webMethods EntireX

Administration of EntireX under BS2000/OSD

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Table of Contents

Administration of EntireX under BS2000/OSD

This document covers the followig topics:

Broker Configuration	Broker-related configuration topics.
Broker Add-ons	Broker add-ons: Broker stubs, command-line utilities.
Batch RPC Server	RPC server, Extractor and Deployment Services.
Tracing webMethods EntireX	Logging, tracing and accounting.

1 Setting up Broker Instances

This chapter contains information on setting up the Broker under BS2000/OSD. It assumes that you have completed the relevant steps described under *Installing EntireX under BS2000/OSD*.

Setting up TCP/IP Transport

The recommended way to set up the TCP/IP communicator is to define `PORT=nnnn` and optionally `HOST=x.x.x.x|hostname` under *TCP/IP-specific Attributes* (`DEFAULTS=TCP`) under *Broker Attributes* in the platform-independent administration documentation.

However, if no port number is specified in the Broker attribute file, the broker kernel will default port number of 1971. This is the same default port number that the stubs use.

Setting up Entire Net-Work/Adabas SVC Transport

To set up EntireX Net-Work communication mechanism

1. Ensure that appropriate values are supplied in the broker attribute file section `DEFAULTS=NET`, paying particular attention to the `IUBL` parameter - which specifies the maximum send/receive buffer length that can be sent between an application and Broker kernel within a single request - and `NABS`, which governs the total amount of storage available concurrently for all users communicating over this transport mechanism. See *Adabas SVC/Entire Net-Work-specific Attributes* (`DEFAULTS=NET`) under *Broker Attributes* in the platform-independent administration documentation.
2. Ensure that communication with the broker is possible by running the installation verification programs (bcoc, bcos) using transport type NET.

Starting and Stopping the Broker

Starting the Broker

To start the broker

- Enter the following SDF command:

```
/ENTER-PROCEDURE *LIB(LIB=EXX960.JOBS,ELE=START-BROKER), -
/JOB-NAME=ETB,LOGGING=*NO,RESOURCES=*PAR(CPU-LIMIT=*NO)
```

We recommend using a three-character job name. The job name is taken as prefix for all subsequently started tasks. Because the job name is limited to eight characters, a longer job name will overwrite the suffix added by EntireX Broker. For example: EntireX Broker running with three worker tasks and NET-TCP communication, `JOB-NAME=ETB`, `CPU-LIMIT=*NO`:

```
NAME      TSN TYPE       PRI      CPU-USED CPU-MAX ACCOUNT#
ETB      5397 2 BATCH    9 255      2.2379  NTL    1
ETBCOM   5398 2 BATCH    9 255      1.3577  NTL    1
ETBWRK00 5399 2 BATCH    9 255      0.8970  NTL    1
ETBWRK01 5400 2 BATCH    9 255      0.7571  NTL    1
ETBWRK02 5401 2 BATCH    9 255      0.7445  NTL    1
ETBTCP00 5402 2 BATCH    9 255      0.6124  NTL    1
ETBTCPPX 5403 2 BATCH    9 255      0.5417  NTL    1
ETBNET00 5404 2 BATCH    9 255      0.6555  NTL    1
ETBTOM   5407 2 BATCH    9 255      6.4044  NTL    1
```

The properties assigned to the main task (ETB), e.g. `JOB-CLASS`, `CPU-LIMIT`, will be inherited by all subsequently started tasks. For `CPU-LIMIT`, if specified, only `*NO` (no time limit) and `*STD` are inherited.

Stopping the Broker

To stop the broker from a privileged user ID

- Enter the following command:

```
/INFORM-PROGRAM MSG='ETBSTOP',JOB-IDENTIFICATION=*TSN(TSN=tsn)
```

where *tsn* is the task number associated with the broker main task (in the example above the TSN of job name ETB)

All other tasks that were created as a result of starting the broker will be stopped automatically.

To stop the broker from an operator console

- Enter the following command:

```
/INTR tsn,ETBSTOP
```

where *tsn* is the task number associated with the broker main task (in the example above the TSN of job name ETB)

All other tasks that were created as a result of starting the broker will be stopped automatically.

To stop the broker from a non-privileged user ID

- Use the S-procedure `STOP-BROKER` in EXX960.JOBS

Startup Parameter	Description	Default

BROKER-ID	Depending on the communication method, the BrokerId can be specified in two different formats:
	■ **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**
	`ETBnnn:SVCmmm:NET`
	where *nnn* is the ID under which EntireX Broker is connected to the Adabas ID table,
	mmm is the SVC number under which the Adabas ID table can be accessed, and
	NET is the protocol name
		none

ADABAS-PARAMETERS	Adabas parameters used for NET communication method.	ETB-ADAPARM
USERID	If EntireX Broker is running with EntireX Security, a user ID needs to be supplied.	none
PASSWORD	If EntireX Broker is running with EntireX Security, a password needs to be supplied.	none
EXX-LIB	EntireX Broker module library.	EXX960.LIB
EXX-JOBS	EntireX Broker jobs library.	EXX960.JOBS

Startup Parameter	Description	Default
WAL-MOD	WAL module library.	WAL826.MOD

Set the broker ID in the PARAMETER-DECLARATION section and enter following command:

```
/CALL-PROCEDURE (EXX960.JOBS, STOP-BROKER)
```

Tracing EntireX Broker

This section covers the following topics:

- Broker TRACE-LEVEL Attribute
- Attribute File Trace Setting
- Deferred Tracing

Broker TRACE-LEVEL Attribute

The Broker TRACE-LEVEL attribute determines the level of tracing to be performed while Broker is running. The Broker has a master TRACE-LEVEL specified in the Broker section of the attribute file as well as several individual TRACE-LEVEL settings that are specified in the following sections of the attribute file. You can also modify the different TRACE-LEVEL values while Broker is running, without having to restart the Broker kernel for the change to take effect.

Individual Settings	Specified in Attribute File Section
Master trace level	DEFAULTS=BROKER
Persistent Store trace level	DEFAULTS=ADABAS
Conversion trace level	Trace option of the CONVERSION parameter that can be defined in DEFAULTS=SERVICE | TOPIC
Security trace level	DEFAULTS=SECURITY
Transport trace level	DEFAULTS=NET | TCP | SSL

These individual TRACE-LEVEL values determine the level of tracing within each subcomponent. If not specified, the master TRACE-LEVEL is used.

Trace messages are written to the SYSOUT file of the EntireX Broker common output manager (COM) task.

Attribute File Trace Setting

Trace Level	Description
0	No tracing. Default value.
1	Traces incoming requests, outgoing replies, and resource usage.
2	All of Trace Level 1, plus all main routines executed.
3	All of Trace Level 2, plus all routines executed.
4	All of Trace Level 3, plus Broker ACI control block displays.
8	All of Trace Level 4, plus Adabas Persistent Store Adabas control blocks.

Note: Trace levels 2 and above should be used only when requested by Software AG support.

Deferred Tracing

It is not always convenient to run with `TRACE-LEVEL` defined, especially when higher trace levels are involved. Deferred tracing is triggered when a specific condition occurs, such as an ACI response code or a broker subtask abend. Such conditions cause the contents of the trace buffer to be written, showing trace information leading up the specified event. If the specified event does not occur, the Broker trace will contain only startup and shutdown information (equivalent to `TRACE-LEVEL=0`). Operating the trace in this mode requires the following additional attributes in the broker section of the attribute file. Values for `TRBUFNUM` and `TRAP-ERROR` are only examples.

Attribute	Value	Description
`TRBUFNUM`	3	Specifies the deferred trace buffer size = 3 * 64 K.
`TRMODE`	WRAP	Indicates trace is not written until an event occurs.
`TRAP-ERROR`	322	Assigns the event ACI response code 00780322 "PSI: UPDATE failed".

Protecting a Broker against Denial-of-Service Attacks

An optional feature of EntireX Broker is available to protect a broker running with `SECURITY=YES` against denial-of-service attacks. An application that is running with invalid user credentials will get a security response code. However, if the process is doing this in a processing loop, the whole system could be affected. If `PARTICIPANT-BLACKLIST` is set to `YES`, EntireX Broker maintains a blacklist to handle such “attacks”. If an application causes ten consecutive security class error codes within 30 seconds, the blacklist handler puts the participant on the blacklist. All subsequent requests from this participant are blocked until the `BLACKLIST-PENALTY-TIME` has elapsed.

Server Shutdown Use Case

Here is a scenario illustrating another use of this feature that is not security-related.

An RPC server is to be shut down immediately, using Broker Command and Information Services (CIS), and has no active request in the broker. The shutdown results in the `LOGOFF` of the server. The next request that the server receives will probably result in message 00020002 "User does not exist", which will cause the server to reinitialize itself. It was not possible to inform the server that shutdown was meant to be performed.

With the *blacklist*, this is now possible. As long as the blacklist is not switched off, when a server is shut down immediately using CIS and when there is no active request in the broker, a marker is set in the blacklist. When the next request is received, this marker results in message 00100050 "Shutdown IMMED required", which means that the server is always informed of the shutdown.

2 Administration of Broker Stubs

Available Stubs

This table lists all Broker stubs available under BS2000/OSD that are to be used with the programming languages Assembler | C | COBOL | Natural | PL/I.

Note: Use of the transport method NET will greatly improve performance when running Broker kernel and applications on the same machine. We recommend using the transport method NET for all local communication within BS2000/OSD. In order to use the transport method NET for messages involving more than 32 KB, you must install Adabas 8.1 cross-memory services. If you have not yet installed Adabas 8.1 cross-memory services, you can instead use TCP/IP to transport more than 32 KB of data.

Note for Adabas 8.1 users

When using Adabas 8.1.1 with any of the BS2000/OSD stubs to transport more than 32 KB of data, note the following:

- Adabas/WAL 8.1 must be installed.
- The Adabas/WAL 8.1 link routine must be used by the application or TP monitor.
- Adabas/WAL 8.1 libraries must be used by the Broker kernel.
- Adabas/WAL 8.1 libraries must be used by the Broker stubs.
- The parameter `EXTENDED-ACB-SUPPORT` must be used for transmitting data from Adabas (NET).
- Sufficient buffer space by `IUBL`, `NABS` and `NUM-COMBUF` must be specified.

The following stubs are available:

Name	Environment	Supported Transport Method
BKIMBTIA	All environments that use batch or Dialog (formerly TIAM)	Adabas communication, SSL and TCP/IP
BROKER	All environments that use batch or Dialog (formerly TIAM)	Adabas communication, SSL and TCP/IP

Note: `BKIMBTIA` is dropped after release 8.1. Stub `BROKER` provides all features of `BKIMBTIA`.

Linking the Stubs

This section covers instruction for linking stubs:

- Stub BROKER
- Stub BROKER with Natural

Stub BROKER

To prepare your appliction to perform Broker calls

1 Link the front-end module `BROKER` from the EntireX load library (EXX960.LIB) to your application. It has the entry point "`BROKER`". When `BROKER` is first called, it loads the actual stub module from the EntireX load library and transfers control to it.

2 Add the following assignment to the startup procedure:

```
/ADD-FILE-LINK LINK-NAME=ETBLIB,FILE-NAME=<EXX_load_library>
```

3 To enable the Adabas transport method, add the following assignment to the startup procedure:

```
/ADD-FILE-LINK LINK-NAME=DDLIB,FILE-NAME=<adabas_load_library>
```

As a result, the required Adabas link module is loaded from the appropriate Adabas load library.

4 Add the following assignment to the startup procedure:

```
/ADD-FILE-LINK LINK-NAME=DDLNKPAR,FILE-NAME=<adalnk-parameter>
```

As a result, ADAUSER reads the configuration parameters, for example IDTNAME.

Stub BROKER with Natural

To prepare your appliction to perform Broker calls

1 Add the following assignment to the startup procedure:

```
/ADD-FILE-LINK LINK-NAME=BLSLIB00,FILE-NAME=<EXX_load_library>
```

2 Add the following assignment to the startup procedure:

```
/ADD-FILE-LINK LINK-NAME=ETBLIB,FILE-NAME=<EXX_load_library>
```

3 Start Natural with the following profile parameters:

```
RCA=(BROKER),RCALIAS=(BROKER,BROKER)
```

As a result, `BROKER` is loaded dynamically, and each broker call will use this stub.

Note:
This dynamic load/execute will work even if an old `NATETB23` has already been linked to the shared Natural nucleus as static module. You need not link `BROKER` statically to the Natural front-end. It is, however, possible to link `BROKER` statically to the front-end Natural and remove the `NATETB23` module from the shared Natural nucleus to avoid specifying the profile parameters mentioned above.

Transport Methods for Broker Stubs

Transport Method Values

The following table describes the possible values for the transport methods:

Transport Value	Description / Tips
NET	Use Adabas BS2000/OSD Communication Environment as transport method. It is also possible to communicate remotely with the transport method NET from an application (client or server) to the broker kernel using Entire Net-Work. For remote NET communication, Entire Net-Work must be installed both on the machine where the broker kernel runs and on the machine where your application (client or server) runs, and a connection must be established.
	Using Adabas/WAL V8 allows more than 32 KB of data to be communicated. Otherwise the following maximum values are allowed:

ACI Version	Max Send/Receive length
1	32167
2, 3	31647
4-8	31643
9 or above	31123

Note: If Adabas version 8 is *not* used, these same limits still apply under BS2000/OSD.

TCP	Use TCP/IP as transport method.

Default Transport Methods

Stub	Default Transport Method
BKIMBTIA	NET
BROKER	NET

Using Transport Methods

This section covers specifications for transport methods as part of the broker ID.

Note: If no transport method has been specified as part of the broker ID, default value NET is used.

- **Using Adabas Communication**

  To Use Adabas Communication as Transport Method

  - Specify:

    ```
    broker-id::NET
    ```

    Notes:

    1. Port number does not apply and is therefore left blank. Adabas communication is the transport method.
    2. It is not possible to provide the `IDTNAME` with the broker ID. The `IDTNAME` is specified in a parameter file controlled by the `ADAUSER` module (assigned using link name `DDLNKPAR`).

- **Using TCP/IP**

  To use TCP/IP as transport method

  - Specify:

    ```
    broker-id:nnnnn:TCP
    ```

    where *nnnnn* is a placeholder for a port number.

Setting the Timeout for the Transport Method

Introduction

If the transport layer is interrupted, communication between the broker and the stub - that is, client or server application - is no longer possible. A client or server might possibly wait infinitely for a broker reply or message in such a situation. To prevent this and return control to your calling application in such a situation, set a timeout value for the transport method.

The timeout settings for transport layers are independent of the timeout settings of the broker.

Setting the timeout for the transport layer is possible for the transport method TCP, and is supported by broker stub `BROKER`.

Transport Timeout Values

The timeout value for the transport method is set by the environment variable `ETB_TIMEOUT` on the stub side. This transport timeout is used together with the broker timeout - which is set by the application in the `WAIT` field of the broker ACI control block - to calculate the actual value for the transport layer's timeout. The following table describes the possible values for the transport timeout:

Transport Timeout Value	Description
0	Infinite wait for the application.
n	The transport method additionally waits this time in seconds. A negative value is treated as `TIMEOUT=0` (infinite wait for the application).
nothing set	Transport method waits additional 20 seconds.

The actual timeout for transport layer equals broker timeout (`WAIT` field) + timeout value for transport method.

Tracing for Broker Stubs

Scope

Setting tracing is supported by the broker stub `BROKER` if transport method TCP is used. The stub tries to access the SDF variable `ETB-STUBLOG` (or, failing that, a job variable with the same name), to evaluate the value of the logging level. If the logging level is set, a sequential file will be created with the file name *9999.ETB* where *9999* is the task sequence number of the running task.

Trace Level		Description
0	`NONE`	No tracing. Switch tracing off.
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 information from the transports.
3	`SUPPORT`	This is full tracing through the stub, including detailed traces of control blocks, message information, etc.

Activating Logging

To activate logging

- Set `JV ETB-STUBLOG` to value [1|2|3].

Where "1" is the lowest log level and "3" is the highest.

Using Job Variables

SDF and job variables (environment variables in an Open Systems architecture, i.e. UNIX or Windows) are used with the stub `BROKER` to read configuration parameters. BS2000/OSD uses the hyphen character whereas environment variables use the underscore character. The stub attempts to read the SDF variable. If this fails, the job variable is read. If neither an SDF variable nor a job variable is read, it is assumed not using any environment variables.

Using BROKER under openUTM

You cannot use BROKER with dialog transactions under openUTM. You can, however, use BROKER within asynchronous transaction processing under openUTM. Prepare your Natural/UTM application as follows:

1. Link module BROKER from the EntireX library *EXX960.LIB* to the front-end part of your Natural/UTM application.
2. Add the following assignment to the Natural/UTM startup job:

```
/ADD-FILE-LINK LINK-NAME=ETBLIB,FILE-NAME=EXX_load_library
```

3. To enable the Adabas transport method, add the following assignment to the Natural/UTM startup job:

```
/ADD-FILE-LINK LINK-NAME=DDLIB,FILE-NAME=adabas_load_library
```

For more information on writing an asynchronous Natural/UTM transaction see section *Asynchronous Transaction Processing under UTM* in the Natural/UTM documentation.

3 Broker Command-line Utilities

EntireX Broker provides the following internal services: Command Service and Information Service, which can be used to administer and monitor brokers. Because these services are implemented internally, nothing has to be started or configured. You can use these services immediately after starting EntireX Broker.

ETBINFO

Queries the Broker for different types of information, generating an output text string with basic formatting. This text output can be further processed by script languages. `ETBINFO` uses data descriptions called profiles to control the type of data that is returned for a request. `ETBINFO` is useful for monitoring and administering EntireX Broker efficiently, for example how many users can run concurrently and whether the number of specified message containers is large enough.

Although basic formatting of the output is available, it is usually formatted by script languages or other means external to the Broker.

Running the Command-line Utility

In a BS2000/OSD environment, run the command-line utility `ETBINFO` as shown below:

```
/CALL-PROCEDURE (LIB=EXX960.JOBS,ELE=ETBINFO)
```

This executes the utility in BS2000/OSD dialog mode.

The `ETBINFO` parameters are supplied using an SDF variable, for example:

```
/COMMAND = '-b&(BROKER-ID) -dBROKER'
```

See the delivered `ETBINFO` job control in EXX960.JOBS.

Command-line Parameters

The table below explains the command-line parameters. The format string and profile parameters are described in detail following the table. All entries in the Option column are case-sensitive.

Option	Command-line Parameter	Req/ Opt	Explanation
-b	brokerid	R	Broker identifier, for example localhost:1971:TCP.
-c	class	O	Class as selection criterion.
-C	csvoutput	O	Comma-separated values, suitable for input into a spreadsheet or other analysis tool. Any format string specified by means of format string or profile command-line parameters is ignored.
-d	object	R	Possible values: Object — Provides Info on BROKER — Broker. CLIENT — Client. CMDLOG-FILTER — Command log filter. CONVERSATION — Conversation. NET — Entire Net-Work transport. PARTICIPANT — Participant. POOL-USAGE — Broker pool usage. PSF — Unit-of-work status. PSFADA — Adabas persistent store. PSFCTREE — c-tree persistent store. PSFDIV — DIV persistent store. PSFFILE — FILE persistent store. PUBLICATION — Publication. PUBLISHER — Publisher. RESOURCE-USAGE — Broker resource usage. SECURITY — EntireX Security. SERVER — Server. SERVICE — Service. SSL — SSL transport. STATISTICS — Broker statistics. SUBSCRIBER — Subscriber. TCP — TCP transport. TOPIC — Topic. USER — Participant (short).

Option	Command-line Parameter	Req/ Opt	Explanation
			WORKER Worker. WORKER-USAGE Worker usage.
-e	recv class	O	Receiver's class name. This selection criterion is valid only for object PSF.
-f	*Format String*	O	Format string how you expect the output. See *Profile*.
-g	recv service	O	Receiver's service name. This selection criterion is valid only for object PSF.
-h	help	O	Prints help information.
-i	convid	O	Conversation ID as selection criterion. Only valid for object CONVERSATION.
-I	conv type	O	Conversation's type.
-j	recv server	O	Receiver's server name. This selection criterion is valid only for object PSF.
-k	recv token	O	Receiver's token. This selection criterion is valid only for object PSF.
-l	level	O	The amount of information displayed: FULL All information. SHORT User-specific information.
-m	recv userid	O	Receiver's user ID. This selection criterion is valid only for object PSF.
-n	server name	O	Server name. This selection criterion is valid only for the objects SERVER, SERVICE or CONVERSATION.
-p	file	O	Here you can specify a file that defines the layout of the output. There are default files you can modify or you can use your own. The default files are: BROKER CLIENT CLOGFLT CONV NET POOL PSF PSFADA PSFCTREE PSFDIV PSFFILE PUBLIC PUBSHR RESOURCE SECURITY SERVER SERVICE SSL STATIS SUBSCBR TCP TOPIC USER WORKER WKRUSAGE See *Profile*.
-q	puserid	O	Physical user ID. This selection criterion is valid only for objects CLIENT, SERVER, CONVERSATION, SUBSCRIBER, PUBLISHER or PUBLICATION. **Note:** Must be a hex value.
-P	publication id	O	Publication ID. This selection criterion is valid only for object PUBLICATION.
-r	sec	O	Refresh information after seconds.

Option	Command-line Parameter	Req/ Opt	Explanation
-s	service	O	Service. This selection criterion is valid only for objects SERVER, SERVICE or CONVERSATION.
-S	"sslparms"	O	When using SSL transport.
-t	token	O	This selection criterion is valid only for objects CLIENT, SERVER, SERVICE, CONVERSATION, SUBSCRIBER, PUBLISHER, PUBLICATION or TOPIC.
-T	topic	O	Topic name. This selection criterion is valid only for objects PUBLICATION, SUBSCRIBER, PUBLISHER, or TOPIC.
-u	userid	O	User ID. This selection criterion is only valid for the display types CLIENT, SERVER, SERVICE, CONVERSATION, SUBSCRIBER, PUBLISHER, PUBLICATION or TOPIC.
-U	subscr type	O	Subscriber's subscription type. This selection criterion is valid only for object SUBSCRIBER.
-v	UOW status	O	Unit of work status. This selection criterion is valid only for object PSF.
-w	UOW ID	O	Unit of work ID. This selection criterion is valid only for object PSF.
-x	userid	O	User ID. For security purposes.
-y	password	O	Password. For security purposes.
-z	token	O	Used with userid to uniquely identify a caller to Command and Information Services.

Profile

If you do not use the profile option or a format string, your output will be an unformatted list with all columns of that display type. To display specific columns, specify a profile that includes only those columns.

The following default sample profiles include all the columns defined for each display type:

- BROKER
- CLIENT
- CONV
- POOL
- PSF
- PSFADA
- PSFDIV
- PSFFILE
- PUBLIC
- PUBSHR
- RESOURCE
- SERVER
- SERVICE
- SSL
- STATIS
- SUBSCBR
- TCP
- TOPIC
- USER
- WKRUSAGE
- WORKER

You can either delete the columns not required or copy the default profile and modify the order of the columns. Ensure that the column names have a leading "%". Column names can be written in one line or on separate lines. The output is always written side by side.

Location of Profiles

On BS2000/OSD, the profiles used to control the amount of data displayed are contained in *EXX960.JOBS* and are called `PRO-BROKER`, `PRO-CLIENT` etc.

Example

Profile for object SERVICE: PRO-SERVICE.

To use a profile, the profile itself needs to be extracted from LMS library EXX960.JOBS. Uncomment the LMS-section including SDF variable `COMMAND` in S-procedure `ETBINFO` and adapt the profile name. For example:

```
...
/ START-LMS
//  MOD-LMS-DEFAULTS MAX-ERROR-WEIGHT=*RECOVERABLE
//  EXTRACT-ELEMENT                                              -
//     *LIB(LIB  = &(EXX-JOBS),                                  -
//          ELEM = PRO-SERVICE,                                  -
//          TYPE = S),                                           -
//          TO-FILE    = #PROFILE,                               -
//          FILE-ATTR  = (ACCESS-METHOD=*SAM),                   -
//          WRITE-MODE = *ANY
//END
/COMMAND = '-b&(BROKER-ID) -dSERVICE -p#PROFILE -lFULL'
...
```

See also the delivered `ETBINFO` job control in EXX960.JOBS for more details.

Format String

The format string, if specified, will override the use of a profile. The format string is built like a `printf()` in C language. The string must be enclosed in quotation marks. You can specify the columns by using a "%" and the column name. The column name must contain letters only. Numeric characters are not allowed. You can specify the length of column output by using a format precision, as in the ANSI-C `printf()` function. The column name must be followed by a blank. For example:

```
/COMMAND = '-b&(BROKER-ID) -d BROKER -f "%12.12CPLATNAME   %NUM-SERVER      ↩
%NUM-CLIENT"'
```

which produces the following output, for example:

```
BS2000/OSD W 30 100
```

You can also use an arbitrary column separator, which can be any character other than “%”. You can use `\n` for a new line in the output and `\t` for a tabulator in the format string or profile. For example:

```
/COMMAND = '-b&(BROKER-ID) -d SERVER -f "UserID: %5.5USER-ID Token: %5.5TOKEN"'
```

which produces:

```
UserID: HUGO  Token: MYTOK
UserID: EGON  Token:
UserID: HELMU Token: Helmu
```

If you want to structure your output a little more, you can operate with the `\n` or `\t` character. For example:

```
/COMMAND = '-b&(BROKER-ID) -d SERVICE -f  "Class:%5.5SERVER-CLASS ↩
\n\tName:%5.5SERVER-NAME \n\tService:%5.5SERVICE"
```

which produces:

```
Class:DATAB
    Name:DB10
    Service:Admin
Class:PRINT
    Name:LPT1
    Service:PRINT
...
```

ETBCMD

Allows the user to take actions - for example purge a unit of work, stop a server, shut down a Broker - against EntireX Broker.

Running the Command-line Utility

In a BS2000/OSD environment, run the `ETBCMD` command-line utility like this:

```
/CALL-PROCEDURE (LIB=EXX960.JOBS,ELE=ETBCMD)
```

This executes the utility in BS2000/OSD dialog mode.

The ETBCMD parameters are supplied using an SDF variable. For example:

```
/COMMAND = '-b&(BROKER-ID) -dBROKER -cTRACE-ON -oLEVEL1'
```

See also delivered `ETBCMD` job control in EXX960.JOBS.

Command-line Parameters

The table below explains the command-line parameters. All entries in the **Option** column are case-sensitive.

Command-line Parameter	Option	Parameter	Req/ Opt	Explanation
`brokerid`	`-b`	e.g. `ETB001`	R	Broker ID.
`command`	`-c`	■ `ALLOW-NEWUOWMSGS` ■ `CLEAR-CMDLOG-FILTER` ■ `CONNECT-PSTORE` ■ `DISABLE-ACCOUNTING` ■ `DISABLE-CMDLOG-FILTER` ■ `DISABLE-CMDLOG` ■ `DISABLE-DYN-WORKER` ■ `DISCONNECT-PSTORE` ■ `ENABLE-ACCOUNTING`	R	Command to be performed. See ***List of Commands and Objects*** below.

Command-line Parameter	Option	Parameter	Req/ Opt	Explanation
		■ ENABLE-CMDLOG-FILTER ■ ENABLE-CMDLOG ■ ENABLE-DYN-WORKER ■ FORBID-NEWUOWMSGS ■ PING ■ PRODUCE-STATISTICS ■ PURGE ■ RESET-USER ■ RESUME ■ SET-CMDLOG-FILTER ■ SHUTDOWN ■ START ■ STATUS ■ STOP ■ SUBSCRIBE ■ SUSPEND ■ SWITCH-CMDLOG ■ TRACE-FLUSH ■ TRACE-OFF ■ TRACE-ON ■ TRAP-ERROR ■ UNSUBSCRIBE		
object type	-d	■ BROKER ■ CONVERSATION ■ PARTICIPANT ■ PSF ■ SUBSCRIBER ■ SECURITY ■ SERVER ■ SERVICE ■ TRANSPORT	R	The object type to be operated on. See ***List of Commands and Objects*** below. Within EntireX Broker nomenclature, a participant is an application implicitly or explicitly logged on to the Broker as a specific user. A participant could act as client, server, publisher or subscriber.
	-e	errornumber	O	Error number being trapped.

Command-line Parameter	Option	Parameter	Req/ Opt	Explanation
	-E		O	Exclude attach servers from service shutdown.
help	-h		O	Prints help information.
class/server/service	-n	class/server/service	O	Service triplet.
option	-o	■ IMMED ■ QUIESCE ■ LEVEL*n*, where *n*=1-8	O	Command option.
puserid	-p	puserid	O	Physical User ID. For SERVER and PARTICIPANT objects only. This must be a hex value.
sslparms	-s	SSL parameters	O	When using SSL transport.
seqno	-S	sequence number	O	Sequence number of participant.
token	-t	token	O	Token. For PARTICIPANT and SUBSCRIBER objects only.
topic	-T	topic	O	Topic name. For SUBSCRIBER object only.
uowid	-u	uowid	O	Unit of work ID. For PSF object only.
userid	-U	userid	O	User ID. For PARTICIPANT and SUBSCRIBER objects only.
secuserid	-x	userid	O	User ID for security purposes.
transportid	-X	Transport ID	O	One of the following: COM|NET|SSL|S*nn*|TCP|T*nn*. See table below.
secpassword	-y	password	O	Password for security purposes.

Transport ID Values

This table explains the possible values for parameter transportid:

Transport ID	Explanation
COM	all communicators
NET	NET transport communicator
SSL	all SSL communicators
S00	SSL communicator 1
S01	SSL communicator 2
S02	SSL communicator 3
S03	SSL communicator 4
S04	SSL communicator 5

Transport ID	Explanation
TCP	all TCP/IP communicators
T00	TCP/IP communicator 1
T01	TCP/IP communicator 2
T02	TCP/IP communicator 3
T03	TCP/IP communicator 4
T04	TCP/IP communicator 5

List of Commands and Objects

This table lists the available commands and the objects to which they can be applied.

Command	Object								
	BROKER	CONVERSATION	PARTICIPANT	PSF	SECURITY	SERVER	SERVICE	SUBSCRIBER	TRANSPORT
ALLOW-NEWUOWMSGS				x					
CLEAR-CMDLOG-FILTER	x								
CONNECT-PSTORE				x					
DISABLE-ACCOUNTING	x								
DISABLE-CMDLOG-FILTER	x								
DISABLE-CMDLOG	x								
DISCONNECT-PSTORE				x					
ENABLE-ACCOUNTING	x								
ENABLE-CMDLOG-FILTER	x								
ENABLE-CMDLOG	x								
FORBID-NEWUOWMSGS				x					
PING	x								
PRODUCE-STATISTICS	x								
PURGE				x					
RESET-USER					x				
SET-CMDLOG-FILTER	x								
SHUTDOWN	x	x	x			x	x		
START									x
STATUS									x
STOP									x
SUBSCRIBE								x	
SWITCH-CMDLOG	x								
TRACE-OFF	x			x	x				
TRACE-ON	x			x	x				
UNSUBSCRIBE								x	

Note: Object type TRANSPORT applies to operating systems z/OS and z/VSE only.

Examples

Example	Description
`/COMMAND ='-h'`	Displays ETBCMD help text.
`/COMMAND='-b &(BROKER-ID) -d BROKER -c TRACE-OFF'`	Turns Broker tracing off.
`/COMMAND='-b &(BROKER-ID) -d BROKER -c TRACE-ON -o LEVEL2'`	Sets Broker trace level to 2.
`/COMMAND='-b &(BROKER-ID) -d BROKER -c SHUTDOWN'`	Performs Broker shutdown.
`/COMMAND='-b &(BROKER-ID) -d SERVICE -c SHUTDOWN -o IMMED -n ACLASS/ASERVER/ASERVICE'`	Shutdown service `CLASS=ACLASS,SERVER=ASERVER,SERVICE=ASERVICE`. See also *SHUTDOWN SERVICE* under *Broker Command and Information Services* for more information on shutdown options.
	Create list of servers and shutdown specific server in two steps (first step uses `ETBINFO`). See also *SHUTDOWN SERVER* under *Broker Command and Information Services*.
`/COMMAND='-b &(BROKER-ID) -d SERVER -l FULL -f"%USER-ID %SEQNO"'`	1. Determine a list of all servers with sequence numbers.
`/COMMAND='-b &(BROKER-ID) -d SERVER -c SHUTDOWN -o IMMED -S32'`	2. Shutdown server with sequence number 32.
`/COMMAND='-b &(BROKER-ID) -d BROKER -c PING'`	Performs an EntireX ping against the Broker.
`/COMMAND='-b &(BROKER-ID) -d PSF -c DISCONNECT-PSTORE'`	Disconnects the Broker PSTORE.
`/COMMAND='-b &(BROKER-ID) -d PSF -c CONNECT-PSTORE'`	Connects the Broker PSTORE.
`/COMMAND='-b &(BROKER-ID) -d PSF -c PURGE -u 100000000U00001A'`	Purges a unit of work.
`/COMMAND='-b &(BROKER-ID) -d PSF -c ALLOW-NEWUOWMSGS'`	Allows new units of work to be stored.
`/COMMAND='-b &(BROKER-ID) -d PSF -c FORBID-NEWUOWMSGS'`	Disallows new units of work to be stored.
`/COMMAND='-b &(BROKER-ID) -d SUBSCRIBER -c SUBSCRIBE -U U1 -t t1 -T NYSE'`	Subscribes subscriber to topic NYSE.
`/COMMAND='-b &(BROKER-ID) -d SUBSCRIBER -c UNSUBSCRIBE -U U1 -t t1 -T NYSE'`	Unsubscribes subscriber from topic NYSE.

ETBSRV

The broker command-line utility `etbsrv` monitors and controls all local brokers; remote brokers can also be monitored.

Starting a Broker

Use command `BROKER START` to start a specified broker:

```
ETBSRV BROKER START "ETB001"
```

Pinging a Broker

Use command `BROKER PING` to display the status of a specified local or remote broker. Return code 0 means the broker is running; any other value means the broker has stopped. See *Component Return Codes in EntireX* under *Error Messages and Codes*. Example:

```
ETBSRV BROKER PING "ETB001"
```

Enter the command without specifying a broker to display the status of all brokers.

The information is the same as displayed using System Management Hub.

Pinging an RPC Server

Use command `BROKER PINGRPC <brokerid> <class/server/service>` to display the status of a specified RPC server. Return code 0 means the RPC server is running; any other value means the RPC server has stopped. See *Component Return Codes in EntireX* under *Error Messages and Codes*. Example:

```
ETBSRV BROKER PINGRPC "ETB001" "SAG/ETBCIS/RPCCIS"
```

The information is the same as displayed using System Management Hub.

Restarting a Broker

Use command `ETBSRV BROKER RESTART` to stop and restart a specified broker. Example:

```
BROKER RESTART "ETB001"
```

Stopping a Broker

Use command `BROKER STOP` to stop a local broker. Example:

```
ETBSRV BROKER STOP "ETB001"
```

Enabling EntireX Security

Activate security with command `ETBSRV SECURITY ENABLE`; once activated, security can only be deactivated with command `SECURITY DISABLE`.

To enable automatic scripts to execute administration service commands without having to enter a password, set the option `TRUSTED-USER=YES` when administration service security is activated.

```
ETBSRV SECURITY ENABLE TRUSTED-USER=YES
```

Disabling EntireX Security

Disable security with command `ETBSRV SECURITY DISABLE`.

4 Operator Commands

Command Syntax

The following command format is required to communicate with EntireX Broker, using the operator console. Parameters in UPPERCASE must be typed “as is”. Parameters in lowercase must be substituted with a valid value. Operator commands have the following format:

```
/INTR tsn,command[parameter]
```

where	*tsn*	is the BS2000/OSD task sequence number of the EntireX Broker main task
	command	is the operator command
	parameter	is an optional parameter allowed by the operator command you are issuing

General Broker Commands

The following broker commands are available:

- BROKER TRACE
- DPOOL
- DRES
- DSTAT
- ETBEND
- ETBSTOP
- FLUSH
- PSTORE TRACE
- SHUTDOWN class,server,service
- TRACE
- TRAP-ERROR

BROKER TRACE

Alias of broker command `TRACE`. Modifies the setting of the broker-specific attribute `TRACE-LEVEL`.

Example

To set a trace level 2 for broker

- Enter command:

```
/INTR tsn,BROKER TRACE=2
```

If the console prompt is suppressed, enter an `MSG` command before the console command:

```
MSG partition_id
```

See `TRACE-LEVEL` under *Broker Attributes* in the platform-independent administration documentation.

DPOOL

Lists all memory pools currently allocated by EntireX Broker. Start address, pool size in bytes and name of pool are provided. There can be multiple entries for a specific type of pool.

Sample Output

```
ETBM0720 Operator typed in: DPOOL
ETBM0657 Broker pool usage:
ETBM0657 0x2338FFB8   16781380 bytes COMMUNICATION POOL
ETBM0657 0x243A9EB8     368964 bytes CONVERSATION POOL
ETBM0657 0x24404F38     233668 bytes CONNECTION POOL
ETBM0657 0x2443EF38    4395204 bytes LONG MESSAGES POOL
ETBM0657 0x24870BB8    3703876 bytes SHORT MESSAGES POOL
ETBM0657 0x24BF9398     134244 bytes PARTICIPANT POOL
ETBM0657 0x24C1AF78      36996 bytes PARTICIPANT EXTENSION POOL
ETBM0657 0x24C24798      26724 bytes PROXY QUEUE POOL
ETBM0657 0x24C2BDA8     131668 bytes SERVICE ATTRIBUTES POOL
ETBM0657 0x24C4CB98      54372 bytes SERVICE POOL
ETBM0657 0x24C5AF78      32900 bytes SERVICE EXTENSION POOL
ETBM0657 0x24D31FA8     344148 bytes SUBSCRIPTION POOL
ETBM0657 0x24D865A8     129620 bytes TOPIC ATTRIBUTES POOL
ETBM0657 0x2338F420       2952 bytes TOPIC POOL
ETBM0657 0x24DA6778      30852 bytes TOPIC EXTENSION POOL
ETBM0657 0x24C63B18      87268 bytes TIMEOUT QUEUE POOL
ETBM0657 0x24C79398     179300 bytes TRANSLATION POOL
ETBM0657 0x24CA5F38     176324 bytes UNIT OF WORK POOL
ETBM0657 0x24CD1798     391268 bytes WORK QUEUE POOL
ETBM0657 0x24DAEB98      33892 bytes PSTORE SUBSCRIBER POOL
ETBM0657 0x24DB73A8      19540 bytes PSTORE TOPIC POOL
ETBM0582 Function completed
```

DRES

Displays EntireX Broker's resource usage for conversations, message buffers, participants, services, topics, the timeout queue, units of work, and the work queue. Resource usage provides the total number, the number of free elements, and the number of used elements.

