webMethods EntireX

Broker

Version 9.5 SP1

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Specifications contained herein are subject to change and these changes will be reported in subsequent release notes or new editions.

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Table of Contents

I Concepts and Facilities of EntireX Broker

EntireX Broker is a middleware infrastructure that allows application components in a distributed processing environment to communicate with each other. EntireX Broker provides access through two communication models - *client and server* and *publish and subscribe* - which the JMS specification designates as messaging domains. Message queues are employed to provide verifiable delivery of message data in asynchronous communication.

Additionally, EntireX Broker allows each application component to use a different programming interface. As a result, your application components can achieve highly flexible interoperability in a loosely coupled way. EntireX Broker can be used where your application components are located on distributed machines and where different operating systems and TP monitors are used on each machine.

Concept of Interoperability	Introduces the basic concept of EntireX Broker: achieving highly flexible interoperability of distributed application components.
Common Use Cases	Provides specific examples of how your organization can achieve flexible interoperability in a distributed processing environment.
General Architecture of EntireX Broker	Describes the components and transport mechanisms of EntireX Broker within the context of EntireX.
Functionality of EntireX Broker	Provides a brief overview of the functionality provided by EntireX Broker.
Broker Quick Reference	Quick Reference to Broker features and functions.

1 Concept of Interoperability

Note: After viewing this chapter, see the chapter *Common Use Cases*, which supplies specific business examples of the interoperability available through EntireX Broker.

Interoperability and EntireX Broker

This section introduces the basic concept of EntireX Broker: achieving highly flexible interoperability of application components in a distributed processing environment. This concept is described from the perspectives of

- a messaging model
- communication models
- application programming interfaces
- EntireX components

in order to give you a comprehensive, high-level view of how EntireX Broker enables flexible interoperability between distributed application components.

Note: Unless otherwise indicated, the communication model used in this section is client and server, and not publish and subscribe.

Messaging Model and Interoperability

Introduction

In a distributed processing environment that uses EntireX Broker, communication occurs through application components exchanging messages. An application component offering a service registers it with EntireX Broker (see `REGISTER`); this makes the service available to other application components able to communicate with EntireX Broker. An application component intending to access a service issues its request through EntireX Broker, which then routes the request to the specific application component offering the service.

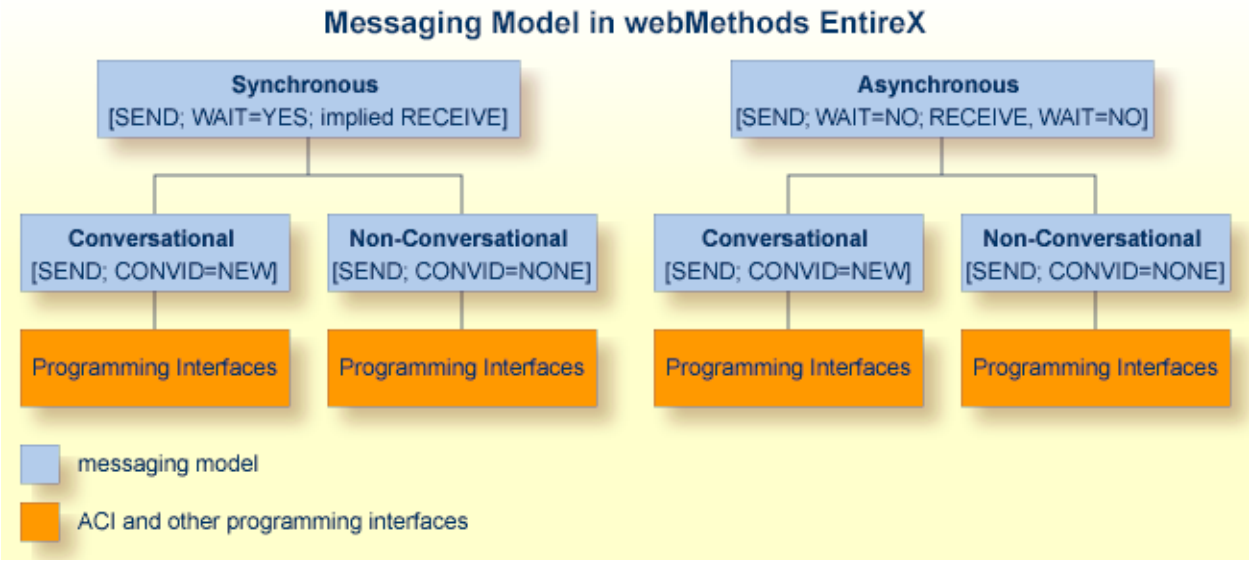
The following concepts help describe how message exchange is structured in EntireX Broker:

- **Synchronicity**
  The application initiating the request either waits for the result to return, whereby it suspends all processing (synchronous); or it does not wait for the result to return, whereby it is freed to do other processing (asynchronous).

- **Conversationality**
  The request can either be a single pair of messages comprising request/reply (non-conversational); or it can be a sequence of multiple messages which are all part of the same request (conversational).

Overview Diagram

The following diagram shows the two major concepts of EntireX Broker's messaging model: synchronicity and conversationality. See *ACI Syntax of Messaging Model* below for a description of the messaging syntax.



ACI Syntax of Messaging Model

The table below describes the messaging terms mentioned in the diagram above from the viewpoint of the application component initiating the request, as expressed in ACI syntax.

The ACI (Advanced Communication Interface) is the lowest level application programming interface that interacts with EntireX Broker. The ACI is common to all of the messaging models and communication models (see *Communication Models and Interoperability*) of EntireX.

Messaging Term		Client and Server		Publish and Subscribe	
		Client	Server	Publish	Subscribe
SYNCHRONICITY	Synchronous	■ SEND [(1)] ■ WAIT=YES [(1)]	■ RECEIVE ■ WAIT=YES	not applicable	not applicable
	Asynchronous [(3)]	■ SEND ■ WAIT=NO ■ WAIT=YES	■ RECEIVE ■ WAIT=NO	■ SEND_PUBLICATION ■ WAIT=NO	■ RECEIVE_PUBLICATION ■ WAIT=NO ■ WAIT=YES [(2)]
CONVERSATIONALITY	Conversational [(3)]	■ SEND ■ CONV-ID=NEW	■ RECEIVE	not applicable	not applicable
	Non-conversational [(3)]	■ SEND ■ CONV-ID=NONE	■ RECEIVE	■ SEND_PUBLICATION	

Notes:

1. The synchronous `SEND, WAIT=YES` command contains an implied `RECEIVE` command.
2. The subscriber has the option of specifying `WAIT=YES`.
   Example: The subscriber uses a repeat loop that issues a `RECEIVE_PUBLICATION`. The advantage is that the program runs continuously, processing publications arising as random events, which simplifies programming effort.
3. Persistence available. See *Concepts of Persistent Messaging* in the general administration documentation.

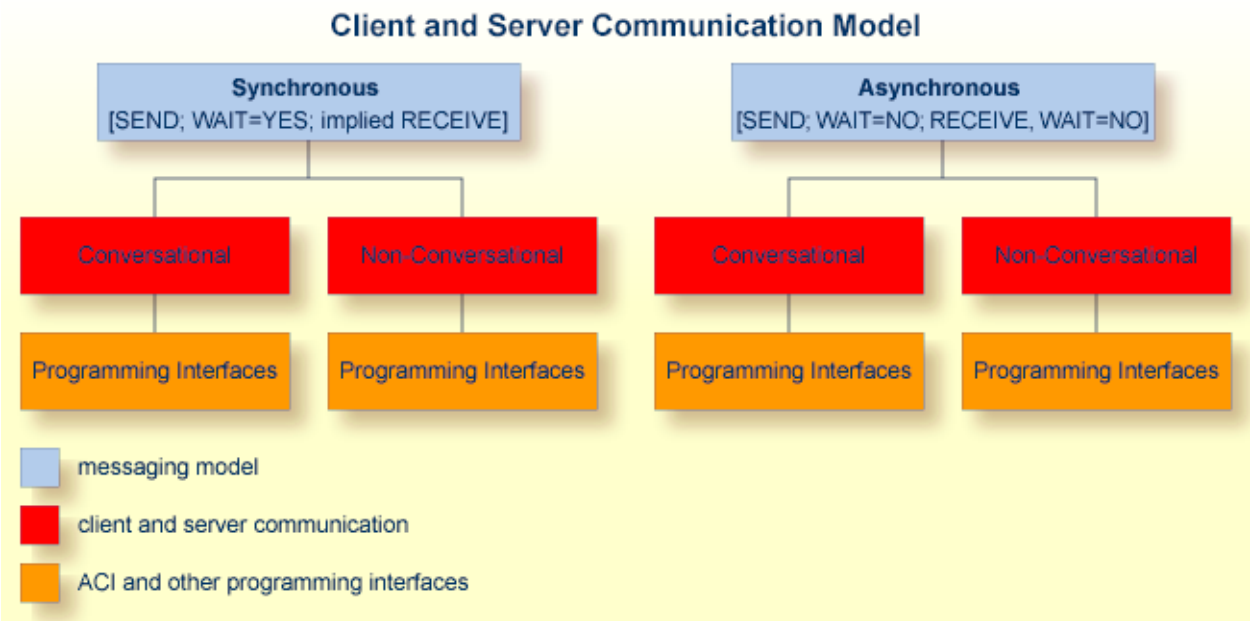
Communication Models and Interoperability

The EntireX Broker uses two communication models: client and server and publish and subscribe. Client-and-server communication is used if data is to be exchanged with exactly one partner; publish-and-subscribe communication is used if data is to be published. The ACI can be used for both client and server and publish and subscribe.

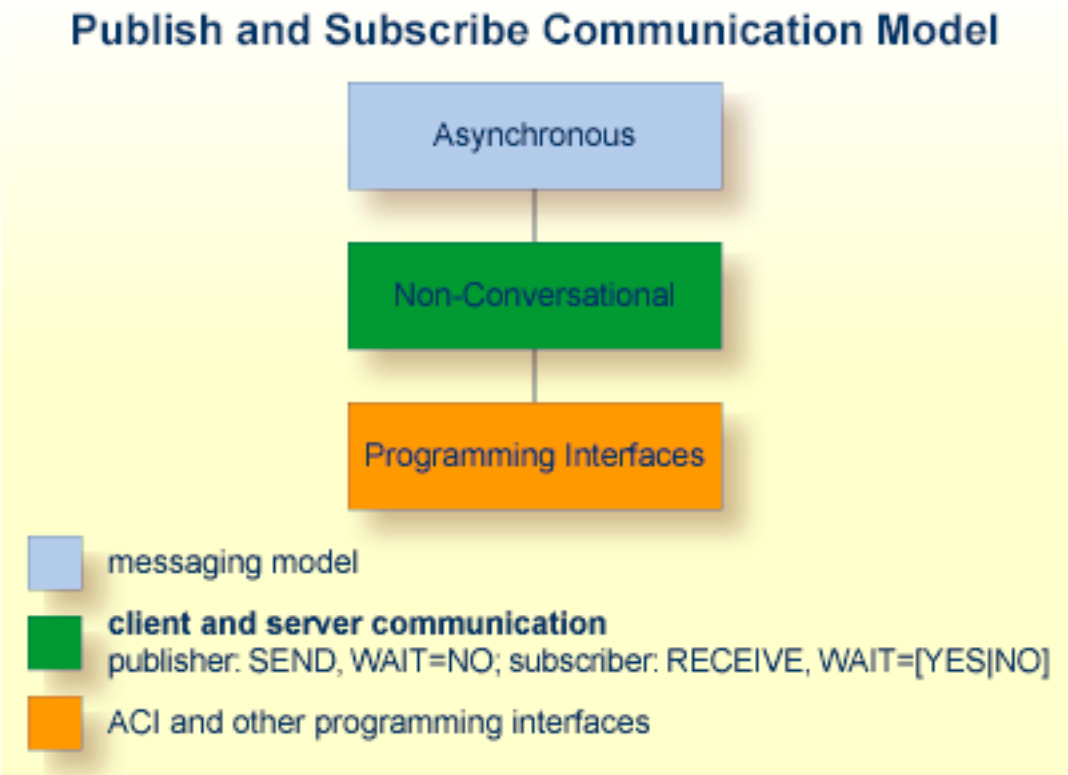
- **Client and Server**
  This model is based on the connection between exactly two partners: client and server. This model covers the requirements of conversational communication and asynchronous processing.
- **Publish and Subscribe**
  This model is implemented as an independent subsystem in the Broker, that is, an attribute determines whether it is set to active or inactive.

The following diagrams shows the two types of communication model used in EntireX Broker: client and server and publish and subscribe.

Client and Server



Publish and Subscribe



Publish and subscribe is normally classified as an asynchronous communication model. It is non-conversational in terms of message flow, that is, publications between publisher(s) and subscriber(s). The classification "asynchronous" is chosen because neither publisher nor subscriber directly depends on the activities of the other. The publisher always sends publications in a non-blocked manner.

Note: The subscriber has the option of specifying `WAIT=YES` (see legend in above graphic). Example: The subscriber uses a repeat loop that issues a `RECEIVE PUBLICATION`. The advantage is that the program runs continuously, processing publications arising as random events, which simplifies programming effort.

2 Common Use Cases

Introduction

This section provides common use cases of the basic concept of EntireX - achieving highly flexible interoperability of distributed application components. Each use case contains a

- business scenario
- table of interoperability, listing the major components selected for the use case
- diagram of the type of message flow resulting from the combination of these specific components
- stepped table describing the message flow depicted in the diagram.

The common use cases based on the EntireX components Broker and Developer's Kit are provided to show the extent and limitations of the EntireX Broker.

The Developer's Kit contains a set of interfaces for using applications written in various programming languages with EntireX Broker. Developer's Kit enables application components to be “wrapped”, i.e. encapsulated, thereby allowing them to behave like an object and be plugged-and-played as needed.

The ACI forms the layer upon which the various wrappers of the Developer's Kit logically exist. This allows application programs to directly utilize the following industry-standard APIs that are exposed through the Developer's Kit and EntireX Broker.

The common use cases in the table below are specific examples of how EntireX Broker provides highly flexible interoperability of application components in a distributed processing environment. The programming interfaces selected for the use cases below are organized by the two communication models exposed through EntireX Broker: client and server and publish and subscribe.

Case	Client	Server	Typical Use
Case 1	ACI	ACI	To integrate applications on separate platforms. (Persistent messaging is described.)
Case 2	JACI	ACI	To integrate applications on separate platforms, whereby the client's application interface is a subset of the ACI.
Case 3	ACI (via Web server)	ACI	To enable Web access to mainframe systems.
Case 4	RPC	RPC	To enable a UNIX or Windows application to access a Natural RPC program.
Case	**Publish**	**Subscribe**	**Typical Use**
Case 5	ACI	ACI	To enable a mainframe application to publish messages to UNIX or Windows subscribers.

