPORT SYMBOL('etbupre') EXPORT SYMBOL('etbueva') ENDPGMEXP</pre> <p>Sample: QSRVSRC(SECUEXIT) Type *BND</p>
Calling convention	<pre>... int etbueva(ETBCB *pEtbCb, void *pEncBuf, void *pReserved, char *pErrTxt) ... int etbupre(ETBCB *pEtbCb, void *pSndBuf, void *pReserved, char *pErrTxt)</pre> <p>Sample source: EXASRC(SECUEXIT)</p>

Create a Service Program for a security user exit	Sample source: EXASRC(EXACRTSXIT) This CL procedure creates module SECUEXIT from a C source and binds it to the service program SUEXIT.
---------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------

### ➤ To create a security exit program

- 1 Write the source code. The supplied C example SECUEXIT provides a framework for the basic functionality.
- 2 Create a source file of type \*BND for the service program exports.
- 3 Compile the source code.
- 4 Create the service program.

See the CL Program sample EXACRTSXIT that contains the relevant commands (CRTCMOD and CRTSRVPGM) for compiling and creating a service program. In that example a service program named SUEXIT is created.

- 5 Usually, the Software AG-supplied security exit is named X\_SECUEXIT. If you have previously renamed it SECUEXIT, rename it back now to X\_SECUEXIT for backup reasons.

Then rename the security exit service program SUEXIT you have just created to SECUEXIT.

- 6 Test the application. When you start your application program, the Broker ACI automatically finds and uses the Security Exit SECUEXIT.

The samples above are based on C examples. For other languages such as ILE COBOL and ILE RPG, use the respective compiler.

## Tracing for Broker Stubs under IBM i

To request a log file from the Broker stub, the environment variable ETB\_STUBLOG must be set. The value of this variable defines how detailed the log will be.

The following table describes the trace values for ETB\_STUBLOG:

Trace Value	Trace Level	Description
0	NONE	No tracing.
1	STANDARD	Traces initialization, errors, and all ACI request/reply strings.
2	ADVANCED	Used primarily by system engineers, traces everything from level 1 and provides additional information - for example the Broker ACI control block - as well as transport information.
3	SUPPORT	This is full tracing through the stub, including detailed traces of control blocks, message information, etc.

➤ **To evaluate error conditions**

- 1 Set the environment variable: run the program EXASETENV or use the command:

```
ADDENVVAR ENVVAR(ETB_STUBLOG) VALUE(3)
```

To change the value of the variable, use the command WRKENVVAR or change and recompile the source file in EXASRC.

- 2 Re-run the example programs.

The member names in the file LOG are created with the prefix ETB and the six-digit process ID (ETBpppppp).



**Note:** The file will be overwritten if you restart your application in the same session.


# 3 Natural RPC Server Configuration for the IDL Extractor for

## Natural

---

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This chapter describes how to configure the Natural RPC Server when using the IDL Extractor for Natural.

 **Note:** Natural Wrapper is not supported under IBM i.

## Natural Steplib Configuration

---

The Natural IDL Generator server library SYSIDL relies on the following Natural system libraries to function correctly:

Library	Function
SYSIDL	IDL Extractor for Natural server library
SYSRPC	Natural RPC system library
SYSEXT	Natural interface library
SYSLIBS	Natural system library

Depending on whether the Natural RPC Server is used in a Natural Security environment or not, steplibs are defined differently.

## Natural RPC Server Configuration when Natural Security is not used

---

### Defining Steplibs when Natural Security is not used

#### ➤ To define Steplibs

- Specify the required steplibs in the Natural parameter module used for the Natural RPC Server. See *Profile Parameters* in the Natural documentation.

### Installation Notes when Natural Security is not used

- If your Natural user applications supported by the Natural RPC Server need more than four steplibs, a separate Natural RPC Server instance must be set up for Natural IDL generation only. You cannot use Natural IDL generation from the same Natural RPC Server instance on which your Natural user application is running. Please remember that Natural supports a maximum of eight steplibs.

## Natural RPC Server Configuration when Natural Security is used

---

### Defining Steplibs when Natural Security is used

In a Natural Security environment, the required steplibs must be defined in the library profile of:

- the IDL Extractor for Natural server library SYSIDL
- every user library from which Natural IDL generation is to be performed (see [installation note 1](#) below).

### Natural Security Definitions

In a Natural Security environment, clients using the IDL Extractor for Natural need to be defined in Natural Security with access to

- the library SYSIDL
- all libraries from which IDL generation has to be performed

### Installation Notes when Natural Security is used

1. If your Natural user applications supported by the Natural RPC Server need more than four steplibs, a separate Natural Security file FSEC and Natural RPC Server instance must be set up for Natural IDL generation only. You cannot use the same Natural Security file FSEC and Natural RPC Server instance on which your Natural user application is running.
2. You cannot use the `STACK` parameter to set steplibs if Natural Security is used.
3. Under Natural Security, start the Natural RPC Server with `LOGONRQ=ON`. If this setting conflicts with your Natural user applications, we recommended setting up a separate Natural RPC Server instance for IDL Generation.

## Natural RPC Server Parameter Configuration

---

Basically all parameters valid for Natural and Natural RPC Server are valid for use with the IDL Extractor for Natural server library SYSIDL.

The most important Natural RPC Server parameters to be set are:

Parameter	Optional/Required	Explanation and Notes
SRVNODE=<value>	Required	The Broker ID.
SRVNAME=<value>	Required	The server name as defined under SERVER under <i>Broker Attributes</i> .
TIMEOUT=55	Optional	Wait timeout for the Natural RPC Server. The default value 55 is suitable for most installations. It can be adapted if necessary.
LOGONRQ=ON	Required to be ON if Natural Security is used.	Forces clients to log on to Natural libraries.
MADIO=0	Required	No limit on DB Calls.
MAXCL=0	Required	No limit on PGM Calls.
YSLW=1979	Optional, but recommended to be set.	<p>The century of save and compile (catalog) dates of Natural objects may be displayed incorrectly if you do not set a Year Sliding or Fixed Window. We suggest setting a fixed window starting from 1979 on. This ensures a correct century in the range 1979 (first release of Natural programs) up to the year 2078. If this window setting conflicts with your application requirements, consider</p> <ul style="list-style-type: none"> <li>■ using a separate RPC server for the server library SYSIDL.</li> <li>■ using other YSLW settings which may also solve the problem. See your Natural documentation for more information.</li> </ul> <p>Displaying an incorrect century does not have any impact on IDL generation - only the timestamp in the browse dialogs will be incorrect.</p>

You will find the above parameters in your NATPARM module or you can set them dynamically.

See your Natural documentation for more information.