Sample Output

```
ETBM0720 Operator typed in: DRES
ETBM0581 Broker resource usage:
ETBM0581 Resource ----------------- Total # --- Free # --- Used #
ETBM0581 Conversations                 4096        852       3244
ETBM0581 Long message buffers             0          0          0
ETBM0581 Short message buffers         8192       7384        808
ETBM0581 Participants                   256        235         21
ETBM0581 Services                       256        240         16
ETBM0581 Topics                           0          0          0
ETBM0581 Timeout Queue                 1280        845        435
ETBM0581 Units Of Work                    0          0          0
ETBM0581 Work Queue                     256        239         17
ETBM0582 Function completed
```

DSTAT

Displays the total number of active elements, and an optional high watermark for services, clients, servers, conversations, message buffers, topics, publishers, subscribers, and publications.

Sample Output

```
ETBM0720 Operator typed in: DSTAT
ETBM0580 Broker statistics:
ETBM0580 NUM-SERVICE ............... 0
ETBM0580 Services active ........... 7
ETBM0580 NUM-CLIENT ................ 0
ETBM0580 Clients active ............ 10
ETBM0580 Clients active HWM ........ 10
ETBM0580 NUM-SERVER ................ 0
ETBM0580 Servers active ............ 10
ETBM0580 Servers active HWM ........ 10
ETBM0580 NUM-CONVERSATION .......... 0
ETBM0580 Conversations active ...... 607
ETBM0580 Conversations active HWM .. 968
ETBM0580 NUM-LONG-BUFFER ........... 0
ETBM0580 Long buffers active ....... 0
ETBM0580 Long buffers active HWM ... 0
ETBM0580 NUM-SHORT-BUFFER .......... 0
ETBM0580 Short buffers active ...... 1219
ETBM0580 Short buffers active HWM .. 1928
ETBM0580 NUM-TOPIC ................. 0
ETBM0580 Topics active ............. 0
```

```
ETBM0580 NUM-PUBLISHER ............. 0
ETBM0580 Publishers active ......... 0
ETBM0580 Publishers active HWM ..... 0
ETBM0580 NUM-SUBSCRIBER ............ 0
ETBM0580 Subscribers active ........ 0
ETBM0580 Subscribers active HWM .... 0
ETBM0580 NUM-PUBLICATION ........... 0
ETBM0580 Publications active ....... 0
ETBM0580 Publications active HWM ... 0
ETBM0582 Function completed
```

ETBEND

Processing stops immediately. Current calls to the EntireX Broker are not allowed to finish.

ETBSTOP

Alias of `ETBEND`.

FLUSH

Flush all trace data kept in internal trace buffers to stderr (`SYSOUT`). The broker-specific attribute `TRMODE=WRAP` is required.

PSTORE TRACE

Modifies the trace level for the Adabas persistent store (Adabas-specific attribute `TRACE-LEVEL`).

Example

To set a trace level 2 for the Adabas persistent store

- Enter command:

```
/INTR tsn,PSTORE TRACE=2
```

See `TRACE-LEVEL` under *Broker Attributes* in the platform-independent administration documentation.

SHUTDOWN class,server,service

Shuts down the specified service immediately and stops all servers that have registered this service.

Example

To shutdown service `CLASS=RPC, SERVER=SRV1, SERVICE=CALLNAT`

- Enter command:

```
/INTR tsn,SHUTDOWN RPC,SRV1,CALLNAT
```

TRACE

Modifies the setting of the broker-specific attribute `TRACE-LEVEL`.

Sample Commands

To modify the trace level

- Enter command, for example:

```
/INTR tsn,TRACE=0
/INTR tsn,TRACE=1
/INTR tsn,TRACE=4
```

See `TRACE-LEVEL` under *Broker Attributes* in the platform-independent administration documentation.

TRAP-ERROR

Modifies the setting of the broker-specific attribute `TRAP-ERROR`.

Sample Command

To modify the setting for `TRAP-ERROR`

- Enter command:

```
/INTR tsn,TRAP-ERROR=nnnn
```

where *nnnn* is the four-digit API error number that triggers the trace handler.

See TRAP-ERROR under *Broker Attributes* in the platform-independent administration documentation.

Participant-specific Commands

Within EntireX Broker nomenclature, a participant is an application implicitly or explicitly logged on to the Broker as a specific user. A participant could act as client, server, publisher or subscriber. The following participant-specific commands are available:

- CANCEL parameter
- USERLIST
- USERS parameter

CANCEL parameter

Operator command `CANCEL` is used to delete participants from EntireX Broker. The following parameters are supported:

Parameter	Description
`[USER=]`*`user_id`*	Cancel all participants with the specified *`user_id`*. Non-persistent resources will be freed by the timeout manager. Prefix "`USER=`" is the default value and may be omitted.
`SEQNO=`*`seqno`*	Cancel the participant with the sequence number *`seqno`*. Non-persistent resources will be freed by the timeout manager. Operator commands `USERLIST` and `USERS` display sequence numbers of all selected participants.

Sample Commands

To cancel all participant entries of user "DOE"

- Enter command:

```
/INTR tsn,CANCEL DOE
```

Or:

```
/INTR tsn,CANCEL USER=DOE
```

To cancel participant with sequence number "11"

- Enter command:

```
/INTR tsn,CANCEL SEQNO=11
```

USERLIST

Operator command `USERLIST` displays a list of selected participant entries. The following parameters are supported:

Parameter	Description
none | *	Display all participants.
user_id	Display all participants with user ID *user_id*. Wildcard characters are supported.

Sample Commands

To display all participants

- Enter command:

```
/INTR tsn,USERLIST
```

Or:

```
/INTR tsn,USERLIST *
```

To display all participants with user ID "DOE"

- Enter command:

```
/INTR tsn,USERLIST DOE
```

This produces the following output. See *Description of USERLIST Output Columns* below.

```
ETBM0720 Operator typed in: USERLIST DOE
ETBM0687 Participants:
ETBM0687 USER-ID ----------------------- C S P U E CHR SEQNO
ETBM0687 DOE                            N Y N N Y ASC 1
ETBM0582 Function completed
```

To display all participants with user ID starting with uppercase "D"

- Enter command:

```
/INTR tsn,USERLIST D*
```

This produces the following output. See *Description of USERLIST Output Columns* below.

```
ETBM0720 Operator typed in: USERLIST D*
ETBM0687 Participants:
ETBM0687 USER-ID ------------------------ C S P U E CHR SEQNO
ETBM0687 DOE                             N Y N N Y ASC 1
ETBM0687 DOE1                            N Y N N Y EBC 2
ETBM0687 DOE2                            N Y N N Y EBC 3
ETBM0687 DOE3                            N Y N N Y EBC 4
ETBM0582 Function completed
```

To display all participants with 4-character user ID, starting with uppercase "D" and with uppercase "E" as third character

- Enter command:

```
/INTR tsn,USERLIST D?E?
```

This produces the following output. See *Description of USERLIST Output Columns* below.

```
ETBM0720 Operator typed in: USERLIST D?E?
ETBM0687 Participants:
ETBM0687 USER-ID ------------------------ C S P U E CHR SEQNO
ETBM0687 DOE1                            N Y N N Y EBC 2
ETBM0687 DOE2                            N Y N N Y EBC 3
ETBM0687 DOE3                            N Y N N Y EBC 4
ETBM0582 Function completed
```

Description of USERLIST Output Columns

Keyword	Description
USER-ID	User ID (32 bytes, case-sensitive). See USER-ID under *Broker ACI Fields*.
C	Client. Y Participant is a client, otherwise "N".
S	Server. Y Participant is a server, otherwise "N".
P	Publisher. Y Participant is a publisher, otherwise "N".

Keyword	Description
U	Subscriber. Y Participant is a subscriber, otherwise "N".
E	Big endian. Y Participant is on a big-endian machine. N Participant is on a little-endian machine.
CHR	Character set. ASC Participant is an ASCII user. EBC Participant is an EBCDIC user.
SEQNO	Sequence number of participant. Can be used for operator command CANCEL *parameter*.

USERS parameter

Operator command USERS displays selected user data of participant entries. The following parameters are supported:

Parameter	Description
none | *	Display all participants.
user_id	Display all participants with user ID *user_id*. Wildcard characters are supported.

Sample Commands

To display all participants

- Enter command:

```
/INTR tsn,USERS
```

Or:

```
/INTR tsn,USERS *
```

To display all participants with user ID "DOE"

- Enter command:

```
/INTR tsn,USERS DOE
```

This produces the following output. See *Description of USERS Output Columns* below.

```
ETBM0720 Operator typed in: USERS DOE
ETBM0687 Participants:
ETBM0687 USER-ID: DOE
ETBM0687 CLIENT: N SERVER: Y PUBLISHER: N SUBSCRIBER: N
ETBM0687 SEQNO: 6 BIG ENDIAN: Y CHARSET: ASCII PUID:
ETBM0687 202073756E6578322D2D303030303024646462D2D30303030303030303031
ETBM0687 TOKEN:
ETBM0582 Function completed
```

Description of USERS Output Columns

Keyword	Description
USER-ID	User ID (32 bytes, case-sensitive). See USER-ID under *Broker ACI Fields*.
CLIENT	Y Participant is a client, otherwise "N".
SERVER	Y Participant is a server, otherwise "N".
PUBLISHER	Y Participant is a publisher, otherwise "N".
SUBSCRIBER	Y Participant is a subscriber, otherwise "N".
BIG ENDIAN	Y Participant is on a big-endian machine. N Participant is on a little-endian machine.
CHARSET	ASC Participant is an ASCII user. EBC Participant is an EBCDIC user.
PUID	Internal unique ID of participant. Hexadecimal 28-byte value in printable format.
TOKEN	Optionally identifies the participant. See TOKEN under *Broker ACI Fields*.

Security-specific Commands

DSECSTAT

Displays the number of successful and failed Security authentications and Security authorizations.

Sample Output

```
ETBM0720 Operator typed in: DSECSTAT
ETBM0579 Security Authentications - successful: 20 failed: 0
ETBM0579 Security Authorizations  - successful: 0 failed: 0
```

RESET userid

Resets the Security context for the specified user ID.

Sample Output

```
ETBM0720 Operator typed in: RESET EXXBATCH
ETBM0578 Reset ACEE for SAF-ID EXXBATCH : 20 instances found
```

SECURITY TRACE

Modifies the trace level for the EntireX Security (security-specific attribute `TRACE-LEVEL`). Broker-specific attribute `SECURITY=YES` must be set.

Example

To set a trace level 2 for EntireX Security

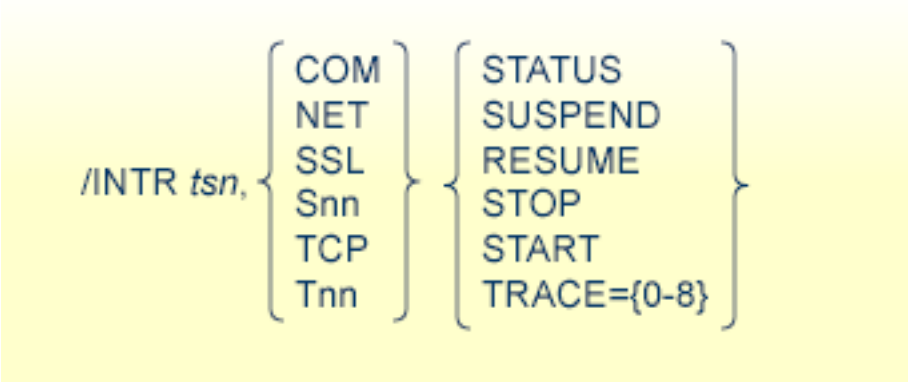
- Enter command:

```
/INTR tsn,SECURITY TRACE=2
```

See `TRACE-LEVEL` under *Broker Attributes* in the platform-independent administration documentation.

Transport-specific Commands

Transport-specific commands are available for Adabas/Entire Net-Work communicators, SSL communicators and TCP communicators; the `COM` command can be used for all communicators. The following command syntax applies:



COM parameter

This command is executed by all configured transport communicators. The following parameters are supported:

Parameter	Description
`STATUS`	Displays the current status of the transport communicator.
`SUSPEND`	Used to suspend the transport communicator. The transport communicator is halted but will not shut down. User requests receive response code 148.
`RESUME`	Resume a suspended transport communicator. If the communicator was not suspended before, an error message will be displayed.
`STOP`	Stop an active or suspended transport communicator. The transport communicator will shut down. All transport-specific resources will be freed. User requests receive response code 148.
`START`	Start a transport communicator that was previously stopped. If the communicator was not stopped before, an error message will be displayed.

`TRACE`	Sets the trace level for the transport method. If the global trace level (see `TRACE`) is set with command
	`/INTR tsn,TRACE=n`
	this applies to *all* transport methods. This command will also override any existing transport-specific settings. If you subsequently enter command
	`/INTR tsn, TCP TRACE=n`
	only the trace level for TCP/IP transport is modified.

Parameter	Description
	Note: With commands `TCP Tnn`, and `SSL` and `Snn`, the trace level is set for *all* TCP and SSL communicators respectively. Setting a trace level for a single TCP or SSL instance is not supported. For example: although it is possible to submit the command `/INTR tsn,T01 TRACE=1` this command sets the trace level for all TCP communicators.

Sample Output

```
ETBM0720 Operator typed in: COM STATUS
ETBW0718 TCP Communicator 0 currently active
ETBW0718 TCP Communicator 1 currently active
ETBW0718 SSL Communicator 0 currently suspended
ETBW0718 NET Communicator 0 currently suspended
XCO0039I 00113 Total number of commands = 17
XCO0057I 00113 Operator entry active
ETBM0720 Operator typed in: COM SUSPEND
ETBM0721 TCP Communicator 0 suspended
ETBM0721 TCP Communicator 1 suspended
ETBM0721 SSL Communicator 0 suspended
ETBM0721 NET Communicator 0 suspended
```

NET parameter

This command is executed by X-COM, the Adabas/Entire Net-Work communicator. See command `COM` above for a list of supported parameters.

Sample Output

```
ETBM0720 Operator typed in: NET STATUS
ETBW0718 NET Communicator 0 currently active
XCO0039I 00113 Total number of commands = 17
XCO0057I 00113 Operator entry active
```

SSL parameter

This command is executed by all SSL communicators. See command `COM` above for a list of supported parameters.

Sample Output

```
ETBM0720 Operator typed in: SSL STATUS
ETBW0718 SSL Communicator 0 currently active
```

To manipulate a specific communicator instance (max. five instances can be started), use the command `S00`, `S01`, `S02`, `S03` or `S04` for the respective SSL instance.

TCP parameter

This command is executed by TCP communicators. See command `COM` above for a list of supported parameters.

Sample Output

```
ETBM0720 Operator typed in: TCP STATUS
ETBW0718 TCP Communicator 0 currently active
ETBW0718 TCP Communicator 1 currently active
```

```
ETBM0720 Operator typed in: TCP RESUME
ETBM0721 TCP Communicator 0 resumed
ETBM0721 TCP Communicator 1 resumed
```

To manipulate a specific communicator instance (max. five instances can be started), use the command `T00`, `T01`, `T02`, `T03` or `T04` for the respective TCP instance.

Sample Output

```
ETBM0720 Operator typed in: T00 STATUS
ETBW0718 TCP Communicator 0 currently active
```

```
ETBM0720 Operator typed in: T01 STATUS
ETBW0718 TCP Communicator 1 currently active
```

Sample Transport Commands

To display status of all transport communicators

- Enter command:

```
/INTR tsn,COM STATUS
```

To suspend first TCP communicator

- Enter command:

```
/INTR tsn,TOO SUSPEND
```

To stop all SSL transport communicators

- Enter command:

```
/INTR tsn,SSL STOP
```

XCOM-specific Commands

Note: All operator commands beginning with "X" belong to X-COM, the Adabas/Entire Net-Work communicator. The following commands operate only on the Adabas transport mechanism: `XCQES`, `XHALT`, `XPARM`, `XSTART`, `XSTAT` and `XUSER`. These commands have no effect on functions not related to the Adabas transport mechanism.

`XEND` and `XSTOP` function independently of the transport mechanism. (They stop the Broker's processing immediately, whereby existing calls to the EntireX Broker are not allowed to finish.)

XABS

Displays the current number, and the highest number, of used bytes in the Adabas attached buffer pool to the console.

Note: This command operates on the Adabas transport mechanism only. It has no effect on functions not related to the Adabas transport mechanism.

Sample Output

```
ETBM0720 Operator typed in: XABS
XC00090I 00113 Attached buffer usage
XC00091I 00113 Number of bytes in use = 0
XC00092I 00113 Highest number of bytes in use = 6400
```

XCQES

Displays the current number, and the highest number, of Adabas command queue elements to the console.

Note: This command operates on the Adabas transport mechanism only. It has no effect on functions not related to the Adabas transport mechanism.

Sample Output

```
ETBM0720 Operator typed in: XCQES
XC00030I 00113 Number of active CQEs = 0
XC00031I 00113 Highest number of active CQEs = 1
```

XEND

Alias of ETBEND.

XHALT

New calls to the EntireX Broker are temporarily rejected. Processing is resumed by issuing the XSTART operator command. XHALT is an alias for command NET SUSPEND.

Note: This command operates on the Adabas transport mechanism only. It has no effect on functions not related to the Adabas transport mechanism.

Sample Output

```
ETBM0720 Operator typed in: XHALT
ETBM0721 NET Communicator 0 suspended
```

XPARM

Displays the values of Adabas SVC, database ID, number of CQEs, number of attached buffers, and the application name for the Adabas transport to the console.

Note: This command operates on the Adabas transport mechanism only. It has no effect on functions not related to the Adabas transport mechanism.

Sample Output

```
ETBM0720 Operator typed in: XPARM
XC00032I 00113 Parameters for this session:
XC00033I 00113 SVC = 249
XC00034I 00113 NODE = 00113
XC00035I 00113 NCQE = 00100
XC00036I 00113 NABS = 10000
XC00037I 00113 User application = ETBNUC
```

XSTART

Processing of new calls to the EntireX Broker, interrupted with the XHALT command, is resumed. XSTART is an alias of command NET RESUME.

Note: This command operates on the Adabas transport mechanism only. It has no effect on functions not related to the Adabas transport mechanism.

Sample Output

```
ETBM0720 Operator typed in: XSTART
ETBM0721 NET Communicator 0 resumed
```

XSTAT

Displays the EntireX Broker statistics as console messages.

Note: This command operates on the Adabas transport mechanism only. It has no effect on functions not related to the Adabas transport mechanism.

XSTOP

Alias of ETBEND.

XUSER

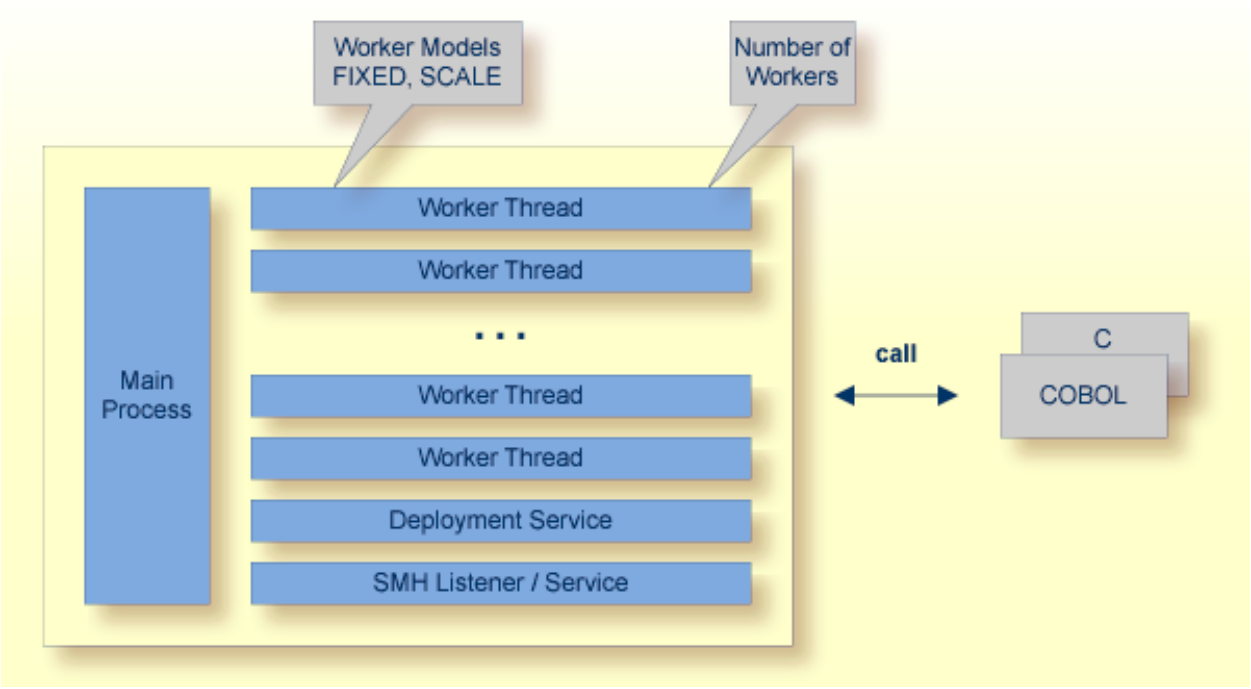
Displays the current number, as well as the highest number, of users actively issuing commands using the Adabas transport mechanism to the console.

Note: The number of users displayed with this operator command will not represent all of the Broker clients and servers but only the subset of users issuing commands using the Adabas transport mechanism. Command and Information Services provides comprehensive information about all Broker clients and servers.

5 Introduction to the BS2000/OSD Batch RPC Server

The EntireX BS2000/OSD Batch RPC Server allows standard RPC clients to communicate with RPC servers on the operating system BS2000/OSD. It supports the programming languages COBOL and C.

Worker Models



RPC requests are worked off inside the RPC server in worker threads, which are controlled by a main thread. Every RPC request occupies during its processing a worker thread. If you are using RPC conversations, each RPC conversation requires its own thread during the lifetime of the conversation. The BS2000/OSD Batch RPC Server provides two worker models:

- `FIXED`
  The *fixed* model creates a fixed number of worker threads. The number of worker threads does not increase or decrease during the lifetime of an RPC server instance.
- `SCALE`
  The *scale* model creates worker threads depending on the incoming load of RPC requests.

  A maximum number (`thru` value of the `workermodel` parameter) of worker threads created can be set to restrict the system load. The minimum number (`from` value of the `workermodel` parameter), allows you to define a certain number of threads - not used by the currently executing RPC request - to wait for new RPC client requests to process. In this way the RPC server is ready to handle many RPC client requests arriving at the same time.

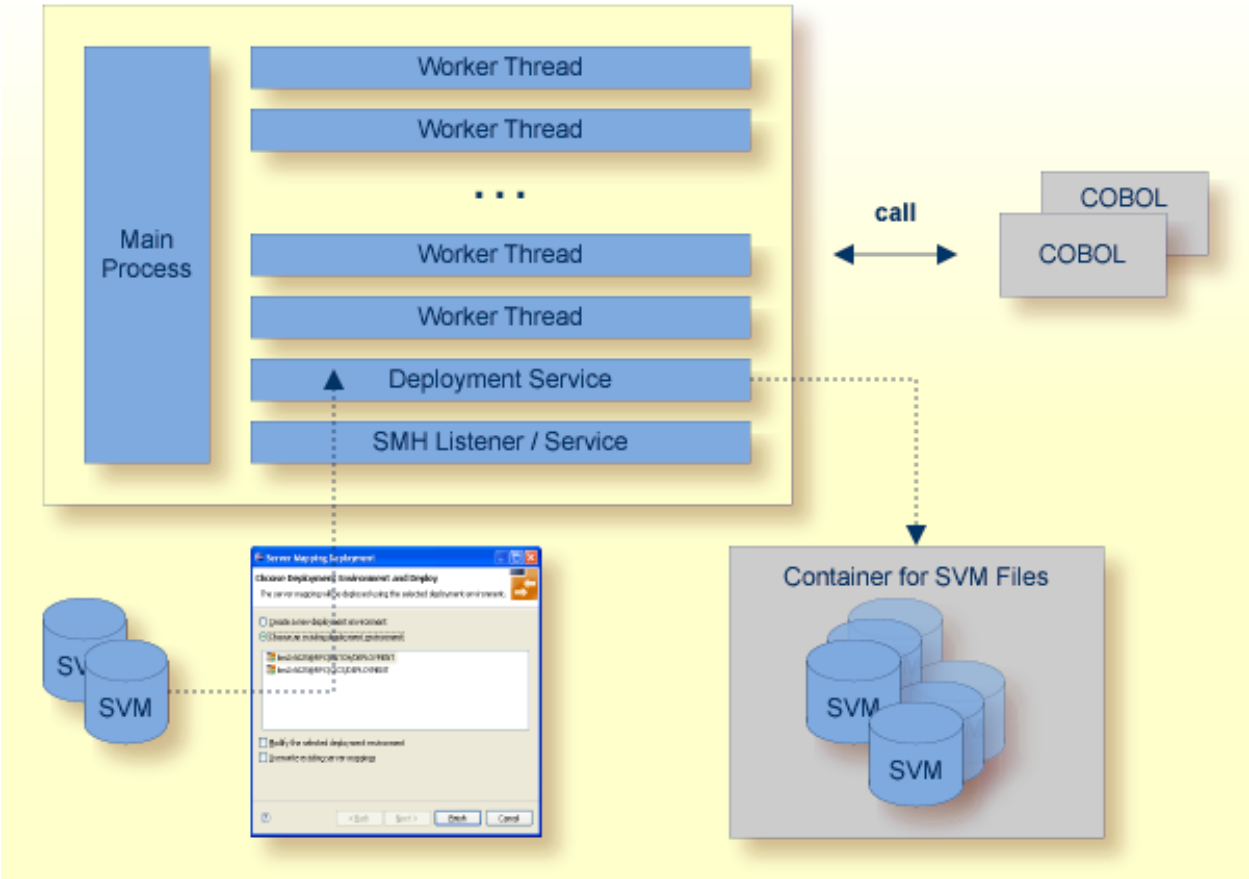
Inbuilt Services

BS2000/OSD Batch RPC Server provides the following services for ease-of-use:

- Deployment Service
- Extractor Service
- SMH Listener Service

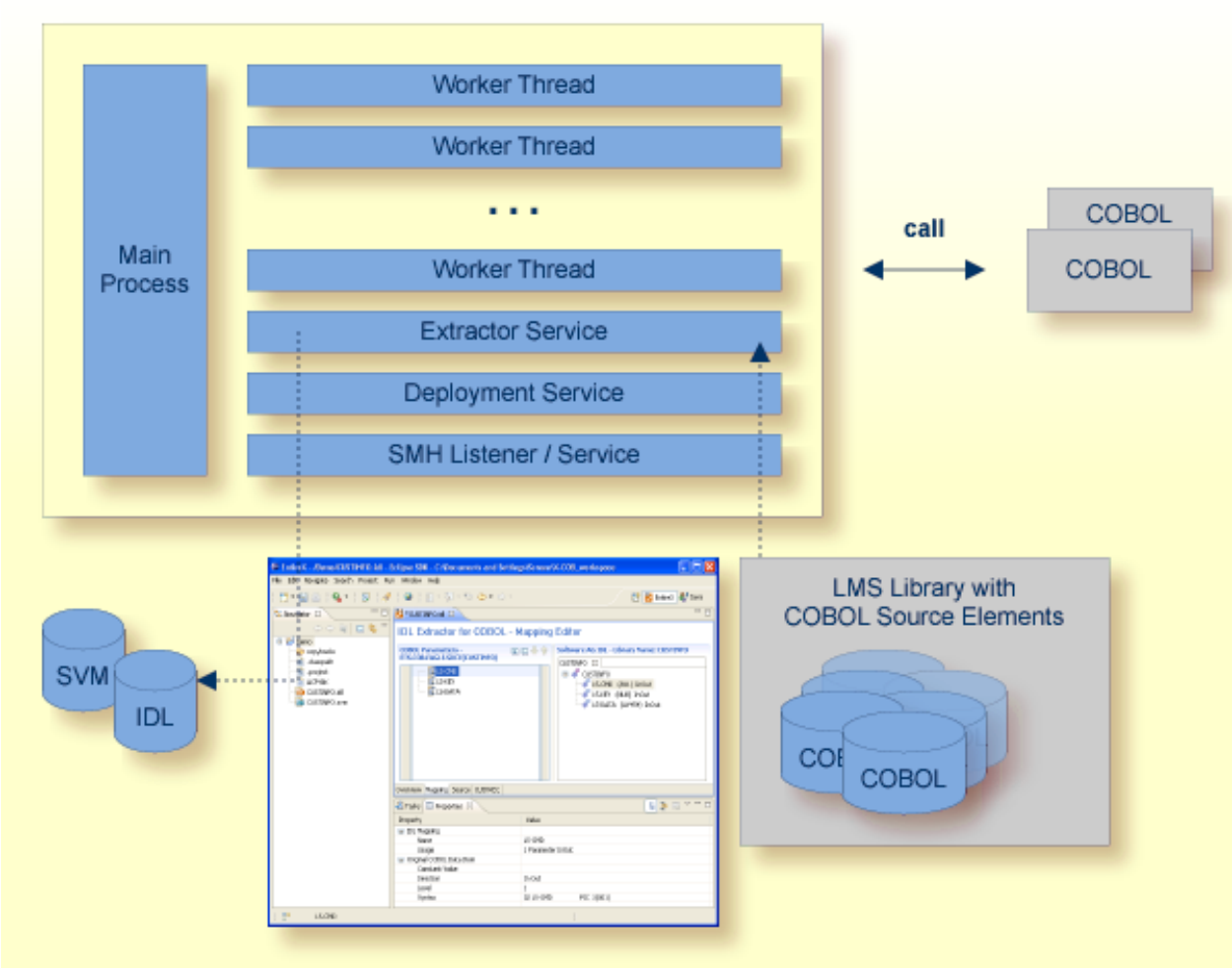
Deployment Service

The Deployment Service allows you to deploy server mapping files (SVM files) interactively using the Deployment Wizard (see *Server Mapping Deployment*). On the RPC server side, the SVM files are stored in an ISAM file as the container. See ***Deployment Service under BS2000/OSD*** for configuration information.



Extractor Service

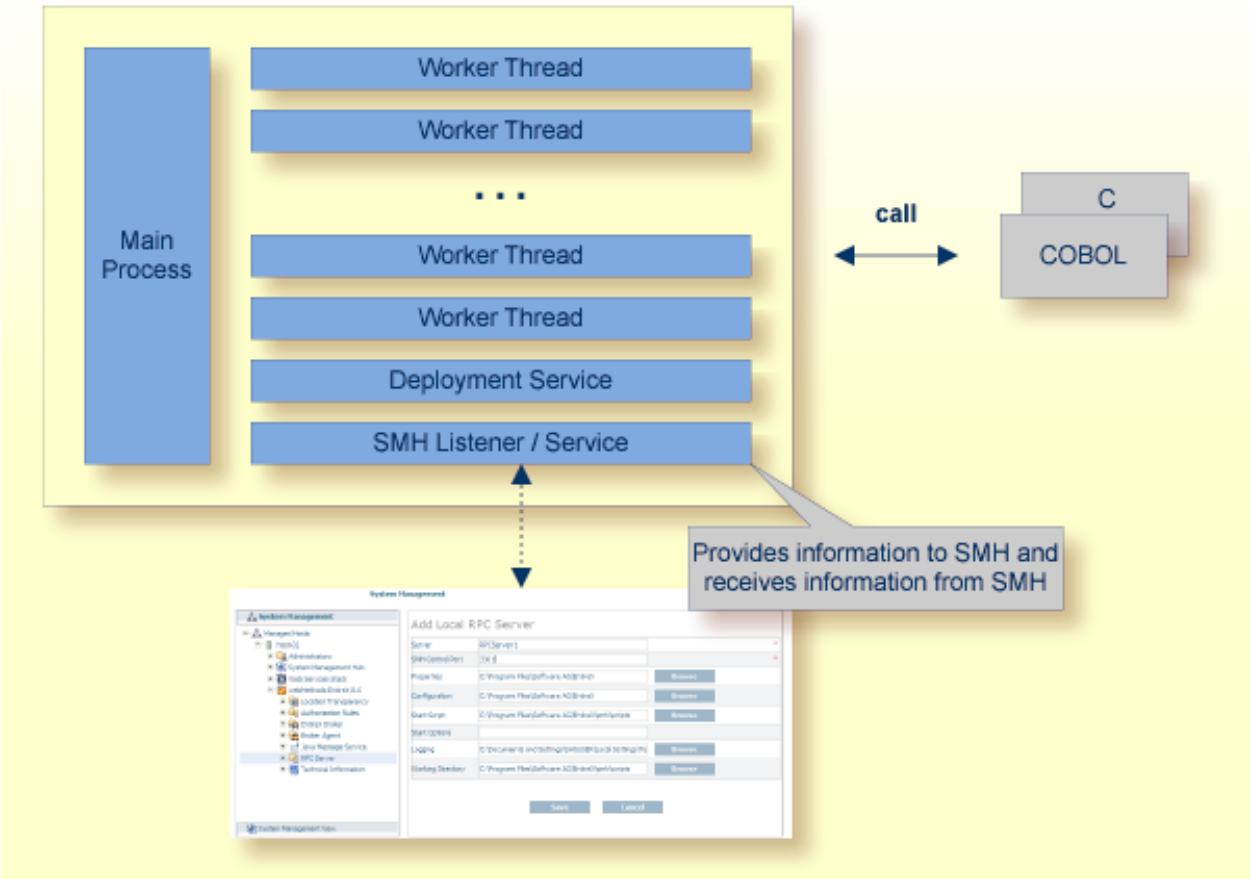
The Extractor Service is a prerequisite for remote extractions with the *IDL Extractor for COBOL* and *IDL Extractor for PL/I*. See ***Extractor Service under BS2000/OSD*** for more information.



SMH Listener Service

With the SMH Listener Service you use the System Management Hub to monitor the RPC server. See *Administering the EntireX RPC Servers using System Management Hub* in the UNIX and Windows administration documentation.

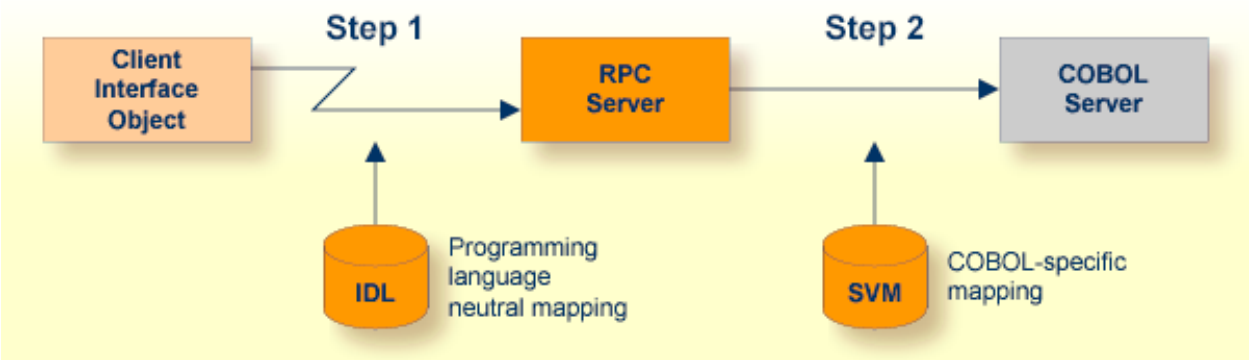
The SMH Service is switched on if the parameter `smhport` is set. See parameter `smhport` under *Configuring the RPC Server*.



Usage of SVM Files

The BS2000/OSD Batch RPC Server is optimized to call COBOL servers originally written for Fujitsu Siemens. For this purpose, the RPC server requires in many situations a server mapping file (SVM).

SVM files contain COBOL-specific mapping information that is not included in the IDL file and therefore *not* sent by an EntireX RPC client to the RPC server. See also ***When is an SVM File Required?*** under ***Handling SVM Files under BS2000/OSD***.



The RPC server marshalls the data in a two-step process: the RPC request coming from the RPC client (Step 1) is completed with COBOL-specific mapping information taken from the SVM file (Step 2). In this way the COBOL server can be called as expected.

The SVM files are retrieved as a result of the *IDL Extractor for COBOL* extraction process and the *COBOL Wrapper* if a COBOL server is generated.

Note: SVM files are used for COBOL only.

6 Administering the BS2000/OSD Batch RPC Server

The EntireX BS2000/OSD Batch RPC Server allows standard RPC clients to communicate with RPC servers on the operating system BS2000/OSD. It supports the programming languages COBOL and C.

Customizing the RPC Server

The following elements are used for setting up the BS2000/OSD Batch RPC Server:

- Common Runtime Environment (CRTE)
- Configuration File
- Start Procedure

Common Runtime Environment (CRTE)

When the BS2000/OSD Batch RPC Server calls COBOL or C server programs, the BS2000/OSD Common Runtime Environment (CRTE) is loaded dynamically into the corresponding address space of the worker task.

There is no need to bind the CRTE statically to the called server object modules. 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 occupy resources and slow down the load time of the server object modules.

The CRTE is not delivered with this package. For a detailed description, see the *CRTE (BS2000/OSD) User's Guide*.

Configuration File

The name of the delivered example configuration file is "RPC-CONFIG". The configuration file contains the configuration for the BS2000/OSD Batch RPC Server. The following settings are important:

- connection information such as broker ID, server address (class, name, service)
- location and usage of server mapping file
- scalability parameters
- trace settings
- etc.

For more information see ***Configuring the RPC Server***.

Start Procedure

The name of the start S-procedure for the BS2000/OSD Batch RPC Server is "START-RPC-SERVER". The start procedure contains the following:

- the location of the Common Runtime Environment (CRTE)
- the target server library name of the called COBOL or C server
- the configuration file used; see *Configuration File*
- etc.

Configuring the RPC Server

The following rules apply:

- Underscored letters in a parameter indicate the minimum number of letters that can be used for an abbreviated command.

  For example, in `brokerid=localhost`, `brok` is the minimum number of letters that can be used as an abbreviation, i.e. the commands/parameters `broker=localhost` and `brok=localhost` are equivalents.

Parameter	Default	Values	Req/ Opt
`brokerid`	`localhost`	Broker ID used by the server. See *Using the Broker ID in Applications* in the RPC Programming documentation. Example: `brokerid=myhost.com:1971`	R
`class`	`RPC`	Server class part of the server address used by the server. The server address must be defined as a service in the broker attribute file (see *Service-specific Attributes* (`DEFAULTS=SERVICE`) under *Broker Attributes* in the platform-independent administration documentation). Case-sensitive, up to 32 characters. Corresponds to `CLASS`. Example: `class=MyRPC`	R
`codepage`	no codepage transferred	Depending on the internationalization approach, the codepage (locale string) where incoming data is provided to the COBOL server. Conversely, the COBOL server must provide outgoing data in the given codepage, otherwise unpredictable results	R

Parameter	Default	Values	Req/ Opt
		occur. See *What is the Best Internationalization Approach to use?* under *Internationalization with EntireX* for information on which internationalization approach requires a codepage (locale string). By default, no codepage is transferred to the broker. For the most popular internationalization approach, *ICU Conversion* under *Introduction to Internationalization*, the correct codepage (locale string) must be provided. This means it must: ■ follow the rules described under *Locale String Mapping* in the internationalization documentation ■ be a codepage supported by the broker ■ be the codepage used in your environment for file and terminal IO, otherwise unpredictable results may occur. Example: `codepage=EDF041`	

`compresslevel`	`N`	Enforce compression when data is transferred between broker and server. See *Data Compression in EntireX Broker* in the general administration documentation.
		