Case 1: ACI and ACI (including Units of Work)

This case is typically used to integrate applications on separate platforms.

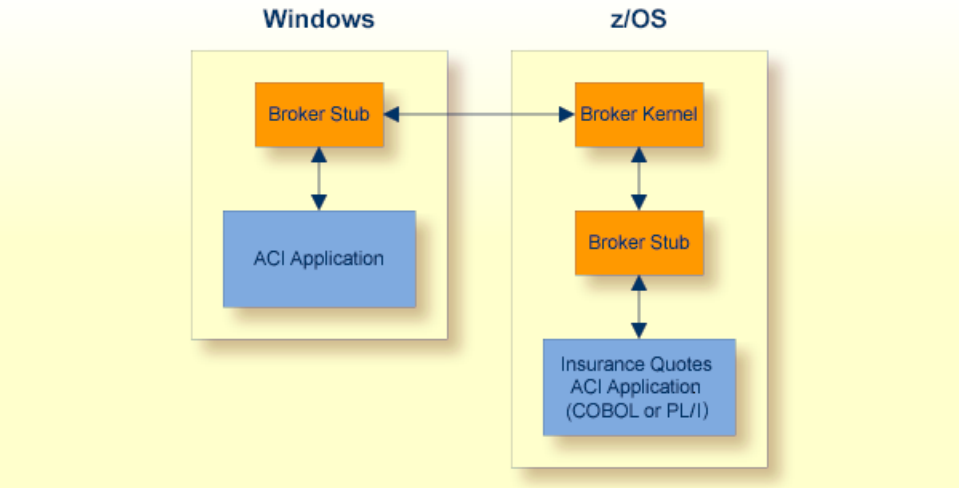
Business Scenario

An insurance company sells its own products as well as those of other insurers. It is company policy for its sales agents to give the most competitive insurance quotes possible to customers. The front-ends used by the sales agent are provided with GUI applications on Windows. To obtain insurance quotes from the back-end data as well as to update those data, the insurance agents must communicate information from/to various mainframe applications written in COBOL and PL/I.

Table of Interoperability

Application Component	Programming Interface	EntireX Component	Operating System	Language	Messaging Model
Client	ACI	Broker	Windows	Visual C	■ Synchronous or asynchronous ■ Conversational or non-conversational
Server	ACI		z/OS	COBOL, PL/I	

Message Flow: ACI and ACI



Description of Steps in Message Flow

1. a. **Synchronous**
   The client program creates a request for information from a mainframe back-end and issues a call via the Broker stub to EntireX Broker.

   With conversational communication, a series of linked requests can be issued, allowing both the client and server to retain context between commands.

   b. **Asynchronous**

   - The client program wants to communicate updated information to the back-end system. It formulates one or more messages within a unit of work (UOW) and performs an asynchronous `SEND` from the stub to the broker.
   - The Broker writes the UOW to the persistent store, enabling the client program to know that the UOW will be processed.

2. a. **Synchronous**
   The server application issues an ACI call via the Broker stub in order to obtain the request from the client program.

   b. **Asynchronous**
   The server application issues a `RECEIVE` command, now or at a later time, in order to obtain the messages from the client program.

3. a. **Synchronous**
   The server application processes the request and returns a message to EntireX Broker via the Broker stub.

b. **Asynchronous**
The server program performs processing to update the data on the back-end system and, only afterwards does it acknowledge that the message has been processed.

4. a. **Synchronous**
The client program receives the reply to the ACI call, allowing the request to be satisfied.

b. **Asynchronous**
The client program can query the status of its messages by `UOWID` in order to determine the status of the back-end processing.

Case 2: JACI and ACI

This case is typically used to integrate applications on separate platforms.

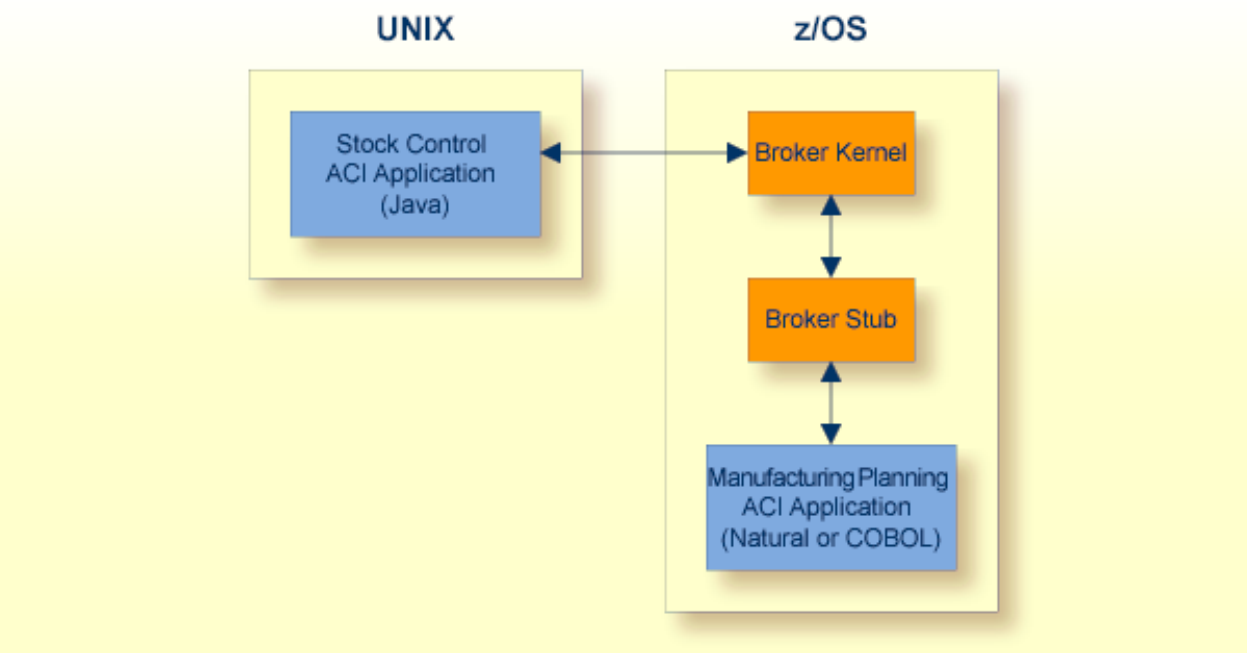
Business Scenario

An organization wants to integrate a UNIX-based stock control system with its existing mainframe-based manufacturing planning systems.

Table of Interoperability

Architecture	Programming Interface	EntireX Component	Operating System	Language	Messaging Model
Client	JACI	Broker	UNIX	Java	■ Synchronous ■ Conversational or Non-conversational
Server	ACI		z/OS	Natural	

Message Flow: JACI and ACI



Description of Steps in Message Flow

1. The client program creates a request and issues a JACI call to EntireX Broker.
2. The server application issues an ACI call via the Broker stub in order to obtain the request from the client program.
3. The server application processes the request and returns a message to EntireX Broker via the Broker stub.
4. The client program receives the reply to the ACI call, allowing the request to be satisfied.

Case 3: ACI (via Web Server) and ACI

This case is typically used to enable Web access to mainframe systems.

Business Scenario

A brokerage has an application which processes orders of personal customers to buy and sell securities. All incoming orders are executed on a back-end system, and some orders are executed at a later time. The incoming orders are in the form of internet communication.

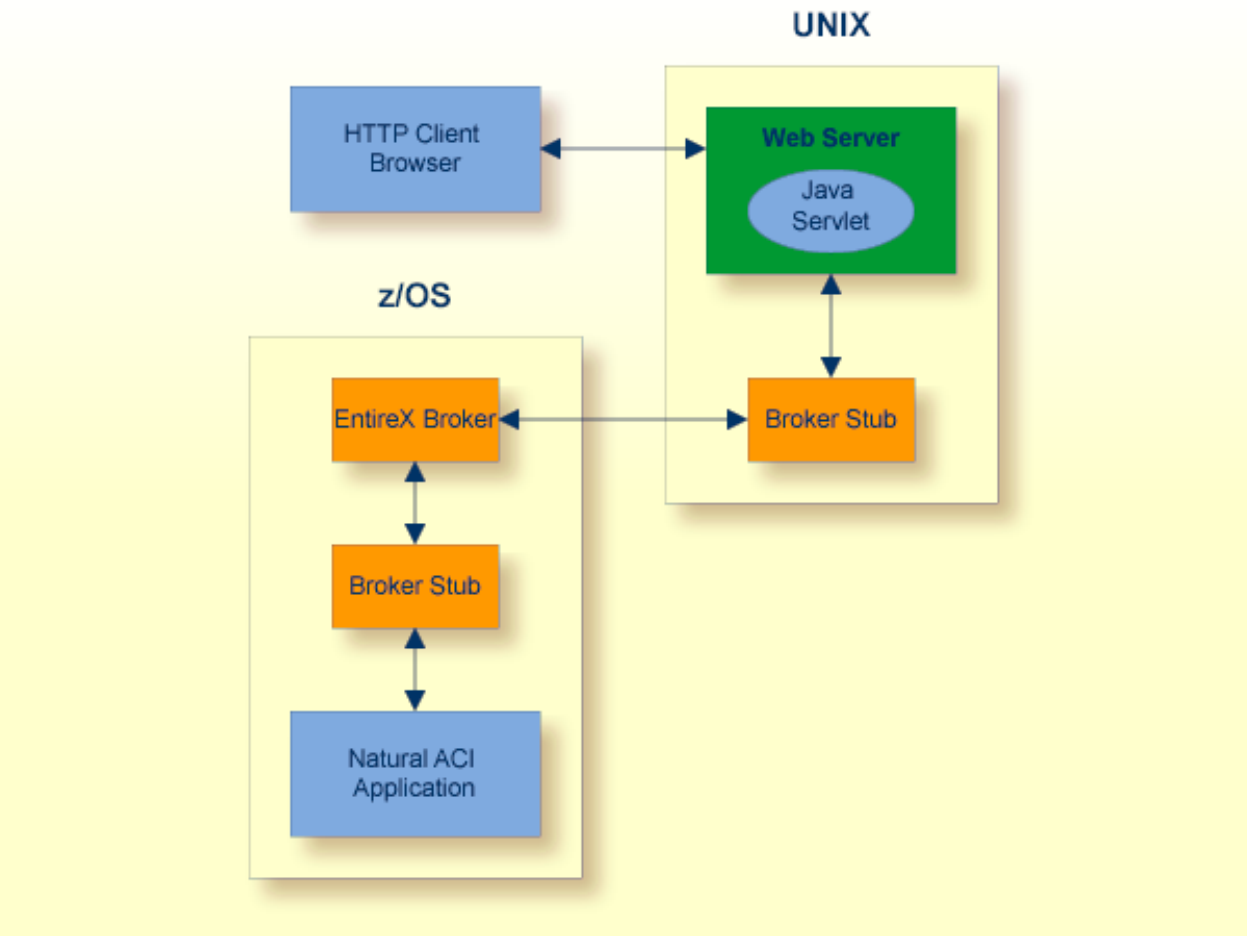
IT Environment

The brokerage uses a Web server as the point-of-entry for incoming orders. These orders are executed either synchronously or asynchronously on a separate back-end system. Located on the brokerage's Web server is an application which is a client to EntireX, which functions as a proxy and provides information to the brokerage's EIS (Enterprise Information System). Because of the critical nature of the orders, units of work are employed to guarantee delivery of the incoming information to the back-end system. This system is robust and can be restarted after failure without loss of data.

Table of Interoperability

Architecture	Programming Interface	EntireX Component	Operating System	Language	Messaging Model
Client	JACI	Broker	UNIX	Java Servlet	■ Synchronous or Asynchronous ■ Conversational
Server	ACI		z/OS	Natural	

Message Flow: ACI and WebSphere MQ



Description of Steps in Message Flow

1. The Web browser sends an HTTP request to the Web server.
2. The Web server instantiates a Web page containing the script (ASP).
3. The script creates a request and issues an ACI call via the Broker stub to EntireX Broker.
4. The back-end application issues an ACI call via the Broker stub in order to obtain the request from the script.
5. The back-end application processes the request and returns a message to EntireX Broker via the Broker stub.
6. The script receives the reply to the ACI call, allowing the execution of the Web page to be completed.
7. The Web server returns the information to the Web browser via HTTP, where the Web page is displayed.

Case 4: RPC Wrapper and RPC

This case is typically used to enable a UNIX or Windows application to access a Natural RPC program.

Note: This use case is the most common within EntireX; it employs the EntireX Broker together with the Developer's Kit.

Business Scenario

An organization actively using Software AG technology - including Adabas and Natural - wants to expand use of Software AG technology in order to build new applications accessible to clients executing under UNIX or Windows. To achieve this, the organization runs a client written to use RPC, which makes calls to EntireX Broker. The client, which is written in either Natural, Java or a 3GL language, will invoke any of these three variants:

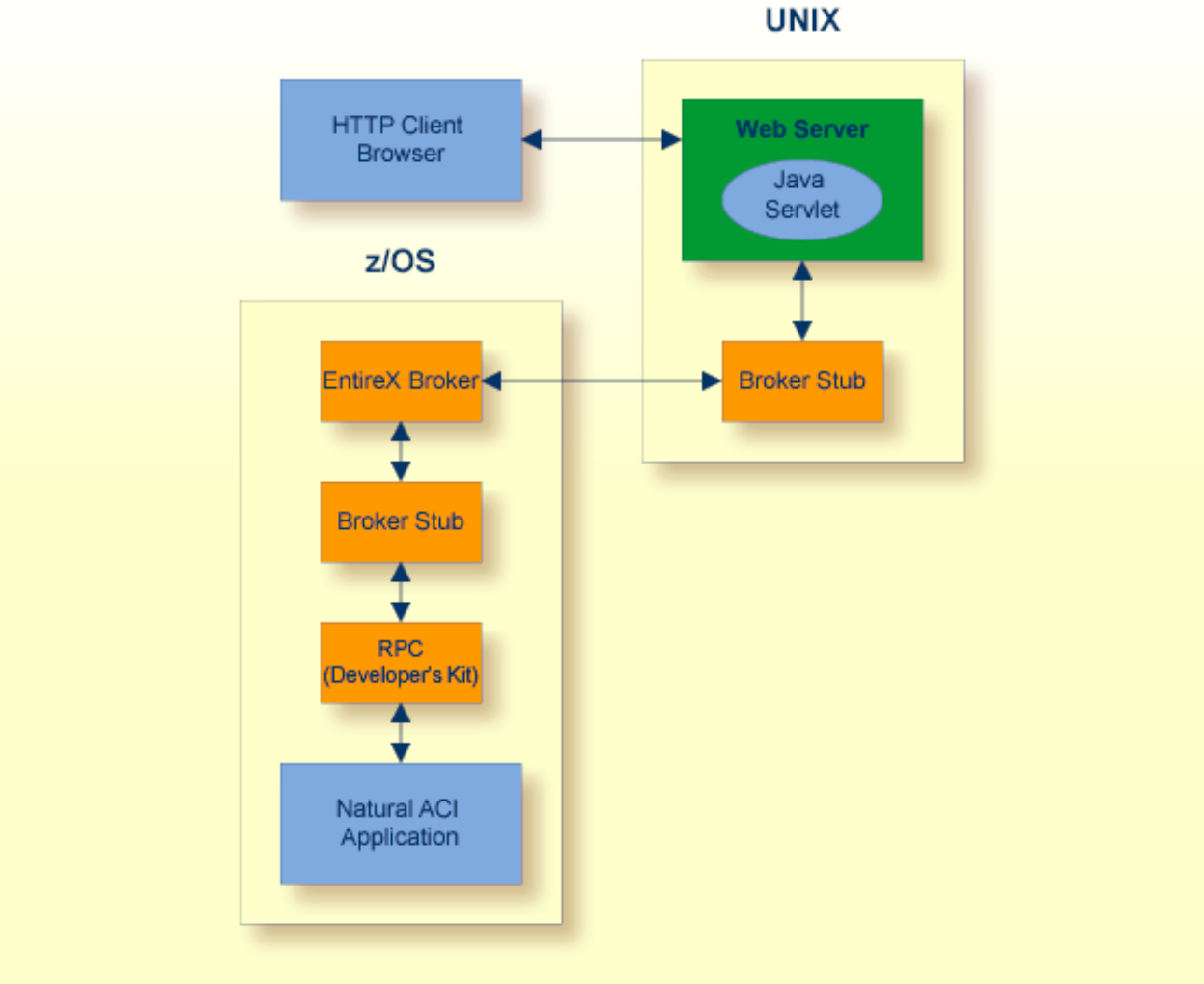
- **(A)**
  RPC programs written in Natural and executing under Natural on z/OS (RPC is available through Natural on z/OS);
- **(B)**
  RPC programs written in Java and executing under the Java RPC Server on UNIX;
- **(C)**
  3GL RPC programs executing under the C RPC Server on Windows.