		`compresslevel= 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8| 9 | Y | N`
		
		`0-9` 0=no compression
		9=max. compression
		`N` No compression.
		`Y` Compression level 6.
		
		Example:
		`compresslevel=6`
			O

`deployment`	`NO`	Activates the deployment service, see ***Deployment Service under BS2000/OSD***. Required to use the deployment wizard. See *Server Mapping Deployment Wizard* in the COBOL Wrapper documentation. `YES` Activates the deployment service. The RPC server registers the deployment service in the broker.	O

Parameter	Default	Values	Req/ Opt
		NO The deployment service is deactivated. The RPC server does not register the deployment service in the broker. Example: deployment=yes	
encryptionlevel	0	Enforce encryption when data is transferred between client and server. Requires EntireX Security. See ENCRYPTION-LEVEL under *Broker ACI Fields*. 0 Encryption is enforced. 1 Encryption is enforced between server and broker kernel. 2 Encryption is enforced between server and broker kernel, and also between client and broker. Example: encryptionlevel=2	O
init_exit		Initialization exit. The BS2000/OSD Batch RPC Server provides user exits that allow you to plug in code during initialization and to terminate RPC worker tasks. This parameter specifies the name of an executable module that is loaded and executed during initialization of each worker task. See also *term_exit*. Example: init_exit=myExit	O
extractor	NO	The extractor service is a prerequisite for remote extractions. See ***Extractor Service under BS2000/OSD***. extractor=YES|NO Example: extractor=yes	O
logon	YES	Execute broker functions LOGON/LOGOFF in worker threads. Must match the setting of the broker attribute AUTOLOGON. Reliable RPC requires logon set to YES. See *Reliable RPC*. NO No logon/logoff functions are executed. YES Logon/logoff functions are executed. Example:	O

Parameter	Default	Values	Req/ Opt
		`logon=no`	
`marshalling`	`COBOL`	The BS2000/OSD Batch RPC Server can be configured to support either COBOL or C. See also ***Locating and Calling the Target Server***. `marshalling=(LANGUAGE=COBOL|C)` `COBOL` The BS2000/OSD Batch RPC Server supports COBOL. The COBOL servers are called directly without a server interface object. The COBOL server modules may be compiled as OM or LLM modules. So-called server mapping (SVM) files are used to call the COBOL server correctly if one is available. See *Server Mapping Deployment*. `C` The BS2000/OSD Batch RPC Server supports C. The modules are called using a server interface object built with the *C Wrapper*.	O
`password`	no default	Password for broker logon. Case-sensitive, up to 32 characters. For more information see broker ACI control block field `PASSWORD`. Example: `password=MyPwd`	O
`restartcycles`	15	Number of restart attempts if the broker is not available. This can be used to keep the BS2000/OSD Batch RPC Server running while the broker is down for a short time. A restart cycle will be repeated at an interval which is calculated as follows: `timeout` + `ETB_TIMEOUT` + 60 seconds where `timeout` is the RPC server parameter (see this table), and `ETB_TIMEOUT` is the environment variable (see *Environment Variables in EntireX* in the general administration documentation) When the number of cycles is reached and a connection to the broker is not possible, the RPC server stops. Example: `restartcycles=30`	O

Parameter	Default	Values	Req/ Opt
servername	SRV1	Server name part of the server address used by the server. The server address must be defined as a service in the broker attribute file. See *Service-specific Attributes* (DEFAULTS=SERVICE) under *Broker Attributes* in the platform-independent administration documentation. Case-sensitive, up to 32 characters. Corresponds to SERVER of the broker attribute file. Example: servername=mySrv	R
service	CALLNAT	Service part of the server address used by the server. The server address must be defined as a service in the broker attribute file. See *Service-specific Attributes* (DEFAULTS=SERVICE) under *Broker Attributes* in the platform-independent administration documentation. Case-sensitive, up to 32 characters. Corresponds to SERVICE attribute of the broker attribute file. Example: service=MYSERVICE	R
smhport	0	The port where the server listens for commands from the System Management Hub (SMH). If this port is 0 (default), no port is used and management by the SMH is disabled. Example: smhport=3001	O
svm	PREFERRED	Usage of SVM files. SVM=PREFERRED|NO PREFERRED This setting is to support COBOL servers built with the EntireX Workbench that do not have a server mapping file (SVM), plus COBOL servers built with an SVM file. If an SVM file is found, it is used to unmarshal the data and call the server. If no SVM file is found, the BS2000/OSD Batch RPC Server tries to unmarshal the data without the SVM file and call the server. This is the default. NO Server mapping files (SVMs) are not used to unmarshal the data. The BS2000/OSD Batch RPC Server tries to	O

Parameter	Default	Values	Req/ Opt
		unmarshal the data without the SVM file and call the server. Example for BS2000/OSD: `SVM=NO`	
`term_exit`		Termination exit. The BS2000/OSD Batch RPC Server provides user exits that allow you to plug in code during initialization and terminate RPC worker tasks. This parameter specifies the name of an executable module that is loaded and executed during termination of each worker task. See also *`init_exit`*. Example: `term_exit=myExit`	O
`timeout`	60	Timeout in seconds, used by the server to wait for broker requests. See broker ACI control block field `WAIT` for more information. Also influences `restartcycles`. Example: `timeout=300`	O
`tracedestination`	`ERXTrace.nnn.log`	Trace output is written to SYSOUT.	O

`tracelevel`	`None`	Trace level for the server. See also ***Activating Tracing for the RPC Server***.
		
		`tracelevel = None | Standard | Advanced ↩ | Support`
		
		`None` No trace output.
		`Standard` For minimal trace output.
		`Advanced` For detailed trace output.
		`Support` This trace level is for support diagnostics and should only be switched on when requested by Software AG support.
		
		Example:
		`tracelevel=standard`
			O

`userid`	`ERX-SRV`	Used to identify the server to the broker. See broker ACI control block field `USER-ID`. Case-sensitive, up to 32 characters. Example: `userid=MyUid`	R

<table>
<tr><th>Parameter</th><th>Default</th><th>Values</th><th>Req/ Opt</th></tr>
<tr><td>workermodel</td><td>SCALE,1,3,slowshrink</td><td>The BS2000/OSD Batch RPC Server can be configured to

■ adjust the number of worker threads to the current number of client requests:

<pre>workermodel=(SCALE,from,thru
              [,slowshrink ↩
| fastshrink])</pre>■ use a fixed number of worker threads:

<pre>workermodel=(FIXED,number)</pre>
<table>
<tr><td>FIXED</td><td>A fixed number of worker threads is used by the BS2000/OSD Batch RPC Server.</td></tr>
<tr><td>SCALE</td><td>The number of worker threads is adjusted to the current number of client requests. With the from value, the minimum number of active worker threads can be set. The thru value restricts the maximum number of worker threads.</td></tr>
<tr><td></td><td>slowshrink: The RPC server stops all worker threads not used in the time specified by the timeout parameter, except for the number of workers specified as minimum value. This is the default if SCALE is used.</td></tr>
<tr><td></td><td>fastshrink: The RPC server stops worker threads immediately as soon as it has finished its conversation, except for the number of workers specified as minimum value.</td></tr>
</table>
Example:
workermodel=(SCALE,2,5)</td><td>O</td></tr>
</table>

Locating and Calling the Target Server

Target server programs are loaded dynamically, using the BS2000 BLSLIB chain. The target server library name needs to be set up as `PROGRAM-LIB` in the parameter declaration section of the START-RPC-SERVER S-procedure, see ***Start Procedure***. Depending on the setting of the parameter `marshalling`, the BS2000/OSD Batch RPC Server supports COBOL object modules or C object modules.

COBOL

The approach used to derive the COBOL object module name for the RPC server depends on whether so-called server mapping files are used or not. See *Usage of SVM Files* in the BS2000/OSD administration documentation for an introduction.

- If SVM files are used, the IDL library and IDL program names are used to form a key to locate the SVM entry in the SVM container. If an SVM entry is found, the COBOL object module name of the RPC server is derived from the SVM entry. In this case the IDL program name can be different to the COBOL object module name if it is renamed during the wrapping process (see *Customize Automatically Generated Server Names*) or during the extraction process in the COBOL Mapping Editor (see *The Software AG IDL Tree Pane*).
- If no SVM files are used at all, the IDL program name is used as the COBOL object module name of the RPC server (the IDL library name is ignored).

See also *Scenario I: Calling an Existing COBOL Server* in the BS2000/OSD administration documentation or *Scenario II: Writing a New COBOL Server* in the BS2000/OSD administration documentation,

C

See *Scenario III: Writing a New C Server* in the BS2000/OSD administration documentation.

Starting the RPC Server

To start the BS2000/OSD Batch RPC Server

- Use the following SDF command:

```
/ENTER-PROCEDURE *LIB(LIB=EXP960.JOBS,ELE=START-RPC-SERVER), -
/JOB-NAME=RPCMAIN,LOG=*NO
```

Stopping the RPC Server

To stop the BS2000/OSD Batch RPC Server using System Management Hub

- Use the RPC server agent in the SMH to stop the BS2000/OSD Batch RPC Server.

To stop the BS2000/OSD Batch RPC Server from a privileged user ID

- Enter the command:

```
/INFORM-PROGRAM MSG='STOP',JOB-IDENTIFICATION=*TSN(TSN=tsn)
```

where *tsn* is the task number associated with the BS2000/OSD Batch RPC Server main task (in the example above the TSN of RPCMAIN)

All other tasks that were created as a result of starting the batch RPC server will be stopped automatically.

To stop the BS2000/OSD Batch RPC Server from an operator console

- Enter the command:

```
/INTR tsn,STOP
```

where *tsn* is the task number associated with the BS2000/OSD Batch RPC Server main task (in the example above the TSN of RPCMAIN)

All other tasks that were created as a result of starting the batch RPC server will be stopped automatically.

To stop the BS2000/OSD Batch RPC Server from a non-privileged user ID

- Use S-procedure STOP-RPC-SERVER in EXP960.JOBS.

Startup Parameter	Description	Default

BROKER-ID	Depending on the communication method, the broker ID can be specified in two different formats:
	■ **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**
	`ETBnnn:SVCmmm:NET`
	where *nnn* is the ID under which EntireX Broker is connected to the Adabas ID table,
	mmm is the SVC number under which the Adabas ID table can be accessed, and
	NET is the protocol name
		none

CLASS	The class name under which the RPC server is registered at the EntireX Broker.	RPC
SERVER	The server name under which the RPC server is registered at the EntireX Broker.	SRV1
SERVICE	The service name under which the RPC server is registered at the EntireX Broker.	CALLNAT
USERID	If EntireX Broker is running with EntireX Security, a user ID needs to be supplied	none
PASSWORD	If EntireX Broker is running with EntireX Security, a password needs to be supplied	none
EXX-JOBS	EntireX Broker jobs library	EXX960.JOBS
EXX-LIB	EntireX Broker module library	EXX960.LIB
WAL-MOD	WAL module library	WAL826.MOD

Set the broker ID in the `PARAMETER-DECLARATION` section and enter following command:

```
/CALL-PROCEDURE (EXP960.JOBS, STOP-RPC-SERVER)
```

Activating Tracing for the RPC Server

To switch on tracing for the RPC server

- Set the parameter `TRACELEVEL` in S-element `RPC-CONFIG` in `EXP960.JOBS`.

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

7 Broker Shutdown Statistics

Shutdown Statistics Output

After a successful Broker execution, shutdown statistics and related information are produced. This output is written in the following sequence:

1. The diagnostic message ETBD0444 is written into the Broker trace log.
2. The output - i.e. statistics, internals and user-specified parameters - is written into the end of the Broker trace log file at shutdown.

Table of Shutdown Statistics

See *Legend* below for explanation of output type.

Output Type	Display Field	Description
U	Broker ID	Identifies the Broker kernel to which the attribute file applies. See `BROKER-ID`.
I	Version	The version of the Broker kernel currently running.
I	Generated platform family	The platform family for which this Broker kernel was built.
I	Runtime platform	The platform on which this Broker kernel is currently running.
I	Start time	The date and time when this Broker kernel started.
S	Restart count	The restart count indicates how many times the Broker kernel has been started with the persistent store. Therefore, after a cold start `(PSTORE=COLD)`, the restart count will be 1. Then, after subsequent hot starts `(PSTORE=HOT)`, the restart count will be 2 or greater.
U	Trace level	The value for the trace setting for this Broker kernel. See `TRACE-LEVEL`.
U	Worker tasks	The number of worker tasks for this Broker kernel. See `NUM-WORKER`.
U	MAX-MEMORY	The value of `MAX-MEMORY` or 0 if not defined. See `MAX-MEMORY`.
S	Memory allocated	Size of the allocated memory, in bytes.
S	Memory allocated HWM	Highest size of allocated memory in bytes since Broker started.
U	NUM-SERVICE	Value of `NUM-SERVICE` or 0 if not defined. See `NUM-SERVICE`.
S	Services active	The number of services currently active for this Broker kernel.
U	NUM-CLIENT	Value of `NUM-CLIENT` or 0 if not defined. See `NUM-CLIENT`.
S	Clients active	The number of clients currently active for this Broker kernel.
S	Clients active HWM	The high watermark for the number of clients active for this Broker kernel.

Output Type	Display Field	Description
U	NUM-SERVER	Value of NUM-SERVER or 0 if not defined. See NUM-SERVER.
S	Servers active	The number of servers currently active for this Broker kernel.
S	Servers active HWM	The high watermark for the number of servers active for this Broker kernel.
U	NUM-CONVERSATION	Value of NUM-CONVERSATION or 0 if not defined. See NUM-CONVERSATION.
S	Conversations active	The number of conversations currently active for this Broker kernel.
S	Conversations active HWM	The high watermark for the number of conversations active for this Broker kernel.
U	NUM-LONG-BUFFER	Value of NUM-LONG-BUFFER or 0 if not defined. See NUM-LONG-BUFFER.
S	Long buffers active	The number of long message buffers currently in use for this Broker kernel.
S	Long buffers active HWM	The high watermark for the number of long message buffers used for this Broker kernel.
U	NUM-SHORT-BUFFER	Value of NUM-SHORT-BUFFER or 0 if not defined. See NUM-SHORT-BUFFER.
S	Short buffers active	The number of short message buffers currently in use for this Broker kernel.
S	Short buffers active HWM	The high watermark for the number of short message buffers used for this Broker kernel.
U	NUM-TOPIC	Value of NUM-TOPIC or 0 if not defined. See NUM-TOPIC.
S	Topics active	The number of topics currently active for this Broker kernel.
U	NUM-PUBLISHER	Value of NUM-PUBLISHER or 0 if not defined.
S	Publishers active	The number of publishers currently active for this Broker kernel.
S	Publishers active HWM	The high watermark for the number of publishers active for this Broker kernel.
U	NUM-SUBSCRIBER	Value of NUM-SUBSCRIBER or 0 if not defined. See NUM-SUBSCRIBER.
S	Subscribers active	The number of subscribers currently active for this Broker kernel.
S	Subscribers active HWM	The high watermark for the number of subscribers active for this Broker kernel.
U	NUM-PUBLICATION	Value of NUM-PUBLICATION or 0 if not defined. See NUM-PUBLICATION.
S	Publications active	The number of publications currently active for this Broker kernel.
S	Publications active HWM	The high watermark for the number of publications active for this Broker kernel.

Output Type	Display Field	Description
U	Persistent store type	The type of persistent store used by this Broker kernel. See PSTORE-TYPE.
U	UOW persistence	Indicates whether units of work are persistent or not in this Broker kernel. See STORE.
U	Persistent store startup	Indicates the status of the persistent store at Broker startup. See PSTORE.
U	Persistent status lifetime	The multiplier to compute the lifetime of the persistent status. See UWSTATP.
U	Deferred UOWs allowed	Indicates whether or not deferred units of work are allowed. See DEFERRED.
U	Maximum allowed UOWs	The maximum number of units of work that can be active concurrently for this Broker kernel. See MAX-UOWS.
U	Maximum messages per UOW	The maximum number of messages allowed in a unit of work. See MAX-MESSAGES-IN-UOW.
U	UOW lifetime in seconds	Indicates the default lifetime for a unit of work. See UWTIME.
U	Maximum message length	Indicates the maximum message size that can be sent. See MAX-UOW-MESSAGE-LENGTH.
U	New UOW messages allowed	Indicates whether or not new units of work are allowed in this Broker kernel. See NEW-UOW-MESSAGES.
S	UOWs active	The number of units of work currently active in this Broker kernel.
S	Current UOW	The number of the last unit of work in this Broker kernel.
U	Accounting	Indicates the status of accounting records in this Broker kernel. See ACCOUNTING.
U	SSL port *	If applicable, the SSL port number on which this Broker kernel will listen for connection requests. See SSLPORT.
U	TCP port *	If applicable, the TCP port number on which this Broker kernel will listen for connection requests. See TCPPORT.
I	Number of function calls	Marks the beginning of the section of summary statistics for all the function calls.
S	DEREGISTER	The number of Broker DEREGISTER function calls since startup.
S	EOC	The number of Broker EOC function calls since startup.
S	KERNELVERS	The number of Broker KERNELVERS function calls since startup.
S	LOGOFF	The number of Broker LOGOFF function calls since startup.
S	LOGON	The number of Broker LOGON function calls since startup.
S	RECEIVE	The number of Broker RECEIVE function calls since startup.
S	REGISTER	The number of Broker REGISTER function calls since startup.
S	SEND	The number of Broker SEND function calls since startup.
S	SYNCPOINT	The number of Broker SYNCPOINT function calls since startup.

Output Type	Display Field	Description
S	UNDO	The number of Broker UNDO function calls since startup.
S	CONTROL_PUBLICATION	The number of Broker CONTROL_PUBLICATION function calls since startup.
S	RECEIVE_PUBLICATION	The number of Broker RECEIVE_PUBLICATION function calls since startup.
S	SEND_PUBLICATION	The number of Broker SEND_PUBLICATION function calls since startup.
S	SUBSCRIBE	The number of Broker SUBSCRIBE function calls since startup.
S	UNSUBSCRIBE	The number of Broker UNSUBSCRIBE function calls since startup.
S	REPLY_ERROR	The number of Broker REPLY_ERROR function calls since startup.
I	Worker task statistics	Marks the beginning of the section of summary statistics for all the worker tasks.
I	Worker number	The identifier of the worker task.
I	Status	The status of the worker task at shutdown.
S	# of calls	The number of Broker calls handled by the worker task since startup.
S	Idle time in seconds	The number of seconds the worker task has been idle since startup.

* Does not apply to z/OS.

Legend

Output Type	Description	Value	Origin of Value
I	Internal Information	Static	Determined by Software AG EntireX.
S	Shutdown Statistic	Variable	Determined by Broker activity during execution.
U	User-Specified Parameter	Variable	Specified by Broker administrator before or, if allowable, during execution.

8 Command Logging in EntireX

Command logging is a feature to assist in debugging Broker ACI applications. A command in this context represents one user request sent to the Broker and the related response of Broker.

Command logging is a feature that writes the user requests and responses to file in a way it is already known with Broker trace and `TRACE-LEVEL=1`. But command logging works completely independent from trace, and data is written to a file only if defined command trace filters detect a match.

Broker stub applications send commands or requests to the Broker kernel, and the Broker kernel returns a response to the requesting application. Developers who need to resolve problems in an application need access to those request and response strings inside the Broker kernel. That's where command logging comes in. With command logging, request and response strings from or to an application are written to a file that is separate from the Broker trace file.

Introduction to Command Logging

This section provides an introduction to command logging in EntireX and offers examples of how command logging is implemented. It covers the following topics:

- Overview
- Command Log Files
- Defining Filters
- Programmatically Turning on Command Logging

Overview

Command logging is similar to a Broker trace that is generated when the Broker attribute `TRACE-LEVEL` is set to 1. Broker trace and command logging are independent of each other, and therefore the configuration of command logging is separate from Broker tracing.

The following Broker attributes are involved in command logging:

Attribute	Description
`CMDLOG`	Set this to "N" if command logging is not needed.
`CMDLOG-FILE-SIZE`	A numeric value indicating the maximum size of command log file in KB.
`NUM-CMDLOG-FILTER`	The maximum number of filters that can be set.

In addition to `CMDLOG=YES`, the Broker needs the assignment of the dual command logging files during startup. If these assignments are missing, Broker will set `CMDLOG=NO`. See also *Broker Attributes* in the platform-independent administration documentation.

Command Log Files

The Broker keeps a record of commands (request and response strings) in a command log file.

At Broker startup, you will need to supply two command log file names and paths. Only one file is open at a time, however, and the Broker writes commands (requests and responses) to this file.

When the size of the active command log file reaches the KB limit set by `CMDLOG-FILE-SIZE`, the file is closed and the second file is opened and becomes active. When the second file also reaches the KB limit set by `CMDLOG-FILE-SIZE`, the first file is opened and second file is closed. Existing log data in a newly opened file will be lost.

Defining Filters

In command logging, a filter is used to store and identify a class, server, or service, as well as a topic name and user ID.

Use the System Management Hub to define a filter. . During processing, the Broker evaluates the class, server, service, topic, and user ID associated with each incoming request and compares them with the same parameters specified in the filters. If there is a match, the request string and response string of the request is printed out to the command log file.

Programmatically Turning on Command Logging

Applications using ACI version 9 or above have access to the new field `LOG-COMMAND` in the ACI control block.

If this field is set, the accompanying request and the Broker's response to this request is logged to the command log file.

Note: Programmatic command logging ignores any filters set in the kernel.

ACI-driven Command Logging

EntireX components that communicate with Broker can trigger command logging by setting the field `LOG-COMMAND` in the ACI control block.

When handling ACI functions with command log turned on, Broker will not evaluate any filters. Application developers must remember to reset the `LOG-COMMAND` field if subsequent requests are not required to be logged.

Dual Command Log Files

Broker's use of two command log files prevents any one command log file from becoming too large.

When starting a Broker with command log support, you must therefore specify two file names and paths - one for each of the two command log files. The sample startup script installed with the product uses the variables `ETB_CMDLOG1` and `ETB_CMDLOG2` as the default command log file names.

At startup, Broker initializes both files and keeps one of them open. Command log statements are printed to the open file until the size of this file reaches the value specified in the Broker attribute `CMDLOG-FILE-SIZE`. This value must be specified in KB.

When the size of the open file exceeds the value specified in the Broker attribute `CMDLOG-FILE-SIZE`, Broker closes this file and opens the other, dormant file. Because the Broker closes a log file only when unable to print out a complete log line, the size of a *full* file may be smaller than `CMDLOG-FILE-SIZE`.

9 Accounting in EntireX Broker

This chapter describes the accounting records for Broker that can be used for several purposes, including:

- **application chargeback**
  for apportioning EntireX resource consumption on the conversation and/or the application level;
- **performance measurement**
  for analyzing application throughput (bytes, messages, etc.) to determine overall performance;
- **trend analysis**
  for using data to determine periods of heavy and/or light resource and/or application usage.

EntireX Accounting Data Fields

In the EntireX Accounting record, there are various types of data available for consumption by applications that process the accounting data:

Field Name	Accounting Version	Type of Field	Description
Record Write Time	1	A14 Timestamp in "YYYYMMDDHHMMSS" format	The time this record was written to the accounting file in YYYYMMDDHHMMSS format.
EntireX Broker ID	1	A32	Broker ID from attribute file.
EntireX Version	1	A8	Version information, *v.r.s.p* where *v* =version *r* =release *s* =service pack *p* =patch level for example 9.6.0.00.
Platform of Operation	1	A32	Platform where EntireX is running.
EntireX Start Time	1	A14 Timestamp in "YYYYMMDDHHMMSS" format	Time EntireX was initialized in YYYYMMDDHHMMSS format.
Accounting Record Type	1	A1	It is always C for conversation. Future Types will have a different value in this field.
Client User ID	1	A32	USER-ID ACI field from the client in the conversation.
Client Token	1	A32	`TOKEN` field from the ACI from the client.

Field Name	Accounting Version	Type of Field	Description
Client Physical ID	1	A56	The physical user ID of the client, set by EntireX.
Client Communication Type	1	I1	Communication used by client: 1 = Net-Work 2 = TCP/IP 3 = APPC 4 = WebSphere MQ 5 = SSL
Client Requests Made	1	I4	Number of Requests made by client.
Client Sent Bytes	1	I4	Number of bytes sent by client.
Client Received Bytes	1	I4	Number of bytes received by client.
Client Sent Messages	1	I4	Number of messages sent by client.
Client Received Messages	1	I4	Number of messages received by client.
Client Sent UOWs	1	I4	Number of UOWs sent by client.
Client UOWs Received	1	I4	Number of UOWs received by client.
Client Completion Code	1	I4	Completion code client received when conversation ended.
Server User ID	1	A32	`USER-ID` ACI field from the server in the conversation.
Server Token	1	A32	`TOKEN` field from the ACI from the server.
Server Physical ID	1	A56	The physical user ID of the server, set by EntireX.
Server Communication Type	1	I1	Communication used by Server: 1 = Entire Net-Work 2 = TCP/IP 3 = APPC 4 = WebSphere MQ 5 = SSL
Server Requests Made	1	I4	Number of requests made by server.
Server Sent Bytes	1	I4	Number of bytes sent by server.
Server Received Bytes	1	I4	Number of bytes received by server.
Server Sent Messages	1	I4	Number of messages sent by server.
Server Received Messages	1	I4	Number of messages received by server.
Server Sent UOWs	1	I4	Number of UOWs sent by server.
Server Received UOWs	1	I4	Number of UOWs received by server.

Field Name	Accounting Version	Type of Field	Description
Server Completion Code	1	I4	Completion code server received when conversation ended.
Conversation ID	1	A16	`CONV-ID` from ACI.
Server Class	1	A32	`SERVER-CLASS` from ACI.
Server Name	1	A32	`SERVER-NAME` from ACI.
Service Name	1	A32	`SERVICE` from ACI.
CID=NONE Indicator	1	A1	Will be N if `CONV-ID=NONE` is indicated in application.
Restarted Indicator	1	A1	Will be R if a conversation was restarted after a Broker shutdown.
Conversation Start Time	1	A14 Timestamp in "YYYYMMDDHHMMSS" format	Time conversation began in YYYYMMDDHHMMSS format.
Conversation End Time	1	A14 Timestamp in "YYYYMMDDHHMMSS" format	Time conversation was cleaned up in YYYYMMDDHHMMSS format.
Conversation CPU Time	1	I4	Number of microseconds of CPU time used by the conversation
Client Security Identity	2	A32	Actual identity of client derived from authenticated user ID.
Client Application Node	2	A32	Node name of machine where client application executes.
Client Application Type	2	A8	Stub type used by client application.
Client Application Name	2	A64	Name of the executable that called the broker. Corresponds to the Broker Information Service field *APPLICATION-NAME* in the ACI Programming documentation.
Client Credentials Type	2	I1	Mechanism by which authentication is performed for client.
Server Security Identity	2	A32	Actual identity of server derived from authenticated user ID.
Server Application Node	2	A32	Node name of machine where server application executes.
Server Application Type	2	A8	Stub type used by server application.
Server Application Name	2	A64	Name of the executable that called the broker. Corresponds to the Broker Information Service field *APPLICATION-NAME* in the ACI Programming documentation.

Field Name	Accounting Version	Type of Field	Description
Server Credentials Type	2	I1	Mechanism by which authentication is performed for server.
Client RPC Library	3	A128	RPC library referenced by client when sending the only/first request message of the conversation.
Client RPC Program	3	A128	RPC Program referenced by client when sending the only/first request message of the conversation.
Server RPC Library	3	A128	RPC library referenced by server when sending the only/first response message of the conversation.
Server RPC Program	3	A128	RPC Program referenced by server when sending the only/first response message of the conversation.
Client IPv4 Address	4	A16	IPv4 address of the client.
Server IPv4 Address	4	A16	IPv4 address of the server.
Client Application Version	4	A16	Application version of the client.
Server Application Version	4	A16	Application version of the server.
Client IPv6 Address	5	A46	IPv6 address of the client.
Server IPv6 Address	5	A46	IPv6 address of the server.

Note: Accounting fields of any version greater than 1 are created only if the attribute `ACCOUNTING-VERSION` value is greater than or equal to the corresponding version. For example: accounting fields of version 2 are visible only if `ACCOUNTING-VERSION=2` or higher is specified.

Example Uses of Accounting Data

- Chargeback
- Trend Analysis

- Tuning for Application Performance

Chargeback

Customers can use the EntireX accounting data to perform chargeback calculations for resource utilization in a data center. Suppose EntireX Broker is being used to dispatch messages for three business departments: Accounts Receivable, Accounts Payable, and Inventory. At the end of each month, the customer needs to determine how much of the operation and maintenance cost of EntireX Broker should be assigned to these departments. For a typical month, assume the following is true:

Department	Amount of Data	Percentage	Messages Sent	Percentage	Average Percentage
Accts Payable	50 MB	25	4000	20	22.5
Accts Receivable	40 MB	20	6000	30	25
Inventory	110 MB	55	10000	50	52.5

The use of Broker resources here is based upon both the amount of traffic sent to the Broker (bytes) as well as how often the Broker is called (messages). The average of the two percentages is used to internally bill the departments, so 52.5% of the cost of running EntireX Broker would be paid by the Inventory Department, 25% by the Accounts Receivable Department, and 22.5% by the Accounts Payable Department.

Trend Analysis

The Accounting Data can also be used for trend analysis. Suppose a customer has several point-of-sale systems in several stores throughout the United States that are tied into the corporate inventory database with EntireX. The stubs would be running at the stores, and the sales data would be transmitted to the Broker, which would hand it off to the appropriate departments in inventory. If these departments wish to ascertain when the stores are busiest, they can use the accounting data to monitor store transactions. Assume all of the stores are open every day from 9 AM to 10 PM.

Local Time	Average: Weekday Transactions per Store	Maximum Weekday Transactions in any Store	Average Weekend Transactions per Store	Maximum Weekend Transactions in any Store
9 AM	7.3	27	28.2	83
10 AM	11.2	31	29.3	102
11 AM	14.6	48	37.9	113
12 noon	56.2	106	34.8	98
1 PM	25.6	65	34.2	95
2 PM	17.2	52	38.5	102
3 PM	12.1	23	42.7	99

Local Time	Average: Weekday Transactions per Store	Maximum Weekday Transactions in any Store	Average Weekend Transactions per Store	Maximum Weekend Transactions in any Store
4 PM	18.3	34	43.2	88
5 PM	26.2	47	45.2	93
6 PM	38.2	87	40.6	105
7 PM	29.6	83	39.2	110
8 PM	18.6	78	28.6	85
9 PM	11.2	55	17.5	62

The owner of the stores can examine the data and make decisions based upon the data here. For example, on weekdays, he or she can see that there is little business until lunchtime, when the number of transactions increase. It then decreases during lunch hour; then there is another increase from 5 PM to 8 PM, after people leave work. Based on this data, the owner might investigate changing the store hours on weekdays to 10 AM to 9 PM. On the weekend the trends are different, and the store hours could be adjusted as well, although there is a more regular customer flow each hour on the weekends.

Tuning for Application Performance

Assume that a customer has two applications that perform basic request/response messaging for similar sized messages. The applications consist of many Windows PC clients and Natural RPC Servers on UNIX. An analysis of the accounting data shows the following:

Application Type	Class	Server	Service	Average Server Messages Received per Conversation	Average Client Messages Received per Conversation
Application 1:	CLASS1	SERVER1	SERVICE1	10.30	10.29
Application 2:	CLASS2	SERVER2	SERVICE2	10.30	8.98

A further analysis of the accounting data reveals that there are a lot of non-zero response codes in the records pertaining to Application 2, and that a lot of these non-zero responses indicate timeouts. With that information, the customer can address the problem by modifying the server code, or by adjusting the timeout parameters for SERVER2 so that it can have more time to get a response from the Service.

10 Broker Resource Allocation

The EntireX Broker is a multithreaded application and communicates among multiple tasks in memory pools.

General Considerations

Resource considerations apply to both the global and service-specific levels:

- Dynamic assignment of global resources to services that need them prevents the return of a "Resource Shortage" code to an application when resources are available globally. It also enables the EntireX Broker to run with fewer total resources, although it does not guarantee the availability of a specific set of resources for a particular service.
- Flow control ensures that individual services do not influence the behavior of other services by accident, error, or simply overload. This means that you can restrict the resource consumption of particular services in order to shield the other services.

In order to satisfy both global and service-specific requirements, the EntireX Broker allows you to allocate resources for each individual service or define global resources which are then allocated dynamically to any service that needs them.

The resources in question are the number of conversations, number of servers, plus units of work and the message storage, separated in a long buffer of 4096 bytes and short buffer of 256 bytes. These resources are typically the bottleneck in a system, especially when you consider that non-conversational communication is treated as the special case of "conversations with a single message only" within the EntireX Broker.

Global resources are defined by the parameters in the Broker section of the attribute file. The number of conversations allocated to each service is defined in the service-specific section of the attribute file. Because the conversations are shared by all servers that provide the service, a larger number of conversations should be allocated to services that are provided by more than one server. The number of conversations required is also affected by the number of clients accessing the service in parallel.

Specifying Global Resources

You can specify a set of global resources with no restrictions on which service allocates the resources:

- Specify the global attributes with the desired values.
- Do not specify any additional restrictions. That is, do not provide values for the following Broker-specific attributes:

```
LONG-BUFFER-DEFAULT
SHORT-BUFFER-DEFAULT
```

```
CONV-DEFAULT
SERVER-DEFAULT
```

- Also, do not provide values for the following server-specific attributes:

```
LONG-BUFFER-LIMIT
SERVER-LIMIT
SHORT-BUFFER-LIMIT
CONV-LIMIT
```

Example

The following example defines global resources. If no additional definitions are specified, resources are allocated and assigned to any server that needs them.

```
NUM-CONVERSATION=1000
NUM-LONG-BUFFER=200
NUM-SHORT-BUFFER=2000
NUM-SERVER=100
```

Restricting the Resources of Particular Services

You can restrict resource allocation for particular services in advance:

- Use `CONV-LIMIT` to limit the resource consumption for a specific service.
- Use `CONV-DEFAULT` to provide a default limit for services for which `CONV-LIMIT` is not defined.

Example

In the following example, attributes are used to restrict resource allocation:

```
DEFAULTS=BROKER
NUM-CONVERSATION=1000
CONV-DEFAULT=200

DEFAULTS=SERVICE
CLASS=A, SERVER=A, SERVICE=A, CONV-LIMIT=100
CLASS=B, SERVER=B, SERVICE=B, CONV-LIMIT=UNLIM
CLASS=C, SERVER=C, SERVICE=C
```

- Memory for a total of 1000 conversions is allocated (`NUM-CONVERSATION=1000`).
- Service A (`CLASS A`,`SERVER A`,`SERVICE A`) is limited to 100 conversation control blocks used simultaneously (`CONV-LIMIT=100`). The application that wants to start more conversations than specified by the limit policy will receive a “Resource shortage” return code. This return code should result in a retry of the desired operation a little later, when the resource situation may have changed.

- Service B (CLASS B,SERVER B,SERVICE B) is allowed to try to allocate as many resources as necessary, provided the resources are available and not occupied by other services. The number of conversations that may be used by this service is unlimited (CONV-LIMIT=UNLIM).
- Service C (CLASS C,SERVER C,SERVICE C) has no explicit value for the CONV-LIMIT attribute. The number of conversation control blocks that it is allowed to use is therefore limited to the default value which is defined by the CONV-DEFAULT Broker attribute.

The same scheme applies to the allocation of message buffers and servers:

- In the following example, long message buffers are allocated using the keywords NUM-LONG-BUFFER, LONG-BUFFER-DEFAULT and LONG-BUFFER-LIMIT:

```
DEFAULTS=BROKER
NUM-LONG-BUFFER=2000
LONG-BUFFER-DEFAULT=250

DEFAULTS=SERVICE
CLASS=A, SERVER=A, SERVICE=A, LONG-BUFFER-LIMIT=100
CLASS=B, SERVER=B, SERVICE=B, LONG-BUFFER-LIMIT=UNLIM
CLASS=C, SERVER=C, SERVICE=C
```

- In the following example, short message buffers are allocated using the keywords NUM-SHORT-BUFFER, SHORT-BUFFER-DEFAULT and SHORT-BUFFER-LIMIT:

```
DEFAULTS=BROKER
NUM-SHORT-BUFFER=2000
SHORT-BUFFER-DEFAULT=250

DEFAULTS=SERVICE
CLASS=A, SERVER=A, SERVICE=A, SHORT-BUFFER-LIMIT=100
CLASS=B, SERVER=B, SERVICE=B, SHORT-BUFFER-LIMIT=UNLIM
CLASS=C, SERVER=C, SERVICE=C
```

- In the following example, servers are allocated using the keywords NUM-SERVER, SERVER-DEFAULT and SERVER-LIMIT:

```
DEFAULTS=BROKER
NUM-SERVER=2000
SERVER-DEFAULT=250

DEFAULTS=SERVICE
CLASS=A, SERVER=A, SERVICE=A, SERVER-LIMIT=100
CLASS=B, SERVER=B, SERVICE=B, SERVER-LIMIT=UNLIM
CLASS=C, SERVER=C, SERVICE=C
```

Specifying Attributes for Privileged Services

If privileged services (services with access to unlimited resources) exist, specify `UNLIMITED` for the attributes `CONV-LIMIT`, `SERVER-LIMIT`, `LONG-BUFFER-LIMIT` and `SHORT-BUFFER-LIMIT` in the service-specific section of the attribute file.

For example:

```
DEFAULTS=SERVICE
CONV-LIMIT=UNLIM
LONG-BUFFER-LIMIT=UNLIM
SHORT-BUFFER-LIMIT=UNLIM
SERVER-LIMIT=UNLIM
```

To ensure a resource reservoir for peak load of privileged services, define more resources than would normally be expected by specifying larger numbers for the Broker attributes that control global resources:

```
NUM-SERVER
NUM-CONVERSATION
CONV-DEFAULT
LONG-BUFFER-DEFAULT
SHORT-BUFFER-DEFAULT
SERVER-DEFAULT
```

Maximum Units of Work

The maximum number of units of work (UOWs) that can be active concurrently is specified in the Broker attribute file. The `MAX-UOWS` attribute can be specified for the Broker globally as well as for individual services. It cannot be calculated automatically. If a service is intended to process UOWs, a `MAX-UOWS` value must be specified.

If message processing only is to be done, specify `MAX-UOWS=0` (zero). The Broker (or the service) will not accept units of work, i.e., it will process only messages that are not part of a UOW. Zero is used as the default value for `MAX-UOWS` in order to prevent the sending of UOWs to services that are not intended to process them.

Calculating Resources Automatically

To ensure that each service runs without impacting other services, allow the EntireX Broker to calculate resource requirements automatically:

- Ensure that the attributes that define the default total for the Broker and the limit for each service are not set to `UNLIM`.
- Specify `AUTO` for the Broker attribute that defines the total number of the resource.
- Specify a suitable value for the Broker attribute that defines the default number of the resource.

The total number required will be calculated from the number defined for each service. The resources that can be calculated this way are Number of Conversations, Number of Servers, Long Message Buffers and Short Message Buffers.

Avoid altering the service-specific definitions at runtime. Doing so could corrupt the conversation consistency. Applications might receive a message such as "`NUM-CONVERSATIONS` reached" although the addressed service does not serve as many conversations as defined. The same applies to the attributes that define the long and short buffer resources.

Automatic resource calculation has the additional advantage of limiting the amount of memory used to run the EntireX Broker. Over time, you should be able to determine which services need more resources by noting the occurrence of the return code "resource shortage, please retry". You can then increase the resources for these services. To avoid disruption to the user, you could instead allocate a relatively large set of resources initially and then decrease the values using information gained from the Administration Monitor application.

Number of Conversations

To calculate the total number of conversations automatically, ensure that the `CONV-DEFAULT` Broker attribute and the `CONV-LIMIT` service-specific attribute are not set to `UNLIM` anywhere in the attribute file. Specify `NUM-CONVERSATION=AUTO` and an appropriate value for the `CONV-DEFAULT` Broker attribute. The total number of conversations will be calculated using the value specified for each service.

For example:

```
DEFAULTS=BROKER
NUM-CONVERSATION=AUTO
CONV-DEFAULT=200

DEFAULTS=SERVICE
CLASS=A, SERVER=A, SERVICE=A
CLASS=B, SERVER=B, SERVICE=B, CONV-LIMIT=100
CLASS=C, SERVER=C, SERVICE=C
```

- Service A and Service C both need 200 conversations (the default value). Service B needs 100 conversations (CONV-LIMIT=100).
- Because NUM-CONVERSATIONS is defined as AUTO, the broker calculates a total of 500 conversations (200 + 200 + 100).
- NUM-CONVERSATIONS=AUTO allows the number of conversations to be flexible without requiring additional specifications. It also ensures that the broker is started with enough resources to meet all the demands of the individual services.
- AUTO and UNLIM are mutually exclusive. If CONV-DEFAULT or a single CONV-LIMIT is defined as UNLIM, the EntireX Broker cannot determine the number of conversations to use in the calculation, and the EntireX Broker cannot be started.

Number of Servers

To calculate the number of servers automatically, ensure that the SERVER-DEFAULT Broker attribute and the SERVER-LIMIT service-specific attribute are not set to UNLIM anywhere in the attribute file. Specify NUM-SERVER=AUTO and an appropriate value for the SERVER-DEFAULT Broker attribute. The total number of server buffers will be calculated using the value specified for each service.

For example:

```
DEFAULTS=BROKER
NUM-SERVER=AUTO
SERVER-DEFAULT=250

DEFAULTS=SERVICE
CLASS=A, SERVER=A, SERVICE=A, SERVER-LIMIT=100
CLASS=B, SERVER=B, SERVICE=B
CLASS=C, SERVER=C, SERVICE=C
```

Long Message Buffers

To calculate the number of long message buffers automatically, ensure that the LONG-BUFFER-DEFAULT Broker attribute and the LONG-BUFFER-LIMIT service-specific attribute are not set to UNLIM anywhere in the attribute file. Specify NUM-LONG-BUFFER=AUTO and an appropriate value for the LONG-BUFFER-DEFAULT Broker attribute. The total number of long message buffers will be calculated using the value specified for each service.

For example:

```
DEFAULTS=BROKER
NUM-LONG-BUFFER=AUTO
LONG-BUFFER-DEFAULT=250

DEFAULTS=SERVICE
CLASS=A, SERVER=A, SERVICE=A, LONG-BUFFER-LIMIT=100
CLASS=B, SERVER=B, SERVICE=B
CLASS=C, SERVER=C, SERVICE=C
```

Short Message Buffers

To calculate the number of short message buffers automatically, ensure that the `SHORT-BUFFER-DEFAULT` Broker attribute and the `SHORT-BUFFER-LIMIT` service-specific attribute are not set to `UNLIM` anywhere in the attribute file. Specify `NUM-SHORT-BUFFER=AUTO` and an appropriate value for the `SHORT-BUFFER-DEFAULT` Broker attribute. The total number of short message buffers will be calculated using the value specified for each service.

For example:

```
DEFAULTS=BROKER
NUM-SHORT-BUFFER=AUTO
SHORT-BUFFER-DEFAULT=250

DEFAULTS=SERVICE
CLASS=A, SERVER=A, SERVICE=A
CLASS=B, SERVER=B, SERVICE=B, SHORT-BUFFER-LIMIT=100
CLASS=C, SERVER=C, SERVICE=C
```

Dynamic Memory Management

Dynamic memory management is a feature to handle changing Broker workload without any restart of the Broker task. It increases the availability of the Broker by using various memory pools for various Broker resources and by being able to use a variable number of pools for the resources.

If more memory is needed than currently available, another memory pool is allocated for the specific type of resource. If a particular memory pool is no longer used, it will be deallocated.

The following Broker attributes can be omitted if `DYNAMIC-MEMORY-MANAGEMENT=YES` has been defined:

- NUM-CLIENT
- NUM-CMDLOG-FILTER
- NUM-COMBUF
- NUM-CONV[ERSATION]
- NUM-LONG[-BUFFER]
- NUM-PUBLICATION
- NUM-PUBLISHER
- NUM-SERVER
- NUM-SERVICE
- NUM-SERVICE-EXTENSION
- NUM-SHORT[-BUFFER]
- NUM-SUBSCRIBER
- NUM-SUBSCRIBER-TOTAL
- NUM-TOPIC
- NUM-TOPIC-EXTENSION
- NUM-TOPIC-TOTAL
- NUM-UOW|MAX-UOWS|MUOW
- NUM-WQE

If you want statistics on allocation and deallocation operations in Broker, you can configure Broker to create a storage report with the attribute STORAGE-REPORT. See *Storage Report* below.

Note: To ensure a stabile environment, some pools of Broker are not deallocated automatically. The first pools of type COMMUNICATION, CONVERSATION, CONNECTION, HEAP, PARTICIPANT, PARTICIPANT EXTENSION, SERVICE ATTRIBUTES, SERVICE, SERVICE EXTENSION, TIMEOUT QUEUE, TRANSLATION, WORK QUEUE are excluded from the automatic deallocation even when they have not been used for quite some time. Large pools cannot be reallocated under some circumstances if the level of fragmentation in the address space has been increased in the meantime.

Dynamic Worker Management

Dynamic worker management is a feature to handle the fluctuating broker workload without re-starting the Broker task. It adjusts the number of running worker tasks according to current workload. The initial portion of worker tasks started at Broker startup is still determined by NUM-WORKER.

If more workers are needed than currently available, another worker task is started. If a worker task is no longer needed, it will be stopped.

The following Broker attributes are used for the configuration if DYNAMIC-WORKER-MANAGEMENT=YES has been defined:

- WORKER-MAX
- WORKER-MIN
- WORKER-NONACT
- WORKER-QUEUE-DEPTH
- WORKER-START-DELAY

The following two attributes are very performance-sensitive:

- Attribute WORKER-QUEUE-DEPTH defines the number of unassigned user requests in the input queue before a new worker task is started.

- Attribute WORKER-START-DELAY defines the time between the last worker task startup and the next check for another possible worker task startup. It is needed to consider the time for activating a worker task.

Both attributes depend on the environment, in particular the underlying operating system and the hardware. The goal is to achieve high-performance user request processing without starting too many worker tasks.

A good starting point to achieve high performance is not to change the attributes and to observe the performance of the application programs after activating the dynamic worker management.

If broker attribute DYNAMIC-WORKER-MANAGEMENT=YES is set, operator commands are available under z/OS to deactivate and subsequently reactivate dynamic worker management.

The following section illustrates the two different modes of dynamic worker management:

- **Scenario 1**

```
DYNAMIC-WORKER-MANAGEMENT=YES
NUM-WORKER = 5
WORKER-MIN = 1
WORKER-MAX = 32
```

  Broker is started with 5 worker tasks and then dynamically varies the number of worker tasks within the range from WORKER-MIN=1 to WORKER-MAX=32 due to DYNAMIC-WORKER-MANAGEMENT=YES.

- **Scenario 2**

```
DYNAMIC-WORKER-MANAGEMENT=NO
NUM-WORKER = 5
WORKER-MIN = 1
WORKER-MAX = 32
```

  Broker is started with 5 worker tasks. The WORKER-MIN/MAX attributes are ignored due to DYNAMIC-WORKER-MANAGEMENT=NO.

Storage Report

You can create an optional report file that provides details about all activities to allocate or to deallocate memory pools. This section details how to create the report and provides a sample report.

- Creating a Storage Report
- Platform-specific Rules
- Sample Storage Report

See also Broker-specific attribute STORAGE-REPORT.

Creating a Storage Report

Use Broker's global attribute `STORAGE-REPORT` with the value `YES`. If attribute value `YES` is supplied, all memory pool operations will be reported if the output mechanism is available. If the value `NO` is specified, no report will be created.

Platform-specific Rules

`LINK-NAME ETBSREP` assigns the report file. Format `REC-FORM=V, REC-SIZE=0, FILE-TYPE ISAM` is used by default.

Sample Storage Report

The following is an excerpt from a sample STORAGE report.

```
EntireX 8.1.0.00     STORAGE Report     2009-06-26 12:28:58    Page     1         ↩
                                                                                  ↩
Identifier                  Address            Size             Total         Date ↩
      Time      Action
KERNEL POOL                0x25E48010     407184 bytes     407184 bytes  2009-06-26 ↩
12:28:58.768  Allocated
HEAP POOL                  0x25EB4010    1050692 bytes    1457876 bytes  2009-06-26 ↩
12:28:58.769  Allocated
COMMUNICATION POOL         0x25FB5010   16781380 bytes   18239256 bytes  2009-06-26 ↩
12:28:58.769  Allocated
ACCOUNTING POOL            0x26FB7010     762052 bytes   19001308 bytes  2009-06-26 ↩
12:28:58.769  Allocated
BROKER POOL                0x27072010      61540 bytes   19062848 bytes  2009-06-26 ↩
12:28:58.775  Allocated
CONVERSATION POOL          0x27082010     368964 bytes   19431812 bytes  2009-06-26 ↩
12:28:58.775  Allocated
CONNECTION POOL            0x270DD010     233668 bytes   19665480 bytes  2009-06-26 ↩
12:28:58.779  Allocated
LONG MESSAGES POOL         0x27117010    4395204 bytes   24060684 bytes  2009-06-26 ↩
12:28:58.782  Allocated
SHORT MESSAGES POOL        0x27549010    3703876 bytes   27764560 bytes  2009-06-26 ↩
12:28:58.806  Allocated
PARTICIPANT POOL           0x278D2010     134244 bytes   27898804 bytes  2009-06-26 ↩
12:28:58.827  Allocated
PARTICIPANT EXTENSION POOL  0x278F3010      36996 bytes   27935800 bytes  2009-06-26 ↩
12:28:58.829  Allocated
PROXY QUEUE POOL           0x278FD010      26724 bytes   27962524 bytes  2009-06-26 ↩
12:28:58.829  Allocated
SERVICE ATTRIBUTES POOL     0x27904010     131668 bytes   28094192 bytes  2009-06-26 ↩
12:28:58.829  Allocated
SERVICE POOL               0x27925010      54372 bytes   28148564 bytes  2009-06-26 ↩
12:28:58.830  Allocated
SERVICE EXTENSION POOL      0x27933010      32900 bytes   28181464 bytes  2009-06-26 ↩
```

```
12:28:58.831  Allocated
TIMEOUT QUEUE POOL         0x2793C010     87268 bytes   28268732 bytes  2009-06-26 ↩
12:28:58.831  Allocated
TRANSLATION POOL           0x27952010    179300 bytes   28448032 bytes  2009-06-26 ↩
12:28:58.832  Allocated
UNIT OF WORK POOL          0x2797E010    176324 bytes   28624356 bytes  2009-06-26 ↩
12:28:58.834  Allocated
WORK QUEUE POOL            0x279AA010    391268 bytes   29015624 bytes  2009-06-26 ↩
12:28:58.835  Allocated
BLACKLIST POOL             0x27A0A010     42084 bytes   29057708 bytes  2009-06-26 ↩
12:28:58.838  Allocated
SUBSCRIPTION POOL          0x27A15010    344148 bytes   29401856 bytes  2009-06-26 ↩
12:28:58.839  Allocated
TOPIC ATTRIBUTES POOL      0x27A6A010    129620 bytes   29531476 bytes  2009-06-26 ↩
12:28:58.841  Allocated
TOPIC POOL                 0x26FB6068      2952 bytes   29534428 bytes  2009-06-26 ↩
12:28:58.842  Allocated
TOPIC EXTENSION POOL       0x27A8A010     30852 bytes   29565280 bytes  2009-06-26 ↩
12:28:58.842  Allocated
PSTORE SUBSCRIBER POOL     0x27A92010     33892 bytes   29599172 bytes  2009-06-26 ↩
12:28:58.843  Allocated
PSTORE TOPIC POOL          0x27A9B010     19540 bytes   29618712 bytes  2009-06-26 ↩
12:28:58.843  Allocated
COMMUNICATION POOL         0x25FB5010   16781380 bytes   12837332 bytes  2009-06-26 ↩
12:30:58.514  Deallocated
ACCOUNTING POOL            0x26FB7010    762052 bytes   12075280 bytes  2009-06-26 ↩
12:30:58.515  Deallocated
BROKER POOL                0x27072010     61540 bytes   12013740 bytes  2009-06-26 ↩
12:30:58.516  Deallocated
CONVERSATION POOL          0x27082010    368964 bytes   11644776 bytes  2009-06-26 ↩
12:30:58.518  Deallocated
CONNECTION POOL            0x270DD010    233668 bytes   11411108 bytes  2009-06-26 ↩
12:30:58.519  Deallocated
LONG MESSAGES POOL         0x27117010   4395204 bytes    7015904 bytes  2009-06-26 ↩
12:30:58.520  Deallocated
SHORT MESSAGES POOL        0x27549010   3703876 bytes    3312028 bytes  2009-06-26 ↩
12:30:58.526  Deallocated
PROXY QUEUE POOL           0x278FD010     26724 bytes    3285304 bytes  2009-06-26 ↩
12:30:58.530  Deallocated
SUBSCRIPTION POOL          0x27A15010    344148 bytes    2941156 bytes  2009-06-26 ↩
12:30:58.530  Deallocated
TOPIC ATTRIBUTES POOL      0x27A6A010    129620 bytes    2811536 bytes  2009-06-26 ↩
12:30:58.531  Deallocated
TOPIC POOL                 0x26FB6068      2952 bytes    2808584 bytes  2009-06-26 ↩
12:30:58.531  Deallocated
TOPIC EXTENSION POOL       0x27A8A010     30852 bytes    2777732 bytes  2009-06-26 ↩
12:30:58.531  Deallocated
TIMEOUT QUEUE POOL         0x2793C010     87268 bytes    2690464 bytes  2009-06-26 ↩
12:30:58.532  Deallocated
UNIT OF WORK POOL          0x2797E010    176324 bytes    2514140 bytes  2009-06-26 ↩
12:30:58.533  Deallocated
WORK QUEUE POOL            0x279AA010    391268 bytes    2122872 bytes  2009-06-26 ↩
```

```
12:30:58.533  Deallocated
BLACKLIST POOL            0x27A0A010     42084 bytes    2080788 bytes  2009-06-26 ↩
12:30:58.534  Deallocated
PSTORE SUBSCRIBER POOL     0x27A92010     33892 bytes    2046896 bytes  2009-06-26 ↩
12:30:58.534  Deallocated
PSTORE TOPIC POOL          0x27A9B010     19540 bytes    2027356 bytes  2009-06-26 ↩
12:30:58.534  Deallocated
PARTICIPANT POOL           0x278D2010    134244 bytes    1893112 bytes  2009-06-26 ↩
12:49:25.817  Deallocated
PARTICIPANT EXTENSION POOL  0x278F3010     36996 bytes    1856116 bytes  2009-06-26 ↩
12:49:25.818  Deallocated
SERVICE ATTRIBUTES POOL    0x27904010    131668 bytes    1724448 bytes  2009-06-26 ↩
12:49:25.818  Deallocated
SERVICE POOL               0x27925010     54372 bytes    1670076 bytes  2009-06-26 ↩
12:49:25.818  Deallocated
SERVICE EXTENSION POOL     0x27933010     32900 bytes    1637176 bytes  2009-06-26 ↩
12:49:25.819  Deallocated
TRANSLATION POOL           0x27952010    179300 bytes    1457876 bytes  2009-06-26 ↩
12:49:25.819  Deallocated
HEAP POOL                 0x25EB4010   1050692 bytes     407184 bytes  2009-06-26 ↩
12:49:25.820  Deallocated
KERNEL POOL                0x25E48010    407184 bytes          0 bytes  2009-06-26 ↩
12:49:25.820  Deallocated
```

Header	Description
Identifier	Name of the memory pool.
Address	Start address of the memory pool.
Size	Size of the memory pool.
Total	Total size of all obtained memory pools.
Date, Time	Date and time of the action.
Action	The action of Broker. The following actions are currently supported: Allocated: memory pool is allocated . Deallocated: memory pool is deallocated.

Maximum TCP/IP Connections per Communicator

This table shows the maximum number of TCP/IP connections per communicator:

Platform	Maximum Number of TCP/IP Connections per Communicator
AIX	2,048
BS2000/OSD	2,048
HP-UX	2,048
Linux	4,096
Solaris	65,356
Windows	4,096
z/OS	16,384
z/VSE	2,048

With the Broker-specific attribute `POLL`, these restrictions can be lifted under z/OS, UNIX and z/VSE. See `POLL`.

See also `MAX-CONNECTIONS` under *`TCP-OBJECT (Struct INFO_TCP)`* under *Information Reply Structures* in the Broker CIS documentation.

11 Broker Attributes

Note: This section lists all EntireX Broker parameters. Not all parameters are applicable to all supported operating systems.

The Broker attribute file contains a series of parameters (attributes) that control the availability and characteristics of clients and servers, publishers and subscribers as well as of the Broker itself. You can customize the Broker environment by modifying the attribute settings.

Name and Location of Attribute File

The name and location of the broker attribute file is platform-dependent.

Platform	File Name/Location
BS2000/OSD	File *ETB-ATTR* in library *EXX960.JOBS*.

* When starting a broker manually, name and location of the broker attribute file can be overwritten with the environment variable `ETB_ATTR`.

Attribute Syntax

Each entry in the attribute file has the format:

```
ATTRIBUTE-NAME=value
```

The following rules and restrictions apply:

- A line can contain multiple entries separated by commas.
- Attribute names can be entered in mixed upper and lowercase.
- Spaces between attribute names, values and separators are ignored.
- Spaces in the attribute names are not allowed.
- Commas and equal signs are not allowed in value notations.
- Lines starting with an asterisk (*) are treated as comment lines. Within a line, characters following an * or # sign are also treated as comments.
- The `CLASS` keyword must be the first keyword in a service definition.
- Multiple services can be included in a single service definition section. The attribute settings will apply to all services defined in the section.
- Multiple topics can be included in a single topic definition section. The attribute settings will apply to all topics defined in the section.
- Attributes specified after the service definition (`CLASS`, `SERVER`, `SERVICE` *`keywords`*) overwrite the default characteristics for the service.
- Attributes specified after the topic definition (`TOPIC` *`keyword`*) override the default characteristics for the topic.
- Attribute values can contain variables of the form `${`*`variable name`*`}` or `$`*`variable name`*:

- Due to variations in EBCDIC codepages, braces should only be used on ASCII (UNIX or Windows) platforms or EBCDIC platforms using the IBM-1047 (US) codepage.
- The variable name can contain only alphanumeric characters and the underscore (_) character.
- The first non-alphanumeric or underscore character terminates the variable name.
- under UNIX and Windows, the string `${variable name}` is replaced with the value of the corresponding environment variable.
- On z/OS, variable values are read from a file defined by the DD name `ETBVARS`. The syntax of this file is the same as the attribute file.
- If a variable has no value: if the variable name is enclosed in braces, error 00210594 is given, otherwise `$variable name` will be used as the variable value.
- If you encounter problems with braces (and this is quite possible in a z/OS environment), we suggest you omit the braces.

Broker-specific Attributes

The broker-specific attribute section begins with the keyword `DEFAULTS=BROKER`. It contains attributes that apply to the broker. At startup time, the attributes are read and duplicate or missing values are treated as errors. When an error occurs, the broker stops execution until the problem is corrected.

Tip: To avoid resource shortages for your applications, be sure to specify sufficiently large values for the broker attributes that define the global resources.

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
`ABEND-LOOP-DETECTION`	YES | NO	O	z	u	w	v	b
	YES Stop broker if a task terminates abnormally twice, that is, the same abend reason at the same abend location already occurred. This attribute prevents an infinite abend loop. NO Use only if requested by Software AG Support. This setting may make sense if a known error leads to an abnormal termination, but a hotfix solving the problem has not yet been provided. Reset to "YES" when the hotfix has been installed.						
`ABEND-MEMORY-DUMP`	YES | NO	O	z	u	w	v	b
	YES Print all data pools of the broker if a task terminates abnormally. This dump is needed to analyze the abend. NO If the dump has already been sent to Software AG, you can set to "NO" to avoid the extra overhead.						
`ACCOUNTING`	NO | 128-255	O	z				
	NO | YES [SEPARATOR=*char*]	O		u	w	v	b
	Determines whether accounting records are created. NO Do not create accounting records. *nnn* The SMF record number to use when writing the accounting records. YES Create accounting data. *char*= separator character(s). Up to seven separator characters can be specified using the `SEPARATOR` suboption, for example `ACCOUNTING = (YES, SEPARATOR=;)`. If no separator character is specified, the comma character will be used.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	See also *Accounting in EntireX Broker* in the z/OS administration documentation.						
ACCOUNTING-VERSION	1 | 2 | 3 | 4	O	z	u	w	v	b
	Determines whether accounting records are created. 1 Collect accounting information. This value is supported for reasons of compatibility with EntireX Broker 7.2.1 and below. 2 Collect extended accounting information in addition to that available with option 1. 3 Create accounting records in layout of version 3. 4 Create accounting records in layout of version 4. This parameter applies when ACCOUNTING is activated.						
AUTOLOGON	YES | NO	O	z	u	w	v	b
	YES LOGON occurs automatically during the first SEND or REGISTER. NO The application has to issue a LOGON call.						
BLACKLIST-PENALTY-TIME	5m | *n* | *n* S | *n* M | *n* H	R	z	u	w	v	b
	Define the length of time a participant is placed on the PARTICIPANT-BLACKLIST to prevent a denial-of-service attack. *n* Same as *n* S. *n* S Non-activity time in seconds (max. 2147483647). *n* M Non-activity time in minutes (max. 35791394). *n* H Non-activity time in hours (max. 596523). See *Protecting a Broker against Denial-of-Service Attacks* in the platform-specific broker administration documentation.						
BROKER-ID	A32	R	z	u	w	v	b
	Identifies the broker to which the attribute file applies. The broker ID must be unique per machine. **Note:** The numerical section of the BROKER-ID is no longer used to determine the DBID in the EntireX Broker kernel with Entire Net-Work transport (NET). To determine the DBID, use attribute NODE in the DEFAULTS=NET section of the attribute file.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
CLIENT-NONACT	15M | *n* | *n*S | *n*M | *n*H	R	z	u	w	v	b
	Define the non-activity time for clients. *n* Same as *n*S. *n*S Non-activity time in seconds (max. 2147483647). *n*M Non-activity time in minutes (max. 35791394). *n*H Non-activity time in hours (max. 596523). A client that does not issue a broker request within the specified time limit is treated as inactive and all resources for the client are freed.						
CMDLOG	NO | YES	O	z	u	w	v	b
	NO Command logging will not be available in the broker. YES Command logging features will be available in the broker.						
CMDLOG-FILE-SIZE	1024 | *n*	O	z	u	w	v	b
	Defines the maximum size of the file that the command log is written to, in kilobytes. The value must be 1024 or higher. The default value is 1024. When one command log file grows to this size, broker starts writing to the other file. For more details, see *Command Logging in EntireX*.						
CONTROL-INTERVAL	60s | *n* | *n*S | *n*M | *n*H |	O	z	u	w	v	b
	Defines the time interval of time-driven broker-to-broker calls. 1. It controls the time between handshake attempts. 2. The standby broker will check the status of the standard broker after the elapsed CONTROL-INTERVAL time. *n* Same as *n*S. *n*S Interval in seconds (max. 2147483647). *n*M Interval in minutes (max. 35791394). *n*H Interval in hours (max. 596523). The minimum value is 16 seconds. We strongly recommend the default value (60 seconds), except for very slow machines.						
CONV-DEFAULT	UNLIM | *n*	O	z	u	w	v	b
	Default number of conversations that are allocated for every service.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	UNLIM The number of conversations is restricted only by the number of conversations globally available. Precludes the use of NUM-CONVERSATION. *n* Number of conversations. This value can be overridden by specifying a CONV-LIMIT for the service. A value of 0 (zero) is invalid.						
DEFERRED	NO | YES	O	z	u	w	v	b
	Disable or enable deferred processing of units of work. NO Units of work cannot be sent to the service until it is available. YES Units of work can be sent to a service that is not up and registered. They will be processed when the service becomes available.						
DYNAMIC-MEMORY-MANAGEMENT	YES | NO	O	z	u	w	v	b
	YES An initial portion of memory is allocated at broker startup based on defined NUM-* attributes or internal default values if no NUM-* attributes have been defined. More memory is allocated without broker restart if there is a need to use more storage. Unused memory is deallocated. The upper limit of memory consumption can be defined by the attribute MAX-MEMORY. See *Dynamic Memory Management* under ***Broker Resource Allocation***. NO All memory is allocated at broker startup based on the calculation from the defined NUM-* attributes. Size of memory cannot be changed. This was the known behavior of EntireX 7.3 and earlier. If you run your broker with attribute DYNAMIC-MEMORY-MANAGEMENT=YES, the following attributes are not needed: ■ CONV-DEFAULT ■ NUM-PUBLISHER ■ HEAP-SIZE ■ NUM-SERVER ■ LONG-BUFFER-DEFAULT ■ NUM-SERVICE-EXTENSION ■ PUBLICATION-DEFAULT ■ NUM-SERVICE ■ SERVER-DEFAULT ■ NUM-SHORT[-BUFFER] ■ SHORT-BUFFER-DEFAULT ■ NUM-SUBSCRIBER-TOTAL ■ SUBSCRIBER-DEFAULT ■ NUM-SUBSCRIBER ■ NUM-CLIENT ■ NUM-TOPIC-EXTENSION						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	■ NUM-CMDLOG-FILTER ■ NUM-TOPIC-TOTAL ■ NUM-COMBUF ■ NUM-TOPIC ■ NUM-CONV[ERSATION] ■ NUM-UOW|MAX-UOWS|MUOW ■ NUM-LONG[-BUFFER] ■ NUM-WQE ■ NUM-PUBLICATION **Caution:** However, if one of these attributes is defined, it determines the allocation size of that particular broker resource.						
DYNAMIC-WORKER-MANAGEMENT	NO | YES	O	z	u	w		b
	NO All worker tasks are started at broker startup. The number of worker tasks is defined by NUM-WORKER. After this initial step, no further worker tasks can be started. This is default and simulates the behavior of EntireX version 8.0 and earlier. YES As above, the initial portion of worker tasks started at broker startup is determined by NUM-WORKER. However, if there is a need to handle an increased workload, additional worker tasks can be started at runtime without restarting broker. Conversely, if a worker task remains unused, it is stopped. The upper and lower limit of running worker tasks can be defined by the attributes WORKER-MIN and WORKER-MAX. If you run broker with DYNAMIC-WORKER-MANAGEMENT=YES, the following attributes are useful to optimize the overall processing: ■ WORKER-MAX ■ WORKER-MIN ■ WORKER-NONACT ■ WORKER-QUEUE-DEPTH ■ WORKER-START-DELAY The attribute NUM-WORKER defines the initial number of worker tasks started during initialization. See *Dynamic Worker Management* under ***Broker Resource Allocation***.						
FORCE	NO | YES	O		u			
	NO Go down with error if IPC resources still exist. YES Clean up the left-over IPC resources of a previous run.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	Note: 1. If broker is started twice, the second instance will kill the first by removing the IPC resources. 2. For BS2000/OSD, z/OS and z/VSE, see separate attribute `FORCE` in section *Adabas SVC/Entire Net-Work-specific Attributes*.						
`HEAP-SIZE`	1024 | *n*	O	z	u	w	v	b
	Defines the size of the internal heap in KB. Not required if you are using `DYNAMIC-MEMORY-MANAGEMENT`. If you are *not* using dynamic memory management, we strongly recommend specifying - as a minimum - the default value of 1024 KB.						
`ICU-CONVERSION`	YES | NO	O	z	u	w	v	b
	Disable or enable ICU conversion. Default for z/VSE is `NO`; other platforms `YES`. YES ICU is loaded and available for conversion. It is a prerequisite for SAGTCHA and SAGTRPC. NO ICU is not loaded and not available for conversion. SAGTCHA and SAGTRPC cannot be used. If any of the broker service definitions uses the internationalization approach “ICU conversion”, that is, the conversion methods SAGTCHA and SAGTRPC are defined by the service-specific or topic-specific attribute `CONVERSION`, `ICU-CONVERSION` must be set to "YES". The internationalization approaches “Translation”, “Translation User Exit” and “SAGTRPC User Exit” do not require ICU conversion. If all broker service definitions use these internationalization approaches, `ICU-CONVERSION` can be set to "NO". ICU requires additional storage to run properly. If ICU conversion is not needed, setting `ICU-CONVERSION` to "NO" will help to avoid unnecessary storage consumption.						
`ICU-SET-DATA-DIRECTORY`	YES | NO	O		u	w		
	Disable or enable ICU custom converter usage. Not defined for mainframe platforms. YES The broker tries to locate ICU custom converters with the mechanism defined by the platform, see *Building and Installing ICU Custom Converters* in the platform-specific administration documentation. NO Use of ICU custom converters is not possible.						
`IPV6`	YES | NO	O	z	u	w		b

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	YES Establish SSL and TCP/IP transport in IPv6 and IPv4 networks according to the TCP/IP stack configuration. NO Establish SSL and TCP/IP transport in IPv4 network only. This attribute applies to EntireX version 9.0 and above.						
LONG-BUFFER-DEFAULT	UNLIM | *n*	O	z	u	w	v	b
	Number of long buffers to be allocated for each service or topic. UNLIM The number of long message buffers is restricted only by the number of buffers globally available. Precludes the use of NUM-LONG-BUFFER. *n* Number of buffers. This value can be overridden by specifying a LONG-BUFFER-LIMIT for the service. A value of 0 (zero) is invalid.						
MAX-MEMORY	0 | *n* | *n*K | *n*M | *n*G | UNLIM	O	z	u	w	v	b
	Defines the upper limit of memory allocated by broker if DYNAMIC-MEMORY-MANAGEMENT=YES has been defined. 0, UNLIM No memory limit. others Defines the maximum limit of allocated memory. If limit is exceeded, error 671 "Requested allocation exceeds MAX-MEMORY" is generated.						
MAX-MESSAGE-LENGTH	2147483647 | *n*	O	z	u	w	v	b
	Maximum message size that the broker kernel can process. This value is transport-dependent. The default value represents the highest positive number that can be stored in a four-byte integer.						
MAX-MESSAGES-IN-UOW	16 | *n*	O	z	u	w	v	b
	Maximum number of messages in a UOW (or publication).						
MAX-MSG	See MAX-MESSAGE-LENGTH.						
MAX-UOW-MESSAGE-LENGTH	See MAX-MESSAGE-LENGTH.						
MAX-UOWS	0 | *n*	O	z	u	w	v	b
	The maximum number of UOWs that can be concurrently active broker-wide. The default value is 0 (zero), which means that the broker will process only messages that are not part of a unit of work. If UOW processing is to be done by any service, a MAX-UOWS value must be 1 or larger for the broker.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	The MAX-UOWS value for the service will default to the value set for the broker. NUM-UOW is an alias of this parameter.						
MESSAGE-CASE	NONE | UPPER | LOWER	O	z	u	w	v	b
	Indicates if certain error message texts returned by the broker to its clients or written by the broker to its log file are to be in mixed case, uppercase, or lowercase. NONE No changes are made to message case. UPPER Messages are changed to uppercase. LOWER Messages are changed to lowercase.						
MUOW	See NUM-UOW.						
NEW-UOW-MESSAGES	YES | NO	O	z	u	w	v	b
	YES New UOW messages are allowed. NO New UOW messages are not allowed. This applies to UOW when using Persistence and should not be used for non-persistent UOWs. A usage example could be the following: The broker persistent store reaches capacity and the broker shuts down. You can set NEW-UOW-MESSAGES to "NO" to prevent new UOW messages from being added after a broker restart. This action allows only consumption (not production) of UOWs to occur after broker restart. After the persistent store capacity has been sufficiently reduced, the EntireX Broker administrator can issue a CIS command, see ALLOW-NEWUOWMSGS under *Broker CIS Data Structures* in the ACI Programming documentation. This action allows new UOW messages to be sent to the broker. Reset attribute NEW-UOW-MESSAGES to "YES", which permits new UOW messages to be produced in subsequent broker sessions.						
NUM-BLACKLIST-ENTRIES	256 | *n*	O	z	u	w	v	b
	Number of entries in the participant blacklist. Default value is 256 entries. Together with BLACKLIST-PENALTY-TIME and PARTICIPANT-BLACKLIST, this attribute is used to protect a broker running with SECURITY=YES against denial-of-service attacks. See *Protecting a Broker against Denial-of-Service Attacks* in the platform-specific broker administration documentation.						
NUM-CLIENT	*n*	R	z	u	w	v	b
	Number of clients that can access the broker concurrently. A value of 0 (zero) is invalid.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
NUM-CMDLOG-FILTER	1 | *n*	O	z	u	w	v	b
	Maximum number of filters that can be specified simultaneously. **Tip:** We recommend you limit this value to the number of services that are being monitored. Minimum value is 1. A value of zero is invalid when the attribute CMDLOG is set to "YES". See *Command Logging in EntireX* for more information.						
NUM-COMBUF	1 - 999999	R	z	u	w	v	b
	Determines the maximum number of communication buffers available for processing commands arriving in the broker kernel. The size of one communication buffer is usually 16 KB split into 32 slots of 512 bytes, but it ultimately depends on the hardware architecture of your CPU. A value of 0 (zero) is invalid.						
NUM-CONVERSATION or NUM-CONV	*n* | AUTO	R	z	u	w	v	b
	Defines the number of conversations that can be active concurrently. The number specified should be high enough to account for both conversational and non-conversational requests. (Non-conversational requests are treated internally as one-conversation requests.) *n* Number of conversations. AUTO Uses the CONV-DEFAULT and the service-specific CONV-LIMIT values to calculate the number of conversations. The values used in the calculation must not be set to "UNLIM". **Note:** 1. A value of 0 (zero) is invalid. If a wildcard service is defined in the service-specific section of the attribute file, the value of AUTO is invalid. 2. See *Wildcard Service Definition* under *Broker Attributes* in the platform-independent administration documentation.						
NUM-LONG-BUFFER or NUM-LONG	*n* | AUTO	R	z	u	w	v	b
	Defines the number of long message containers. Long message containers have a fixed length of 4096 bytes and are used to store requests that are larger than 2048 bytes. Storing a request of 8192 bytes, for example, would require two long message containers. *n* Number of buffers. AUTO Uses the LONG-BUFFER-DEFAULT and the service-specific LONG-BUFFER-LIMIT values to calculate the number of long						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	message buffers. The values used in the calculation must not be set to "UNLIM". A value of 0 (zero) is invalid. In *non-conversational* mode, message containers are released as soon as the client receives a reply from the server. If no reply is requested, message containers are released as soon as the server receives the client request. In *conversational* mode, the last message received is always kept until a new one is received. **Note:** 1. If a catch-all service is defined in the service-specific section of the attribute file, the value of AUTO is invalid. 2. See *Wildcard Service Definition* under *Broker Attributes* in the platform-independent administration documentation.							
NUM-PUBLICATION	*n* | AUTO	O	z	u	w	v	b
	Defines the number of publications that can be active concurrently. *n* Number of publications AUTO Uses the PUBLICATION-DEFAULT and the topic-specific PUBLICATION-LIMIT to calculate the number of publications. The values used in the calculation must not be set to "UNLIM" **Note:** 1. A value of 0 (zero) is invalid. 2. If a wildcard topic is defined in the topic-specific section of the attribute file, the value of AUTO is invalid.							
NUM-PARTICIPANT-EXTENSION	*n*	O	z	u	w	v	b
	Defines the number of participant extensions to link participants as clients and servers. *n* Number of participant extensions *not specified* If this attribute is not set, the default value is calculated based on NUM-CLIENT and NUM-SERVER.							