Table of Interoperability

Application Component		Programming Interface	EntireX Component	Operating System	Language *	Messaging Model
(A)	Client	RPC	EntireX Broker and Developer's Kit	C	Visual Basic	■ Synchronous ■ Conversational or Non-conversational
	Server	RPC		z/OS	Natural	
(B)	Client	RPC		Windows	Natural	
	Server	RPC		UNIX	Java	
(C)	Client	RPC		UNIX	Java	
	Server	RPC		Windows	C (=3GL)	

Message Flow: RPC Wrapper and RPC

This diagram represents variant (A) in Table of Interoperability above.



1. The client application ACI application initiates an RPC request through the SDK: synchronous/conversational or synchronous/non-conversational.
2. Broker stub communicates this request to the broker kernel.
3. a. **Natural**
   The broker kernel communicates this request to Natural nucleus, which behaves like an RPC server for Natural-written applications programs.

   b. **Java**
   Broker communicates this request to RPC server.

c. **C**
Broker communicates this request to RPC server.

4. a. **Natural**
Natural nucleus invokes the RPC server program.

b. **Java**
RPC server invokes the server application program.

c. **C**
RPC server invokes the server application program.

5. a. **Natural**
Natural nucleus returns the request to EntireX Broker.

b. **Java**
RPC server returns the request to EntireX Broker.

c. **C**
RPC server returns the request to EntireX Broker.

6. Broker passes the request to the ACI application.

Case 5: Publisher (Natural Mainframe) and Subscriber (UNIX or Windows)

This case is typically used to enable a mainframe application to publish messages to UNIX or Windows subscribers.

Business Scenario

A government department publishes details of various construction projects for which contractors are required. Companies are then able to bid for the contracts.

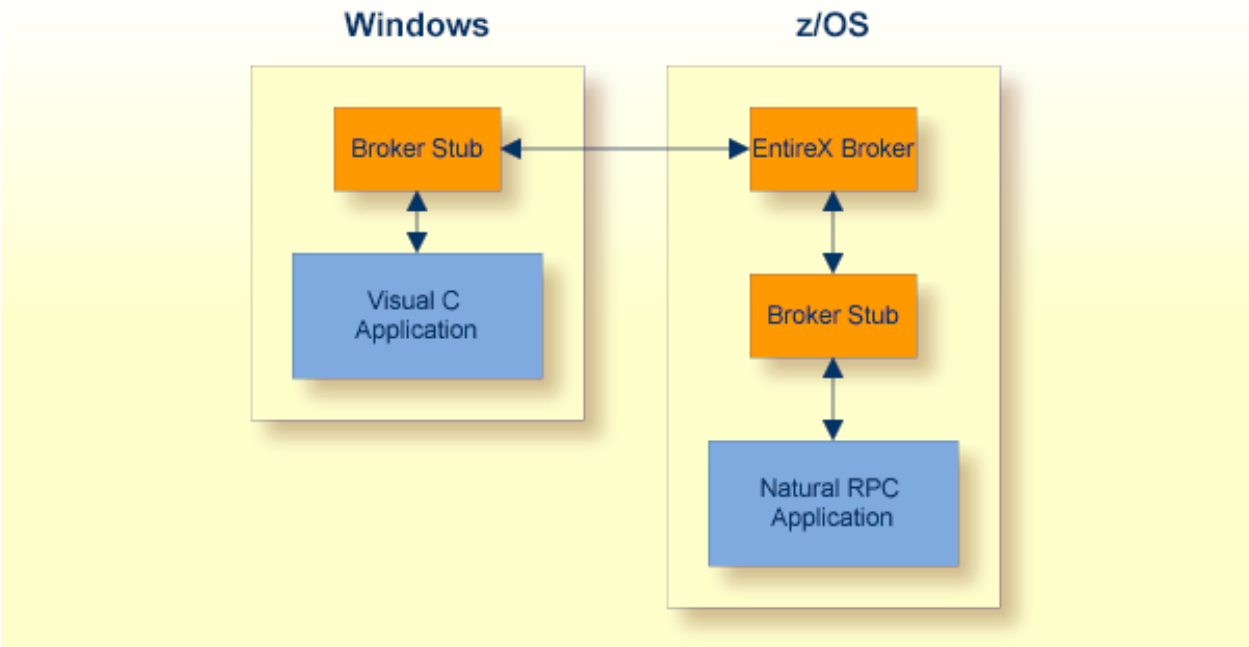
IT Environment

The government application consists of two pieces: a publisher and a subscriber component. An application running on z/OS publishes details for each new construction project. Publications are sent asynchronously with a logical topic name in accordance with the type of construction project required, for example freeways, minor roads, bridges. Approved contractors are given access to the subscriber component of the application which runs under Windows. Here the contractors can subscribe to the project types of interest and can receive details of projects for the specified project types at their convenience.

Table of Interoperability

Architecture	Programming Interface	EntireX Component	Operating System	Language	Messaging Model
Publisher	ACI	Broker	z/OS	Natural	■ Asynchronous
Subscriber	ACI		Windows	Visual C	

Message Flow: Publisher and Subscriber



Description of Steps in Message Flow

1. The publisher component is executed when new publication messages are to be sent, using an ACI call via the Broker Stub to EntireX Broker.
2. EntireX Broker stores these publication messages into the persistent store, where they are available after a system restart.
3. The subscriber component is executed asynchronously, issuing an ACI call via the Broker stub to obtain published messages from EntireX Broker.
4. The subscriber repeats step (3) until all published messages have been received.

3 General Architecture of EntireX Broker

Introduction to EntireX Broker Architecture

This section describes the command process flows within the Broker kernel and stubs when two application components communicate with each other using EntireX Broker. The Broker consists of the following components:

- a stub (application binding), which resides within the process space of each application component;
- a Broker kernel, which resides in a separate process space, managing all the communication between application components.

The details of the transport protocols remain transparent to the application components because they reside within EntireX Broker (stubs and kernel). The EntireX Broker kernel and the location of the transport protocols are the architectural aspects of EntireX Broker that distinguish it from other messaging middleware.

EntireX Broker Communication Models

The EntireX Broker uses two communication models: client and server and publish and subscribe. Client and server communication is used if data is to be sent to exactly one partner. “Publish and subscribe” communication is used if data is to be published.

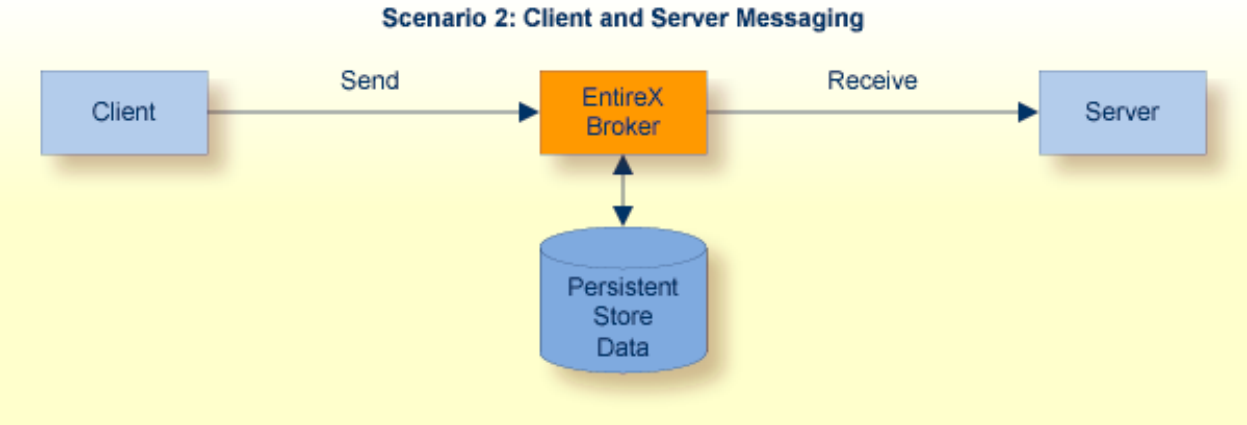
Client and Server

See *Writing Applications: Client and Server* in the EntireX Broker ACI Programming documentation for details of the client and server model.

Example Scenario 1: Client and Server Messaging (Synchronous)

This is a synchronous messaging scenario: send request and wait for a response.

Example Scenario 2: Client and Server Messaging (Asynchronous)



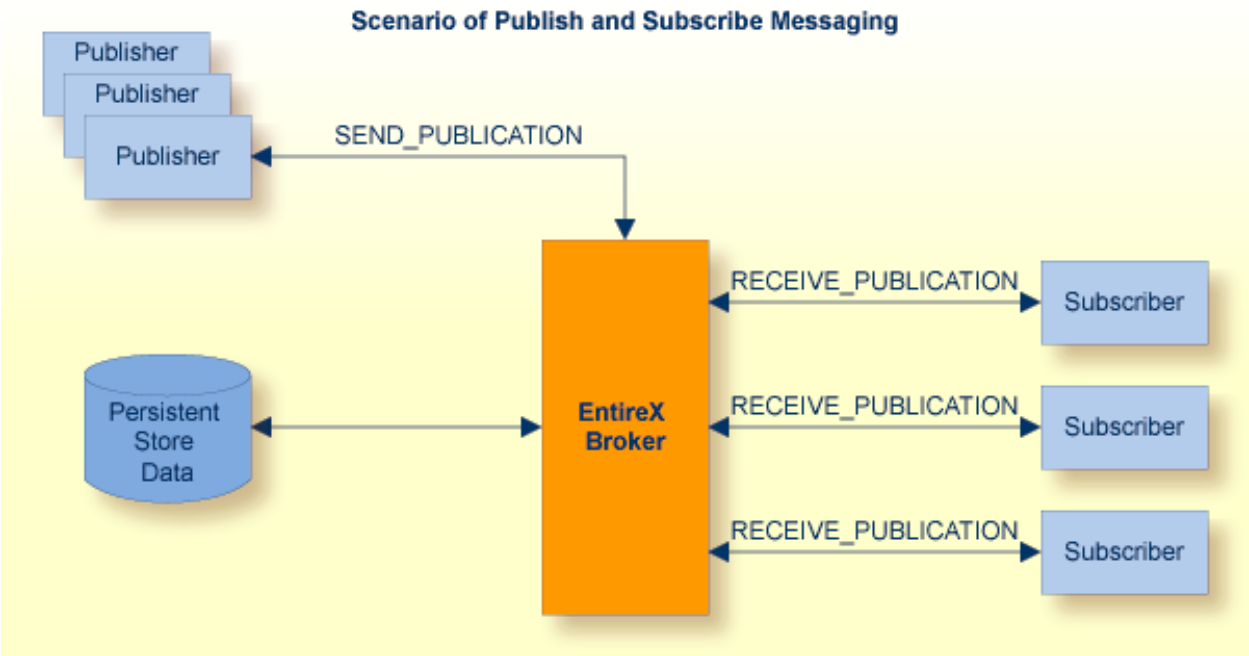
This is an asynchronous messaging scenario: put message in service queue.

Note: Client and server have specific meanings within the context of EntireX.

Term	Description
Client	An application component intending to access a service makes its request via EntireX Broker which routes the request to the specific application component offering this service. The request can be a single pair of messages comprising request/reply; or it can be a sequence of multiple, related messages containing one or more requests and one or more replies, known as a conversation. This enables EntireX Broker to be used for applications supporting different programming interfaces. It also allows interoperability between types of application components employing these different interfaces.
Server	An application component offering a service registers it with EntireX Broker. EntireX Broker makes the registered service available to other application components capable of communicating with EntireX Broker. The fact that a server has been registered and is available in this way defines it as a service in terms of class/name/server within the context of EntireX.

Publish and Subscribe

See section *Writing Applications: Publish and Subscribe* for details of the publish-and-subscribe model.