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	A value of 0 (zero) is invalid.						
NUM-PUBLISHER	*n*	O	z	u	w	v	b
	Number of publishers that can access the broker concurrently. A value of 0 (zero) is invalid.						
NUM-SERVER	*n* | AUTO	R	z	u	w	v	b
	Defines the number of servers that can offer services concurrently using the broker. This is *not* the number of services that can be registered to the broker (see NUM-SERVICE). *n* Number of servers. AUTO Uses the SERVER-DEFAULT and the service-specific SERVER-LIMIT values to calculate the number of servers. The values used in the calculation must not be set to "UNLIM". **Note:** 1. Setting this value higher than the number of services allows the starting of server replicas that provide the same service. 2. A value of 0 (zero) is invalid. If a wildcard service is defined in the service-specific section of the attribute file, the value of AUTO is invalid. 3. See *Wildcard Service Definition* under *Broker Attributes* in the platform-independent administration documentation.						
NUM-SERVICE	*n*	R	z	u	w	v	b
	Defines the number of services that can be registered to the broker. This is *not* the number of servers that can offer the services (see NUM-SERVER). A value of 0 (zero) is invalid.						
NUM-SERVICE-EXTENSION	*n* | AUTO	O	z	u	w	v	b
	Defines the number of service extensions to link servers to services. *n* Number of service extensions. AUTO Uses the value specified or calculated for NUM-SERVER + NUM-CLIENT, plus an extra cushion. *not specified* If this attribute is not set, the default value is NUM-SERVER multiplied by NUM-SERVICE. The minimum value is NUM-SERVER. The maximum value is NUM-SERVER multiplied by NUM-SERVICE. Caution is recommended with this attribute:						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	■ Set this attribute only if the storage resources allocated for service extensions need to be restricted. ■ Note that the value <*n*> allows only the specified number of server instances of <*n*> to be used. ■ Value AUTO will calculate the number of allowed server instances from NUM-SERVER, which itself might be set to AUTO. In this case, this also considers the value of SERVER-DEFAULT and even the individual SERVER-LIMIT for each service definition (see note below).						
NUM-SHORT-BUFFER or NUM-SHORT	*n* | AUTO	R	z	u	w	v	b
	Defines the number of short message containers. Short message containers have a fixed length of 256 bytes and are used to store requests of no more than 2048 bytes. To store a request of 1024 bytes, for example, would require four short message containers. *n* Number of buffers. AUTO Uses the SHORT-BUFFER-DEFAULT and the service-specific SHORT-BUFFER-LIMIT values to calculate the number of short message buffers. The values used in the calculation must not be set to "UNLIM". **Note:** 1. In *non-conversational* mode, message containers are released as soon as the client receives a reply from the server. If no reply is requested, message containers are released as soon as the server receives the client request. 2. In *conversational* mode, the last message received is always kept until a new one is received. 3. If a wildcard service is defined in the service-specific section of the attribute file, the value of AUTO is invalid. 4. See *Wildcard Service Definition* under *Broker Attributes* in the platform-independent administration documentation.						
NUM-SUBSCRIBER	*n* | AUTO	O	z	u	w	v	b
	Defines the number of subscribers that can be active concurrently. *n* Number of subscribers. AUTO Uses the SUBSCRIBER-DEFAULT and the topic-specific SUBSCRIBER-LIMIT to calculate the number of subscribers.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	A value of 0 (zero) is invalid. If a wildcard topic is defined in the topic-specific section of the attribute file, the value of AUTO is invalid.						
NUM-SUBSCRIBER-TOTAL	*n* | AUTO	O	z	u	w	v	b
	Defines the total number of subscribers that can be durably subscribed. Their subscription information is saved in the persistent store. *n* Total number of subscribers. AUTO Uses the value defined or calculated for NUM-SUBSCRIBER. A value of 0 (zero) is invalid. This value must be greater than or equal to the NUM-SUBSCRIBER value. Parameter is required if SUBSCRIBER-STORE=PSTORE is defined.						
NUM-TOPIC	*n*	O	z	u	w	v	b
	Defines the number of topics that can be active in the broker. A value of 0 (zero) is invalid.						
NUM-TOPIC-EXTENSION	*n* | AUTO	O	z	u	w	v	b
	Defines the number of topic extensions to link subscribers to topics. *n* Number of topic extensions. AUTO Uses the value specified for NUM-SUBSCRIBER + NUM-PUBLISHER, plus an extra cushion. *not specified* If this attribute is not set, the default value is NUM-SUBSCRIBER multiplied by NUM-TOPIC. The minimum value is NUM-SUBSCRIBER. The maximum value is NUM-SUBSCRIBER multiplied by NUM-TOPIC. Caution is recommended with this attribute. ■ Set this attribute only if the storage resources allocated for topic extensions need to be restricted. ■ Note that the value <*n*> allows only the specified number of topic instances of <*n*> to be used. ■ Value AUTO calculates the number of allowed server instances from NUM-SUBSCRIBER, which itself might set to AUTO. In this case, this also considers the value of SERVER-DEFAULT and even the individual SERVER-LIMIT for each topic definition (see note below).						
NUM-TOPIC-TOTAL	*n* | AUTO	O	z	u	w	v	b
	Defines the total number of topics for which durable subscribers are allowed.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	n Total number of topics that allow durable subscriptions. AUTO Uses the value defined for NUM-TOPIC. This value must be greater than or equal to the NUM-TOPIC value. This parameter is required if SUBSCRIBER-STORE=PSTORE is defined.						
NUM-UOW	0 | *n*	O	z	u	w	v	b
	The maximum number of UOWs that can be concurrently active broker-wide. The default value is 0 (zero), which means that the broker will process only messages that are not part of a unit of work. If UOW processing is to be done by any service, a NUM-UOW value must be 1 or larger for the broker. (MAX-UOWS is an alias for this attribute.) The NUM-UOW value for the service will default to the value set for the broker.						
NUM-WORKER	1 | *n* (max. 10)	R	z	u	w	v	b
	Number of worker tasks that the broker can use. The number of worker tasks determines the number of functions (SEND, RECEIVE, REGISTER, etc.) that can be processed concurrently. At least one worker task is required; this is the default value.						
NUM-WQE	1 - 32768	R	z	u	w	v	b
	Maximum number of requests that can be processed by the broker in parallel, over all transport mechanisms. Each broker command is assigned a worker queue element, regardless of the transport mechanism being used. This element is released when the user has received the results of the command, including the case where the command has timed out.						
PARTICIPANT-BLACKLIST	YES | NO	R	z	u	w	v	b
	Determines whether participants attempting a denial-of-service attack on the broker are to be put on a blacklist. YES Create a participant blacklist. NO Do not create a participant blacklist. See *Protecting a Broker against Denial-of-Service Attacks* in the platform-specific broker administration documentation.						
PARTNER-CLUSTER-ADDRESS	A32	R	z	u	w	v	b
	This is the address of the load/unload broker in transport-method-style. Transport methods TCP and SSL are supported. See *Transport-method-style*						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	Broker ID for more details. This attribute is required if the attribute RUN-MODE is specified.						
POLL	YES | NO	O	z	u		v	
	In earlier EntireX versions, the maximum number of TCP/IP connections per communicator was limited; see *Maximum TCP/IP Connections per Communicator* under ***Broker Resource Allocation*** for platform-specific list. With attribute POLL introduced in EntireX version 9.0, this restriction can be lifted under z/OS, UNIX and z/VSE. YES The poll() system call is used to lift the resource restrictions with select() in multiplexing file descriptor sets. NO This setting is used to run the compatibility mode in Broker. The poll() system call is not used. The limitations described under *Maximum TCP/IP Connections per Communicator* under ***Broker Resource Allocation*** apply. **Note:** Setting this attribute to YES increases CPU consumption. POLL=YES is only useful if you need more than the maximum number of TCP/IP connections per communicator; we recommend POLL=NO to reduce CPU consumption.						
PSTORE	NO | HOT | COLD	O	z	u	w	v	b
	Defines the status of the persistent store at broker startup, including the condition of persistent units of work (UOWs). With any value other than "NO", PSTORE-TYPE must be set. NO No persistent store. HOT Persistent UOWs are restored to their prior state during initialization. COLD Persistent UOWs are not restored during initialization, and the persistent store is considered empty. **Note:** For a hot or cold start, the persistent store must be available when your broker is restarted.						
PSTORE-REPORT	NO | YES	O	z	u	w	v	b
	Determines whether PSTORE report is created. NO Do not create the PSTORE report file. YES Create the PSTORE report file.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	See also *Persistent Store Report* under *Concepts of Persistent Messaging* in the general administration documentation.						
PSTORE-TYPE	DIV (z/OS) | CTREE (UNIX, Windows) | Adabas (all platforms) | FILE (UNIX, Windows)	O	z	u	w	v	b
	Describes the type of persistent store driver required. DIV — Data in Virtual. z/OS only, and default on this platform. See *DIV-specific Attributes* below and *Implementing a DIV Persistent Store* under *Managing the Broker Persistent Store* in the z/OS administration documentation. CTREE — c-tree database. UNIX and Windows only. See *c-tree-specific Attributes* and *c-tree Database as Persistent Store* in the UNIX and Windows administration documentation. ADABAS — Adabas. All platforms. See also *Adabas-specific Attributes* (below) and ***Managing the Broker Persistent Store***. FILE — B-Tree database. UNIX and Windows only. No longer supported.						
PSTORE-VERSION	2 | 3 | 4	O	z	u	w	v	b
	Determines the version of the persistent store. PSTORE=COLD is not needed to upgrade the PSTORE to version 3. Any broker restart with PSTORE-VERSION=3 will upgrade the PSTORE version. PSTORE-VERSION=3 is needed for ICU support. We recommended setting PSTORE-VERSION=3. PSTORE-VERSION=4 is needed to use the DIV PSTORE handler introduced with version 9.0. It requires much less configuration data. **Caution:** ■ If you go back to PSTORE-VERSION=2 after upgrading to PSTORE-VERSION=3, the broker will only process data previously created with version 2. No version 3 data will be accessible. ■ If you change the DIV PSTORE from version 3 to 4, perform a COLD restart for the change to take effect, or run PSTORE UNLOAD/LOAD first.						
PUBLICATION-DEFAULT	n | UNLIM	O	z	u	w	v	b
	Default number of publications that are allocated for every topic.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	n Number of publications. UNLIM The number of publications is restricted only by the number of publications globally available. Precludes the use of `NUM-PUBLICATION=AUTO`. This value can be overridden by specifying a `PUBLICATION-LIMIT` for the topic. A value of 0 (zero) is invalid.						
`PUBLICATION-LIFETIME`	*n* | *n*S | *n*M | *n*H | *n*D | *n*Y	O	z	u	w	v	b
	Lifetime of a publication in absolute time units. Publications are retained by broker until they are either received by all subscribers or the publication lifetime has expired. *n* Same as *n*S. *n*S Publication lifetime in seconds (max. 2147483647). *n*M Publication lifetime in minutes (max. 35791394). *n*H Publication lifetime in hours (max. 596523). *n*D Publication lifetime in days (max. 24855). *n*Y Publication lifetime in years (max. 68). The publication lifetime is calculated even for periods of time when broker is stopped.						
`PUBLISH-AND-SUBSCRIBE`	YES | NO	O	z	u	w	v	b
	Run publish and subscribe subsystem. Subsystem requires a license.						
`RUN-MODE`	STANDARD | STANDBY | PSTORE-LOAD | PSTORE-UNLOAD	O	z	u	w	v	b
	Determines the initial run mode of the broker. STANDARD Default value. Normal mode. STANDBY Deprecated. Supported for compatibility reasons. PSTORE-LOAD Broker will run as load broker to write Persistent Store data to a new persistent store. See also *Migrating the Persistent Store* in the general administration documentation. PSTORE-UNLOAD Broker will run as unload broker to read an existing persistent store and pass the data to a broker running						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	in PSTORE-LOAD mode. See also *Migrating the Persistent Store* in the general administration documentation.						
SECURITY	NO | YES	O	z	u	w	v	b
	Determines whether the EntireX Broker security exits are activated. NO The security exits are not activated. YES The security exits are activated. If the security routines cannot be activated, the broker will not start. Broker trace reports the type of security which is active and from where the security module USRSEC is loaded: ■ EntireX Security ■ User-written USRSEC.						
SECURITY-PATH	A255	O	z	u	w		b

	Full path and file name of an executable file (for example, DLL for Windows or shared library for UNIX) containing the user security exit which the kernel will load and call. Example:
	
	`SECURITY-PATH=usersec.dll`
	
	This assumes the DLL is in the default path. Or:
	
	`SECURITY-PATH=c:\brokerexit\yoursecu.dll`
	
	If the path name contains spaces, enclose it in quotation marks. Example:
	
	`SECURITY-PATH="c:\Software AG\broker exit\yoursecu.dll"`
	
	Note: This attribute is used only when implementing a user-written security exit.						

SERVER-DEFAULT	*n* | UNLIM	O	z	u	w	v	b
	Default number of servers that are allowed for every service. *n* Number of servers. UNLIM The number of servers is restricted only by the number of servers globally available. Precludes the use of `NUM-SERVER=AUTO`.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	This value can be overridden by specifying a SERVER-LIMIT for the service. A value of 0 (zero) is invalid.						
SERVICE-UPDATES	YES | NO	O	z	u	w	v	b
	Switch on/off the automatic update mode of the broker. YES The broker reads the attribute file whenever a service registers for the first time. This allows the broker to honor modifications in the attribute file *without* a restart. The attribute file is read only when the first server registers for a particular service; it is not reread when a second replica is activated. NO The attribute file is read only once during broker startup. Any changes to the attribute file will be honored only if the broker is restarted.						
SHORT-BUFFER-DEFAULT	UNLIM | *n*	O	z	u	w	v	b
	Number of short buffers to be allocated for each service. UNLIM The number of short message buffers is restricted only by the number of buffers globally available. Precludes the use of NUM-SHORT-BUFFER=AUTO. *n* Number of buffers. This value can be overridden by specifying a SHORT-BUFFER-LIMIT for the service. A value of 0 (zero) is invalid.						
SSLPORT	See PORT.						
SSL-RESTART	See RESTART.						
SSL-RETRY-LIMIT	See RETRY-LIMIT.						
SSL-RETRY-TIME	See RETRY-TIME.						
SSTORE SSTORE-TYPE	These parameters are obsolete. The subscriber store in a secondary store is no longer supported. We recommend you use the PSTORE persistent store to store your subscriber data. For this, set broker-specific parameter SUBSCRIBER-STORE=PSTORE.						
STORAGE-REPORT	NO | YES	O	z	u	w	v	b
	Create a storage report about broker memory usage. NO Do not create the storage report. YES Create the storage report. See *Storage Report* under ***Broker Resource Allocation***.						
STORE	OFF | BROKER	O	z	u	w	v	b

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	Sets the default STORE attribute for all units of work. This attribute can be overridden by the `STORE` field in the Broker ACI control block. OFF Units of work are not persistent. BROKER Units of work are persistent.						
`SUBSCRIBER-DEFAULT`	*n* | UNLIM	O	z	u	w	v	b
	Default number of subscribers that are allowed for every topic. *n* Number of subscribers UNLIM The number of subscribers is restricted only by the number of subscribers globally available. Precludes the use of `NUM-SUBSCRIBER=AUTO`. This value can be overridden by specifying a `SUBSCRIBER-LIMIT` for the topic. A value of 0 (zero) is invalid.						
`SUBSCRIBER-STORE`	NO | PSTORE	O	z	u	w	v	b
	Determines whether subscriber information is stored and where. NO No subscriber information is to be stored. PSTORE Save subscriber data in PSTORE. **Tip:** The subscriber store in a secondary store is no longer supported. We recommend you use the PSTORE persistent store to store your subscriber data.						
`TCPPORT`	See `PORT`.						
`SWAP-OUT-NEW-UOWS`	NO | YES	O	z	u	w	v	b
	Determines whether conversations with units of work remain in memory or are swapped. See slso *Swapping out New Units of Work* in the general administration documentation. NO All conversations with UOWs remain in memory. YES Conversations with UOWs (`STORE=BROKER`) created by a client and finished with an EOC without being accepted by a server will be swapped out of memory. The data is persisted on PSTORE and there is no need to keep it in memory unless a server wants to receive this data. **Note:** See service-specific attribute `MIN-UOW-CONVERSATIONS-IN-MEMORY` for defining a minimum number of UOW conversations kept in memory to						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	improve the performance for servers receiving new UOW conversations without waiting for swap-in of data from PSTORE. During broker restart, all new and unassigned UOW conversations remain in PSTORE only. This reduces the restart time significantly. See also *Swapping out New Units of Work* in the general administration documentation.						
TCP-RESTART	See RESTART.						
TCP-RETRY-LIMIT	See RETRY-LIMIT.						
TCP-RETRY-TIME	See RETRY-TIME.						
TOPIC-UPDATES	YES | NO	O	z	u	w	v	b
	Switch on/off automatic update of topic defaults in the broker. YES The broker reads the attribute file whenever a topic is being subscribed for the first time. This allows broker to honor modifications in the attribute file without a restart. The attribute file is read only when the first subscriber subscribes to a particular topic. It is not reread when a second subscriber subscribes to the same topic. NO The attribute file is read only once during broker startup. Any changes to the attribute file will be honored only if the broker is restarted.						
TRACE-DD	A255	O	z				
	A string containing data set attributes enclosed in quotation marks. These attributes describe the trace output file and must be defined if you are using using a GDG (generation data group) as output data set. See *Flushing Trace Data to a GDG Data Set* under *Tracing EntireX Broker*. The following keywords are supported as part of the TRACE-DD value: ■ DATACLAS ■ DCB including BLKSIZE, DSORG, LRECL, RECFM ■ DISP ■ DSN ■ MGMTCLAS ■ SPACE ■ STORCLAS ■ UNIT Refer to your JCL Reference Manual for a complete description of the syntax.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000

	Example:
	
	`TRACE-DD = "DSNAME=EXX.GDG,`
	`DCB=(BLKSIZE=1210,DSORG=PS,LRECL=121,RECFM=FB),`
	`DISP=(NEW,CATLG,CATLG),`
	`SPACE=(CYL,(100,10)),`
	`STORCLAS=SMS"`						

TRACE-LEVEL	0 - 4	O	z	u	w	v	b
	The level of tracing to be performed while the broker is running. 0 No tracing. Default value. 1 Traces incoming requests, outgoing replies, resource usage and conversion errors if SAGTRPC is used for CONVERSION with the conversion options SUBSTITUTE-NONCONV or STOP. 2 All of trace level 1, plus all main routines executed. 3 All of trace level 2, plus all routines executed. 4 All of trace level 3, plus Broker ACI control block displays. If you modify the TRACE-LEVEL attribute, you must restart the broker for the change to take effect. For temporary changes to TRACE-LEVEL without restarting the broker, use System Management Hub or ETBCMD. Trace levels 2, 3, and 4 should be used only when requested by Software AG support.						
TRANSPORT	TCP | SSL | NET	O	z	u	w	v	b
	The broker transport may be specified as any combination of one or more of the following methods: TCP TCP/IP is supported. SSL SSL or TLS is supported. This value is not supported for a broker under z/VSE. NET Entire Net-Work is supported. This value is not supported for a broker under UNIX or Windows. **Examples:** TRANSPORT=NET specifies that only the Entire Net-Work transport method will be supported by the broker. TRANSPORT=TCP-NET specifies that both the TCP/IP and Net-Work transport methods will be supported by the broker.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	TRANSPORT=TCP-SSL-NET specifies that the TCP/IP, SSL (or TLS), and Entire Net-Work transport methods will be supported by the broker. Section *TCP/IP-specific Attributes* (DEFAULTS=TCP) under *Broker Attributes* in the platform-independent administration documentation describes the parameters for each transport method.						
TRAP-ERROR	*nnnn*	O	z	u	w		b
	Where *nnnn* is the four-digit API error number that triggers the trace handler, for example 0007 (Service not registered). Leading zeros are not required. There is no default value. See *Deferred Tracing* in the platform-specific Broker administration documentation.						
TRBUFNUM	*n*	O	z	u	w		b
	Changes the trace to write trace data to internal trace buffers. *n* is the size of the trace buffer in 64 KB units. There is no default value.						
TRMODE	WRAP	O	z	u	w		b
	Changes the trace mode. "WRAP" is the only possible value. This value instructs broker to write the trace buffer (see TRBUFNUM) if an event occurs. This event is triggered by a matching TRAP-ERROR during request processing or when an exception occurs.						
UMSG	See MAX-MESSAGES-IN-UOW.						
UOW-MSGS	See MAX-MESSAGES-IN-UOW.						
UWSTAT-LIFETIME	no value | *n*[S] | *n*M | *n*H | *n*D	O	z	u	w	v	b
	The value to be added to the UWTIME (lifetime of associated UOW). If a value is entered, it must be 1 or greater; a value of 0 will result in an error. If no value is entered, the lifetime of the UOW *status* information will be the same as the lifetime of the UOW itself. *n*S Number of seconds the UOW status exists longer than the UOW itself (max. 2147483647). *n*M Number of minutes (max. 35791394). *n*H Number of hours (max. 596523). *n*D Number of days (max. 24855). The lifetime determines how much additional time the UOW status is retained in the persistent store and is calculated from the time at which the associated UOW enters any of the following statuses: "PROCESSED", "TIMEOUT", "BACKEDOUT", "CANCELLED", "DISCARDED". The						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	additional lifetime of the UOW status is calculated only when broker is executing. Value in `UWSTAT-LIFETIME` supersedes the value (if specified) in attribute `UWSTATP`. **Note:** If no unit is specified, the default unit is seconds. The unit does not have to be identical to the unit specified for `UWTIME`.						
`UWSTATP`	0 | *n*	O	z	u	w	v	b
	Contains a multiplier used to compute the lifetime of a persistent status for the service. The `UWSTATP` value is multiplied by the `UWTIME` value (the lifetime of the associated UOW) to determine the length of time the status will be retained in the persistent store. 0 The status is not persistent. 1 - 254 Multiplied by the value of `UWTIME` to determine how long a persistent status will be retained. **Note:** This attribute has not been supported since EntireX version 7.3. Use `UWSTAT-LIFETIME` instead.						
`UWTIME`	1D | *n*S | *n*M | *n*H | *n*D	O	z	u	w	v	b
	Defines the default lifetime for units of work for the service. *n*S Number of seconds the UOW can exist (max. 2147483647). *n*M Number of minutes the UOW can exist (max. 35791394). *n*H Number of hours the UOW can exist (max. 596523). *n*D Number of days the UOW can exist (max. 24855). If the UOW is inactive - that is, is not processed within the time limit - it is deleted and given a status of "TIMEOUT". This attribute can be overridden by the `UWTIME` field in the Broker ACI control block. See *Timeout Considerations for EntireX Broker* in the general administration documentation.						
`WAIT-FOR-ACTIVE-PSTORE`	NO | YES	O	z	u	w	v	b
	Determines whether broker should wait for the Adabas Persistent Store to become active. NO If broker should start with a `PSTORE-TYPE=ADABAS` and the database is not active or is not accessible, broker will stop.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	YES If broker should start with a PSTORE-TYPE=ADABAS and the database is not active or is not accessible, broker will retry every 10 seconds to initiate communications with the PSTORE. Broker will reject any user requests until broker is able to contact the Adabas database.						
WORKER-MAX	32 | *n* (min. 1, max. 32)	O	z	u	w		b
	Maximum number of worker tasks the broker can use.						
WORKER-MIN	1 | *n* (min. 1, max. 32)	O	z	u	w		b
	Minimum number of worker tasks the broker can use.						
WORKER-NONACT	70S *n* | *n*S | *n*M | nH	O	z	u	w		b
	Non-activity time to elapse before a worker tasks is stopped. *n* Same as *n*S. *n*S Non-activity time in seconds (default 70, max. 2147483647). *n*M Non-activity time in in minutes (max. 35791394). *n*H Non-activity time in hours (max. 596523). **Caution:** A value of 0 (zero) is invalid. If you set this value too low, additional overhead is required for starting and stopping worker tasks. The default and recommended value is 70S.						
WORKER-QUEUE-DEPTH	1 | *n* (min. 1)	O	z	u	w		b
	Number of unassigned user requests in the input queue before another worker task gets started. The default and recommended value is 1. A higher value will result in longer broker response times.						
WORKER-START-DELAY	*internal-value* | *n*	O	z	u	w		b
	n Delay is extended by *n* seconds. Delay after a successful worker task invocation before another worker task can be started to handle current incoming workload. This attribute is used to avoid the risk of recursive invocation of worker tasks, because starting a worker task itself causes workload increase. If no value is specified, an internal value calculated by the broker is used to optimize dynamic worker management. This calculated value is the maximum time required to start a worker task.						

Service-specific Attributes

Each section begins with the keyword DEFAULTS=SERVICE. Services with common attribute values can be grouped together. The attributes defined in the grouping apply to all services specified within it. However, if a different attribute value is defined immediately following the service definition, that new value applies. See also the sections *Wildcard Service Definition* under *Broker Attributes* in the platform-independent administration documentation and ***Service Update Modes*** below the table.

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
CLASS	A32 (case-sensitive)	R	z	u	w	v	b
	Part of the name that identifies the service together with the SERVER and SERVICE attributes. CLASS must be specified first, followed immediately by SERVER and SERVICE. Classes starting with any of the following are reserved for use by Software AG and should not be used in customer-written applications: BROKER, SAG, ENTIRE, ETB, RPC, ADABAS, NATURAL. Valid characters for class name are letters a-z, A-Z, numbers 0-9, hyphen and underscore. Do not use dollar, percent, period or comma. See also the restriction for SERVICE attribute names.						
CLIENT-RPC-AUTHORIZATION	N | Y	O	z				b
	Determines whether this service is subject to RPC authorization checking. N No RPC authorization checking is performed. Y RPC library and program name are appended to the authorization check performed by EntireX Security. Specify "YES" only to RPC-supported services. To allow conformity with Natural Security, the CLIENT-RPC-AUTHORIZATION parameter can optionally be defined with a prefix character as follows: CLIENT-RPC-AUTHORIZATION= (YES,<prefix-character>).						
CONV-LIMIT	UNLIM | *n*	O	z	u	w	v	b
	Allocates a number of conversations especially for this service.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	UNLIM The number of conversations is restricted only by the number of conversations globally available. Precludes the use of `NUM-CONVERSATION=AUTO` in the Broker section of the attribute file. *n* Number of conversations. A value of 0 (zero) is invalid. If `NUM-CONVERSATION=AUTO` is specified in the Broker section of the attribute file, `CONV-LIMIT=UNLIM` is not allowed in the service section. A value must be specified or the `CONV-LIMIT` attribute must be suppressed entirely for the service so that the default (`CONV-DEFAULT`) becomes active.							
`CONV-NONACT`	5M | *n* | *n*S | *n*M | *n*H	R	z	u	w	v	b
	Non-activity time for connections. *n* Same as *n*S. *n*S Non-activity time in seconds (max. 2147483647). *n*M Non-activity time in minutes (max. 35791394). *n*H Non-activity time in hours (max. 596523). A value of 0 (zero) is invalid. If a connection is not used for the specified time, that is, a server or a client does not issue a broker request that references the connection in any way, the connection is treated as inactive and the allocated resources are freed.							
`CONVERSION`	Format: A255 `( SAGTCHA [, TRACE =n] [, OPTION =s] | SAGTRPC [, TRACE =n] [, OPTION =s] | name [, TRACE =n] | NO )`	O	z	u	w	v	b
	Defines conversion for internationalization. See *Internationalization with EntireX* and *What is the Best Internationalization Approach to use?* under *Introduction to Internationalization* for help on making decisions about the internationalization approach.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	SAGTCHA — Conversion using ICU Conversion [1] for *ACI-based Programming*. SAGTRPC [2] — Conversion using ICU Conversion [1] for *RPC-based Components* and *Reliable RPC*. We recommend always using SAGTRPC for RPC data streams. *Conversion with Multibyte, Double-byte and other Complex Codepages* will always be correct, and *Conversion with Single-byte Codepages* is also efficient because SAGTRPC detects single-byte codepages automatically. See *Conversion Details*. <*name*> [2] — Name of the SAGTRPC user exit for RPC-based components. See also *Configuring SAGTRPC User Exits* under *Configuring Broker for Internationalization* in the platform-specific administration documentation and *Writing SAGTRPC User Exits* in the platform-specific administration documentation. NO — If conversion is not to be used, either omit the `CONVERSION` attribute or specify `CONVERSION=NO`, for example for binary payload. Only one internationalization approach can be active at one time for a service. The `CONVERSION` attribute for internationalization overrides the `TRANSLATION` attribute when defined for a service. That is, when `TRANSLATION` and `CONVERSION` are both defined, `TRANSLATION` will be ignored. **Note:** 1. See also *Configuring ICU Conversion* under *Configuring Broker for Internationalization* in the platform-specific administration documentation. 2. SAGTRPC and SAGTRPC user exit are not supported on z/VSE. **TRACE** If tracing is switched on, the trace output is written to the broker log file: 0 No tracing						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	1 Trace level STANDARD — This level is an "on-error" trace. It provides information on conversion errors only. For RPC calls this includes the IDL library, IDL program and the data. Please note that if *OPTION Values for Conversion* are set, errors are ignored. 2 Trace level ADVANCED — Tracing of incoming, outgoing parameters and the payload. 3 Trace level SUPPORT — This trace level is for support diagnostics and should only be switched on when requested by Software AG support. **OPTION** See table of possible values under *OPTION Values for Conversion*.						
DEFERRED	NO | YES	O	z	u	w	v	b
	NO Units of work cannot be sent to the service until it is available. YES Units of work can be sent to a service that is not up and registered. The units of work will be processed when the service becomes available.						
ENCRYPTION-LEVEL	0 | 1 | 2	O	z	u	w	v	b
	Enforce encryption when data is transferred between client and server. 0 No encryption is enforced. 1 Encryption is enforced between server and broker kernel. 2 Encryption is enforced between server and broker kernel, and also between client and broker. See also ENCRYPTION-LEVEL in Broker ACI control block and *Encryption* under *Writing Applications using EntireX Security* in the ACI Programming documentation. **Note:** The per service ENCRYPTION-LEVEL attribute is to be specified only where the broker attribute SECURITY=YES has been specified and only if you are using EntireX Security.						
LOAD-BALANCING	YES | NO	O	z	u	w	v	b

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	YES When servers that offer a particular service are started, new conversations will be assigned to these servers in a round-robin fashion. The first waiting server will get the first new conversation, the second waiting server will get the second new conversation, and so on. NO A new conversation is always assigned to the first server in the queue.						
LONG-BUFFER-LIMIT	UNLIM | *n*	O	z	u	w	v	b
	Allocates a number of long message buffers for the service. UNLIM The number of long message buffers is restricted only by the number of buffers globally available. Precludes the use of NUM-LONG-BUFFER=AUTO in the Broker section of the attribute file. *n* Number of long message buffers. A value of 0 (zero) is invalid. If NUM-LONG-BUFFER=AUTO is specified in the Broker section of the attribute file, LONG-BUFFER-LIMIT=UNLIM is not allowed in the service section. A value must be specified or the LONG-BUFFER-LIMIT attribute must be suppressed entirely for the service so that the default (LONG-BUFFER-DEFAULT) becomes active.						
MAX-MESSAGES-IN-UOW	16 | *n*	O	z	u	w	v	b
	Maximum number of messages in a UOW.						
MAX-MESSAGE-LENGTH	2147483647 | *n*	O	z	u	w		b
	Maximum message size that can be sent to a service. This is transport-dependent. The default value represents the highest positive number that can be stored in a four-byte integer.						
MAX-MSG	See MAX-MESSAGE-LENGTH.						
MAX-UOW-MESSAGE-LENGTH	See MAX-MESSAGE-LENGTH.						
MAX-UOWS	0 | *n*	O	z	u	w	v	b
	0 The service does not accept units of work, i.e. it processes only messages that are not part of a UOW. Using zero prevents the sending of UOWs to services that are not intended to process them.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	n Maximum number of UOWs that can be active concurrently for the service. If you do not provide a MAX-UOWS value for the service, it defaults to the MAX-UOWS setting for the broker. If you provide a value that exceeds that of the broker, the service MAX-UOWS is set to the broker's MAX-UOWS value and a warning message is issued. Specify MAX-UOWS=0 for Natural RPC Servers. This restriction will be removed with a later release.						
MIN-UOW-CONVERSATIONS-IN-MEMORY	256 | *n*	O	z	u	w	v	b
	Defines the minimum number of UOW conversations (STORE=BROKER, created by a client and finished with an EOC without being accepted by a server) kept in memory to improve the performance for servers receiving new UOW conversations without waiting for data to be swapped in from PSTORE. See also *Swapping out New Units of Work* in the general administration documentation. 256 The default value should be used if producer (client) and consumer (server) of UOW conversations are both active at the same time regardless of the speed producing or consuming UOW conversations. It guarantees a reasonable balance between memory being used and swap-out/swap-in activities. *n* Minimum number of UOW conversations kept in memory. The value *n* is equal to or greater than 256. **Note:** If broker-specific attribute SWAP-OUT-NEW-UOWS is set to "NO", MIN-UOW-CONVERSATIONS-IN-MEMORY has no effect.						
MUOW	See MAX-UOWS.						
NOTIFY-EOC	NO | YES	O	z	u	w	v	b
	Specifies whether timed-out conversations are to be stored or discarded. NO Discard the EOC notifications if the server is not ready to receive. YES Store the EOC notifications if the server is not ready to receive and then notify the server if possible.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	If a server is not ready to receive an EOC notification, it can be stored or discarded. If it is stored, the server is notified, if possible, when it is ready to receive. **Caution:** The behavior activated by this parameter can be relied upon only during a single lifetime of the broker kernel. Specifically, conversations containing units of work, whose lifetime can span multiple broker kernel sessions, cannot be assumed to show this behavior, even with `NOTIFY-EOC=YES`.						
`NUM-UOW`	Alias for `MAX-UOWS`.						
`SERVER`	A32 (case-sensitive)	R	z	u	w	v	b
	Part of the name that identifies the service together with the `CLASS` and `SERVICE` attributes. `CLASS` must be specified first, followed immediately by `SERVER` and `SERVICE`. Valid characters for server name are letters a-z, A-Z, numbers 0-9, hyphen and underscore. Do not use dollar, percent, period or comma.						
`SERVER-DEFAULT`	*n* | UNLIM	O	z	u	w	v	b
	Default number of servers that are allowed for every service. *n* Number of servers. UNLIM The number of servers is restricted only by the number of servers globally available. Precludes the use of `NUM-SERVER=AUTO`. A value of 0 (zero) is invalid. This value can be overridden by specifying a `SERVER-LIMIT` for the service.						
`SERVER-LIMIT`	*n* | UNLIM	O	z	u	w	v	b
	Allows a number of servers especially for this service. *n* Number of servers. UNLIM The number of servers is restricted only by the number of servers globally available. Precludes the use of `NUM-SERVER=AUTO` in the Broker section of the attribute file.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	A value of 0 (zero) is invalid. If NUM-SERVER=AUTO is specified in the Broker section of the attribute file, SERVER-LIMIT=UNLIM is not allowed in the service section. A value must be specified or the SERVER-LIMIT attribute must be suppressed entirely for the service so that the default (SERVER-DEFAULT) becomes active.						
SERVER-NONACT	5M | *n* | *n*S | *n*M | *n*H	R	z	u	w	v	b
	Non-activity time for servers. A server that does not issue a broker request within the specified time limit is treated as inactive and all resources for the server are freed. *n* Same as *n*S. *n*S Non-activity time in seconds (max. 2147483647). *n*M Non-activity time in minutes (max. 35791394). *n*H Non-activity time in hours (max. 596523). If a server registers multiple services, the highest value of all the services registered is taken as non-activity time for the server.						
SERVICE	A32 (case-sensitive)	R	z	u	w	v	b
	Part of the name that identifies the service together with the CLASS and SERVER attributes. CLASS must be specified first, followed immediately by SERVER and SERVICE. The SERVICE attribute names "EXTRACTOR" and "DEPLOYMENT" are reserved for Software AG internal use and should not be used in customer-written applications. Valid characters for service name are letters a-z, A-Z, numbers 0-9, hyphen and underscore. Do not use dollar, percent, period or comma. See also the restriction for CLASS attribute names.						
SHORT-BUFFER-LIMIT	UNLIM | *n*	O	z	u	w	v	b
	Allocates a number of short message buffers for the service. UNLIM The number of short message buffers is restricted only by the number of buffers globally available. Precludes the use of NUM-SHORT-BUFFER=AUTO in the Broker section of the attribute file.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	n Number of short message buffers. If NUM-SHORT-BUFFER=AUTO is specified in the Broker section of the attribute file, SHORT-BUFFER-LIMIT=UNLIM is not allowed in the service section. A value must be specified or the SHORT-BUFFER-LIMIT attribute must be suppressed entirely for the service so that the default (SHORT-BUFFER-DEFAULT) becomes active.						
STORE	OFF | BROKER	O	z	u	w	v	b
	Sets the default STORE attribute for all units of work sent to the service. OFF Units of work are not persistent. BROKER Units of work are persistent. This attribute can be overridden by the STORE field in the Broker ACI control block.						
TRANSLATION	Format: A255 SAGTCHA | NO | <*name*>	O	z	u	w	v	b
	Activates *translation* or *translation user exit* for internationalization (see *Translation User Exit* under *Introduction to Internationalization*). For help on deciding the right internationalization approach for your environment, see *What is the Best Internationalization Approach to use?* under *Introduction to Internationalization* SAGTCHA Conversion routine SAGTCHA for *ACI-based Programming*, *RPC-based Components* and *Reliable RPC*. NO If translation is not to be used - e.g., for binary payload (broker messages) - either omit the TRANSLATION attribute or specify TRANSLATION=NO. <*name*> Name of Translation User Exit. See also *Configuring Translation User Exits* under *Configuring Broker for Internationalization* in the platform-specific administration documentation or *Writing Translation User Exits* under *Configuring Broker for Internationalization* in the platform-specific administration documentation.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	The CONVERSION attribute for internationalization overrides the TRANSLATION attribute when defined for a service; that is, when TRANSLATION and CONVERSION are both defined, TRANSLATION will be ignored.						
UMSG	Alias for MAX-MESSAGES-IN-UOW.						
UOW-MSGS	Alias for MAX-MESSAGES-IN-UOW.						
UWSTAT-LIFETIME	no value | *n*[S] | *n*M | *n*H | *n*D	O	z	u	w	v	b
	The value to be added to the UWTIME (lifetime of associated UOW). If a value is entered, it must be 1 or greater; a value of 0 will result in an error. If no value is entered, the lifetime of the UOW *status* information will be the same as the lifetime of the UOW itself. *n*S Number of seconds the UOW status exists longer than the UOW itself (max. 2147483647). *n*M Number of minutes (max. 35791394). *n*H Number of hours (max. 596523). *n*D Number of days (max. 24855). The lifetime determines how much additional time the UOW status is retained in the persistent store and is calculated from the time at which the associated UOW enters any of the following statuses: "PROCESSED", "TIMEOUT", "BACKEDOUT", "CANCELLED", "DISCARDED". The additional lifetime of the UOW status is calculated only when broker is executing. Value in UWSTAT-LIFETIME supersedes the value (if specified) in attribute UWSTATP. **Note:** If no unit is specified, the default unit is seconds. The unit does not have to be identical to the unit specified for UWTIME.						
UWSTATP	0 | *n*	O	z	u	w	v	b
	Contains a multiplier used to compute the lifetime of a persistent status for the service. The UWSTATP value is multiplied by the UWTIME value (the lifetime of the associated UOW) to determine the length of time the status will be retained in the persistent store. 0 The status is not persistent. 1 - 254 Multiplied by the value of UWTIME to determine how long a persistent status will be retained.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	Note: This attribute has not been supported since EntireX version 7.3. Use `UWSTAT-LIFETIME` instead.						
`UWTIME`	1D | *n* S | *n* M | *n* H | nD	O	z	u	w	v	b
	Defines the default lifetime for units of work for the service. *n*S Number of seconds the UOW can exist (max. 2147483647). *n*M Number of minutes the UOW can exist (max. 35791394). *n*H Number of hours the UOW can exist (max. 596523). *n*D Number of days the UOW can exist (max. 24855). If the unit of work (UOW) is inactive, that is, not processed within the time limit, it is deleted and given a status of `TIMEOUT`. This attribute can be overridden by the `UWTIME` field in the Broker ACI control block.						

Wildcard Service Definition

The special names of `CLASS = *`, `SERVER = *` and `SERVICE = *` are allowed in the service-specific section of the broker attribute file. These are known as "wildcard" service definitions. If this name is present in the attribute file, any service that registers with the broker and does not have its own entry in the attribute file will inherit the attributes that apply to the first wildcard service definition found.

For example, a server that registers with `CLASS=ACLASS`, `SERVER=ASERVER` and `SERVICE=ASERVICE` can inherit attributes from any of the following entries in the attribute file (this list is not necessarily complete):

```
CLASS = *, SERVER = ASERVER, SERVICE = ASERVICE
CLASS = ACLASS, SERVER = *, SERVICE = *
CLASS = *, SERVER = *, SERVICE = *
```

Of course, if there is a set of attributes that are specifically defined for `CLASS=ACLASS`, `SERVER=ASERVER`, `SERVICE=ASERVICE`, then all of the wildcard service definitions will be ignored in favor of the exact matching definition.

Service Update Modes

EntireX has two modes for handling service-specific attributes. See broker-specific attribute SERVICE-UPDATES.

- In **service update mode** (SERVICE-UPDATES=YES), the service configuration sections of the attribute file are read whenever the first replica of a particular service registers.
- In **non-update mode** (SERVICE-UPDATES=NO), the attribute file is not reread. All attributes are read during startup and the broker does not honor any changes in the attribute file. This mode is useful if
  - there is a high frequency of REGISTER operations, or
  - the attribute file is rather large and results in a high I/O rate for the broker.

  The disadvantage to using non-update mode is that if specific attributes are modified, the broker must be restarted to effect the changes. Generally, this mode should be used only if the I/O rate of the broker is considerably high, and if the environment seldom changes.

OPTION Values for Conversion

The different option values allow you to either handle character conversion deficiencies as errors, or to ignore them:

1. Do not ignore any character conversion errors and force an error always (value STOP). This is the default behavior.
2. Ignore if characters can not be converted into the receiver's codepage, but force an error if sender characters do not match the sender's codepage (value SUBSTITUTE-NONCONV).
3. Ignore any character conversion errors (values SUBSTITUTE and BLANKOUT).

The situations 1 and 2 above are reported to the broker log file if TRACE option for CONVERSION is set to level 1.

Value	Description	Options Supported for		Report Situation in Broker Log File if TRACE Option for CONVERSION is set to 1	
		SAGTCHA	SAGTRPC	Bad Input Characters (Sender's Codepage)	Non-convertible Characters (Receiver's Codepage)
SUBSTITUTE	Substitutes both non-convertible characters (receiver's codepage) and bad input characters (sender's codepage) with a	yes	yes	No message.	No message

Value	Description	Options Supported for		Report Situation in Broker Log File if TRACE Option for CONVERSION is set to 1	
		SAGTCHA	SAGTRPC	Bad Input Characters (Sender's Codepage)	Non-convertible Characters (Receiver's Codepage)
	codepage-dependent default replacement character.				
SUBSTITUTE-NONCONV	If a corresponding code point is not available in the receiver's codepage, the character cannot be converted and is substituted with a codepage-dependent default replacement character. Bad input characters in sender's codepage are not substituted and result in an error.	yes	yes	Write detailed conversion error message.	No message.
BLANKOUT	Substitutes non-convertible characters with a codepage-dependent default replacement; blanks out the complete RPC IDL field containing one or more bad input characters.	no	yes	No message.	No message.
STOP	Signals an error on detecting a non-convertible or bad input character. This is the default behavior if no option is specified.	yes	yes	Write detailed conversion error message.	Write detailed conversion error message.

Topic-specific Attributes

The topic-specific attribute section begins with the keyword `DEFAULTS=TOPIC` as shown in the sample attribute file. It contains attributes that apply to the publish and subscribe communication model.

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
`ALLOW-DURABLE`	YES | NO	O	z	u	w	v	b
	Determines whether a subscriber is allowed to perform a durable subscription to a topic. YES Subscriber may perform durable subscription. NO Durable subscription not allowed. If users are allowed to durably subscribe to any topic, you must specify a value for the `SUBSCRIBER-STORE` parameter.						
`ALLOW-USER-SUBSCRIBE`	YES | NO	O	z	u	w	v	b
	Determines if it is possible for a user to subscribe to a topic directly (YES) or only by Administrator. YES Users are allowed to subscribe to the topic. NO Users must be subscribed by the Administrator through CIS. See *Broker Command and Information Services*. The subscribe request of users is rejected.						
`AUTO-COMMIT-FOR-SUBSCRIBER`	NO | YES	O	z	u	w	v	b
	NO No `COMMIT` performed. YES An implicit `COMMIT` is performed by broker when the subscriber receives a publication, that is, the subscriber does not need the `CONTROL_PUBLICATION` option `COMMIT` after receiving each publication. **Caution:** You may lose your last message.						
`CONVERSION`	Format: A255 `( SAGTCHA [TRACE =`*n*`]`	O	z	u	w	v	b

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	[, *OPTION* =*s*])						

Defines conversion for internationalization. See *Internationalization with EntireX*. For help on making decisions about the internationalization approach, see *What is the Best Internationalization Approach to use?* under *Introduction to Internationalization*

SAGTCHA	Conversion using ICU Conversion for *ACI-based Programming*. For more information see *Conversion Details*. See also *Configuring ICU Conversion* under *Configuring Broker for Internationalization* in the platform-specific administration documentation.
NO	If conversion is not to be used, either omit the `CONVERSION` attribute or specify `CONVERSION=NO`, for example for binary payload.

Only one internationalization approach can be active at one time for a topic. The `CONVERSION` attribute for internationalization overrides the `TRANSLATION` attribute when defined for a topic, that is, when `TRANSLATION` and `CONVERSION` are both defined, `TRANSLATION` will be ignored.

TRACE

If tracing is switched on, the trace output is written to the broker log file:

0 No tracing	
1 Trace level `STANDARD`	This level is an "on-error" trace. It provides information on conversion errors only. Please note that if *`OPTION` Values for Conversion* are set, errors are ignored.
2 Trace level `ADVANCED`	Tracing of incoming, outgoing parameters and the payload.
3 Trace level `SUPPORT`	This trace level is for support diagnostics and should only be switched on when requested by Software AG support.

OPTION

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	See *OPTION Values for Conversion* under *Service-specific Attributes* above.						
LONG-BUFFER-LIMIT	UNLIM | *n*	O	z	u	w	v	b
	Allocates a number of long message buffers for the topic. UNLIM The number of long message buffers is restricted only by the number of buffers globally available. Excludes the use of NUM-LONG-BUFFER=AUTO in the Broker section of the attribute file. *n* Number of long message buffers. A value of 0 (zero) is invalid. If NUM-LONG-BUFFER=AUTO is specified in the Broker section of the attribute file, LONG-BUFFER-LIMIT=UNLIM is not allowed in the topic section. A value must be specified or the LONG-BUFFER-LIMIT attribute must be suppressed entirely for the topic so that the default (LONG-BUFFER-DEFAULT) becomes active.						
MAX-MESSAGES-IN-PUBLICATION	16 | *n*	O	z	u	w	v	b
	Maximum number of messages in a publication.						
MAX-PUBLICATION-MESSAGE-LENGTH	31647 | *n*	O	z	u	w	v	b
	Maximum size of a message in a publication. The actual publication size is transport-dependent.						
PUBLICATION-LIFETIME	*n* | *n*S | *n*M | *n*H | *n*D | *n*Y	O	z	u	w	v	b
	Lifetime of a publication in absolute time units. Publications are retained by broker until they are either received by all subscribers or the publication lifetime has expired. *n* Same as *n*S. *n*S Publication lifetime in seconds (max. 2147483647). *n*M Publication lifetime in minutes (max. 35791394). *n*H Publication lifetime in hours (max. 596523). *n*D Publication lifetime in days (max. 24855). *n*Y Publication lifetime in years (max. 68). The publication lifetime is calculated even for periods of time when broker is stopped.						
PUBLICATION-LIMIT	*n* | UNLIM	O	z	u	w	v	b

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	There is no default. Maximum number of publications possible for this topic. If specified, this overrides the publication default value, which is a general maximum value per topic. If neither parameter is specified, the total number of publications for the topic is limited only by `NUM-PUBLICATION`. *n* Number of publications. UNLIM The number of publications is restricted only by the number of publications globally available. Excludes the use of `NUM-PUBLICATION=AUTO` in the Broker section of the attribute file. A value of 0 (zero) is invalid. If `PUBLICATION-LIMIT=AUTO` is specified in the Broker section of the attribute file, `PUBLICATION-LIMIT=UNLIM` is not allowed in the topic section. A value must be specified, or the `PUBLICATION-LIMIT` attribute must be suppressed entirely for the topic so that the default (`PUBLICATION-DEFAULT`) becomes active.							
`PUBLISHER-NONACT`	5M | *n* | *n*S | *n*M | *n*H | *n*D | *n*Y	O	z	u	w	v	b
	Non-activity of the publisher, after which an auto-logoff is performed and the publisher's resources are freed. *n* Same as *n*S. *n*S Non-activity time in seconds (max. 2147483647). *n*M Non-activity time in minutes (max. 35791394). *n*H Non-activity time in hours (max. 596523). *n*D Non-activity time in days (max. 24855). *n*Y Non-activity time in years (max. 68). If not specified, defaults to 5 minutes. This is the time after which the publisher's internal memory structures will be cleaned up and a subsequent logon is required.							
`SHORT-BUFFER-LIMIT`	UNLIM | *n*	O	z	u	w	v	b
	Allocates a number of short message buffers for the topic. UNLIM The number of short message buffers is restricted only by the number of buffers globally available. Excludes the							

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	use of NUM-LONG-BUFFER=AUTO in the Broker section of the attribute file. *n* Number of short message buffers. A value of 0 (zero) is invalid. If NUM-SHORT-BUFFER=AUTO is specified in the Broker section of the attribute file, SHORT-BUFFER-LIMIT=UNLIM is not allowed in the topics section. A value must be specified, or the SHORT-BUFFER-LIMIT attribute must be suppressed entirely for the topic so that the default (SHORT-BUFFER-DEFAULT) becomes active.							
SSTORE SSTORE-TYPE	These parameters are obsolete. The subscriber store in a secondary store is no longer supported. We recommend you use the primary persistent store (PSTORE) to store your subscriber data. For this, set broker-specific parameter SUBSCRIBER-STORE=PSTORE.						
SUBSCRIBER-LIMIT	*n* | UNLIM	O	z	u	w	v	b
	There is no default. Maximum number of subscriptions possible for this topic. If specified, this overrides the subscriber default value, which is a general maximum value per topic. If neither parameter is specified, the total number of subscribers for the topic is limited only by NUM-SUBSCRIBER. *n* Number of subscribers. UNLIM The number of subscribers is restricted only by the number of subscribers globally available. Excludes the use of NUM-SUBSCRIBER=AUTO in the Broker section of the attribute file. A value of 0 (zero) is invalid. If NUM-SUBSCRIBER=AUTO is specified in the Broker section of the attribute file, SUBSCRIBER-LIMIT=UNLIM is not allowed in the topic section. A value must be specified, or the SUBSCRIBER-LIMIT attribute must be suppressed entirely for the topic so that the default (SUBSCRIBER-DEFAULT) becomes active.							
SUBSCRIBER-NONACT	5M | *n* | *n*S | *n*M | *n*H | *n*D | *n*Y	O	z	u	w	v	b
	Non-activity of the subscriber after which an auto-logoff is performed and the publisher's resources are freed. *n* Same as *n*S.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	*n*S Non-activity time in seconds (max. 2147483647). *n*M Non-activity time in minutes (max. 35791394). *n*H Non-activity time in hours (max. 596523). *n*D Non-activity time in days (max. 24855). *n*Y Non-activity time in years (max. 68). In the case of a non-durable subscriber, the user's subscription is also cancelled. In the case of a durable subscriber, the user's subscription is persisted, and it is not necessary for the user to issue any subsequent `SUBSCRIBE` commands. The subscription of a durable subscriber is also persisted even while broker is stopped. If not specified, defaults to 5 minutes. This is the time after which the subscriber's internal memory structures will be cleaned up and a subsequent logon is required.							
`SUBSCRIPTION-EXPIRATION`	NEVER | *n* | *n*S | *n*M | *n*H | *n*D | *n*Y	O	z	u	w	v	b
	Lifetime of a user's subscription in absolute time units. Subscriptions are retained by broker until either the user issues an `UNSUBSCRIBE` command or the subscription lifetime has expired. NEVER Subscriber will never be purged from PSTORE. *n* Same as *n*S. *n*S Expiration time in seconds (max. 2147483647). *n*M Expiration time in minutes (max. 35791394). *n*H Expiration time in hours (max. 596523). *n*D Expiration time in days (max. 24855). *n*Y Expiration time in years (max. 68). Durable subscriptions remain effective even if the user performs the `LOGOFF` command or broker is stopped. The subscription lifetime is calculated also for periods of time when broker is stopped. `SUBSCRIPTION-EXPIRATION` is the time after which the subscription expires. In the case of durable subscription, the subscription is removed from the PSTORE. Broker removes expired subscriptions only when the user is not currently active, for example							

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	when the user has issued a LOGOFF command or after the SUBSCRIBER-NONACT has passed if no LOGOFF is issued. If SUBSCRIBER-NONACT is specified greater than SUBSCRIPTION-EXPIRATION, broker adjusts SUBSCRIPTION-EXPIRATION to the value of SUBSCRIBER-NONACT.						
TOPIC	A96 (case-sensitive)	R	z	u	w	v	b
	Name of the topic for publish and subscribe processing. Valid characters for topic name are letters a-z, A-Z, numbers 0-9, hyphen and underscore. Do not use dollar, percent, period or comma.						
TRANSLATION	Format: A255 SAGTCHA | NO | <*name*>	O	z	u	w	v	b
	Activates *translation* or *translation user exit* for internationalization (see *Translation User Exit* under *Introduction to Internationalization*). See also *What is the Best Internationalization Approach to use?* under *Introduction to Internationalization* SAGTCHA: Conversion routine SAGTCHA for ACI-based programming, RPC-based components and for *Reliable RPC*. NO: If translation is not to be used, e.g. for binary payload (broker messages), either omit the TRANSLATION attribute or specify TRANSLATION=NO. <*name*>: Name of Translation User Exit. See also *Configuring SAGTRPC User Exits* under *Configuring Broker for Internationalization* in the platform-specific administration documentation and *Writing SAGTRPC User Exits* in the platform-specific administration documentation. The CONVERSION attribute for internationalization overrides the TRANSLATION attribute when defined for a service, i.e. when TRANSLATION and CONVERSION are both defined, TRANSLATION will be ignored.						

Codepage-specific Attributes

The codepage-specific attribute section begins with the keyword `DEFAULTS=CODEPAGE` as shown in the sample attribute file. You can use the attributes in this section to customize the broker's locale string defaults and customize the mapping of locale strings to codepages for the internationalization approaches ICU conversion and SAGTRPC user exit. These attributes do not apply to other approaches. See *Internationalization with EntireX* for more information.

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
`DEFAULT_ASCII`	Any ICU converter name or alias. See also ***Additional Notes*** below.	O	z	u	w	v	b

	Customize the broker's locale string defaults by assigning the default codepage for EntireX components (client or server, publisher or subscriber). See *Broker's Locale String Defaults* under *Locale String Mapping* in the internationalization documentation. This value is used instead of the broker's locale string defaults if
	■ the calling component does not send a locale string itself, and
	■ the calling component is running on an ASCII platform (UNIX, Windows, etc.), and
	■ one of the internationalization approaches ICU conversion or SAGTRPC user exit is used. See *ICU Conversion* under *Introduction to Internationalization* and *SAGTRPC User Exit* under *Introduction to Internationalization*.
	Example:
	`DEFAULTS=CODEPAGE`
	`  /* Broker Locale String Defaults */`
	`  DEFAULT_ASCII=windows-950`
	For more examples, see *Configuring Broker's Locale String Defaults* under *Locale String Mapping* in the internationalization documentation and also ***Additional Notes*** below.						

`DEFAULT_EBCDIC_IBM`	Any ICU converter	O	z	u	w	v	b

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	name or alias						

	Customize the broker's locale string defaults by assigning the default codepage for EntireX components (client or server, publisher or subscriber). See *Broker's Locale String Defaults* under *Locale String Mapping* in the internationalization documentation. This value is used instead of the broker's locale string defaults if
	■ the calling component does not send a locale string itself and
	■ the calling component is running on an IBM mainframe platform (z/OS, z/VSE etc.) and
	■ one of the internationalization approaches ICU conversion or SAGTRPC user exit is used.
	Example:
	`DEFAULT=CODEPAGE`
	`  DEFAULT_EBCDIC_IBM=ibm-937`
	For more examples, see *Configuring Broker's Locale String Defaults* under *Locale String Mapping* in the internationalization documentation and also ***Additional Notes*** below.						

`DEFAULT_EBCDIC_SNI`	Any ICU converter name or alias	O	z	u	w	v	b
	Customize the broker's locale string defaults by assigning the default codepage for EntireX components (client or server, publisher or subscriber). See *Broker's Locale String Defaults* under *Locale String Mapping* in the internationalization documentation. This value is used instead of the locale string defaults if ■ the calling component does not send a locale string itself, and ■ the calling component is running on a Fujitsu EBCDIC mainframe platform (BS2000/OSD), and ■ one of the internationalization approaches ICU conversion or SAGTRPC user exit is used. Example:						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000

	`DEFAULT=CODEPAGE`
	`  DEFAULT_EBCDIC_SNI= bs2000-edf03drv`
	
	For more examples, see *Configuring Broker's Locale String Defaults* under *Locale String Mapping* in the internationalization documentation and also ***Additional Notes*** below.						

`locale-string`	Any ICU converter name or alias. See also ***Additional Notes*** below.	O	z	u	w	v	

	Customize the mapping of locale strings to codepages and bypass the broker's locale string processing mechanism. See *Broker's Locale String Processing* under *Locale String Mapping* in the internationalization documentation. This is useful:
	
	■ if the broker's locale string processing fails - i.e. leads to no codepage or to the wrong codepage - you can explicitly assign the codepage which meets your requirements.
	■ if you want to install user-written ICU converters (codepages) into the broker, see *Building and Installing ICU Custom Converters* in the platform-specific administration documentation.
	
	The attribute (locale string) is the locale string sent by your EntireX component (client or server, publisher or subscriber) and the value is the codepage that you want to use in place of that locale string. In the first line of the example below, the client or server application sends ASCII as a locale string; the broker maps this to the codepage ISO 8859_1. In the same way EUC_JP_LINUX is mapped to ibm-33722_P12A-1999. All other locale strings are mapped by the broker's mapping mechanism, see *Broker's Built-in Locale String Mapping* under *Locale String Mapping* in the internationalization documentation. Example:
	
	`DEFAULTS=CODEPAGE`
	`  /* Broker Locale String Codepage Assignments */`
	`  ASCII=ISO8859`
	`  EUC_JP_LINUX=ibm-33722_P12A-1999`
	`  /* Customer-written ICU converters */`
	`  CP1140=myebcdic`
	`  CP0819=myascii`						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	For more examples, see *Bypassing Broker's Built-in Locale String Mapping* under *Locale String Mapping* in the internationalization documentation and also ***Additional Notes*** below.						

Additional Notes

- Locale string matching is case insensitive when bypassing the broker's built-in mechanism, that is, when the broker examines the codepages section in the attribute file.
- If ICU is used for the internationalization approach and if the style in not known by ICU, e.g. ECS*nnnn*, <ll>_<cc> etc., the name will be mapped to a suitable ICU alias. For more details on the mapping mechanism, see *Broker's Built-in Locale String Mapping* under *Locale String Mapping* in the internationalization documentation. For more details on ICU and ICU converter name standards, see *ICU Resources* under *Introduction to Internationalization*.
- If SAGTRPC user exit is used for the internationalization approach, we recommend assigning the codepage in the form CP<*nnnnn*>. To determine the number given to SAGTRPC user exit, see *Broker's Built-in Locale String Mapping* under *Locale String Mapping* in the internationalization documentation.
- See `CONVERSION` and `CONVERSION` attribute `CONVERSION` on this page for the internationalization approach in use.

Adabas SVC/Entire Net-Work-specific Attributes

The Adabas SVC/Entire Net-Work-specific attribute section begins with the keyword `DEFAULTS=NET` as shown in the sample attribute file. The attributes in this section are needed to execute the Adabas SVC/Entire Net-Work communicator of the EntireX Broker kernel.

Note: This section applies to mainframe platforms only. It does not apply to UNIX and Windows.

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
ADASVC	*nnn*	R	z			v	
	Sets the Adabas SVC number for EntireX Broker access. The Adabas SVC is used to perform various internal functions, including communication between the caller program and EntireX Broker. Not supported on BS2000/OSD.						
EXTENDED-ACB-SUPPORT	NO | YES	O	z			v	b
	Determines whether extended features of Adabas version 8 (or above) are supported. NO No features of Adabas version 8 or above will be used. YES Informs broker kernel to provide Adabas/WAL version 8 transport capability. This parameter is required for sending/receiving more than 32 KB data over Adabas [NET] transport. This value should be set only if you have installed Adabas/WAL version 8, Adabas SVC, and included Adabas/WAL version 8 load libraries into the steplib of broker kernel; otherwise, unpredictable results can occur.						
FORCE	NO | YES	O	z			v	b
	Determines whether DBID table entries can be overwritten. NO Overwrite of DBID table entries not permitted. YES Overwrite of DBID table entries permitted. This is required when the DBID table entry is not deleted after abnormal termination. **Caution:** Overwriting an existing entry prevents any further communication with the overwritten node. Use `FORCE=YES` only if you are absolutely sure that no target node with that DBID is active.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
IDTNAME	FORMAT: A8 *idtname* | ADABAS5B	O					b
	If an ID table name is specified with the appropriate ADARUN parameter for Entire Net-Work, Adabas or Natural, the same name must be specified here. The ID table is used to perform various internal functions, including communication between the caller program and the EntireX Broker. Only supported under BS2000/OSD.						
IUBL	8000 | *n*	O	z			v	b
	This parameter sets the maximum length (in bytes) of the buffer that can be passed from the caller to EntireX Broker. The maximum size of IUBL is the same as the maximum value of the Adabas parameter LU (see the *Adabas Operations Manual*). IUBL must be large enough to hold the maximum send-length plus receive-length required for any caller program plus any administrative overhead for Adabas and Entire Net-Work control structures.						
LOCAL	NO | YES	O	z			v	b
	Specifies whether the broker ID is local. NO Broker ID can be accessed from remote nodes. YES The broker ID is local. It is not accessible from remote nodes.						
MAX-MESSAGE-LENGTH	2147483647 | *n*	O	z	u	w	v	b
	Maximum message size that the broker kernel can process using transport method NET. The default value represents the highest positive number that can be stored in a four-byte integer.						
NABS	10 | *n*	O	z			v	b
	The number of attached buffers to be used (max. 524287). An attached buffer is an internal buffer used for interprocess communication. An attached buffer pool equal to the NABS value multiplied by 4096 will be allocated. This buffer pool must be large enough to hold all data (IUBL) of all parallel calls to EntireX Broker. The following formula can be used to calculate the value for NABS: NABS = NCQE *IUBL / 4096.						
NCQE	10 | *n*	O	z			v	b

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	NCQE defines the number of command queue elements which are available for processing commands arriving at the broker kernel over Adabas SVC / Net-Work transport mechanism. Sufficient NCQE should be allocated to allow this transport mechanism to process multiple broker commands concurrently. Each command queue element requires 192 bytes, and the element is released when either the user (client or server) has received the results of the command, or if the command is timed out. The number of command queue elements required to handle broker calls depends on the number of parallel active broker calls that are using the transport mechanism Adabas SVC / Entire Net-Work. For example, all broker commands issued by any of the following application components using this transport mechanism: ■ clients ■ servers ■ publishers ■ subscribers						
NODE	1-65534	O	z			v	b
	Defines the unique DBID for EntireX Broker. Used for internode Adabas/Entire Net-Work communication. There is no default; the value of NODE must be a value greater than or equal to 1 or less than or equal to 65534. If you set the parameter LOCAL=YES, you can use the same node number for different installations of EntireX Broker in an Entire Net-Work environment. Please note that the maximum value for NODE that is allowed for Entire Net-Work under UNIX is 255. If NODE is specified, it overrides the DBID derived from the numeric part of BROKER-ID.						
TIME	30 | *n*	O	z			v	b
	This parameter sets the timeout value for broker calls in seconds. The results of a broker call must be received by the caller within this time limit.						
TRACE-LEVEL	0 - 4	O	z			v	b
	The level of tracing to be performed while the broker is running with transport method NET. It overrides the global value of trace level for all NET routines. 0 No tracing. Default value. 1 Display invalid Adabas commands.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	2 All of trace level 1, plus errors if request entries could not be allocated. 3 All of trace level 2, plus all routines executed. 4 All of trace level 3, plus function arguments and return values. If you modify the `TRACE-LEVEL` attribute, you must restart the broker for the change to take effect. For temporary changes to `TRACE-LEVEL` without restarting the broker, use System Management Hub or `ETBCMD`. Trace levels 2, 3, and 4 should be used only when requested by Software AG support.						

Security-specific Attributes

The security-specific attribute section begins with the keyword `DEFAULTS=SECURITY`as shown in the sample attribute file. This section applies only if broker-specific attribute `SECURITY=YES` is specified.

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
`ACCESS-SECURITY-SERVER`	NO | YES	O					b
	Determines where authentication is checked. NO Authentication is checked in the broker tasks. This requires broker to be running under TSOS in order to execute privileged security checks. YES Authentication is checked in the EntireX Broker Security Server for BS2000/OSD. This does not require broker to be running under TSOS. See ***EntireX Broker Security Server for BS2000/OSD***.							
`APPLICATION-NAME`	A8	O	z				

	Specifies the name of the application to be checked if `FACILITY-CHECK=YES` is defined. In RACF, for example, an application "`BROKER`" with read permission for user "`DOE`" is defined with following commands:
	
	`RDEFINE APPL BROKER UACC(NONE)`
	`PERMIT BROKER CLASS(APPL) ID(DOE) ACCESS(READ)`
	`SETROPTS CLASSACT(APPL)`
	
	See attribute `FACILITY-CHECK` for more information.							

`AUTHENTICATION-TYPE`	OS | *`ldapUrl`* | *`iafUrl`*	O	z	u	w		b
	OS Authentication is performed against the local operating system. Default if `SECURITY=YES` is specified and section `DEFAULTS=SECURITY` is omitted from the attribute file. *`ldapUrl`* Authentication is performed against the LDAP repository specified under *`ldapUrl`*. Not supported under BS2000/OSD. ■ For TCP, specify repository URL:							

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	AUTHENTICATION-TYPE="ldap://*HostName* [:*PortNumber*]" ■ For SSL or TLS: AUTHENTICATION-TYPE="ldaps://*HostName* [:*PortNumber*]" If no port number is specified, the default is the standard LDAP port numbe 389 for TCP transport. Examples for TCP and SSL (or TLS): AUTHENTICATION-TYPE="ldap://myhost.mydomain.com" AUTHENTICATION-TYPE="ldaps://myhost.mydomain.com:636"						
	iafUrl Authentication is performed using Software AG's Integrated Authentication Framework against the IAF service specified under *iafUrl*. Not supported ur BS2000/OSD. The URL of the IAF service is specified using AUTHENTICATION-TYPE= "iaf://HostName[:PortNumber]?SSLParameters" If no port number is specified, the default is port number 1958. SSL or TLS parameters are specified in the same format as for the ACI function SETSSLPAR Example: AUTHENTICATION-TYPE="iaf://myhost.mydomain.com:1000 AUTHENTICATION-TYPE= "iaf://myhost.mydomain.com:10000? verify_server= no& trust_store= /opt/softwareag/EntireX/etc/ExxCACert.pem" On z/OS, the URL of an IAF service running on the same host may specified						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000

	```AUTHENTICATION-TYPE= "iaf.ipc://IAFServiceID[:SVCNumber]"```
	Example:
	```AUTHENTICATION-TYPE= "iaf.ipc://IAF075:SVC245"```
	Under z/OS, IAF is currently not capable of performing authorization calls against RACF resource definitions. As the default `SECURITY-LEVEL` sets both authentication and authorization, it must be explicitly restricted to `SECURITY-LEVEL=AUTHENTICATION`.							

`AUTHORIZATIONDEFAULT`	YES | NO	O		u	w		
	Determines whether access is granted to a specified service if the specified could not be found listed in the repository of authorization rules. YES Grant access. NO Deny access. Applies only when using EntireX Security under UNIX and Windows. Authorization rules can be stored within a repository. When an authorization call occurs, EntireX Security uses the values of this parameter and `AUTHORIZATIONDEFAULT` to perform an access check for a particular broker instance against an (authenticated) user ID and list of rules. See also *Administering Authorization Rules using System Management Hub* in the UNIX and Windows administration documentation.							
`AUTHORIZATIONRULE`	A32	O		u	w		
	List of authorization rules. Multiple sets of rules can be defined, each set is limited to 32 chars. The maximum number of `AUTHORIZATIONRULE` entries in the attribute file is 16. Applies only when using EntireX Security under UNIX or Windows. Authorization rules can be stored within a repository. When an authorization call occurs, EntireX Security uses the values of this parameter and `AUTHORIZATIONDEFAULT` to perform an access check for a particular broker instance against an (authenticated) user ID and list of rules. See also *Administering Authorization Rules using System Management Hub* in the UNIX and Windows administration documentation.							
`CHECK-IP-ADDRESS`	YES | NO	O	z				
	Determines whether the TCP/IP address of the caller is subject to a resource check.							
`ERRTXT-MODULE`	NA2MSG0 | NA2MSG1 |	O	z				

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	NA2MSG2 | *ModuleName*						
	Specifies the name of the security error text module. Default is "NA2MSG0", English messages. For instructions on how to customize messages, see *Build Language-specific Mess (Optional)* under *Installing EntireX Security under z/OS under z/OS* in the z/OS installatio documentation.						
FACILITY-CHECK	NO | YES	O	z				
	It is possible to check whether a particular user is at all allowed to use an application be performing a password check. The advantage of this additional check is that when the is not allowed to use this application, the broker returns error 00080013 and does not tr authenticate the user. Failing an authentication check may lead to the user's password b revoked; this situation is avoided if the facility check is performed first. See attribute APPLICATION-NAME for further details. **Note:** This facility check is an additional call to the security subsystem and is executed be each authentication call.						
IGNORE-STOKEN	NO | YES	O	z	u	w		b
	Determines whether the value of the ACI field SECURITY-TOKEN is verified on each ca						
INCLUDE-CLASS	YES | NO	O	z				
	Determines whether the class name is included in the resource check.						
INCLUDE-NAME	YES | NO	O	z				
	Determines whether the server name is included in the resource check.						
INCLUDE-SERVICE	YES | NO	O	z				
	Determines whether the service name is included in the resource check.						
LDAP-PERSON-BASE-BINDDN	*ldapDn*	O	z	u	w		
	Used with LDAP authentication to specify the distinguished name where authenticati information is stored. This value is prefixed with the user ID field name (see below). Exam `LDAP-PERSON-BASE-BINDDN="cn=users,dc=mydomain,dc=com"`						
LDAP-REPOSITORY-TYPE	OpenLDAP | ActiveDirectory | SunOneDirectory | Tivoli | Novell | ApacheDS	O	z	u	w		
	Use predefined known fields for the respective repository type. Specify the repository that most closely matches your actual repository. In the case of Windows Active Direc the user ID is typically in the form *domainName**userId*.						
LDAP-SASL-AUTHENTICATION	NO | YES	O			w		

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	Specifies whether or not Simple Authentication and Security Layer (SASL) is to perform the authentication check. In practice, this determines whether or not the password supplied by the user is passed in plain text between the broker kernel and the LDAP server. If SASL is activated, this implies that the password is encrypted. NO Password is sent to LDAP server in plain text. YES Password is sent to LDAP server encrypted.						
LDAP-USERID-FIELD	cn | *uidFieldName*	O	z	u	w		
	Used with LDAP authentication to specify the first field name of a user in the Distinguished Name, for example: LDAP-USERID-FIELD=*uid*						
MAX-SAF-PROF-LENGTH	1-256	O	z				
	This parameter should be increased if the length of the resource checks - that is, the length of the profile comprising "<class>.<server>.<service>" - is greater than 80 bytes. This parameter defaults to 80 if a value is not specified.						
PASSWORD-TO-UPPER-CASE	NO | YES	O	z	u	w		b
	Determines whether the password and new password are converted to uppercase before verification.						
PRODUCT	RACF | ACF2 | TOP-SECRET	O	z				
	Specifies the name of the installed security product. This attribute is used to analyze security-system-specific errors. The following systems are currently supported: ACF2 Security system ACF2 is installed. RACF Security system RACF is installed. Default. TOP-SECRET Security system TOP-SECRET is installed. The default value is used if an incorrect or no value is specified.						
PROPAGATE-TRUSTED-USERID	YES | NO	O	z				
	Determines whether a client user ID obtained by means of the trusted user ID mechanism is propagated to a server using the ACI field CLIENT-USERID.						
SAF-CLASS	NBKSAG | *SAFClassName*	O	z				
	Specifies the name of the SAF class/type used to hold the EntireX-related resource profiles.						
SAF-CLASS-IP	NBKSAG | *SAFClassName*	O	z				

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	Specifies the name of the SAF class/type used when performing IP address authorizati checks.						
SECURITY-LEVEL	AUTHORIZATION | AUTHENTICATION | ENCRYPTION	O	z	u	w	v	b
	Specifies the mode of operation. AUTHORIZATION — Authorization, authentication, and encryption (not under BS2000/OSD or z/VSE). AUTHENTICATION — Authentication and encryption. ENCRYPTION — Encryption only. **Caution:** In version 8.0, the default value for this parameter was "AUTHORIZATION"						
SECURITY-NODE	YES | *name*	O	z				
	This parameter can be used to specify a prefix that is added to all authorization checks enabling different broker kernels, in different environments, to perform separate authorization checks according to each broker kernel. For example, it is often importa distinguish between production, test, and development environments. YES — This causes the broker ID to be used as a prefix for all authorization checks. *name* — This causes the actual text (maximum 8 characters) to be prefixed onto all authorization checks. **Note:** By *not* setting this parameter, no prefix is added to the resource check (the defau behavior).						
TRACE-LEVEL	0 - 4	O	z	u	w	v	b
	Trace level for EntireX Security. It overrides the global value of trace level in the attribu file.						
TRUSTED-USERID	YES | NO	O	z				
	Activates the trusted user ID mechanism for broker requests arriving over the local Ad IPC mechanism.						
USERID-TO-UPPER-CASE	NO | YES	O	z				b
	Determines whether user ID is converted to uppercase before verification.						
UNIVERSAL	NO | YES	O	z				
	Determines whether access to undefined resource profiles is allowed.						
WARN-MODE	NO | YES	O	z	u	w		b
	Determines whether a resource check failure results in just a warning or an error.						

TCP/IP-specific Attributes

The TCP/IP-specific attribute section begins with the keyword `DEFAULTS=TCP` as shown in the sample attribute file. It contains attributes that apply to the TCP/IP transport communicator. The transport is activated by `TRANSPORT=TCP` in the Broker-specific section of the attribute file. A maximum of five TCP/IP communicators can be activated by specifying up to five `HOST/PORT` pairs.

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
`CONNECTION-NONACT`	*n* | *n*S | *n*M | *n*H	O	z	u	w	v	b
	Non-activity of the TCP/IP connection, after which a close is performed and the connection resources are freed. If this parameter is not specified, broker will close the connection only when the application (or the network itself) terminates the connection. *n* Same as *n*S. *n*S Non-activity time in seconds (min. 600, max. 2147483647). *n*M Non-activity time in minutes (min. 10, max. 35791394). *n*H Non-activity time in hours (max. 596523). If not specified, the connection non-activity test is disabled. On the stub side, non-activity can be set with the environment variable `ETB_NONACT`. See *Limiting the TCP/IP Connection Lifetime* in the platform-specific *Stub Administration* sections of the EntireX documentation.						
`HOST`	0.0.0.0 | *HostName* | *IP address*	O	z	u	w	v	b
	The address of the network interface on which broker will listen for connection requests. If `HOST` is not specified, broker will listen on any attached interface adapter of the system (or stack). A maximum of five `HOST/PORT` pairs can be specified to start multiple instances of broker's TCP/IP transport communicator.						
`MAX-MESSAGE-LENGTH`	2147483647 | *n*	O	z	u	w	v	b

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	Maximum message size that the broker kernel can process using transport method TCP/IP. The default value represents the highest positive number that can be stored in a four-byte integer.						
PORT	1025 - 65535	O	z	u	w	v	b
	The TCP/IP port number on which the broker will listen for connection requests. If specified, PORT overrides broker attribute TCPPORT. **Note:** TCPPORT will be retired with the next version. If PORT is not specified but TCPPORT is specified, TCPPORT is used. If TCPPORT is not specified, the broker will attempt to find its TCP/IP port number from the TCP/IP Services file, using *getservbyname*. If broker cannot find its TCP/IP port number from the TCP/IP Services file, it will use the default value of 1971. A maximum of five HOST/PORT pairs can be specified to start multiple instances of broker's TCP/IP transport communicator.						
RESTART	YES | NO	O	z	u	w	v	b
	YES The broker kernel will attempt to restart the TCP/IP communicator. NO The broker kernel will not try to restart the TCP/IP communicator. If specified, RESTART overrides broker attribute TCP-RESTART. **Note:** TCP-RESTART will be retired with the next version. If RESTART is not specified but TCP-RESTART is specified, TCP-RESTART is used. The RESTART setting applies to all TCP/IP communicators.						
RETRY-LIMIT	20 | *n* | UNLIM	O	z	u	w	v	b
	Maximum number of attempts to restart the TCP/IP communicator. If specified, RETRY-LIMIT overrides broker attribute TCP-RETRY-LIMIT. **Note:** TCP-RETRY-LIMIT will be retired with the next version. If RETRY-LIMIT is not specified but TCP-RETRY-LIMIT is specified, TCP-RETRY-LIMIT is used. The RETRY-LIMIT setting applies to all TCP/IP communicators.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
RETRY-TIME	3M | *n* | *n*S | *n*M | *n*H	O	z	u	w	v	b
	Wait time between stopping the TCP/IP communicator due to an unrecoverable error and the next attempt to restart it. *n* Same as *n* S. *n* S Wait time in seconds (max. 2147483647). *n* M Wait time in minutes (max. 35791394). *n* H Wait time in hours (max. 596523). Minimum wait time is 1S. If specified, RETRY-TIME overrides broker attribute TCP-RETRY-TIME. **Note:** TCP-RETRY-TIME will be retired with the next version. If RETRY-TIME is not specified but TCP-RETRY-TIME is specified, TCP-RETRY-TIME is used. The RETRY-TIME setting applies to all TCP/IP communicators.						
REUSE-ADDRESS	YES | NO	O	z	u		v	b
	YES | NO	O			w		
	YES The TCP port assigned to the broker can be taken over and assigned to other applications (this is the default value on all non-Windows platforms). NO The TCP port assigned to the broker cannot be taken over and assigned to other applications. This is the default setting on Windows, and we strongly advise you do not change this value on this platform. **Note:** This setting might be required at your site when restarting broker immediately after stopping it. This is due to the inherent latency of the TCP/IP stack when closing connections.						
STACK-NAME	*StackName*	O	z				
	Name of the TCP/IP stack that the broker is using. If not specified, broker will connect to the default TCP/IP stack running on the machine.						
TRACE-LEVEL	0 - 4	O	z	u	w	v	b
	The level of tracing to be performed while the broker is running with transport method TCP/IP. It overrides the global value of trace level for all TCP/IP routines.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	0 No tracing. Default value. 1 Display IP address of incoming request, display error number of outgoing error responses. 2 All of trace level 1, plus errors if request entries could not be allocated. 3 All of trace level 2, plus all routines executed. 4 All of trace level 3, plus function arguments and return values. If you modify the `TRACE-LEVEL` attribute, you must restart the broker for the change to take effect. For temporary changes to `TRACE-LEVEL` without restarting the broker, use System Management Hub or `ETBCMD`. Trace levels 2, 3, and 4 should be used only when requested by Software AG support.						

c-tree-specific Attributes

The c-tree-specific attribute section begins with the keyword `DEFAULTS = CTREE`. The attributes in this section are optional. This section applies only if `PSTORE-TYPE = CTREE` is specified.