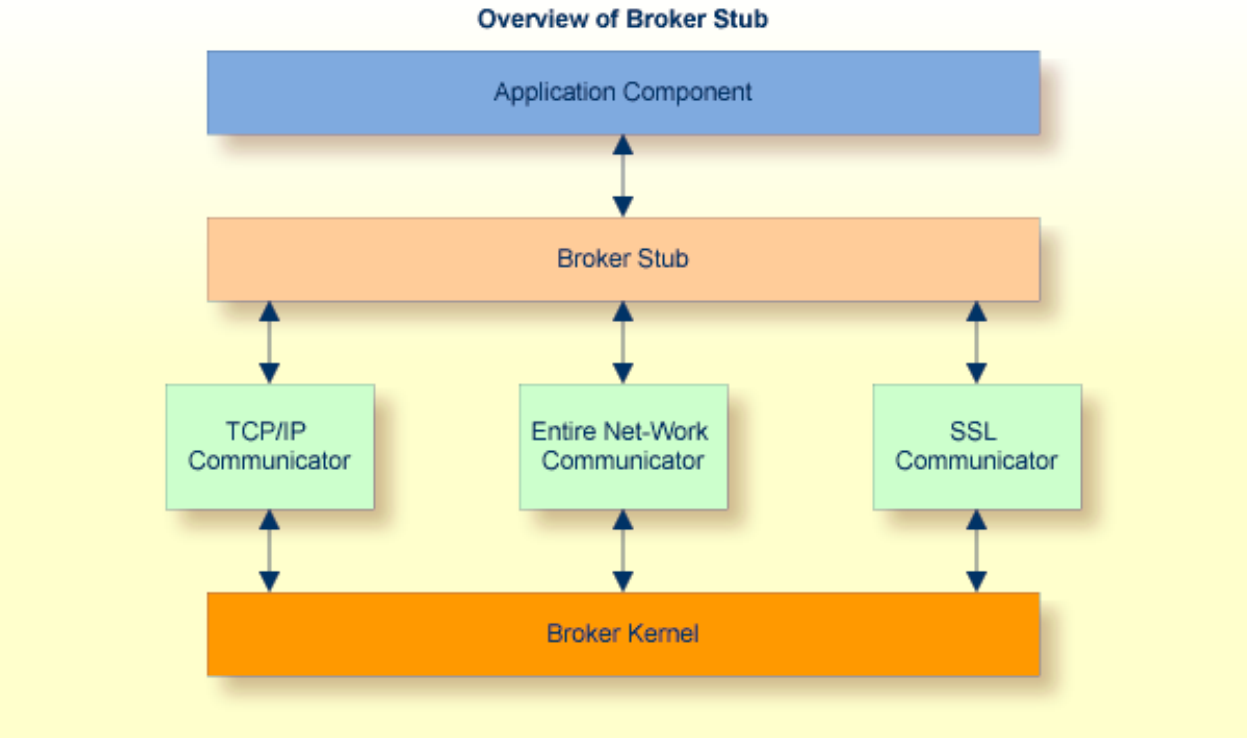
Term	Description
Publisher	An application component acting as a publisher is able to send messages to a specified topic: These messages constitute publications which are now available to the various different subscribers. These messages are automatically kept in the persistent store if there are any subscribers with “durable” status. Publications are retained for a specified time limit of days, months or years until all the subscribers have had the opportunity to receive them. After this time, or upon delivery to every existing subscriber, the publications are removed from the system.
Subscriber	An application component which is interested in one or more specific topics notifies Broker kernel, using the Subscribe command. This informs Broker that any publications sent to the specified topics will be required by this subscriber and so should be retained and then forwarded to this subscriber when this application component solicits these subscriptions. Subsequently the subscriber can issue receive commands to solicit any outstanding subscriptions. The subscriber can subscribe to EntireX Broker with the `ALLOW-DURABLE` option which means the subscriptions are kept in the persistent store even after the Broker kernel or the application component has been restarted.

Architecture of Broker Stub

The type of communication model described in this section and in the section *Architecture of Broker Kernel* is client and server.

Overview of Broker Stub

The EntireX Broker stub is another name for Software AG's ACI (Advanced Communication Interface). The stub implements an API (application programming interface) that allows programs written in various languages to access EntireX Broker.



See also *Administration of Broker Stubs* in the platform-specific administration documentation.

Description of Command Process Flow within Broker Stub

The following table gives a step-by-step description of a typical command process flow from and to a Broker stub. This example describes a `SEND/RECEIVE` command pair.

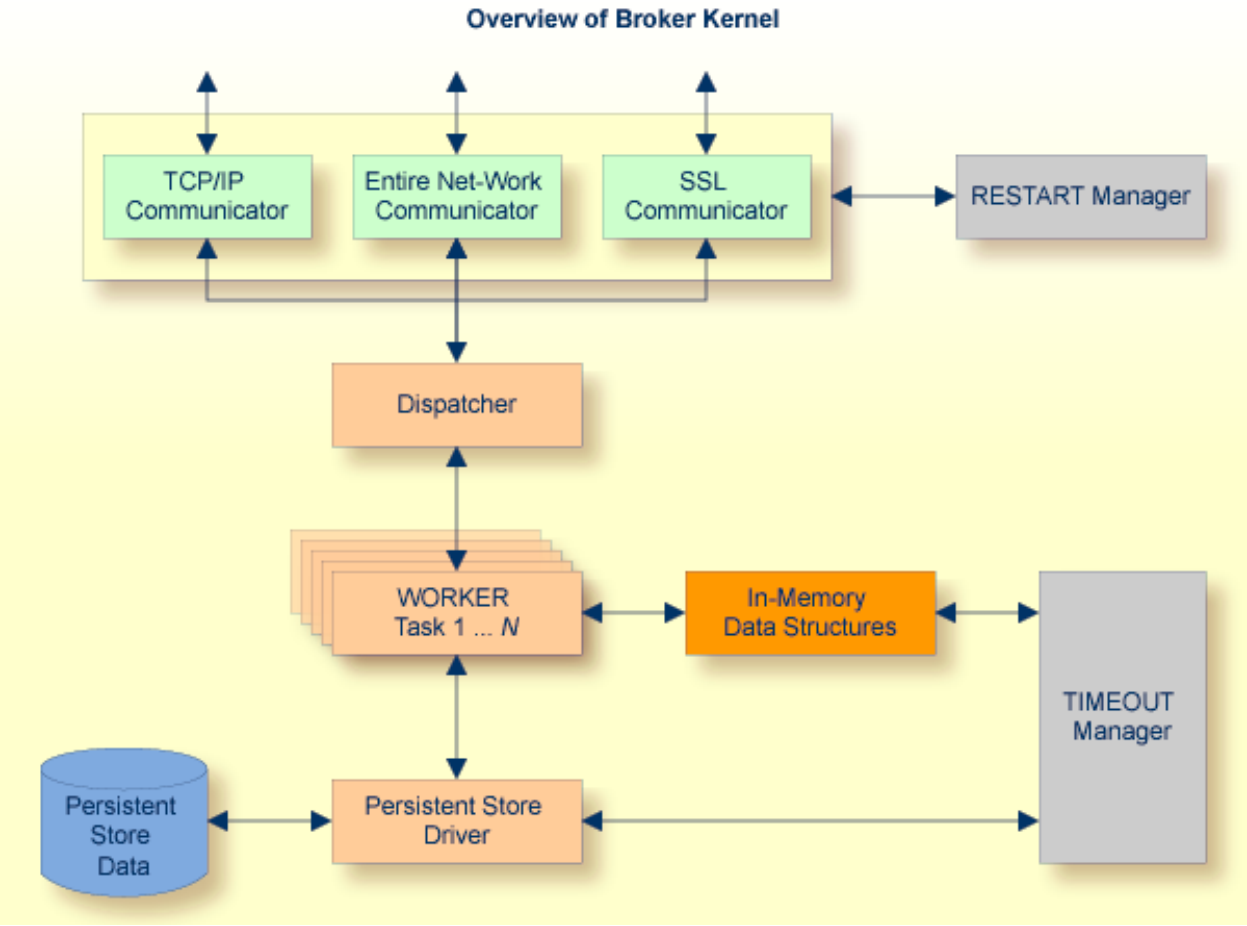
Note: Publish and subscribe uses `SEND_PUBLICATION` instead of `SEND`, and `RECEIVE_PUBLICATION` instead of `RECEIVE`.

Step	Description
1	The originating application program calls the stub with a `SEND/WAIT=YES` command. The stub builds the necessary information structures and communicates the message to the Broker kernel. Basic validation is performed in the stub before the command is passed to the Broker kernel.
2	The stub uses one of the following transport mechanisms to transmit the command to the Broker kernel: TCP, SSL or Entire Net-Work. The application does not have to recognize the details of the transport protocol since all transport protocol processing resides entirely within the stub.
3	The application is suspended while the stub waits for a response. Since the application has issued `SEND`, `WAIT=YES` it must wait for the message to travel via the Broker kernel to the partner application which will satisfy the request.
4	After the request has been satisfied and the message returns from the partner application, via the Broker kernel, the stub will pass control back to the originating application.

Architecture of Broker Kernel

The type of communication model described in this section and in the section *Architecture of Broker Stub* is client and server.

Overview of Broker Kernel



Description of Command Process Flow within Broker Kernel

The following table gives a step-by-step description of a typical command process flow within the Broker kernel. This example describes a `SEND/RECEIVE` command pair.

Note: Publish and subscribe uses `SEND_PUBLICATION` instead of `SEND`, and `RECEIVE_PUBLICATION` instead of `RECEIVE`.

Step	Description
1	The originating application program calls the Broker stub with a `SEND` command. The stub builds the necessary information structures and transmits the message to the Broker kernel using TCP, SSL or Entire Net-Work.
2	The message is received by one of the communications subtasks running within the Broker kernel. The communications subtask passes the message to the dispatcher.
3	The dispatcher schedules the processing of the message within a worker task inside the Broker kernel.
4	Worker task processes the inbound message, performing any necessary data conversion and security operations, and then determines the partner to which the message is to be routed. Any necessary persistence operations are performed under control of the worker task.
5	The outbound message is passed to the relevant communications subtasks within the Broker kernel for transmission to the partner application component.
6	The partner application component which has issued a `RECEIVE` command via the broker stub obtains the message from the originating application program.
7	The partner application component then processes the message and normally makes a reply.

Notes:

1. Application components can exchange successive related message pairs. This action constitutes a conversation.
2. Clean-up processing of timed-out commands is performed asynchronously by the Broker kernel Timeout Manager which acts upon in-memory data structures as well as data within the persistent store.
3. The communications restart manager is able to restart any communications subtasks which may have become temporarily disabled, for example by restarting the machine's TCP/IP driver.

4 Functionality of EntireX Broker

This chapter gives an overview of the major value-added services provided by EntireX Broker. These services relieve the administrator or application builder of the task of providing the desired functionality.

Application Bindings (Stubs)

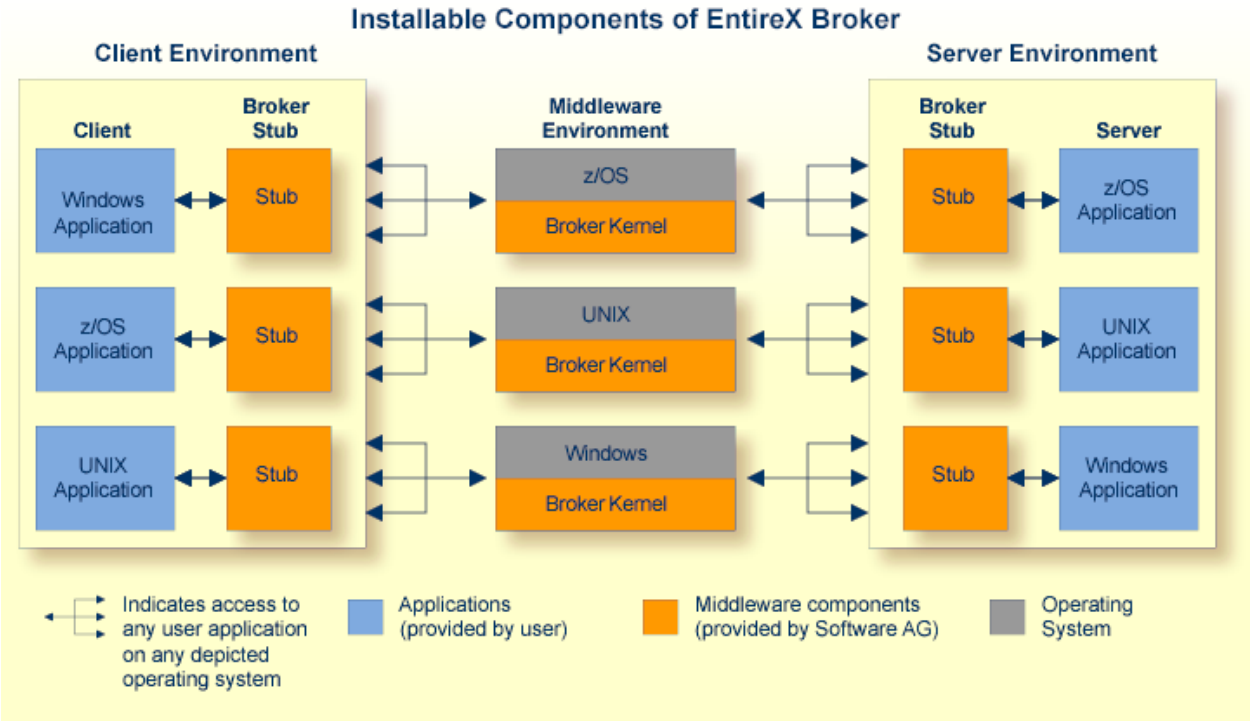
Application bindings allow applications developed in different programming languages and executing on various different platforms to be enabled by using EntireX Broker, see ***Architecture of Broker Stub***. Specifically, almost all 3GL, Java and Natural programs are easily enabled using EntireX Broker. These bindings are available on all major mainframe, UNIX and Windows platforms. In addition, the SDK provided by EntireX allows different programming interfaces to be utilized, including COM, JMS, RPC and .NET, in addition to EntireX Broker's native programming interface, the Broker ACI.

The application binding - and SDK component, where appropriate - is the glue between the application and the EntireX Broker kernel (see ***Architecture of Broker Kernel***, allowing your application to leverage all the functionality of EntireX regardless of

- programming language
- operating system
- hardware platform
- transport mechanism and
- choice of programming interfaces.

This binding capability enables various different application components to be integrated in a loosely coupled manner.

These are the locations where EntireX Broker stubs can be installed:



Attach Services

This topic does not apply to the publish-and-subscribe communication model.

EntireX Broker provides a choice of mechanisms which enable application components to be started automatically when required.

Example: A client application requires some processing from a server application component. The range of attach services includes starting IMS TM and CICS transactions on the mainframe, and batch programs/processes on mainframe, UNIX and Windows.

Codepage Conversion

Software internationalization is the process of designing products and services so that they can be adapted easily to a variety of different local languages and cultures. Codepage conversion within the EntireX Broker facilitates the internationalization of messages: the incoming and outgoing data is converted to the desired codepage of the platform in use.

Command and Information Services

EntireX Broker includes a set of monitoring and control functions that enable you to monitor system resource utilization and view the current activities of the clients, servers, publishers and subscribers on the system. These services are available through a Web-based interface, in addition to a command-line tool. An interface exists to allow program access to these facilities.

Accounting

This topic does not apply to the publish-and-subscribe communication model.