Not available under z/OS, BS2000/OSD, z/VSE.

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
`MAXSIZE`	*n* | *n*M | *n*G	O		u	w		
	Defines the maximum size of c-tree data files. Broker allocates one data file for control data and another data file for message data: *n* Maximum size in MB. *n*M Maximum size in MB. *n*G Maximum size in GB.						
`PAGESIZE`	*n* | *n*K	O		u	w		
	Determines how many bytes are available in each c-tree node. `PSTORE COLD` start is required after changing this value. *n* Same as *n*K *n*K PAGESIZE in KB. The default and minimum value is 8 KB. If `PSD Reason Code = 527` is returned during UOW write processing, increase the `PAGESIZE` value and restart broker with `PSTORE=COLD`, or migrate the existing PSTORE to a new PSTORE with an increased `PAGESIZE` value. See *Migrating the Persistent Store* in the general administration documentation and define the increased `PAGESIZE` value for the load broker.						
`PATH`	A255	O		u	w		
	Path name of the target directory for c-tree index and data files.						
`SYNCIO`	NO | YES	O		u	w		
	Controls the open mode of the c-tree transaction log. NO c-tree transaction log is not opened in synchronous mode. Default. YES c-tree transaction log is opened in synchronous mode to improve data security. It may degrade performance of PSTORE operations, but offers the highest level of data						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	security. See *c-tree Database as Persistent Store* in the UNIX and Windows administration documentation.						
TRACE-LEVEL	0-8	O		u	w		
	Trace level for c-tree persistent store. It overrides the global value of trace level in the attribute file.						

SSL-specific Attributes

The SSL-specific attribute section begins with the keyword `DEFAULTS=SSL` as shown in the sample attribute file. The attributes in this section are needed to execute the SSL communicator of the EntireX Broker kernel. In this section, "SSL" also applies to TLS (Transport Layer Security).

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
`CIPHER-SUITE`	*string*	O	z	u	w		b

String that is passed to the underlying SSL implementation. SSL is a standardized protocol that uses different cryptographic functions (hash functions, symmetric and asymmetric encryption etc.). Some of these must be implemented in the SSL stack; others are optional. When an SSL connection is created, both parties agree by "handshake" on the *cipher suite*, that is, the algorithms and key lengths used. In a default scenario, this information depends on what both sides are capable of. It can be influenced by setting the attribute `CIPHER-SUITE` for the SSL server side (the broker always implements the server side). Ths stubs connect to the broker and thereby become the SSL clients.

Under UNIX and Windows, the OpenSSL implentation of the SSL server side is used; on z/OS and BS2000/OSD it is GSK.

Example for OpenSSL:

`CIPHER-SUITE=RC4-MD5`	Use RC4 with standard 128-bit key and MD5 as hash.
`CIPHER-SUITE=EXP-EDH-DSS-DES-CBC-SHA`	Extreme example.

Example for GSK:

`CIPHER-SUITE=090306`	Use DES and SHA1 with export key lengths, or RC4 and MD5 with export key lengths, or RC2 and MD5 with export key lengths.

For more information see:

- **OpenSSL**
  http://www.openssl.org/docs/apps/ciphers.html

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	■ **GSK** http://publib.boulder.ibm.com/iseries/v5r2/ic2924/index.htm?info/apis/gsk_attribute_set_buffer.htm						
CONNECTION-NONACT	*n* | *n*S | *n*M | *n*H	O	z	u	w		b
	Non-activity of the SSL connection, after which a close is performed and the connection resources are freed. If this parameter is not specified here, broker will close the connection only when the application (or the network itself) terminates the connection. *n* Same as *n*S. *n*S Non-activity time in seconds (min. 600, max. 2147483647). *n*M Non-activity time in minutes (min. 10, max. 35791394). *n*H Non-activity time in hours (max. 596523). If not specified, the connection non-activity test is disabled.						
HOST	*hostname*	O	z	u	w		b
	The address of the network interface on which broker will listen for connection requests. If HOST is not specified, broker will listen on any attached interface adapter of the system (or stack). A maximum of five HOST/PORT pairs can be specified to start multiple instances of EntireX Broker's TCP/IP transport communicator.						
KEY-LABEL	*name*	O	z				
	The label of the key in the RACF keyring that is used to authenticate the broker kernel (see also TRUST-STORE parameter). (Example: "ETBCERT")						
KEY-FILE	*file name*	R		u	w		b
	File that contains the broker's private key (if not contained in KEY-STORE). (Example: *MyAppKey.pem*) **Note:** EntireX Broker supports only key files of type .pem. Files of type .jks are not supported.						
KEY-PASSWD	*password* (A32)	R		u	w		b
	Password used to protect the private key. Unlocks *MyAppKey.pem*. Deprecated. See KEY-PASSWD-ENCRYTPED below.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
KEY-PASSWD-ENCRYPTED	*encrypted value* (A64)	R		u	w		b
	Password used to protect the private key. Unlocks *MyAppKey.pem*. This attribute replaces KEY-PASSWD to avoid a clear-text password as attribute value. If KEY-PASSWD and KEY-PASSWD-ENCRYTPED are both supplied, KEY-PASSWD-ENCRYTPED takes precedence.						
KEY-STORE	*file name*	R		u	w		b
	SSL certificate; may contain the private key. (Example: *ExxAppCert.pem*) **Note:** EntireX Broker supports only keystores of type .pem. Files of type .jks are not supported.						
MAX-MESSAGE-LENGTH	2147483647 | *n*	O	z	u	w		b
	Maximum message size that the broker kernel can process using transport method SSL. The default value represents the highest positive number that can be stored in a four-byte integer.						
PORT	*1025 - 65535*	O	z	u	w		b
	The SSL port number on which the broker will listen for connection requests. If not changed, this parameter takes the standard value as specified in the example attribute file. If the port number is not specified, the broker will use the default value of 1958.						
RESTART	YES | NO	O	z	u	w		b
	YES The broker kernel will attempt to restart the SSL communicator (this is the default value). NO The broker kernel will not attempt to restart the SSL communicator.						
RETRY-LIMIT	20 | *n* | UNLIM	O	z	u	w		b
	Maximum number of attempts to restart the SSL communicator.						
RETRY-TIME	3M | *n* | *n*S | *n*H	O	z	u	w		b
	Wait time between suspending SSL communication due to unrecoverable error and the next attempt to restart it. *n* Same as *n*S. *n*S Wait time in seconds (max.2147483647). *n*M Wait time in minutes (max. 35791394). *n*H Wait time in hours (max. 596523).						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	Minimum: 1S						
REUSE-ADDRESS	YES | NO	O	z	u	w		b
	YES The SSL port assigned to the broker can be taken over and assigned to other applications (this is the default value). NO The SSL port assigned to the broker cannot be taken over and assigned to other applications. **Note:** This setting might be required at your site when restarting broker immediately after stopping it. This is due to the inherent latency of the TCP/IP stack when closing connections.						
STACK-NAME	*name*	O	z	u	w		
	Name of the TCP/IP stack that the broker is using. If not specified, broker will connect to the default TCP/IP stack running on the machine.						
TRACE-LEVEL	0 - 4	O	z	u	w		b
	The level of tracing to be performed while the broker is running with transport method SSL or TLS. It overrides the global value of trace level for all SSL or TLS routines. 0 No tracing. Default value. 1 Display IP address of incoming request, display error number of outgoing error responses. 2 All of trace level 1, plus errors if request entries could not be allocated. 3 All of trace level 2, plus all routines executed. 4 All of trace level 3, plus function arguments and return values. If you modify the TRACE-LEVEL attribute, you must restart the broker for the change to take effect. For temporary changes to TRACE-LEVEL without restarting the broker, use System Management Hub or ETBCMD. Trace levels 2, 3, and 4 should be used only when requested by Software AG support.						
TRUST-STORE	*file name|keyring*	R	z	u	w		b
	Location of the store containing certificates of trust Certificate Authorities (or CAs).						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	z/OS		Specify the RACF keyring using the following format: `[USER-ID/]RING-NAME`. If no value for `USER-ID` is provided, the keyring is assumed to be associated with the user ID that the broker kernel is running under.				
	BS2000/OSD/Windows/UNIX		Specify the file name of the CA certificate store. Examples: *EXXCACERT.PEM*, *C:\Certs\ExxCACert.pem*				
`VERIFY-CLIENT`	NO | YES	O	z	u	w		b
	YES Additional client certificate required. NO No client certificate required (default).						

DIV-specific Attributes

The DIV-specific attribute section begins with the keyword `DEFAULTS = DIV`. The attributes in this section are required if `PSTORE-TYPE = DIV` is specified.

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
`DIV`	A511	R	z				
	The VSAM Persistent Store parameters, enclosed in double quotes (""). The value can span more than one line. See *Format Parameters* under *Managing the Broker Persistent Store* in the z/OS administration documentation for details of the parameters. In previous versions of EntireX, these parameters were read from the SYSIN DD during broker kernel startup.						

Adabas-specific Attributes

The Adabas-specific attribute section begins with the keyword `DEFAULTS = ADABAS`. The attributes in this section are required if `PSTORE-TYPE = ADABAS` is specified. In previous versions of EntireX, these Adabas-specific attributes and values were specified in the broker-specific `PSTORE-TYPE` attribute.

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
`BLKSIZE`	126-20000	O	z	u	w	v	b
	Optional blocking factor used for message data. If not specified, broker will split the message data into 2 KB blocks to be stored in Adabas records. The maximum value depends on the physical device assigned to data storage. See the *Adabas* documentation. For reasons of efficiency, do not specify a `BLKSIZE` much larger than the actual total size of the UOW data to be written. The total UOW size is the sum of all messages in the UOW plus 41 bytes of header information. This takes effect only after COLD start. The `BLKSIZE` parameter applies only for a cold start of broker; subsequently the value of `BLKSIZE` is taken from the last cold start. Default value is 2000.						
`DBID`	1 - 32535	R	z	u	w	v	b

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	Database ID of Adabas database where the persistent store resides.						
FNR	1 - 32535	R	z	u	w	v	b
	File number of broker persistent store file.						
FORCE-COLD	N | Y	O	z	u	w	v	b
	Determines whether a broker cold start is permitted to overwrite a persistent store file that has been used by another broker ID and/or platform. Specify Y to allow existing information to be overwritten.						
MAXSCAN	0-*n*	O	z	u	w	v	b
	Limits display of persistent UOW information in the persistent store through Command and Information Services. Default value is 1000.						
OPENRQ	N | Y	O	z	u	w	v	b
	Determines whether driver for Adabas persistent store is to issue an OPEN command to Adabas.						
SVC	200-255	R	z			v	
	Use this parameter to specify the Adabas SVC number to be used by the Adabas persistent store driver.						
TRACE-LEVEL	0-8	O	z	u	w	v	b
	Trace level for Adabas persistent store. It overrides the global value of trace level in the attribute file.						

Variable Definition File

The broker attribute file contains the configuration of one EntireX Broker instance. In order to share attribute files between different brokers, you identify the attributes that are unique and move them to a variable definition file. This file enables you to share one attribute file among different brokers. Each broker in such a scenario requires its own variable definition file.

The following attributes are considered unique for each machine:

- `BROKER-ID` (in Broker-specific attribute`BROKER-ID`)
- `NODE` (in Entire Net-Work-specific attribute `NODE`)
- `PORT` (in `PORT` (SSL) and `PORT` (TCP/IP))

How you use the variable definition file will depend upon your particular needs. For instance, some optional attributes may require uniqueness - for example, `DBID` and `FNR` in `DEFAULTS=ADABAS` - so that you may specify the persistent store.

12 EntireX Broker Security Server for BS2000/OSD

The Broker Security Server authenticates users who log on to EntireX Broker, e.g. it performs a user ID and password check against the operating system. The user ID must exist under BS2000/OSD. Since the server reads information from the user catalog, it requires administrator rights at runtime. The Broker Security Server task therefore needs to run under a privileged user ID (TSOS).

User IDs and passwords are case-insensitive.

The Broker Security Server can handle multiple broker instances on BS2000/OSD.

Activating Authentication

To activate authentication, switch on security in the broker attribute file. Add the following two parameters to `ETB-ATTR` or, if you use the delivered attribute file, switch the `SECURITY` parameter to "YES".

```
SECURITY =YES
ACCESS-SECURITY-SERVER=YES
```

The Broker Security Server requires administrator rights and must be run under a privilieged user ID. Set up the correct broker load library in `START-SECURITY-SERVER`.

Note: If `ACCESS-SECURITY-SERVER` is set to "NO", EntireX Broker itself will do the authentication. In that case EntireX Broker must run under a privileged user ID and the Broker Security Server is not needed.

Starting the Broker Security Server

To start the Broker Security Server

1 Set up the correct broker library within `START-SECURITY-SERVER`, because the server task does not usually run under same user ID where the module library resides.

2 Issue the following command from a privileged user ID (TSOS) to run the server:

```
/ENTER-PROCEDURE *LIB(LIB=$kkk.EXXnnn.JOBS,    -
/                 ELE=START-SECURITY-SERVER),  -
/                 JOB-NAME=SECUSERV,LOG=*NO
```

where $kkk is the user ID under which the broker library resides.

Stopping the Broker Security Server

To stop the Broker Security Server from a privileged user ID

- Enter:

```
/INFORM-PROGRAM MSG='EOJ',JOB-IDENTIFICATION=*TSN(TSN=tsn)
```

where <tsn> is the BS2000/OSD task number associated with the server.

To stop the Broker Security Server from an operator console

- Enter:

```
/INTR tsn,EOJ
```

where tsn is the BS2000/OSD task number associated with the server.

To stop the Broker Security Server from a non-privileged user ID

- Enter the following SDF command:

```
/CALL-PROCEDURE (EXX960.JOBS, STOP-SECURITY-SERVER)
```

Note: This works from all user IDs in the system.

Tracing with the Broker Security Server

The Broker Security Server comes with a trace facility that can be used to track the IDs of users logging on to EntireX Broker. It also produces some diagnostic messages that are helpful for problem analysis. By default, no tracing is performed.

To switch on tracing for Broker Security Server

- Set up an `SDF` variable in the server's job control.

```
TRACE='ON'
```

To switch off tracing for Broker Security Server

- Set the following in the server's job control.

```
TRACE='OFF'
```

See *EntireX Broker Security Server for BS2000/OSD* under *Error Messages and Codes*.

Broker Security Server Parameters

The Broker Security Server uses a global common memory pool for communicating with its clients (broker instances). This common memory pool is established and initialized by the Broker Security Server task. If the pool already exists, the Broker Security Server will not start. This is possible if a client did not disconnect correctly or the Broker Security Server is already running. The message SECE010 “Broker Security Server already active” message is issued. In such a situation, you can use the `FORCE` parameter to reconnect the Broker Security Server to the security common memory pool. The pool is initialized again, and open requests are deleted, which means that authentication for these clients will fail. The initialization process is indicated by message SECI004 “Running with FORCE = YES, the security CMP will be newly initialized”.

Before you set `FORCE=YES`, make sure that no other Broker Security Server is running.

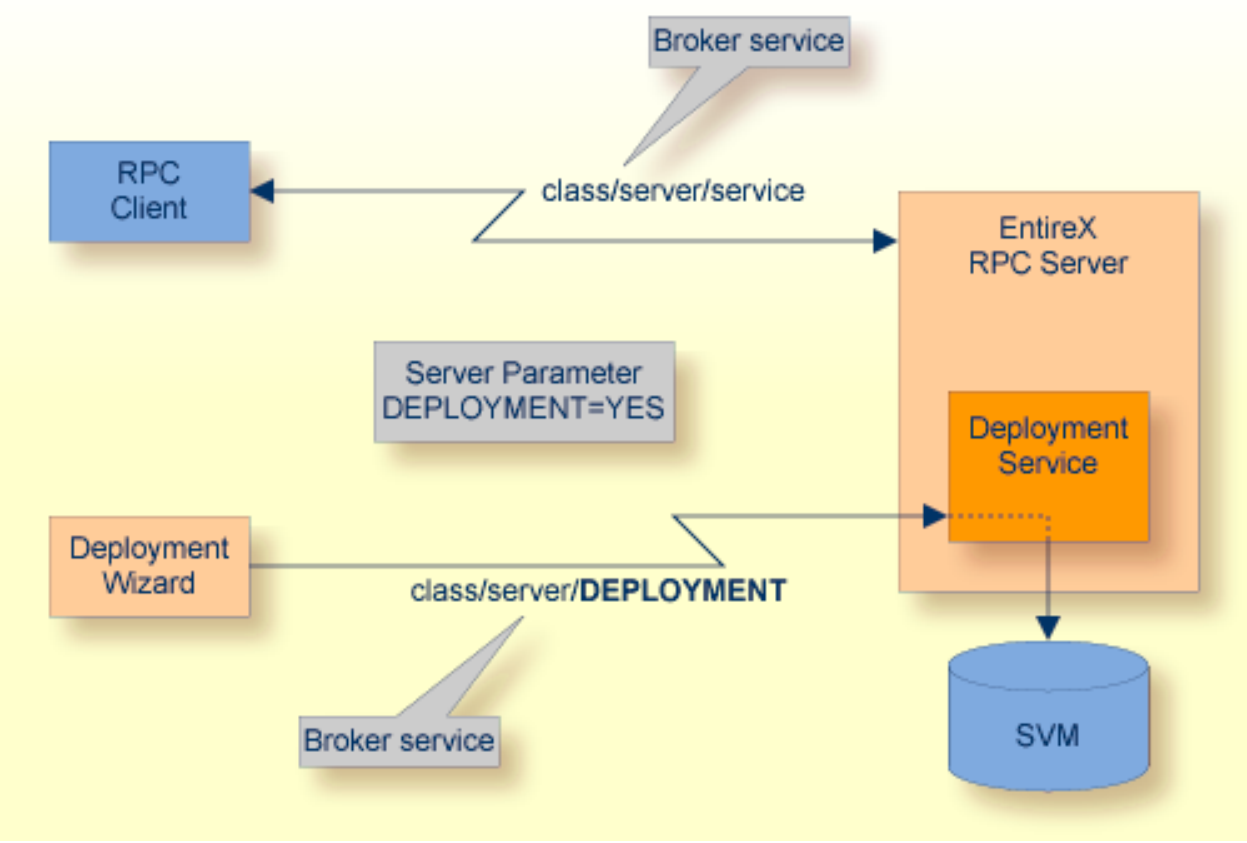
```
FORCE='NO/YES'
```

13 Deployment Service under BS2000/OSD

Introduction

The deployment service

- is the (server-side) counterpart to the deployment wizard; see *Server Mapping Deployment Wizard*.
- is a built-in service of the EntireX RPC server, which can be enabled/disabled by EntireX RPC server configuration settings
- usage can be restricted to certain users or group of users, using EntireX Security; see *Authorization of Client and Server* under *Overview of EntireX Security* in the EntireX Security documentation.



Scope

The deployment service is used for the

- IDL Extractor for COBOL to deploy SVM files with the deployment wizard;
- COBOL Wrapper for server generation to deploy SVM files with the deployment wizard.

See *Server Mapping Deployment Wizard*.

The deployment service uses the same class and server names as defined for the EntireX RPC server, and `DEPLOYMENT` as the service name, resulting in *`class`*`/`*`server`*`/DEPLOYMENT` as the broker service. Please note `DEPLOYMENT` is a service name reserved by Software AG. See broker attribute `SERVICE`.

Enabling the Deployment Service

To enable the deployment service

1 For a BS2000/OSD Batch RPC Server, the server mapping file ISAM (container) must be installed and configured. See *Step 1: Define an RPC SVM File* in the BS2000/OSD installation documentation.

2 Set the RPC server parameter `deployment=yes`. See `deployment` under ***Configuring the RPC Server***.

3 Define in the broker attribute file, under the RPC service, an additional broker service with `DEPLOYMENT` as the service name and values for class and server identical to those used for the RPC service. For example, if your RPC service is named

```
CLASS = RPC    SERVER = SRV1    SERVICE = CALLNAT
```

the deployment service requires the following additional service definition in the broker attribute file:

```
CLASS = RPC    SERVER = SRV1    SERVICE = DEPLOYMENT
```

4 Optional. If you need to restrict the use of the deployment service to a selected group of users, use EntireX Security and define security rules for the *`class`*`/`*`server`*`/DEPLOYMENT` broker service. The service name `DEPLOYMENT` is a constant.

- For a z/OS broker, see *Resource Profiles in EntireX Security* in the EntireX Security documentation.

- For a UNIX or Windows broker, see *Administering Authorization Rules using System Management Hub* in the UNIX and Windows administration documentation.
- Not applicable to a BS2000/OSD or z/VSE broker.

Disabling the Deployment Service

To disable the deployment service

- Set the Batch RPC Server parameter `deployment=no`. See `deployment` under ***Configuring the RPC Server***.

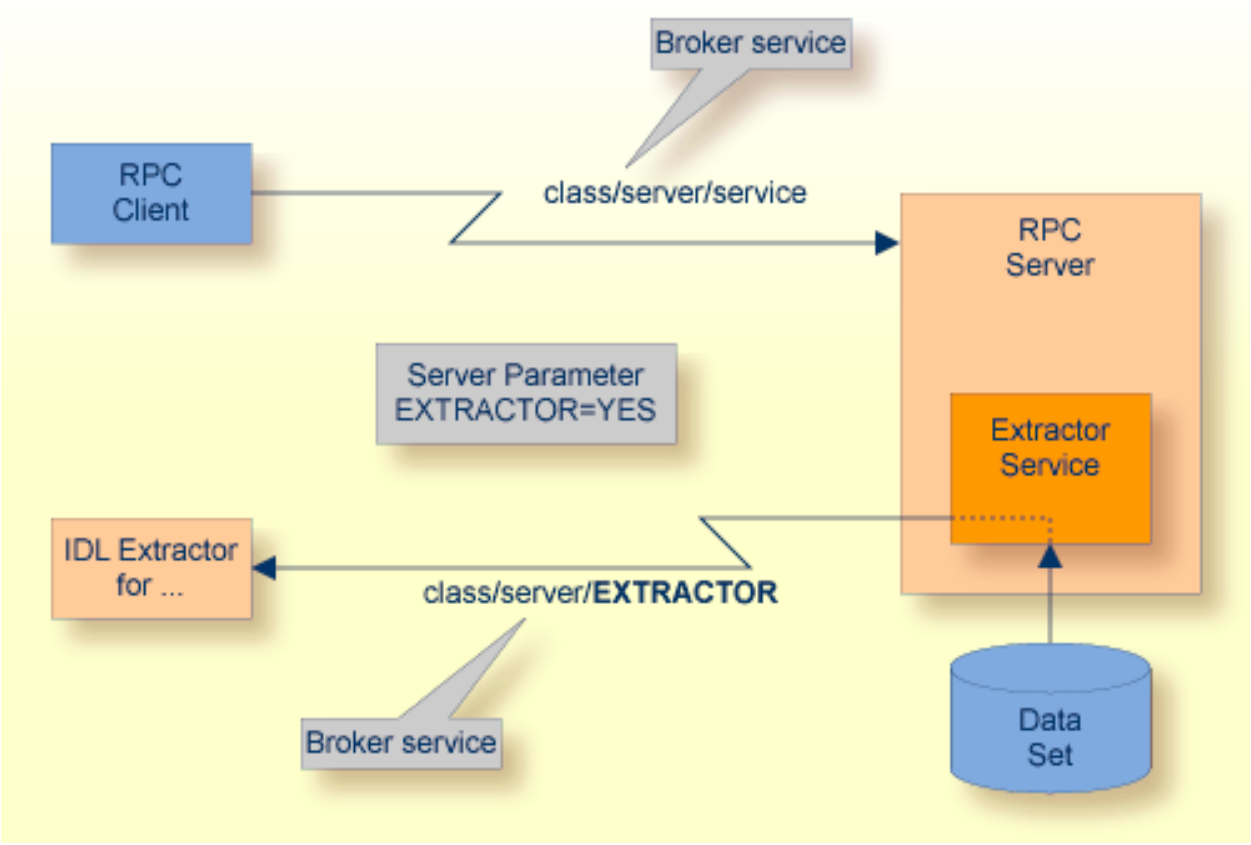
  The Batch RPC Server will not register the deployment service in the broker.

14 Extractor Service under BS2000/OSD

Introduction

The extractor service

- provides access to LMS libraries
- is a built-in service of the RPC server, which can be enabled/disabled by RPC server configuration settings
- depending on the platform where the broker is running, usage can be restricted to certain users or group of users, using EntireX Security; see *Authorization of Client and Server* under *Overview of EntireX Security* in the EntireX Security documentation.



Scope

The extractor service is a prerequisite for the

- **IDL Extractor for COBOL**
  used together with a remote extractor environment, see *Step 2: Select a COBOL Extractor Environment or Create a New One* in the IDL Extractor for COBOL documentation.

The extractor service uses the same class and server names as defined for the RPC server, and "EXTRACTOR" as the service name, resulting in *class*/*server*/EXTRACTOR as the broker service. Please note "EXTRACTOR" is a service name reserved by Software AG. See SERVICE under *Broker Attributes* in the platform-independent administration documentation.

Enabling the Extractor Service

To enable the extractor service

1 Set the Batch RPC Server parameter extractor=yes. See extractor under ***Configuring the RPC Server***.

2 Define in the broker attribute file, under the RPC service, an additional broker service with "EXTRACTOR" as the service name and values for class and server identical to those used for the RPC service. For example, if your RPC service is named

```
CLASS = RPC    SERVER = SRV1    SERVICE = CALLNAT
```

the extractor service requires the following additional service definition in the Broker attribute file:

```
CLASS = RPC    SERVER = SRV1    SERVICE = EXTRACTOR
```

3 Optional. If you need to restrict the use of the extractor service to a selected group of users, use EntireX Security and define security rules for the *class*/*server*/EXTRACTOR broker service. The service name EXTRACTOR is a constant.

- For a z/OS broker, see *Resource Profiles in EntireX Security* in the EntireX Security documentation.
- For a UNIX or Windows broker, see *Administering Authorization Rules using System Management Hub* in the UNIX and Windows administration documentation.
- Not applicable to a BS2000/OSD broker.

Disabling the Extractor Service

To disable the extractor service

- Set the Batch RPC Server parameter `extractor=no`. See `extractor` under *Configuring the RPC Server*. The Batch RPC Server will not register the extractor service in the broker.

15 Handling SVM Files under BS2000/OSD

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.

SVM Files in the EntireX Workbench

In the *EntireX Workbench*, an SVM file has to relate to an appropriate IDL file. Therefore, you always have to keep the IDL file and the SVM file together in the same folder.

If there is an SVM file and a corresponding IDL file,

- at least one of the IDL programs in the corresponding IDL file requires server-mapping information to correctly call the target server. For those IDL programs, there is an SVM entry (line) in the Workbench SVM file.
- deployment of the SVM file to the RPC server is mandatory, see *Server Mapping Deployment*.

If there is an IDL file but no corresponding SVM file,

- there is no IDL program that requires server mapping information.

SVM Files in the RPC Server

Under BS2000/OSD, SVM entries of Workbench SVM files are stored as records of one ISAM file (containing all SVM entries from all Workbench SVM files). The unique key of the ISAM file consists of the first 255 bytes of the record: for the type (1 byte), the IDL library (127 bytes) and the IDL program (127 bytes).

If *one* server requires an SVM file, you need to provide this to the RPC server:

- Development environments: to allow the deployment of new SVM files, enable the deployment service. See ***Enabling the Deployment Service***.
- Production environments: provide SVM files to the RPC server. See configuration parameter `svm`.

If *no* server requires an SVM file, you can execute the RPC server without SVM files:

- Development environments: you can disable the deployment service. See ***Disabling the Deployment Service***.

- Production environments: there is no need to provide SVM files to the RPC server. See configuration parameter *svm*.

Source Control of SVM Files

Because SVM entries within an SVM file contain text data only, a Workbench SVM file is text-based (although it is not intended for human consumption). Therefore, you can include it in your source control management together with the IDL file and the COBOL source(s) as a triplet that should always be kept in sync.

Change Management of SVM Files

Under BS2000/OSD, change management for an ISAM file (SVM container) is similar to change management for an ordinary file. The complete ISAM file can be backed up at any time. All updates to the ISAM file done after a backup must be kept.

All Workbench SVM files added since the last backup should be available.

Compare SVM Files

For SVM files in the *EntireX Workbench* format, you can use a third party file/text compare tool to check if two files are identical.

The SVM entries (corresponding to lines in a Workbench SVM file) contain a creation timestamp at offset 276 (decimal) in the format *YYYYMMDDHHIISST*. The precision is 1/10 of a second.

List Deployed SVM Files

To list the SVM entries of Workbench SVM files, use the command:

```
SHOW-FILE <server-mapping-file>
```

where *<server-mapping-file>* is the ISAM file containing all SVM entires from all Workbench SVM files. See ***SVM Files in the RPC Server***.

Check if an SVM File Revision has been Deployed

SVM entries (corresponding to lines in Workbench SVM files) contain a creation timestamp at offset 276 (decimal) in the format `YYYYMMDDHHIISST`. Precision is 1/10 of a second. The creation timestamp can be checked.

The timestamp can be found on the same offset in the records in the ISAM file (SVM container).

Access Control: Secure SVM File Deployment

For deployment with the *Server Mapping Deployment Wizard*, use EntireX Security if the broker is running on platforms z/OS, UNIX , Windows or z/VSE. See ***Enabling the Deployment Service***.

When is an SVM File Required?

For the IDL Extractor for COBOL

Interface Type	COBOL Syntax	COBOL Mapping Editor	SVM Required	More Information
CICS with DFHCOMMAREA Calling Convention and `IN` different to `OUT`	all		yes	*CICS with `DFHCOMMAREA` Calling Convention* under *Introduction to the IDL Extractor for COBOL* | *CICS `DFHCOMMAREA`* under *COBOL Parameter Selection*
CICS Channel Container Calling Convention	all		yes	*CICS with Channel Container Calling Convention*
CICS with DFHCOMMAREA Large Buffer Interface	all		yes	*CICS with `DFHCOMMAREA` Large Buffer Interface*
IMS MPP Message Interface (IMS Connect)	all		yes	*IMS MPP Message Interface (IMS Connect)*
IMS BMP with Standard Linkage Calling Convention	all		yes	*IMS BMP with Standard Linkage Calling Convention*
Micro Focus with Standard Linkage Calling Convention	`BINARY` clause		yes	*Micro Focus with Standard Linkage Calling Convention*

Interface Type	COBOL Syntax	COBOL Mapping Editor	SVM Required	More Information
all	OCCURS DEPENDING ON clause		yes	*Tables with Variable Size - DEPENDING ON Clause* under *COBOL to IDL Mapping* in the IDL Extractor for COBOL documentation
all	REDEFINES clause		yes	*REDEFINE Clause*
all	TRAILING [SEPARATE] clause		yes	*SIGN LEADING and TRAILING SEPARATE Clause*
all	LEADING [SEPARATE] clause		yes	*SIGN LEADING and TRAILING SEPARATE Clause*
all	ALIGNED RIGHT attribute		yes	
all	all	Rename of program	yes	*The Software AG IDL Tree Pane* under *Mapping Editor User Interface* in the IDL Extractor for COBOL documentation
all	all	Map to operation	yes	*Context Menu* under *The COBOL Parameters Pane*
all	all	Map to constant	yes	*Context Menu*
all	all	Suppress	yes	*Context Menu*
other combinations			no	

For the COBOL Wrapper

This depends on the interface type chosen and the IDL type:

Interface Type	IDL Type	COBOL Wrapper	SVM Required	More Information
CICS with DFHCOMMAREA Large Buffer Interface	all		yes	*CICS with DFHCOMMAREA Large Buffer Interface* under *COBOL Server Interface Types*
CICS with Channel Container Calling Convention	all		yes	*CICS with Channel Container Calling Convention*
IMS BMP with Standard Linkage Calling Convention	all		yes	*IMS BMP with Standard Linkage Calling Convention*
Micro Focus	I2 or I4		yes	*Micro Focus with Standard Linkage Calling Convention* | *IDL Data Types* under

Interface Type	IDL Type	COBOL Wrapper	SVM Required	More Information
				Software AG IDL File in the IDL Editor documentation
all	IDL unbounded array		yes	`array-definition` under *Software AG IDL Grammar* in the IDL Editor documentation
all	IDL unbounded group		yes	`group-parameter-definition` under *Software AG IDL Grammar* in the *IDL Editor* documentation
all	all	IDL program name is not a valid COBOL name and is therefore adapted, or the COBOL program name is customized	yes	*Customize Automatically Generated Server Names*
other combinations			no	

Is There a Way to Smoothly Introduce SVM Files?

All EntireX RPC servers can be executed without SVM files. There is no need to install the SVM container (see ***SVM Files in the RPC Server***) as long as you do not use features that require SVM files (see ***When is an SVM File Required?***). You can also call COBOL servers generated or extracted with previous versions of EntireX mixed with a COBOL server that requires SVM files. All EntireX RPC servers are backward compatible.

16 Scenarios and Programmer Information

This chapter covers the following topics:

COBOL Scenarios

Scenario I: Calling an Existing COBOL Server

To call an existing COBOL server

1 Use the *IDL Extractor for COBOL* to extract the Software AG IDL and, depending on the complexity of the extraction, also an SVM file.

2 Build an EntireX RPC client using any EntireX wrapper. See *EntireX Wrappers*. For a quick test you can:

- use the IDL Tester; see *EntireX IDL Tester* in the EntireX Workbench documentation
- generate an XML mapping file (XMM) and use the XML Tester for verification; see *EntireX XML Tester*

See *Client and Server Examples for BS2000/OSD* in the COBOL Wrapper documentation for COBOL RPC Server examples.

Scenario II: Writing a New COBOL Server

To write a new COBOL server

1 Use the *COBOL Wrapper* to generate a COBOL server skeleton and, depending on the complexity of the extraction, also an SVM file. Write your COBOL server and proceed as described under *Using the COBOL Wrapper for the Server Side*.

2 Build an EntireX RPC client using any EntireX wrapper. See *EntireX Wrappers*. For a quick test you can:

- use the IDL Tester; see *EntireX IDL Tester* in the EntireX Workbench documentation
- generate an XML mapping file (XMM) and use the XML Tester for verification; see *EntireX XML Tester*

See *Client and Server Examples for BS2000/OSD* in the COBOL Wrapper documentation for COBOL RPC Server examples.

C Scenarios

Scenario III: Writing a New C Server

To write a new C server

1 Use the *C Wrapper* to generate a C server skeleton and a C server interface object. Write your C server and proceed as described under *Using the C Wrapper for the Server Side (z/OS, UNIX, Windows, BS2000/OSD, IBM i)*.

2 Build an EntireX RPC client using any EntireX wrapper. See *EntireX Wrappers*. For a quick test you can:

- use the IDL Tester; see *EntireX IDL Tester* in the EntireX Workbench documentation
- generate an XML mapping file (XMM) and use the XML Tester for verification; see *EntireX XML Tester*

17 Tracing EntireX Components under BS2000/OSD

Tracing EntireX Broker

To switch on tracing

- Set the attribute `TRACE-LEVEL` in the broker attribute file
  - for minimal trace output to "1"
  - for detailed trace output to "2"
  - for full trace output to "3"

  Example:

```
TRACE-LEVEL=2
```

To switch off tracing

- Set the attribute `TRACE-LEVEL` in the broker attribute file to 0:

```
TRACE-LEVEL=0
```

  Or:

  Omit the `TRACE-LEVEL` attribute.

Tracing Broker Stubs

The broker stubs provide an option for writing trace files.

To switch on tracing for the broker stub

- Before starting the client application, set the environment variable `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.

Trace Value	Trace Level	Description
3	SUPPORT	This is full tracing through the stub, including detailed traces of control blocks, message information, etc.

Example:

```
ETB_STUBLOG=2
```

If the trace level is greater than 1, unencrypted contents of the send/receive buffers may be exposed in the trace.

Trace output is written to SYSOUT.

Remember to switch off tracing to prevent trace files from filling up your disk.

To switch off tracing for the broker stub

- Set the environment variable ETB_STUBLOG to NONE or delete it.

Activating Tracing for the RPC Server

To switch on tracing for the RPC server

- Set the parameter TRACELEVEL in S-element RPC-CONFIG in EXP960.JOBS.

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

Tracing Broker Security Server

The Broker Security Server comes with a trace facility that can be used to track the IDs of users logging on to EntireX Broker. It also produces some diagnostic messages that are helpful for problem analysis. By default, no tracing is performed.

To switch on tracing for Broker Security Server

- Set up an SDF variable in the server's job control.

```
TRACE='ON'
```

To switch off tracing for Broker Security Server

- Set the following in the server's job control.

```
TRACE='OFF'
```

See *EntireX Broker Security Server for BS2000/OSD* under *Error Messages and Codes*.

18 Managing the Broker Persistent Store

The persistent store is used for storing unit-of-work messages and publish-and-subscribe data to disk. This means message and status information can be recovered after a hardware or software failure to the previous commit point issued by each application component. Under BS2000/OSD, the broker persistent store can be implemented with the Adabas database of Software AG. This chapter covers the following topics:

See also *Concepts of Persistent Messaging* in the general administration documentation.

Implementing an Adabas Database as Persistent Store

Introduction

EntireX provides an Adabas persistent driver. This enables Broker unit of work (UOW) messages and their status to be stored in an Adabas file. It is designed to work with Adabas databases under z/OS, UNIX, Windows, BS200/OSD and z/VSE, and can be used where the database resides on a different machine to Broker kernel. For performance reasons, we recommend using EntireX Broker on the same machine as the Adabas database.