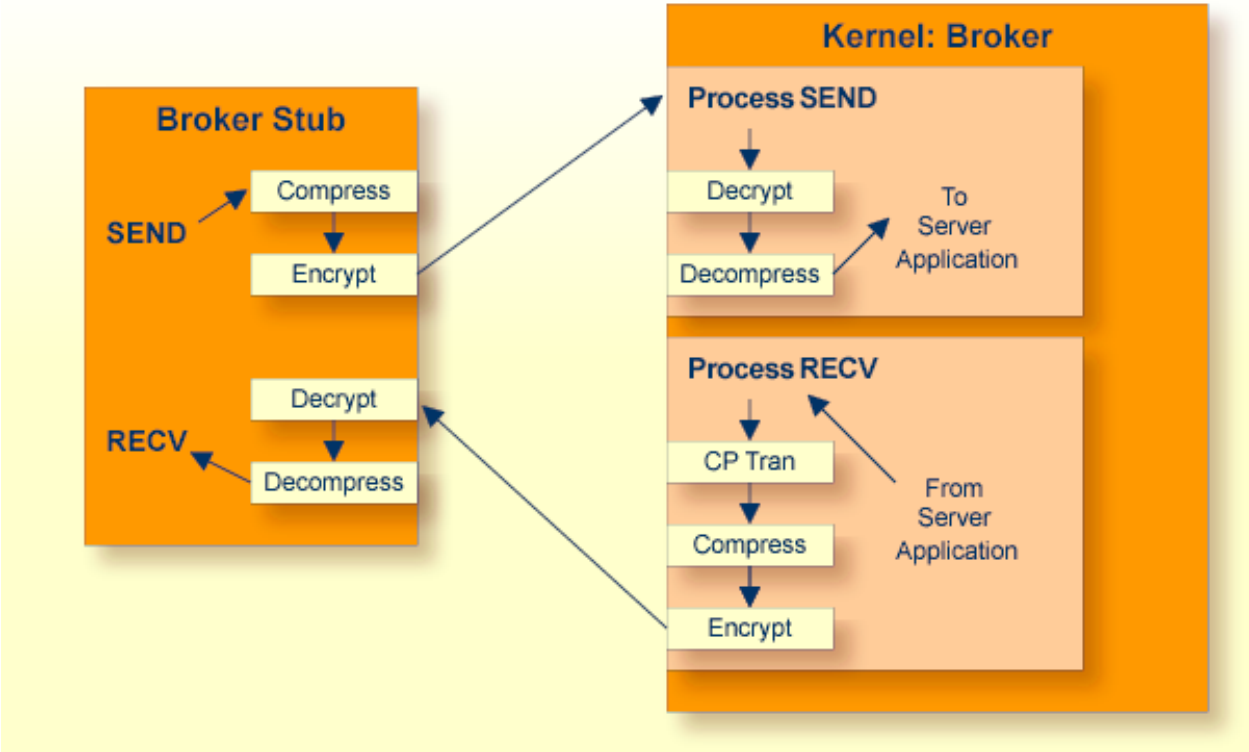
EntireX Broker provides accounting information based upon the flow of message sequences (or conversations). On z/OS, this information is written to standard accounting (SMF) records; on other platforms it is written to a file. The information can be used for:

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

Data Compression

EntireX allows compression of messages passed between application components so as to consume less network bandwidth. This is done independently of transport mechanism by compressing the message in the application binding before it is transmitted to the **EntireX Broker kernel**. The Broker kernel decompresses the message to enable security and data conversion to be applied.

The following graphic illustrates the sequencing of data compression within the stub and Broker kernel:



Persistent Store

The persistent store stores units of work for client and server applications and also stores publication/subscription data for publish-and-subscribe applications.

- **Client and Server**
  Persistent message delivery ensures that messages sent between client and server (or server and client) application components can reach their target even in the event of application or system failures. The user application programs units of work to achieve persistent messaging. EntireX Broker provides persistent message delivery by grouping messages into units of work (UOWs) that are committed in one atomic operation by the sender. See also *Units of Work*.
- **Publish and Subscribe**
  Two classes of information (subscription records and the publication itself) are provided to ensure that durable subscription status is preserved and that message content remains persistent during system failure. The publish-and-subscribe specific verbs `SEND_PUBLICATION` and `RECEIVE_PUBLICATION` provide persistent messaging of publications, which relieves the user of programming units of work.

Persistence is implemented centrally within the **EntireX Broker kernel**. Therefore, the consistency of all the stored messages is guaranteed independently of the different application components and platforms from which the messages are derived.

Persistent Store Types

A persistent store driver is an executable, or a load module, which implements access to the physical persistent store. EntireX Broker allows the choice of three persistent store repositories: Adabas (DBMS), Data In Virtual (DIV) for z/OS, and native file system. The following table gives an overview of the persistent store options:

Persistent Store Type	Description	Operating System	Notes
Adabas	Uses Adabas database.	UNIX, Windows, z/OS, z/VSE	Adabas, Software AG's ADAptable dataBASe, is a high-performance, multithreaded, database management system.
DIV	Uses IBM Data In Virtual facility on z/OS.	z/OS	This persistent store option is implemented as a VSAM linear data set.
CTREE	c-tree© is an embedded local database that can be used as your persistent store.	UNIX and Windows	c-tree© is the fast and reliable embedded database of FairCom Corporation®.

Units of Work

This topic does not apply to the publish-and-subscribe communication model.

Units of work inform the sender of messages about their past and current status. Specifically, UOWs are used to:

- commit the sending of messages;
- acknowledge the receipt of messages;
- track the progress of sent messages at any point in time.

Units of work are also the vehicle for achieving persistent messaging, although UOWs can be used without persistence.

See also *Using Units of Work* in the general administration documentation.

Security

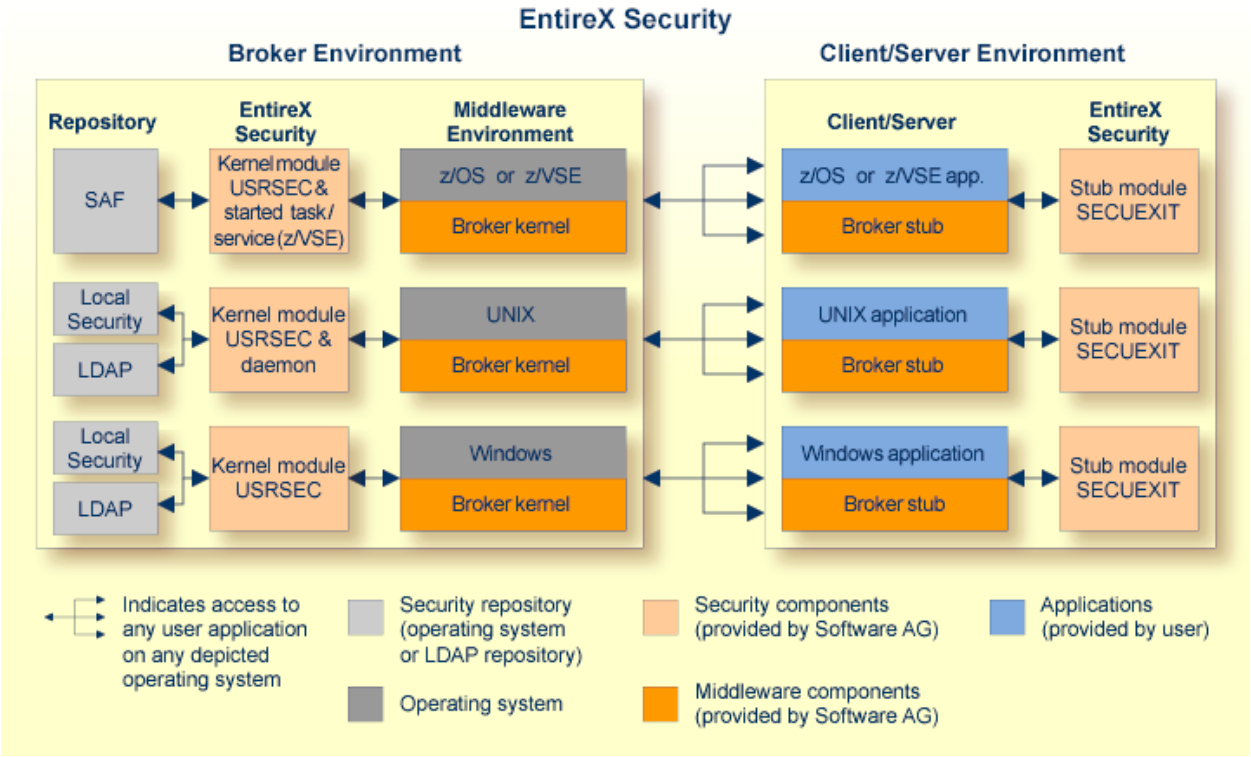
EntireX Security enables distributed application components running with Broker to be executed securely. EntireX Security is located centrally in the kernel of EntireX Broker giving it an overview of all messages sent between application components and therefore providing complete control over the authentication and authorization of each component.

Security checks are performed using a choice of security repositories, including:

- RACF
- CA ACF2
- CA Top Secret
- UNIX and Windows security systems

The security repository chosen depends on the location of the Broker kernel. Encryption of message data - by means of a generic RC4-compatible algorithm or SSL - is also available to protect sensitive information flowing between different application components. Since EntireX was designed to operate together with a security system, there is no additional application programming necessary.

This diagram depicts the location of the security components of the kernel and stubs of EntireX Broker:



5 Broker Quick Reference

Functionality: Communication Models

The table below shows which functionality of EntireX Broker is supported by each of the two communication models: *Writing Applications: Client and Server* and *Writing Applications: Publish and Subscribe*.

Functionality	Client and Server	Publish and Subscribe
Application bindings (stubs)	x	x
Command and Information Services	x	x
Accounting	x	
Data compression	x	x
Codepage conversion	x	x
Persistent store	x	x
Security	x	x
Units of work	x	

ACI Syntax of Messaging Model

This table provides the ACI syntax used in both of EntireX Broker's communication models *Writing Applications: Client and Server* and *Writing Applications: Publish and Subscribe*

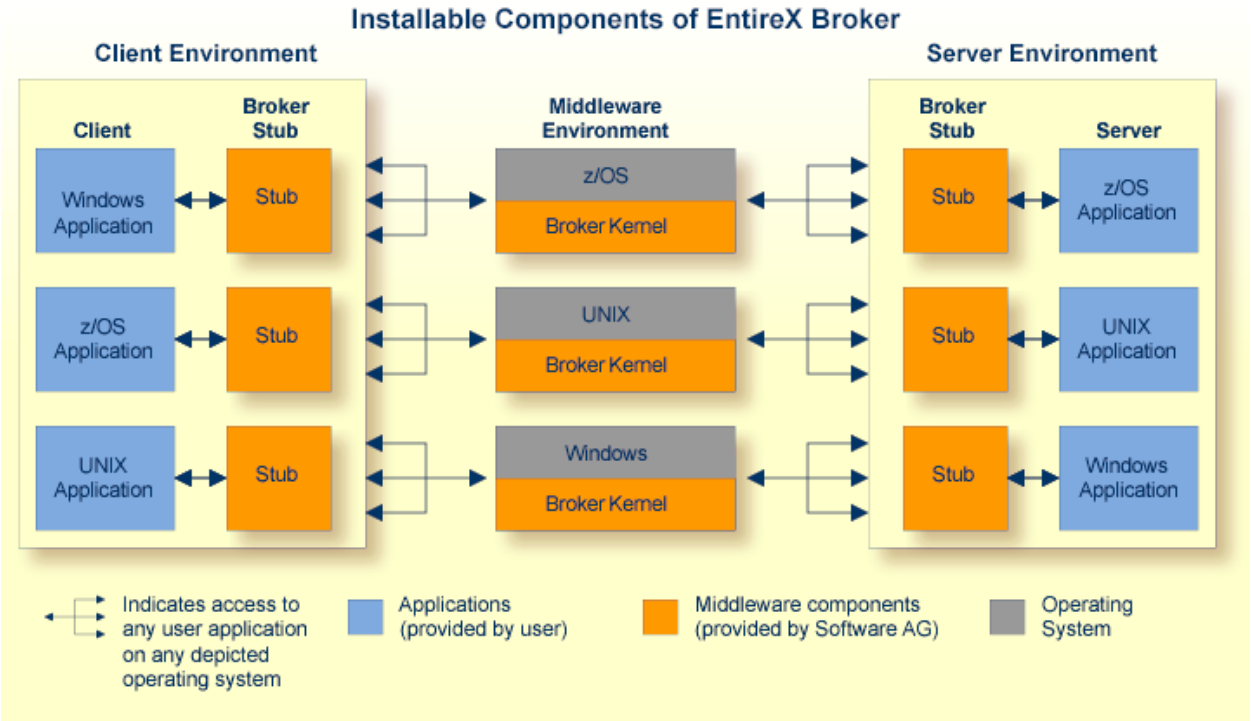
Messaging Term		Client and Server		Publish and Subscribe	
		Client	Server	Publish	Subscribe
SYNCHRONICITY	Synchronous	■ SEND (1) ■ WAIT=YES (1)	■ RECEIVE ■ WAIT=YES	not applicable	not applicable
	Asynchronous (3)	■ SEND ■ WAIT=NO ■ WAIT=YES	■ RECEIVE ■ WAIT=NO	■ SEND_PUBLICATION ■ WAIT=NO	■ RECEIVE_PUBLICATION ■ WAIT=NO ■ WAIT=YES (2)
CONVERSATIONALITY	Conversational (3)	■ SEND ■ CONV-ID=NEW	■ RECEIVE	not applicable	not applicable
	Non-conversational (3)	■ SEND ■ CONV-ID=NONE	■ RECEIVE	■ SEND_PUBLICATION	

Notes:

1. The synchronous SEND, WAIT=YES command contains an implied RECEIVE command.
2. The subscriber has the option of specifying WAIT=YES.
   Example: The subscriber uses a repeat loop that issues a RECEIVE_PUBLICATION. The advantage is that the program runs continuously, processing publications arising as random events, which simplifies programming effort.
3. Persistence available. See *Concepts of Persistent Messaging* in the general administration documentation.

Location of Broker Kernel and Stubs

This graphic shows the locations where the broker kernel and broker stubs can be installed. See ***Architecture of Broker Kernel*** and ***Architecture of Broker Stub***.


Installable Components of EntireX Broker
Client Environment
Server Environment
Client
Broker Stub
Middleware Environment
Broker Stub
Server
Windows Application
Stub
z/OS
Broker Kernel
Stub
z/OS Application
z/OS Application
Stub
UNIX
Broker Kernel
Stub
UNIX Application
UNIX Application
Stub
Windows
Broker Kernel
Stub
Windows Application
Indicates access to any user application on any depicted operating system
Applications (provided by user)
Middleware components (provided by Software AG)
Operating System

Transport: Broker Stubs and APIs

This table gives an overview of the transport methods supported by EntireX Broker stubs.

Operating System	Environment	Module	Transport to Broker			
			TCP	SSL	NET [1]	HTTP(S) [6]
z/OS [2]	Batch, TSO, IMS (BMP)	BROKER	x	x	x	
	Com-plete	COMETB	x	[3]	x	
	CICS	CICSETB	x	[3]	x	
	IMS (MPP)	MPPETB	x	x	x	
	IDMS/DC [4]	IDMS	x	[3]		
	Natural	NATETB23	x	x	x	
	UNIX System Services	*Java ACI* in the Developer's Kit documentation	x	x		x
UNIX		broker.so	x	x		
		Java ACI in the Developer's Kit documentation	x	x		x
Windows		broker.dll [5]	x	x		
		Java ACI in the Developer's Kit documentation	x	x		x
BS2000/OSD	Batch, Dialog (formerly TIAM)	BROKER	x	x	x	
z/VM		BKIMBCMS	x		x	
IBM i		EXA	x			
OpenVMS		BROKER	x	x		

Notes:

1. NET is available for transport to a broker running under mainframe platforms only; not to a broker running under UNIX or Windows.
2. Under z/OS you can use IBM's Application Transparent Transport Layer Security (AT-TLS) as an alternative to direct SSL support inside the broker stub. Refer to the IBM documentation for more information.
3. Use AT-TLS. See Note 2.
4. Tracing and transport timeout are not supported in this environment.
5. Stub broker32.dll is supported for reasons of backward compatibility. The functionality is identical to broker.dll.

6. Via Broker HTTP(S) Agent; see *Settting up and Administering the Broker HTTP(S) Agent* in the UNIX and Windows administration documentation.

See also:

- *Setting Transport Methods for Broker Stubs* in the platform-specific broker stub administration documentation
- *Setting Transport Methods* under *Writing Advanced Applications - EntireX Java ACI*

II Broker Attributes

6 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
z/OS	Member *EXBATTR* in the EntireX Broker source library.
UNIX	File *etbfile* in directory <*InstDir*>/EntireX/config/etb/<*BrokerName*> (default) *
Windows	File <*BrokerName*>.atr in directory <*InstDir*>\EntireX\config\etb\<*BrokerName*> (default) *
BS2000/OSD	File *ETB-ATTR* in library *EXX951.JOBS*.
z/VSE	Library member *ETBnnn.ATR*, where ETB*nnn* is the assigned broker ID.

* 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		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		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 to z/OS, UNIX, Windows and BS2000/OSD 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* in the general administration documentation. 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 ■ LONG-BUFFER-DEFAULT ■ NUM-SERVER ■ PUBLICATION-DEFAULT ■ NUM-SERVICE-EXTENSION ■ SERVER-DEFAULT ■ NUM-SERVICE ■ SHORT-BUFFER-DEFAULT ■ NUM-SHORT[-BUFFER] ■ SUBSCRIBER-DEFAULT ■ NUM-SUBSCRIBER-TOTAL ■ NUM-CLIENT ■ NUM-SUBSCRIBER ■ NUM-CMDLOG-FILTER ■ NUM-TOPIC-EXTENSION						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	■ NUM-COMBUF ■ NUM-CONV[ERSATION] ■ NUM-LONG[-BUFFER] ■ NUM-PUBLICATION ■ NUM-TOPIC-TOTAL ■ NUM-TOPIC ■ NUM-UOW|MAX-UOWS|MUOW ■ NUM-WQE **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* in the general administration documentation.						
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. We strongly recommend using the default value (1024 KB).						
`ICU-CONVERSION`	YES | NO	O	z	u	w	v	b
	Disable or enable ICU conversion. 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 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 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 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 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			
	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* in the general administration documentation for platform-specific list. With attribute `POLL` introduced in EntireX version 9.0, this restriction can be lifted under z/OS and UNIX. 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* in the general administration documentation apply.						
`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. 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)	O	z	u	w	v	b

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	| FILE (UNIX, Windows)						
	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* in the platform-specific administration documentation. 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. *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.						

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

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

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	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* in the general administration documentation.						
STORE	OFF | BROKER	O	z	u	w	v	b
	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.						

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

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

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	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. 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. TRANSPORT=TCP-SSL-NET specifies that the TCP/IP, SSL (or TLS), and Entire Net-Work transport methods will be supported by the broker.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	Section *TCP/IP-specific Attributes* (DEFAULTS=TCP) under *Broker Attributes* in the 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 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.						

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

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
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 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. UNLIM The number of conversations is restricted only by the number of conversations globally available. Precludes						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	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	v	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				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* in the BS2000/OSD administration documentation.							
`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"						
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 | NA2MSG2 | *ModuleName*	O	z				
	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 Messages*						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	(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 t 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		
	Specifies whether or not Simple Authentication and Security Layer (SASL) is to perform authentication check. In practice, this determines whether or not the password supplie the user is passed in plain text between the broker kernel and the LDAP server. If SAS activated, this implies that the password is encrypted.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	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				
	Specifies the name of the SAF class/type used when performing IP address authorization checks.						

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
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		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*)						
KEY-PASSWD	*password* (A32)	R		u	w		b
	Password used to protect the private key. Unlocks *MyAppKey.pem*. Deprecated. See KEY-PASSWD-ENCRYTPED below.						
KEY-PASSWD-ENCRYPTED	*encrypted value* (A64)	R		u	w		b

Attribute	Values	Opt/ Req	Operating System				
			z/OS	UNIX	Windows	z/VSE	BS2000
	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*)						
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). Minimum: 1S						
REUSE-ADDRESS	YES | NO	O	z	u	w		b

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

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

III Broker Command and Information Services

7 Broker Command and Information Services

EntireX Broker provides two internal services: Command Service and Information Services that can be used administer and monitor the EntireX Broker. The command service allows you to issue a set of Broker commands; the information services provide you with various statistics to better administer and tune your Broker. Because these services are implemented internally, nothing has to be started or configured. You can use these services immediately after starting EntireX Broker.

See also *Broker CIS Data Structures* in the ACI Programming documentation.

CIS Overview Table

EntireX Broker provides these predefined internal services:

- **Command Service**
  Provides a facility to issue commands against the Broker (e.g. `SHUTDOWN` etc.).
- **Information Services**
  Provides a query mechanism to obtain various types of information on the Broker, which is helpful for administration and tuning.

Since these services are implemented internally, nothing has to be started, configured or defined in the Broker attribute file. You can use them immediately after starting the Broker. They can be requested as follows:

Mode of Request	Tools	Services	Requirements
User-Written Interface	application program	■ `INFO` ■ `USER-INFO` ■ `CMD` ■ `PARTICIPANT-SHUTDOWN` ■ `SECURITY-CMD`	■ request structures
Graphical User Interface	System Management Hub	■ `INFO` ■ `USER-INFO` ■ `CMD` ■ `SECURITY-CMD`	■ none
Command-line Utilities	`ETBINFO` utility	■ `INFO` ■ `USER-INFO`	■ profile ■ command-line parameters
	`ETBCMD` utility	■ `CMD` ■ `PARTICIPANT-SHUTDOWN`	■ command-line parameters

Mode of Request	Tools	Services	Requirements
		■ SECURITY-CMD	
	System Management Hub (batch interface argbatch)	■ INFO ■ USER-INFO ■ CMD ■ SECURITY-CMD	■ command-line parameters

Applicable operating systems: z/OS, UNIX and Windows.

Description of Services

INFO and USER-INFO

- INFO is the full information service. Specify it for the full information service. All clients, servers and conversations are listed.
- USER-INFO is limited to your user-specific information. Specify it for limited information service. Only the user's own resources are listed.

CMD, PARTICIPANT-SHUTDOWN and SECURITY

- CMD is the full command service.
- PARTICIPANT-SHUTDOWN is limited to shutting down participants.
- SECURITY-CMD is limited to EntireX Security-related commands.

Modes of Requesting the Services

Use one of these three modes to request a service:

- Command-line Utilities
- Graphical User Interface
- User-Written Interface

The method for requesting these services is the same as the method for requesting any other service. For both types of services, an application issues a SEND command with appropriate data and retrieves a reply. The request itself is specified within the SEND buffer; the reply - if there is one - is specified in the RECEIVE buffer.

For Information Services requests, RECEIVE operations must be repeated until the Information Service indicates the end of data with an EOC return message.

Command-line Utilities

Software AG provides three command-line utility programs for use with EntireX Broker. All utility programs use command-line parameters that specify various options and information to be built into a request. These utility programs are:

- `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 (or elsewhere). `ETBINFO` uses data descriptions called profiles to control the type of data that is returned for a request. `ETBINFO` is useful for configuring and administering EntireX Broker efficiently - e.g., how many users are to run concurrently and whether the number of specified message containers is large enough.

  See *ETBINFO* under *Broker Command-line Utilities* in the platform-specific administration documentation for profiles, examples and utility parameters.
- `ETBCMD`
  Allows you to take actions - e.g., purge a unit of work, stop a server, shut down a Broker - against EntireX Broker.

  See *ETBCMD* under *Broker Command-line Utilities* in the platform-specific administration documentation for utility parameters.
- `ARGBATCH`
  This is the command line utility of SMH (see ***Graphical User Interface***). It allows you to perform various administrative commands over a broker. You can access Broker Command and Information Services with a subset of all available commands.

  See *Description of `argbatch` Commands* under *System Management Hub for EntireX*.

Version Information

- The `ETBINFO` and `ETBCMD` CIS command-line utilities are compatible with all versions of EntireX Broker.
- Display keywords applying to a specific version of Broker will not be returned when a call is made to any older version of Broker.

Graphical User Interface

Software AG provides a graphical user interface, the System Management Hub (SMH), for displaying information on the Broker and/or executing administrative functions.

Many of the capabilities of the Broker CIS can be accessed through the SMH, which is Software AG's cross-product and cross-platform product management framework. The EntireX-specific SMH agents are installed automatically when the EntireX software is installed under UNIX or Windows. SMH is not installable under z/OS.

User-Written Interface

If you access the Command and Information Services through a user-written application, you must use a defined protocol. This protocol describes the structures needed to communicate with the service(s) so that the request is correctly interpreted by the Broker.

See *Writing Applications: Command and Information Services* in the ACI documentation and *Broker CIS Data Structures* in the ACI Programming documentation.

ETBCMD: Executable Command Requests

The following command requests can be issued, using `ETBCMD`. All the functions listed in this table are applicable to all three request modes; see ***Modes of Requesting the Services***.

Note: Version numbers in this table refer to the interface version and not to the Broker version.

Command Request	Comment	CIS Interface Version
`ALLOW-NEWUOWMSGS`	New UOW messages are allowed.	3
`CLEAR-CMDLOG-FILTER`	Remove the specified command log filter.	5
`CONNECT-PSTORE`	Connects the persistent store. See *Availability of Persistent Store* in the general administration documentation.	4
`DISABLE-ACCOUNTING`	Disables accounting. Accounting records are discarded until accounting is enabled.	5
`DISABLE-CMDLOG`	Disable command logging.	5
`DISABLE-DYN-WORKER`	Disable the `DYNAMIC-WORKER-MANAGEMENT`. `DYNAMIC-WORKER-MANAGEMENT=YES`	7

Command Request			Comment	CIS Interface Version
			must be configured in the attribute file. The current number of active worker tasks will not be changed until DYNAMIC-WORKER-MANAGEMENT is enabled again.	
DISCONNECT-PSTORE			Disconnects the persistent store. See *Availability of Persistent Store* in the general administration documentation.	4
ENABLE-ACCOUNTING			Enable accounting.	5
ENABLE-CMDLOG			Enable command logging.	5
ENABLE-DYN-WORKER			Enable the DYNAMIC-WORKER-MANAGEMENT again. DYNAMIC-WORKER-MANAGEMENT=YES must be configured in the attribute file. DYNAMIC-WORKER-MANAGEMENT has been disabled before. Additional worker tasks can be started again, or stopped if not used.	
FORBID-NEWUOWMSGS			New UOW messages are not allowed.	3
PRODUCE-STATISTICS			Output current statistics to the broker log.	5
PURGE			Remove a unit of work from the persistent store.	2
RESET-USER			Clear all cached security information for the specified user ID.	5
RESUME			Transport ID: NET|S*nn*|T*nn*. Resume a suspended transport communicator. If the communicator was not suspended before, an error message will be returned.	
SET-CMDLOG-FILTER			Add the specified command log filter.	5
SHUTDOWN	BROKER		Shutdown Broker immediately.	1
	CONVERSATION <*conversation-id*>	Command applies to conversations without units of work only. The security rights shutting down the service are required for shutting down the conversation.		7
		IMMED	The specified conversation is immediately removed. All messages of the conversation are lost.	
		QUIESCE	An end of conversation is issued. The conversation remains active.	

Command Request			Comment	CIS Interface Version
	SERVER	IMMED	Shutdown server immediately. The server must be uniquely identified using field P-USER-ID under *Broker CIS Data Structures* in the ACI Programming documentation or SEQNO under *Broker CIS Data Structures* in the ACI Programming documentation and will be completely removed from the broker environment. The following steps will be performed: ■ Error code 00100050 will be returned to the server, if it is waiting. ■ All existing conversations will be finished with EOC. ■ User will be logged off.	1
		QUIESCE	Shutdown server but allow existing conversations to continue. The termination is signaled to the server by error code 00100051. After this, the next call issued must be a DEREGISTER for all services (SC=*, SN=*, SV=* if more than one service is active).	
	SERVICE <*class/server/service*>	Internal services cannot be shut down.		7
		IMMED	Caution: All servers offering this service will be deregistered and logged off. The following steps will be performed: ■ Error code 00100050 will be replied to all servers, if they are waiting. ■ All existing conversations will be finished with EOC. ■ Users will be logged off.	
		QUIESCE	All servers offering this service are deregistered. Shutdown servers but allow existing conversations to continue. The termination is signaled to the servers by error code 00100051.	