Adabas Persistent Store Parameters

Parameters are supplied using the *Adabas-specific Attributes* (`DEFAULTS=ADABAS`) under *Broker Attributes* in the platform-independent administration documentation. See excerpt from the broker attribute file:

```
DEFAULTS=BROKER
  STORE                     = BROKER
  PSTORE-TYPE               = ADABAS
  PSTORE                    = COLD

DEFAULTS=ADABAS
  DBID                      = dbid
  FNR                       = fnr
```

Configuring and Operating the Adabas Persistent Store

Selecting the Adabas Persistent Store Driver

Restrictions

If a HOT start is performed, the Broker kernel must be executed on the same platform on which also the previous Broker executed. This is because some portions of the persistent data are stored in the native character set and format of the Broker kernel. It is also necessary to start Broker with the same Broker ID as the previous Broker executed.

If a COLD start is executed, a check is made to ensure the Broker ID and platform information found in the persistent store file is consistent with the Broker being started (provided the persistent store file is not empty). This is done to prevent accidental deletion of data in the persistent store by a different Broker ID. If you intend to COLD start Broker and to utilize a persistent store file which has been used previously by a different Broker ID, you must supply the additional `PSTORE-TYPE` parameter `FORCE-COLD=Y`.

Recommendations

- Perform regular backup operations on your Adabas database. The persistent store driver writes C1 checkpoint records at each start up and shut down of Broker.
- For performance reasons, execute Broker on the same machine as Adabas.

Broker Checkpoints in Adabas

During startup, Broker writes the following C1 checkpoint records to the Adabas database. The time, date and job name are recorded in the Adabas checkpoint log. This enables Adabas protection logs to be coordinated with Broker executions. This information can be read from Adabas, using the `ADAREP` utility with option `CPLIST`:

Broker Execution Name	Broker Execution Type	Adabas
ETBC	Broker Cold Start	Normal Cold Start
ETBH	Broker Hot Start	Normal Hot Start
ETBT	Broker Termination	Normal Termination

Adabas DBA Considerations

BLKSIZE : Adabas Persistent Store Parameter for Broker

Caution should be exercised when defining the block size (`BLKSIZE`) parameter for the Adabas persistent store. This determines how much UOW message data can be stored within a single Adabas record. Therefore, do not define a much larger block size than the size of the maximum unit of work being processed by Broker. (Remember to add 41 bytes for each message in the unit of work.) The advantage of having a good fit between the unit of work and the block size is that fewer records are required for each I/O operation.

It is necessary to consider the following Adabas parameters and settings when using Adabas for the persistent store file:

Table of Adabas Parameter Settings

Topic	Description
Allowing Sufficient Adabas UQ Elements	Allow sufficient Adabas user queue (UQ) elements each time you start Broker. The Broker utilizes a number of user queue elements equal to the number of worker tasks (`NUM-WORKER`), plus two. Adabas timeout parameter (`TNAE`) determines how long the user queue elements will remain. This can be important if Broker is restarted after an abnormal termination, and provision must be made for sufficient user queue elements in the event of restarting Broker.
Setting Size of Hold Queue Parameters	Consideration must be given to the Adabas hold queue parameters `NISNHQ` and `NH`. These must be sufficiently large to allow Adabas to add/update/delete the actual number of records within a single unit of work. Example: where there are 100 message within a unit of work and the average message size is 10,000 bytes, the total unit of work size is 1 MB. If, for example, a 2 KB block size (default `BLKSIZE=2000`) is utilized by the Adabas persistent store driver, there will be 500 distinct records within a single Adabas commit (`ET`) operation, and provision must be made for this to occur successfully.
Setting Adabas TT Parameter	Consideration must be given to the Adabas transaction time (`TT`) parameter for cases where a large number of records is being updated within a single unit of work.
Defining LWP Size	Sufficient logical work pool (`LWP`) size must be defined so that the Adabas persistent store can update and commit the units of work. Adabas must be able to accommodate this in addition to any other processing for which it is used.

Topic	Description
Executing Broker Kernel and Adabas Nucleus on Separate Machines	If Broker kernel is executed on a separate machine to the Adabas nucleus, with a different architecture and codepage, then we recommend running the Adabas nucleus with the `UEC` (universal conversion) option in order to ensure that Adabas C1 checkpoints are legible within the Adabas checkpoint log.
Setting `INDEXCOMPRESSION=YES`	This Adabas option can be applied to the Adabas file to reduce by approximately 50% the amount of space consumed in the indexes.
4-byte ISNs	If you anticipate having more than 16 million records within the persistent store file, you must use 4-byte ISNs when defining the Adabas file for EntireX.
Specification of Adabas LP Parameter	**Caution:** This parameter must be specified large enough to allow the largest UOW to be stored in Adabas. If this is not large enough, Broker will detect an error (response 9; subresponse - 4 bytes - X'0003',C'LP') and Broker will not be able to write any further UOWs. See the description of the `LP` parameter under *ADARUN Parameters* in the*DBA Reference Summary* of the Adabas documentation.

Estimating the Number of Records to be Stored

To calculate the Adabas file size it is necessary to estimate the number of records being stored. As an approximate guide, there will be one Adabas record (500 bytes) for each unprocessed unit of work, plus also *n* records containing the actual message data, which depends on the logical block size and the size of the unit of work. In addition, there will be one single record (500 bytes) for each unit of work having a persisted status.

Always allow ample space for the Adabas persistent store file since the continuous operation of Broker relies of the availability of this file to store and retrieve information.

Estimating the Number of Records to be Stored

In this example there are 100,000 Active UOW records at any one time. Each of these is associated with two message records containing the message data. UOW records are 500 bytes in length. Each message record contains 2,000 bytes. In addition, there are 500,000 UOW status records residing in the persistent store, for which the UOW has already been completely processed. These are 500 bytes long.

Note: The actual size of the data stored within the UOW message records is the sum of all the messages within the UOW, plus a 41-byte header for each message. Therefore, if the average message length is 59 bytes, the two 2,000 bytes, messagesrecords, could contain n = 4,000 / (59+41), or 40 messages. Adabas is assumed to compress the message data by 50% in the example (this can vary according to the nature of the message data).

3-byte ISNs and RABNs are assumed in this example. A device type of 8393 is used; therefore, the ASSO block size is 4,096, and DATA block size is 27,644. Padding factor of 10% is specified.

The following example calculates the space needed for Normal Index (NI), Upper Index (UI), Address Converter (AC) and Data Storage (DS).

Calculation Factors	Required Space
■ Number entries for descriptor WK (21-byte unique key)	■ = number UOW records: 0.1 + 0.5 million + number message records: 0.2 million
■ NI Space for descriptor WK ■ (3-byte ISN) ■ (4,092 ASSO block 10% padding)	■ = 800,000 * (3 + 21 + 2) ■ = 20,800,000 bytes ■ = 5,648 blocks
■ UI Space for descriptor WK ■ (3-byte ISN + 3-byte RABN) ■ (4,092 ASSO block 10% padding)	■ = 5,648 * (21 + 3 + 3 + 1) ■ = 158,140 bytes ■ = 43 blocks
■ Number entries for descriptor WI (8-byte unique key)	■ = number processed UOW records: 0.5 million
■ NI Space for descriptor WI ■ (3-byte ISN) ■ (4,092 ASSO block 10% padding)	■ = 500,000 * (3 + 8 + 2) ■ = 6,500,000 bytes ■ = 1,765 blocks
■ UI Space for descriptor WI ■ (3-byte ISN and 3 byte RABN) ■ (4,092 ASSO block 10% padding)	■ = 17,649 * (8 + 3 + 3 + 1) ■ = 26,475 bytes ■ = 8 blocks
■ Number entries for descriptor WL (96 byte key)	■ = number UOW records 0.1 + 0.5 million
■ NI Space for descriptor WL ■ (3-byte ISN) ■ (4,092 ASSO block 10% padding)	■ = 600,000 * (3 + 96 + 2) ■ = 60,600,000 bytes ■ = 16,455 blocks
■ UI Space for descriptor WL ■ (3-byte ISN and 3 byte RABN) ■ (4,092 ASSO block 10% padding)	■ = 164,548 * (96 + 3 + 3 + 1) ■ = 16,948,517 bytes ■ = 461 blocks
■ Address Converter space ■ (4,092 ASSO block)	■ = (800,000 + 1) * 3 / 4092 ■ = 587 blocks

Calculation Factors	Required Space
■ Data storage for message data (2,000-byte records compressed by 50%)	■ = 0.2 million * 2000 * 0.5 = 200,000,000 bytes
■ Data storage for UOW data (2,000-byte records compressed by 50%)	■ = 0.6 million * 500 * 0.5 = 150,000,000 byte
■ Combined space required for data (27,644 DATA block 10% padding)	■ = 14,068 blocks
Entity Requiring Space	**Total Required Space**
Normal Index (NI)	= 23,868 blocks
Upper Index (UI)	= 512 blocks
Data Storage (DS)	= 14,068 blocks
Address Converter (AC)	= 587 blocks

Tips on Transports, Platforms and Versions

- **Entire Net-Work**
  If you intend to use Adabas persistent store through Entire Net-Work, see the Entire Net-Work documentation for installation and configuration details.
- **Adabas Versions**
  Adabas persistent store can be used on all Adabas versions currently released and supported by Software AG.
- **Prerequisite Versions of Entire Net-Work with Adabas**
  See the Adabas and Entire Net-Work documentation to determine prerequisite versions of Entire Net-Work to use with Adabas at your site.

Migrating the Persistent Store

The contents of EntireX Broker's persistent store can be migrated to a new persistent store in order to change the PSTORE type or to use the same type of PSTORE with increased capacity.

The migration procedure outlined here requires two Broker instances started with a special `RUN-MODE` parameter. One Broker unloads the contents of the persistent store and transmits the data to the other Broker, which loads data into the new PSTORE. Therefore, for the purposes of this discussion, we will refer to an *unload* Broker and a *load* Broker.

This procedure is based on Broker-to-Broker communication to establish a communication link between two Broker instances. It does not use any conversion facilities, since the migration procedure is supported for homogeneous platforms only.

Configuration

The migration procedure requires two Broker instances started with the `RUN-MODE` parameter. The unload Broker should be started with the following attribute:

```
RUN-MODE=PSTORE-UNLOAD
```

The load Broker should be started with the following attribute:

```
RUN-MODE=PSTORE-LOAD
```

These commands instruct the Broker instances to perform the PSTORE migration.

Note: The attribute `PARTNER-CLUSTER-ADDRESS` must be defined in both Broker instances to specify the transport address of the load Broker. The unload Broker must know the address of the load broker, and the load Broker must in turn know the address of the unload Broker.

Example:

Broker ETB001 performs the unload on host HOST1, and Broker ETB002 performs the load on host HOST2. The transmission is based on TCP/IP. Therefore, Broker ETB001 starts the TCP/IP communicator to establish port 1971, and Broker ETB002 starts the TCP/IP communicator to establish port 1972.

For ETB001, attribute `PARTNER-CLUSTER-ADDRESS=HOST2:1972:TCP` is set, and for ETB002, attribute `PARTNER-CLUSTER-ADDRESS=HOST1:1971:TCP` is set to establish the Broker-to-Broker communication between the two Broker instances.

In addition to attributes RUN-MODE and PARTNER-CLUSTER-ADDRESS, a fully functioning Broker configuration is required when starting the two Broker instances. To access an existing PSTORE on the unloader side, you must set the attribute PSTORE=HOT. To load the data into the new PSTORE on the loader side, you must set the attribute PSTORE=COLD. The load process requires an empty PSTORE at the beginning of the load process.

Note: Use caution not to assign PSTORE=COLD to your unload Broker instance, as this startup process will erase all data currently in the PSTORE.

For the migration process, the unload Broker and the load Broker must be assigned different persistent stores.

A report can be generated to detail all of the contents of the existing persistent store. At the end of the migration process, a second report can be run on the resulting new persistent store. These two reports can be compared to ensure that all contents were migrated properly. To run these reports, set the attribute PSTORE-REPORT=YES. See PSTORE for detailed description, especially for the file assignment.

Migration Procedure

The migration procedure is made up of three steps.

Step 1

The unload Broker and the load Broker instances can be started independently of each other. Each instance will wait for the other to become available before starting the unload/load procedure.

The unload Broker instance sends a handshake request to the load Broker instance in order to perform an initial compatibility check. This validation is performed by Broker according to platform architecture type and Broker version number. The handshake ensures a correctly configured partner cluster address and ensures that the user did not assign the same PSTORE to both Broker instances. If a problem is detected, an error message will be issued and both Broker instances will stop.

Step 2

The unload Broker instance reads all PSTORE data in a special non-destructive raw mode and transmits the data to the load Broker instance. The load Broker instance writes the unchanged raw data to the new PSTORE. A report is created if PSTORE-REPORT=YES is specified, and a valid output file for the report is specified.

Step 3

The unload Broker instance requests a summary report from the load Broker instance to compare the amount of migrated data. The result of this check is reported by the unload Broker instance and the load Broker instance before they shut down.

When a Broker instances is started in `RUN-MODE=PSTORE-LOAD` or `RUN-MODE=PSTORE-UNLOAD`, the Broker instances only allow Administration requests. All other user requests are prohibited.

Notes:

1. The contents of the persistent store are copied to the new persistent store as an exact replica. No filtering of unnecessary information will be performed, for example, UOWs in received state. The master records will not be updated.
2. Before restarting your Broker with the new persistent store, be sure to change your PSTORE attribute to `PSTORE=HOT`. *Do not* start your broker with the new persistence store using `PSTORE=COLD`; this startup process will erase all of the data in your persistent store.
3. After completing the migration process and restarting your broker in a normal run-mode, it is important not to bring both the new PSTORE and the old PSTORE back online using separate Broker instances; otherwise, applications would receive the same data twice. Once the migration process is completed satisfactorily, and is validated, the old PSTORE contents should be discarded.

19 Broker Shutdown Statistics

Shutdown Statistics Output

After a successful Broker execution, shutdown statistics and related information are produced. This output is written in the following sequence:

1. The diagnostic message ETBD0444 is written into the Broker trace log.
2. The output - i.e. statistics, internals and user-specified parameters - is written into the end of the Broker trace log file at shutdown.

Table of Shutdown Statistics

See *Legend* below for explanation of output type.

Output Type	Display Field	Description
U	Broker ID	Identifies the Broker kernel to which the attribute file applies. See `BROKER-ID`.
I	Version	The version of the Broker kernel currently running.
I	Generated platform family	The platform family for which this Broker kernel was built.
I	Runtime platform	The platform on which this Broker kernel is currently running.
I	Start time	The date and time when this Broker kernel started.
S	Restart count	The restart count indicates how many times the Broker kernel has been started with the persistent store. Therefore, after a cold start `(PSTORE=COLD)`, the restart count will be 1. Then, after subsequent hot starts `(PSTORE=HOT)`, the restart count will be 2 or greater.
U	Trace level	The value for the trace setting for this Broker kernel. See `TRACE-LEVEL`.
U	Worker tasks	The number of worker tasks for this Broker kernel. See `NUM-WORKER`.
U	MAX-MEMORY	The value of `MAX-MEMORY` or 0 if not defined. See `MAX-MEMORY`.
S	Memory allocated	Size of the allocated memory, in bytes.
S	Memory allocated HWM	Highest size of allocated memory in bytes since Broker started.
U	NUM-SERVICE	Value of `NUM-SERVICE` or 0 if not defined. See `NUM-SERVICE`.
S	Services active	The number of services currently active for this Broker kernel.
U	NUM-CLIENT	Value of `NUM-CLIENT` or 0 if not defined. See `NUM-CLIENT`.
S	Clients active	The number of clients currently active for this Broker kernel.
S	Clients active HWM	The high watermark for the number of clients active for this Broker kernel.

Output Type	Display Field	Description
U	NUM-SERVER	Value of NUM-SERVER or 0 if not defined. See NUM-SERVER.
S	Servers active	The number of servers currently active for this Broker kernel.
S	Servers active HWM	The high watermark for the number of servers active for this Broker kernel.
U	NUM-CONVERSATION	Value of NUM-CONVERSATION or 0 if not defined. See NUM-CONVERSATION.
S	Conversations active	The number of conversations currently active for this Broker kernel.
S	Conversations active HWM	The high watermark for the number of conversations active for this Broker kernel.
U	NUM-LONG-BUFFER	Value of NUM-LONG-BUFFER or 0 if not defined. See NUM-LONG-BUFFER.
S	Long buffers active	The number of long message buffers currently in use for this Broker kernel.
S	Long buffers active HWM	The high watermark for the number of long message buffers used for this Broker kernel.
U	NUM-SHORT-BUFFER	Value of NUM-SHORT-BUFFER or 0 if not defined. See NUM-SHORT-BUFFER.
S	Short buffers active	The number of short message buffers currently in use for this Broker kernel.
S	Short buffers active HWM	The high watermark for the number of short message buffers used for this Broker kernel.
U	NUM-TOPIC	Value of NUM-TOPIC or 0 if not defined. See NUM-TOPIC.
S	Topics active	The number of topics currently active for this Broker kernel.
U	NUM-PUBLISHER	Value of NUM-PUBLISHER or 0 if not defined.
S	Publishers active	The number of publishers currently active for this Broker kernel.
S	Publishers active HWM	The high watermark for the number of publishers active for this Broker kernel.
U	NUM-SUBSCRIBER	Value of NUM-SUBSCRIBER or 0 if not defined. See NUM-SUBSCRIBER.
S	Subscribers active	The number of subscribers currently active for this Broker kernel.
S	Subscribers active HWM	The high watermark for the number of subscribers active for this Broker kernel.
U	NUM-PUBLICATION	Value of NUM-PUBLICATION or 0 if not defined. See NUM-PUBLICATION.
S	Publications active	The number of publications currently active for this Broker kernel.
S	Publications active HWM	The high watermark for the number of publications active for this Broker kernel.

Output Type	Display Field	Description
U	Persistent store type	The type of persistent store used by this Broker kernel. See PSTORE-TYPE.
U	UOW persistence	Indicates whether units of work are persistent or not in this Broker kernel. See STORE.
U	Persistent store startup	Indicates the status of the persistent store at Broker startup. See PSTORE.
U	Persistent status lifetime	The multiplier to compute the lifetime of the persistent status. See UWSTATP.
U	Deferred UOWs allowed	Indicates whether or not deferred units of work are allowed. See DEFERRED.
U	Maximum allowed UOWs	The maximum number of units of work that can be active concurrently for this Broker kernel. See MAX-UOWS.
U	Maximum messages per UOW	The maximum number of messages allowed in a unit of work. See MAX-MESSAGES-IN-UOW.
U	UOW lifetime in seconds	Indicates the default lifetime for a unit of work. See UWTIME.
U	Maximum message length	Indicates the maximum message size that can be sent. See MAX-UOW-MESSAGE-LENGTH.
U	New UOW messages allowed	Indicates whether or not new units of work are allowed in this Broker kernel. See NEW-UOW-MESSAGES.
S	UOWs active	The number of units of work currently active in this Broker kernel.
S	Current UOW	The number of the last unit of work in this Broker kernel.
U	Accounting	Indicates the status of accounting records in this Broker kernel. See ACCOUNTING.
U	SSL port *	If applicable, the SSL port number on which this Broker kernel will listen for connection requests. See SSLPORT.
U	TCP port *	If applicable, the TCP port number on which this Broker kernel will listen for connection requests. See TCPPORT.
I	Number of function calls	Marks the beginning of the section of summary statistics for all the function calls.
S	DEREGISTER	The number of Broker DEREGISTER function calls since startup.
S	EOC	The number of Broker EOC function calls since startup.
S	KERNELVERS	The number of Broker KERNELVERS function calls since startup.
S	LOGOFF	The number of Broker LOGOFF function calls since startup.
S	LOGON	The number of Broker LOGON function calls since startup.
S	RECEIVE	The number of Broker RECEIVE function calls since startup.
S	REGISTER	The number of Broker REGISTER function calls since startup.
S	SEND	The number of Broker SEND function calls since startup.
S	SYNCPOINT	The number of Broker SYNCPOINT function calls since startup.

Output Type	Display Field	Description
S	UNDO	The number of Broker UNDO function calls since startup.
S	CONTROL_PUBLICATION	The number of Broker CONTROL_PUBLICATION function calls since startup.
S	RECEIVE_PUBLICATION	The number of Broker RECEIVE_PUBLICATION function calls since startup.
S	SEND_PUBLICATION	The number of Broker SEND_PUBLICATION function calls since startup.
S	SUBSCRIBE	The number of Broker SUBSCRIBE function calls since startup.
S	UNSUBSCRIBE	The number of Broker UNSUBSCRIBE function calls since startup.
S	REPLY_ERROR	The number of Broker REPLY_ERROR function calls since startup.
I	Worker task statistics	Marks the beginning of the section of summary statistics for all the worker tasks.
I	Worker number	The identifier of the worker task.
I	Status	The status of the worker task at shutdown.
S	# of calls	The number of Broker calls handled by the worker task since startup.
S	Idle time in seconds	The number of seconds the worker task has been idle since startup.

* Does not apply to z/OS.

Legend

Output Type	Description	Value	Origin of Value
I	Internal Information	Static	Determined by Software AG EntireX.
S	Shutdown Statistic	Variable	Determined by Broker activity during execution.
U	User-Specified Parameter	Variable	Specified by Broker administrator before or, if allowable, during execution.

20 Configuring Broker for Internationalization

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

This chapter explains in detail how to configure the broker for the various internationalization approaches, how to write a translation user exit and how to write a SAGTRPC user exit.

See also *What is the Best Internationalization Approach to use?* under *Introduction to Internationalization*

Configuring Translation

To configure translation

- In the Broker attribute file, set the service-specific or topic-specific broker attribute `TRANSLATION` to `SAGTCHA` as the name of the translation routine. Example:

```
TRANSLATION=SAGTCHA
```

Configuring Translation User Exits

To configure translation user exits

As a prerequisite, the user-written translation module must be accessible to the Broker worker threads.

1 Copy the user-written translation module into the EntireX Broker load library (EXX960.LIB).

2 In the Broker attribute file, set the service-specific or topic-specific broker attribute `TRANSLATION` to the name of the user-written translation routine. Example:

```
TRANSLATION=MYTRANS
```

Configuring ICU Conversion

To configure ICU conversion

1 In the Broker attribute file, set the service-specific or topic-specific broker attribute `CONVERSION`. Examples:

- ICU Conversion with SAGTCHA for *ACI-based Programming*:

```
CONVERSION=(SAGTCHA,TRACE=1,OPTION=SUBSTITUTE)
```

- ICU Conversion with SAGTRPC for *RPC-based Components* and *Reliable RPC*:

```
CONVERSION=(SAGTRPC,TRACE=2,OPTION=STOP)
```

We recommend always using SAGTRPC for RPC data streams. *Conversion with Multibyte, Double-byte and other Complex Codepages* will always be correct, and *Conversion with Single-byte Codepages* is also efficient because SAGTRPC detects single-byte codepages automatically. See *Conversion Details*.

2 Optionally configure a `CONVERSION OPTION` to tune error behavior to meet your requirements; see *`OPTION` Values for Conversion*.

3 For the Broker attribute, check if ICU conversion is possible, that is, the attribute `ICU-CONVERSION` is either

- not defined, its default is `YES`
- set to `YES`

To configure locale string defaults (optional)

- If the broker's locale string defaults do not match your requirements (see *Broker's Locale String Defaults* under *Locale String Mapping* in the internationalization documentation), we recommend you assign suitable locale string defaults for your country and region, see the respective attribute in *Codepage-specific Attributes* (`DEFAULTS=CODEPAGE`) under *Broker Attributes* in the platform-independent administration documentation for how to customize the broker's locale string defaults.

To customize mapping of locale strings (optional)

- If the built-in locale string mapping mechanism does not match your requirements, you can assign specific codepages to locale strings. See *Broker's Built-in Locale String Mapping* under *Locale String Mapping* in the internationalization documentation and `locale-string` for information on customizing the mapping of locale strings to codepages.

Configuring SAGTRPC User Exits

To configure SAGTRPC user exits

As a prerequisite, the user-written conversion module must be accessible to the Broker worker threads.

1. Copy the user-written conversion module into any library of the Broker's steplib concatenation.
2. In the Broker attribute file, set the service-specific or topic-specific broker attribute `CONVERSION` to the name of the user-written SAGTRPC user exit routine. Example:

```
CONVERSION=(MYTRANS,TRACE=1)
```

To configure locale string defaults

- If the broker's locale string defaults do not match your requirements, we recommend you assign suitable locale string defaults for your country and region. See the appropriate attribute under *Codepage-specific Attributes* (`DEFAULTS=CODEPAGE`) under *Broker Attributes* in the platform-independent administration documentation for information on customizing broker's locale string defaults, and also *Locale String Mapping* in the internationalization documentation.

To customize mapping of locale strings

- If the broker's built-in locale string mechanism does not match your requirements, you can assign specific codepages to locale strings. See *Broker's Built-in Locale String Mapping* under *Locale String Mapping* in the internationalization documentation and the appropriate attribute under *Codepage-specific Attributes* (`DEFAULTS=CODEPAGE`) under *Broker Attributes* in the platform-independent administration documentation for information on customizing broker's locale string defaults.

Writing Translation User Exits

This section covers the following topics:

Introduction

EntireX Broker provides an interface to enable user-written translation routines in the programming language Assembler. It contains three parameters:

- The address of the TRAP control block (TRAP = Translation Routine / Area for Parameters).
- The address of a temporary work area. It is aligned to fullword / long integer boundary (divisible by 4). The work area can only be used for temporary needs and is cleared after return.
- A fullword (long integer) that contains the length of the work area.

Note: Names for user-written translation routines starting with "SAG" are reserved for Software AG usage and must not be used, e.g. "SAGTCHA" and "SAGTRPC".

Structure of the TRAP Control Block

The Assembler dummy section `TR$TRAP` covers the layout of the TRAP control block:

```
TR$TRAP  DSECT ,
TR$TYPE  DS       F            TRAP type
TR$TYP2  EQU      2            TRAP type ETB 121
TR$ILEN  DS       F            Input buffer length
TR$IBUF  DS       A            Address of input buffer
TR$OLEN  DS       F            Output buffer length
TR$OBUF  DS       A            Address of output buffer
TR$DLEN  DS       F            Length of data returned:
*                              Should be set to the minimum value of TR$ILEN
```

```
*                               and TR$OLEN.
TR$SHOST DS       F             Sender's host:
*                               x'00000000' = little endian
*                               x'00000001' = big endian
TR$SCODE DS       F             Sender's character set:
SEBCIBM  EQU      X'00000022'   EBCDIC (IBM)
SEBCSNI  EQU      X'00000042'   EBCDIC (SNI)
SA88591  EQU      X'00000080'   ASCII
TR$RHOST DS       F             Receiver's host     --> see TR$SHOST
TR$RCODE DS       F             Receiver's char set --> see TR$SCODE
TR$BHOST DS       F             BROKER host         --> see TR$SHOST
TR$BCODE DS       F             BROKER char set     --> see TR$SCODE
TR$SENVA DS       F             Sender's ENVIRONMENT field supplied:
OFF      EQU      X'00000000'   ENVIRONMENT field not set
ON       EQU      X'00000001'   ENVIRONMENT field set
*
TR$RENVA DS       F             Receiver's ENVIRONMENT field supplied:
*                               --> see TR$SENVA
TR$SENV  DS       CL32          Sender's ENVIRONMENT field
TR$RENV  DS       CL32          Receiver's ENVIRONMENT field
TR$LEN   EQU      *-TR$TRAP     Length of TRAP
```

The translation routine USRTCHA is an example of the translation user exit, it is contained in the EntireX Common source library.

Using the TRAP Fields

The `TR$DLEN` must be supplied by the user-written translation routine. It tells the Broker the length of the message of the translation. In our example its value is set to the minimum length of the input and output buffer.

All other TRAP fields are supplied by the Broker and must not be modified by the user-written translation routine.

The incoming message is located in a buffer pointed to by `TR$IBUF`. The length (not to be exceeded) is supplied in `TR$ILEN`. The character set information from the send buffer can be taken from `TR$SCODE`.

The outgoing message must be written to the buffer pointed to by `TR$OBUF`. The length of the output buffer is given in the field `TR$OLEN`. The character set is specified in `TR$RCODE`. If the addresses given in `TR$IBUF` and `TR$OBUF` point to the same location, it is not necessary to copy the data from the input buffer to the output buffer.

The environment fields `TR$SENVA` and `TR$RENVA` are provided to handle site-dependent character set information. For the `SEND` and/or `RECEIVE` functions, you can specify data in the `ENVIRONMENT` field of the Broker ACI control block. This data is translated into the codepage of the platform where EntireX Broker is running (see field `TR$BCODE`) and is available to the `TR$SENV` or `TR$RENV` field in the TRAP control block. `TR$SENVA` or `TR$RENVA` are set to `ON` if environmental data is available.

The sample source USRTCHA contains a section to handle the ENVIRONMENT value *NONE. The translation will be skipped if *NONE is supplied by the sender or receiver. Any values given in the API field ENVIRONMENT must correspond to the values handled in the translation routine.

Writing SAGTRPC User Exits

This section covers the following topics:

Introduction

EntireX Broker provides an interface to SAGTRPC user exit routines written in the programming language Assembler. The interface contains three parameters:

- The address of the UE (user exit) control block.
- The address of a temporary work area. It is aligned to a fullword / long-integer boundary (divisible by 4). The work area can only be used temporarily and is cleared after return.
- A fullword (long integer) that contains the length of the work area.

Note: Names for conversion routines starting with "SAG" are reserved for Software AG usage and must not be used, e.g. "SAGTCHA" and "SAGTRPC".

Structure of the User Exit Control Block

The Assembler dummy section `UE$CB` shows the layout of the user exit control block.

```
UE$CB    DSECT , ..... User Exit Control Block
*                      ***********************
*                                                    Direction
*                                                    ---------
UE$VERS  DS    F       UECB version                   input
UE$VER1  EQU   1       UECB version 1
UE$IBUF  DS    A       Address of input buffer        input
UE$ILEN  DS    F       Input buffer length            input
UE$OBUF  DS    A       Address of output buffer       input
UE$OLEN  DS    F       Output buffer length           input
UE$DLEN  DS    F       Length of data returned        output
*
UE$SHOST DS    F       Senders host:                  input
*                      x'00000000' = little endian
*                      x'00000001' = big endian
*
UE$SCODE DS    F       Senders character set:         input
SEBCIBM EQU X'00000022' EBCDIC (IBM)
SEBCSNI EQU X'00000042' EBCDIC (SNI)
```

```
SA88591 EQU X'00000080' ASCII
*
UE$RHOST DS    F        Receivers host      --> see UE$SHOST  input
UE$RCODE DS    F        Receivers char set  --> see UE$SCODE  input
UE$BHOST DS    F        BROKER host         --> see UE$SHOST  input
UE$BCODE DS    F        BROKER char set     --> see UE$SCODE  input
*
UE$SCP   DS    F        Sender   Codepage number
UE$RCP   DS    F        Receiver Codepage number
UE$BCP   DS    F        Broker   Codepage number
*
UE$FCT   DS    CL1      Function                           input
FCTCONV  EQU   C'C'     Function CONVERT
FCTGLEN  EQU   C'L'     Function GETLENGTH
UE$DIR   DS    CL1      Direction                          input
DIRS2B   EQU   C'1'     Direction Sender to Broker
DIRS2R   EQU   C'2'     Direction Sender to Receiver
DIRB2R   EQU   C'3'     Direction Broker to Receiver
UE$FMT   DS    CL2      Format                             input
FMTUSER  EQU   C'01'    User Data like User ID, Program, Library
FMTMETA  EQU   C'02'    Meta Data Header
FMTFB    EQU   C'03'    Format Buffer
FMTSB    EQU   C'04'    String Buffer
FMTVBN   EQU   C'05'    Meta data value buffer
FMTPRE   EQU   C'99'    Preview format buffer
FMTA     EQU   C'A '    Data Type A
FMTAV    EQU   C'AV'    Data Type AV
FMTB     EQU   C'B '    Data Type B
FMTBV    EQU   C'BV'    Data Type BV
FMTD     EQU   C'D '    Data Type D
FMTF4    EQU   C'F4'    Data Type F4
FMTF8    EQU   C'F8'    Data Type F8
FMTI1    EQU   C'I1'    Data Type I1
FMTI2    EQU   C'I2'    Data Type I2
FMTI4    EQU   C'I4'    Data Type I4
FMTK     EQU   C'K '    Data Type K
FMTKV    EQU   C'KV'    Data Type KV
FMTL     EQU   C'L '    Data Type L
FMTN     EQU   C'N '    Data Type N
FMTP     EQU   C'P '    Data Type P
FMTT     EQU   C'T '    Data Type T
FMTU     EQU   C'U '    Data Type U
FMTUV    EQU   C'UV'    Data Type UV
UE$ETXT  DS    CL40     Error Text output
UE$LEN   EQU   *-UE$CB  Length of UECB
         SPACE ,
```

The user-written conversion exit example `USRTRPC` is delivered in the EntireX common source library.

Using the User Exit Interface Fields

The user exit provides two separate functions, `CONVERT` and `GETLENGTH`. The field `UE$FCT` indicates the function to execute.

Errors

Both functions can send an error, using register 15 in the range 1 to 9999 to SAGTRPC together with an error text in the field `UE$ETXT`.

- A value of 0 returned in register 15 means successful response.
- Error 9999 is reserved for output buffer overflow. See *`CONVERT` Function*.
- When an error occurs, the conversion of the message will be aborted and the error text will be sent to the receiver (client or server). The error is prefixed with the error class 1011. See *Message Class 1011 - User-definable SAGTRPC Conversion Exit* under *Error Messages and Codes*.

Example:

The user exit returns 1 in register 15 and the message “Invalid Function” in `UE$ETXT`. The receiver gets the error message `10110001 Invalid Function`.

CONVERT Function

This function has to be executed when the contents of `UE$FCT` match the definition `FCTCONV`.

`UE$DLEN` must be supplied by SAGTRPC's user-written conversion exit. Its value must be set to the length of the output buffer.

All other interface fields are supplied by the Broker and must not be modified by SAGTRPC's user-written conversion exit.

The incoming data is located in a buffer pointed to by `UE$IBUF`. `UE$ILEN` defines the length.

The outgoing converted message must be written to the buffer pointed to by `UE$OBUF`. The field `TR$OLEN` defines the maximum length available.

For variable length data such as AV and KV, an output buffer overflow can occur if the message size increases after conversion or the receiver's receive buffer is too small. In this case error 9999 “output buffer overflow” must be returned, which calls the *`GETLENGTH` Function* for the remaining fields.

GETLENGTH Function

The GETLENGTH function evaluates the needed length of the output buffer after conversion. An actual conversion must not be performed. The length needed must be returned in the field UE$OLEN.

The GETLENGTH function is called for remaining fields after the CONVERT function returned the error 9999 “output buffer overflow”.

The purpose of this function is to evaluate the length needed by the receiver's receive buffer. This length is returned to the receiver in the ACI field RETURN-LENGTH. The receiver can then use the Broker ACI function RECEIVE with the option LAST together with a receive buffer large enough to reread the message.

Character Set and Codepage

The character-set information used is the same as in the user-written translation routine and is taken from UE$SCODE (for the sender), UE$RCODE (for the receiver) and UE$BCODE (for the Broker). The character-set information depends on the direction information given in the field UE$DIR. See the following table:

UE$DIR	From Character Set	To Character Set
DIRS2B (Sender to Broker)	UE$SCODE	UE$BCODE
DIRS2R (Sender to Receiver)	UE$SCODE	UE$RCODE
DIRB2R (Broker to Receiver)	UE$BCODE	UE$RCODE

Alternatively, the codepage as derived from the locale string mapping process is provided in UE$SCP (sender codepage), UE$RCP (receiver codepage) and UE$BCP (Broker codepage), and can be used to find the correct conversion table. See the following table and also *Locale String Mapping* in the internationalization documentation.

UE$DIR	From Codepage	To Codepage
DIRS2B (Sender to Broker)	UE$SCP	UE$BCP
DIRS2R (Sender to Receiver)	UE$SCP	UE$RCP
DIRB2R (Broker to Receiver)	UE$BCP	UE$RCP

Software AG IDL Data Types to Convert

The field UE$FMT provides the SAGTRPC user-written conversion exit with the information on the IDL data types to convert. Each data type can be handled independently.

UE$FMT	Data to be converted	Notes
FMTA	IDL data type A	1, 3, 4
FMTAV	IDL data type AV	4, 5
FMTB	IDL data type B	1, 2, 7
FMTBV	IDL data type BV	1, 2, 7
FMTD	IDL data type D	1, 2, 7
FMTF4	IDL data type F4	1, 2, 7
FMTF8	IDL data type F8	1, 2, 7
FMTI1	IDL data type I1	1, 2, 7
FMTI2	IDL data type I2	1, 2, 7
FMTI4	IDL data type I4	1, 2, 7
FMTK	IDL data type K	1, 3, 4
FMTKV	IDL data type KV	4, 5
FMTL	IDL data type L	1, 2, 7
FMTN	IDL data type N	1, 2, 7
FMTP	IDL data type P	1, 2, 7
FMTT	IDL data type T	1, 2, 8
FMTU	IDL data type U	1, 2, 7
FMTUV	IDL data type UV	1, 2, 7
FMTUSER	RPC user data such as user ID, library, program...	1, 3, 4
FMTMETA	RPC metadata	1, 2, 7
FMTFB	RPC format buffer	1, 2, 7
FMTSB	RPC metadata variable length	4, 5, 7
FMTPRE	Preview data	4, 6, 7

Notes:

1. Field length is constant.
2. The field content length must not increase or decrease during conversion. If this happens, the user exit should produce an error.
3. If the field content length *decreases* during the conversion, suitable padding characters (normally blanks) have to be used.
   If the field content length *increases* during conversion and exceeds the field length, the contents must be truncated or, alternatively, the conversion can be aborted and an error produced.

4. If the contents are truncated, character boundaries are the responsibility of the user exit. Complete valid characters after conversion have to be guaranteed. This may be a complex task for codepages described under *Conversion with Multibyte, Double-byte and other Complex Codepages*. For *Conversion with Single-byte Codepages* it is simple because the character boundaries are the same as the byte boundaries.
5. The field length can decrease or increase during the conversion up to the output buffer length. The new field length must be returned in `UE$DLEN`. If the output buffer in the `CONVERT` function is too small, error 9999 must be returned to the caller.
6. The field buffer should continue to be converted until the output buffer is full or the input buffer has been processed. If the field content length increases or truncations occur, no error should be produced. If the field content length decreases, there should be no padding. The new field length should simply be returned to the caller.
7. Codepages used for RPC data streams must meet several requirements. See *Codepage Requirements for RPC Data Stream Conversions* under *What is the Best Internationalization Approach to use?* under *Introduction to Internationalization*. If these are not met, the codepage cannot be used to convert RPC data streams.

To assemble and link the SAGTRPC user-written conversion exit

1 Assemble the conversion exit to a module named USRTRPC. This name cannot be changed.

2 Link the USRTRPC module to the supplied SAGTRPC module. You can give the resulting load module any name that does not begin with "SAG". Names starting with "SAG", such as "SAGTCHA" and "SAGTRPC", are reserved for Software AG.

Building and Installing ICU Custom Converters

User-written ICU converters (codepages) are not supported under BS2000/OSD.