Command Request			Comment	CIS Interface Version
			After this, the next call issued must be a `DEREGISTER` for the service.	
	`PARTICIPANT`	`IMMED`	Shutdown participant immediately. The participant must be identified, using fields `P-USER-ID` under *Broker CIS Data Structures* in the ACI Programming documentation, `UID` under *Broker CIS Data Structures* in the ACI Programming documentation `TOKEN` under *Broker CIS Data Structures* in the ACI Programming documentation or `SEQNO` under *Broker CIS Data Structures* in the ACI Programming documentation and will be completely removed from the Broker environment. See *Broker CIS Data Structures* in the ACI Programming documentation. The following steps will be performed: ■ Error code 00100050 will be replied to the participant, if it is waiting. ■ All existing conversations will be finished with `EOC`. ■ User will be logged off. 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.	4
		`QUIESCE`	Shutdown participant but allow existing conversations to continue. The termination is signaled to the participant by error code 00100051.	
`START`	`TRANSPORT`	Transport ID: `NET|Snn|Tnn`	Start a transport communicator that was previously stopped. If the communicator was not stopped before, an error message will be returned.	7
`STATUS`	`TRANSPORT`	Transport ID: `NET|Snn|Tnn`	Check the current status of the transport communicator.	7

Command Request			Comment	CIS Interface Version
STOP	TRANSPORT	Transport ID: NET|Snn|Tnn	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.	7
SUBSCRIBE			Subscribe a user to a topic.	4
SUSPEND	TRANSPORT	Transport ID: NET|Snn|Tnn	Suspend an active transport communicator.	7
SWITCH-CMDLOG			Force a switch of command logging output files.	5
TRACE-FLUSH	BROKER		Flush all trace data kept in internal trace buffers to stderr (DD:SYSOUT). The broker-specific attribute TRMODE=WRAP is required.	7
TRACE-OFF	BROKER		Set TRACE-LEVEL off in Broker.	1
	PSF		Set TRACE-LEVEL off in persistent store.	5
	SECURITY		Set TRACE-LEVEL off in EntireX Security.	5
TRACE-ON	BROKER		Set TRACE-LEVEL on in Broker. Values: 1 | 2 | 3 | 4.	1
	PSF		Set TRACE-LEVEL on in persistent store. Values: 1 | 2 | 3 | 4.	5
	SECURITY		Set TRACE-LEVEL on in EntireX Security. Values: 1 | 2 | 3 | 4.	5
TRAP-ERROR	BROKER	Error number: *nnnn*	Modifies the setting of the broker-specific attribute TRAP-ERROR.	7
UNSUBSCRIBE			Unsubscribe a user from a topic.	4

ETBINFO: Returnable Information Requests

The following information requests can be returned. All the functions listed in this table are applicable to all three request modes; see *Modes of Requesting the Services*.

Note: Version numbers in this table refer to the interface version and not to the Broker version.

Information Request	Comment	Interface Version
BROKER	Global information on this Broker. No additional selection criteria are needed. Other selection criteria fields are ignored.	1
CLIENT	Information on active clients.	1
CMDLOG-FILTER	Information on command log filters.	5
CONVERSATION	Information on active conversations.	1
NET	Information on the Entire Net-Work communicator.	5
POOL	Information on Broker pool usage and dynamic memory management.	7
PSF	Information on a unit of work's status and Information for persistent store.	2
PSFDIV	Global information on the DIV persistent store.	2
PSFADA	Global information on the Adabas persistent store.	3
PSFCTREE	Global information on the c-tree persistent store.	5
PSFFILE	Global information on the B-Tree persistent store (no longer supported).	4
PUBLICATION	Information on active publications.	4
PUBLISHER	Information on active publishers.	4
RESOURCE	Information on Broker resource usage.	7
SECURITY	Global information on EntireX Security.	5
SERVER	Information on active servers.	1
SERVICE	Information on active services.	1
SSL	Information on the SSL communicator.	5
STATISTICS	Statistics on selected Broker resources.	7
SUBSCRIBER	Information on subscribers.	4
TCP	Information on the TCP/IP communicator.	5
TOPIC	Information on active topics.	4
USER	Information on all users of Broker regardless of the user type.	7
WORKER	Global information on all workers. No additional selection criteria are needed. Other selection criteria fields are ignored.	1
WORKER_USAGE	Information on usage of worker tasks and dynamic worker management.	7

IV

8 Sample Security Exits for Broker Security

Sample security exits are a user-written security solution for use only in exceptional processing situations. Example: If your organization wants to access its own user-written security system when operating EntireX Broker.

Note: See ***Using Sample Security Exits for Broker Security***, which describes implementation issues and how to use sample security exits on the operating where Broker executes.

See also *Security Solutions in EntireX*.

Sample Security Exits as Alternative Security Solution

Software AG intends security supplied by EntireX Broker to be only an alternative to EntireX Security, which is Software AG's standard security solution and shipped with EntireX. See *Overview of EntireX Security* in the EntireX Security documentation. Do not mix these two security solutions: do not use a stub secured with a sample exit against a kernel secured with EntireX Security or vice versa.

Most organizations that use Software AG's EntireX choose EntireX Security instead of sample security exits for EntireX Broker security. If your organization is deploying distributed computer systems encompassing mainframe, UNIX and Windows environments, you will use EntireX Security instead of sample security exits for EntireX Broker security.

Major Advantages of EntireX Security

Comprehensive Security

EntireX Security provides comprehensive security for EntireX Broker:

- user authentication
- user authorization
- application-data encryption
- supplied in object code only

Protection of Application Systems

EntireX Security protects client and server and publish and subscribe application systems, and, in most installations, EntireX Security operates without altering runtime applications.

One User=One Definition

EntireX Security allows your organization to control the use of all applications, including distributed components, from a central point, enabling flexible control with a "one user = one definition" approach.

No User Exits to Write/Debug

There are no user exits to write and debug when using EntireX Security. Compare *Sample Security Exits for Broker Security*.

Standard Security Definitions

EntireX Security enables security definitions, based on class/name/service (client and server) or topic (publish and subscribe), to be credentialized within your SAF Security system. All definitions are managed using existing security procedures and software.

Protected Investment in SAF-based Security Repositories

Your investment in SAF-based security repositories is protected. This includes not only the security systems RACF, CA ACF2 and CA Top Secret, but also the infrastructure to administer security profiles.

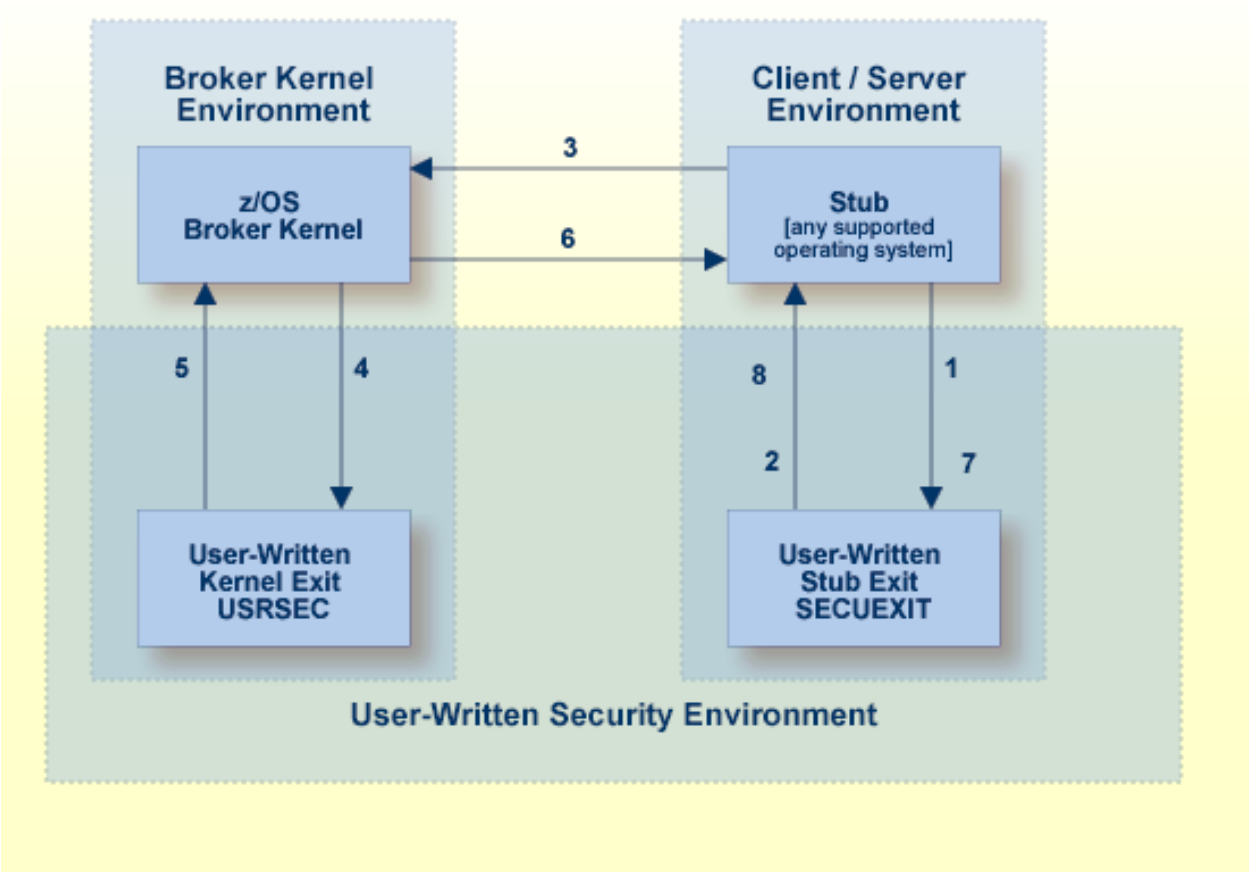
Lightweight USRSEC

For compatibility with previous versions (API level 3 and below), a "lightweight" security exit is supplied in load module USRSEC in library EXX&*vrs*..LOAD for Broker and Broker Services under z/OS. This "lightweight" version of USRSEC performs authentication only against RACF, CA ACF2 and CA Top Secret. It does not include the full functionality of the standard EntireX Security installation of USRSEC (e.g. resource authorization, etc.). The "lightweight" version of USRSEC does not require any security components, i.e. SECUEXIT, to be installed into the application (stub) environment. If you are using ACI version 1 to 7 and you intend to use the "lightweight" version of USRSEC, please ensure you do not have any security components installed into the application (stub) environment.

Note: You cannot use the SNMP support provided by System Management Hub in conjunction with the "lightweight" version of USRSEC.

Implementation of Sample Security Exits

Sample security exits are a user-written security solution for use only in exceptional processing situations. The diagram below depicts the data flow which users can implement in their own user exits for Broker security. In this example, the Broker kernel is located on z/OS.



Note: To activate your user-written security exits, specify `SECURITY=YES` in the broker attribute file.

Description of Steps in Data Flow

1. Broker stub calls security exit *SECUEXIT*, if present.
2. Security exit *SECUEXIT* encrypts the password and optionally the application data. See ***Encryption / Decryption***. SECUEXIT accesses the ACI control block and the SEND/RECEIVE buffers. SECUEXIT returns call to the broker stub.
3. Broker stub communicates the call to the broker kernel.
4. Broker kernel calls security exit *USRSEC* for each specific event type:
   - Create security context for user; authentication is usually performed in this event. See ***Authentication***.
   - Destroy security context for user.
   - Perform authorization for server to register a service. See ***Authorization***.
   - Perform authorization for client to send request.
   - Perform encryption of application data.
   - Perform decryption of application data.
   - Perform optional processing if a user acquires a new physical user ID. Re-authentication can also be performed.
   - Perform optional processing if the value of a user's ACI security token changes. Re-authentication can also be performed.
5. Security exit *USRSEC* passes call to broker kernel.
6. Broker kernel communicates the call to the broker stub of the partner application.
7. The broker stub calls SECUEXIT. SECUEXIT determines whether decryption is to be performed, if correspondingly coded by user.
8. Security exit SECUEXIT returns call to broker stub.

Definition of Terms

- Authentication
- Authorization
- Broker and Kernel
- Broker Stub
- Encryption / Decryption

- Exits

Authentication

Authentication verifies whether the identity specified by the user ID in the ACI control block is the actual identity. Authentication is usually performed by checking the user's ID and password against a security system. The details of this check are specific to the specific operating system and security system.

Authentication is not needed with every call. It is required when the user's security context is created within the Broker kernel; it is also required, optionally, if the user's physical user ID or ACI security token changes.

Authorization

Authorization can be performed when:

- a client issues a request to a service in the case of the first `SEND` command in a conversation, or of each `SEND` command if `CONV-ID=NONE`;
- a server registers a service to the Broker;

Broker and Kernel

It is the location of the Broker kernel that determines the point at which the authentication and authorization checks can be performed. ***Authentication*** and ***Authorization*** can be performed in the kernel exit `USRSEC`. Encryption/decryption can be performed in the kernel exit `USRSEC` (as well as in the stub exit `SECUEXIT`).

See *List of Components per Platform* under *Platform Coverage* in the EntireX Release Notes for where Broker kernel is supported.

Broker Stub

In EntireX Broker, a module that implements the ACI (Advanced Communication Interface) is commonly referred to as broker stub or stub. Stubs are installed on the client and the server side.

See *Platform Coverage* in the EntireX Release Notes for where Broker stubs are supported.

Encryption / Decryption

Encryption is the process by which the information or data being sent back and forth between two computers (including the password submitted when logging on) is encoded, shielding it from view by unauthorized persons. With EntireX, the algorithms for encryption/decryption must be present in both the Broker stubs and in the Broker kernel.

In the case of user-written security exits, encryption/decryption must be implemented in:

- the stub security exits (SECUEXIT or ETBUPRE / ETBUEVA);
- the kernel security exit (USRSEC).

See *Encryption of Application Data* under *Overview of EntireX Security* in the EntireX Security documentation.

Exits

- **Kernel Exit** `USRSEC`
  USRSEC is the name of the security exit which is invoked if `SECURITY=YES` is specified in the attribute file.

  In the case of user-written security exits, this exit will include functionality for authentication, authorization and encryption/decryption.

  See *Platform Coverage* in the EntireX Release Notes for where Broker kernel is supported.
- **Stub Exit** `SECUEXIT`
  SECUEXIT is the stub security exit for use with the Broker C-based stub. This module is executed during a Broker command if `SECUEXIT` is present in the path of execution.

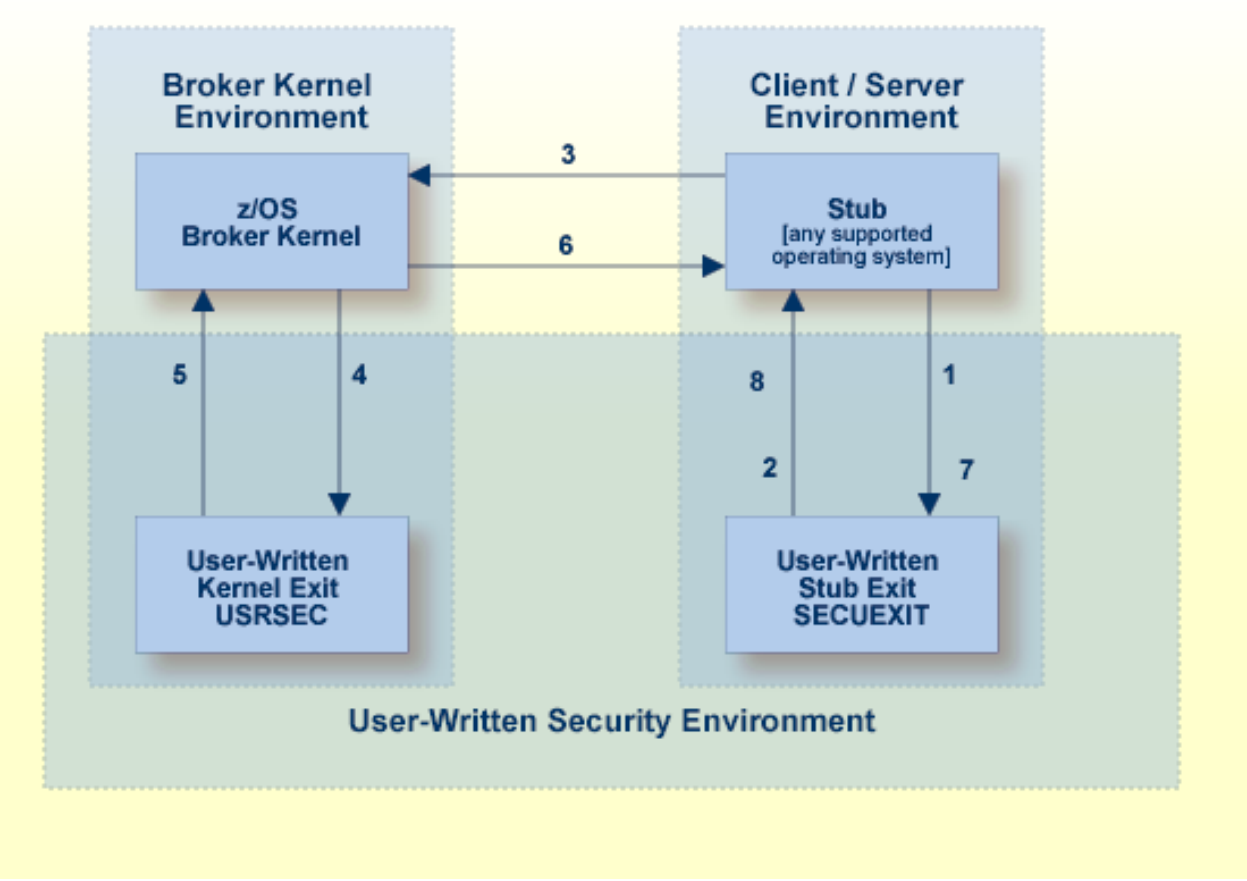
  In the case of user-written security exits, this exit will include functionality for encryption/decryption.
- **Stub exit** `ETBUPRE /ETBUEVA`
  `ETBUPRE` / `ETBUEVA` are the stub security exits for use with the Broker Assembler stub. These modules are executed during a Broker command if they are linked to the Assembler stub.

9 Using Sample Security Exits for Broker Security

This page describes implementation issues and how to use sample security exits in EntireX Broker. It assumes you are familiar with EntireX Broker from both an administrative and an application perspective, and with the ACI programming interface in particular. See *Introduction to ACI-based Programming*.

Overview of Security Data Flow

The diagram shows a data flow for sample security exits, with Broker Kernel located, for example, on z/OS. See also ***Description of Steps in Data Flow***.



Prerequisites for Running EntireX Broker in a Secure Environment

To run EntireX Broker in a secure environment, the following prerequisites must be met:

- The security system in the EntireX Broker kernel must be activated by setting `SECURITY=YES` in the broker attribute file.
- The security routines must be accessible to the Broker. The method you use to achieve this depends on the operating system where your user-written USRSEC is implemented.

Note: EntireX Broker will not start if `SECURITY=YES` is specified but the security routines cannot be activated.

General Security Recommendations

If you run a secure environment, we recommend you performing an explicit LOGON with the `AUTOLOGON=NO` definition in the attribute file. All security violations are logged to the EntireX Broker log file.

Implementing the Kernel Security Exit under z/OS

To implement the kernel security exit under z/OS

1. Write the exits `USRSEC`. The code must always be reentrant and reusable.
2. The kernel security exit `USRSEC` is loaded automatically during startup of Broker. Use module and entry name `USRSEC` for this exit. A security module sample source is delivered with the ETB source library.
3. Under z/OS, link the exit as reentrant and reusable.
4. Ensure that the security exit is accessible in the Broker `STEPLIB`.

Implementing Security for Broker Stubs under z/OS

To implement security exits for Broker stubs under z/OS

1 Write the stub security exits `ETBUPRE` and `ETBUEVA`. The code must always be reentrant, except for batch, where the code must be reusable.

2 Link these exits `ETBUPRE` and `ETBUEVA` to the stub of the target application. The stub contains weak externals for both entries.

Implementing Security Exits for Broker Stubs on UNIX

To implement security exits for Broker stubs under UNIX

1 Write your own *usrsec.c* and *secuexit.c*, based on the samples delivered with EntireX.

2 Build your own *secuexit.s*[o|l] and *usrsec.s*[o|l], using the provided makefiles. (A sample makefile, makexa, is provided.)

3 Ensure that *usrsec.s*[o|l] is made available to the Broker kernel at execution time. The attribute file parameter `SECURITY-PATH` must be used to specify the location of *usrsec.s*[o|l].

4 Ensure that *secuexit.s*[o|l] is made available to the application in the same directory as the Broker stub.

Implementing Security Exits for Broker Stubs on Windows

To implement security exits for Broker stubs under Windows

1 Write your own *usrsec.c* and *secuexit.c*, based on the samples delivered with EntireX.

2 Build your own *secuexit.dll* and *usrsec.dll*, using the provided makefiles.

Writing Security Exits

This section describes how to write your own security exits. It describes the interfaces, indicates what can be modified and what has to be done within an exit. It also provides some helpful tips.

This section covers the following topics:

- Requirements

Requirements

You must provide the following functions:

- The Preparation exit `etbupre()` and the Evaluation exit `etbueva()` for the Broker stub. These two functions are linked statically to the Broker stub routines.
- The Kernel exit `usrsec()` which is loaded by the kernel. This exit is more generic than the other two. It is called with the function that has been performed and a function-dependent Broker ACI control block that provides all the necessary information. This function is loaded dynamically by EntireX Broker during startup. One parameter of the kernel exit is the function that is performed.

The functions map to the exit type is as follows:

Exit Type	Function	Function to perform
Authentication exit	ETB_SEC_LOGON	Checks authentication for the user.
	ETB_SEC_LOGOFF	Release user-specific information if necessary.
	ETB_SEC_NEWPUID	Application call with different physical USER ID.
	ETB_SEC_NEWST	Application call with a different SECURITY TOKEN
Authorization exit	ETB_SEC_SEND	Check whether user is allowed to use the addressed service.
	ETB_SEC_REGISTER	Check whether the user is allowed to offer that service.
Encryption exit	ETB_SEC_ENCRYPT	Encrypt the given data.
	ETB_SEC_DECRYPT	Decrypt the given data.

In the following text, “encryption” or “authentication” exit refers to the functions listed above.

Error Checking for Incomplete Security Installation

With `ACI_VERSION=4` or above, the security configuration of the caller's stub is checked against the security configuration of the broker kernel. The request will be rejected with the error message `00200379 - API: Inconsistent Security Installation`, if security

- is present in the stub and it is not present in the kernel;

  or

- is not present in the stub and it is present in the kernel.

Note: If you have written your own security - instead of using *Security Solutions in EntireX* - and it is implemented only on the kernel, you will have to add a dummy security exit to the stub.

Security-Related Parameters

The following security-related parameters are provided. These are fields in the *Broker ACI Fields* in the ACI Programming documentation:

- USER-ID
- PASSWORD
- SECURITY-TOKEN
- CLIENT-UID
- ERROR-CODE
- ERROR-TEXT
- KERNELSECURITY
- ENCRYPTION-LEVEL

USER-ID

The USER ID is defined by the application. It is available in all ACI exits as well as in the kernel exits, except the encryption and decryption exits. Theoretically the preparation exit can be used to retrieve the login name by an operating system specific mechanism. This would allow a user identification without the application being involved. See the description of the `USER-ID` field in the Broker ACI control block.

PASSWORD

The `PASSWORD` is defined by the application. It is available in all ACI and kernel exits except the encryption exit. The `PASSWORD`, if provided by the application in plain text, should be encrypted in the Preparation exit before sending it across insecure network connections. If the `PASSWORD` is needed in the application again, it must be decrypted after receipt in the Evaluation exit. The authentication exit must ensure that the `PASSWORD` is properly decrypted if necessary before sending it to an external security system.

The EntireX Broker provides minimal encryption of the `PASSWORD` field, that is, the field is not transmitted in plain text. If your environment requires absolute security, however, you will need to provide both Broker stub and EntireX Broker kernel exits to perform encryption and decryption. See the description of the `PASSWORD` field in the Broker ACI control block.

SECURITY-TOKEN

The SECURITY TOKEN can be created by the application and sent to EntireX Broker. That allows for a kind of credential algorithm. The security token is passed to all kernel exits and can therefore contain security information which is also important for the authorization and encryption exits. The SECURITY TOKEN can be altered in the authentication exit to provide a context token for that application and that session. It is transmitted back to the application and can then be used in all subsequent calls. For each subsequent call, the EntireX Broker checks whether the SECURITY TOKEN is identical to the one returned from the last call to the authentication exit, which could be the ETB_SEC_LOGON, the ETB_SEC_NEWPUI or the ETB_SEC_NEWST function. After an ETB_SEC_LOGOFF call, a subsequent call is always a ETB_SEC_LOGON call. See the description of the SECURITY-TOKEN field in the Broker ACI control block.

CLIENT-UID

CLIENT-UID is returned to a server application after a RECEIVE and contains the user ID of the sending client. This allows for further security checks (logging, separate checks, etc.). See the description of the CLIENT-UID field in the Broker ACI control block.

ERROR-CODE

All security-related ERROR CODEs start with the ERROR CLASS 0008. The following four digits in the ERROR CODE can be assigned by any exit if a security violation occurs. These digits only reach the application if the current operation is aborted by the security exit with a security violation, i.e. an appropriate return code. See ERROR-CODE under *Broker ACI Fields*.

ERROR-TEXT

The security exits can also pass an error message back to the application. This error text must not be longer than 40 bytes.

KERNELSECURITY

See KERNELSECURITY under *Broker ACI Fields*.

ENCRYPTION-LEVEL

See ENCRYPTION-LEVEL under *Broker ACI Fields* or *Encryption* under *Writing Applications using EntireX Security* in the ACI Programming documentation.

Programming Broker Stub Exits

The exits in the stub have the following interface:

- Preparation Exit
- Evaluation Exit
- Programming the Kernel Exit Routine

Preparation Exit

Synopsis

```
int etbupre (ETBCB *pEtbCb,
    void *pSendBuf,
    void *pReserved,
    char *pErrText)
```

Parameter	Format	Direction	Description
Address of ETBCB	Pointer to ETBCB control block.	I/O	ETBCB's user_id and password are used to generate the credential which will be saved in field security_token for function LOGON.
Address of send buffer	void pointer	I/O	Send buffer supplied by caller, only available for function SEND, length of send buffer is member of ETBCB.
Reserved	void pointer	I	Must be NULL.
Address of error text	char pointer	O	The error text is an array of 40 characters containing the error text that will be returned by the stub routine.

Return value

0 (okay) or non-zero (error)

The real error code must be written to the Broker control block as an 8-byte character array (without trailing 0 byte!) . The error class 0008 (security / encryption error class) is reserved for all errors in function `etbupre`. The error number is user-defined. Additionally, the error text can be returned to the user in the error text array.

Required Actions in the Exit

If no data encryption is desired, no action is required.

Recommended Actions in the Exit

- Generate a credential if function is `LOGON` and move it to the field security_token.
- Encrypt the send buffer if function is `SEND`. The encryption process must not change the length of the buffer.

The exit gets control for each function of ACI version 2 and above. The exit must exist.

Evaluation Exit

Synopsis

```
int etbueva (ETBCB *pEtbCb,
    void *pRecBufEncr,
    void *pReserved,
    char *pErrText)
```

Parameters

Parameter	Format	Direction	Description
Address of ETBCB	Pointer to ETBCB control block.	I/O	ETBCB's security token is used for data decryption.
Address of receive buffer.	void pointer	I/O	Receive buffer provided by EntireX Broker. Only available for functions `RECEIVE` and `SEND WAIT=x` (implicit receive). Length of receive buffer is member of ETBCB.
Reserved	void pointer	I	Must be NULL.
Address of error text	char pointer	O	The error text is an array of 40 characters containing the error text which will be returned by the stub routine.

Return Value

0 (okay) or non-zero (error)

The real error code must be written to the Broker control block as an 8-byte character string (without trailing 0 bytes!). The error class 0008 (security / encryption error class) is reserved for all errors in function `etbueva`. The error number is user-defined.

In addition, the error text can be returned to the user.

Required Actions in the Exit

If no data decryption is wanted, no action is required.

Recommended Actions in the Exit

- Decrypt the receive buffer if functions are `RECEIVE` or `SEND` with `WAIT`. The decryption process must not change the length of the buffer.

The exit gets control for each function of ACI Version 2 and above. The exit must exist.

Use of a Single Send/Receive Buffer

A single send/receive buffer is used to perform encryption in place. This means that encrypted data is provided in the send buffer. After the completion of a send/nowait command, the application should ignore the contents of the send buffer, i.e. the encrypted data.

Programming the Kernel Exit Routine

All authentication, authorization, encryption and decryption exits are combined within one exit module named `USRSEC`. The various security checks are indicated by a type parameter in the CALL interface. `USRSEC` is provided with EntireX Broker as the default security exit. It is invoked if `SECURITY=YES` is set in the attribute file. Prior to EntireX, the `USRSEC` exit was available only with the SAF Gateway security package.

The general syntax of this user exit is defined as follows:

Synopsis

```
long usrsec (ETB_SECPAR *pParSec,
    void  *pVarious,
    char  *pErrText,
    char  *pWorkArea,
    long  lWorkArea)
```

Parameters

Parameter	Format	Direction	Description
Address of security parameter block	Pointer to structure ETB_SECPAR	I	Contains the security type flag.
Address of type-dependent security parameter block	void pointer	I	See control block structures ETB_SECPAR_<type>.
Address of error text	char pointer	O	The error text is an array of 40 characters containing the error text which will be returned to the user.
Address of work area	char pointer	O	Volatile work area.
Length of work area	long integer value	I	Size of the work area in number of bytes.

Return Value

0 (okay) or user-defined error number

Error class 0008 (security / encryption error class) and the error number will be returned to the user. In addition, the error text can be returned to the user.

Layout of Security Parameter Block ETB_SECPAR

```
typedef struct _ETB_SECPAR
{
 unsigned long vers;    /* I: interface version number   */

#define ETB_SEC_VERSION_1 (1) /* ETBCB version1 (no stub exits)*/
#define ETB_SEC_VERSION_2 (2) /* ETBCB version2 (stub exits)   */

 unsigned long type;          /* I: security type             */
#define ETB_SEC_LOGON     (1) /* user authentication (LOGON)   */
#define ETB_SEC_LOGOFF    (2) /* destroy user env (LOGOFF)     */
#define ETB_SEC_REGISTER  (3) /* authorization for REGISTER    */
#define ETB_SEC_SEND      (4) /* authorization for SEND        */
#define ETB_SEC_ENCRYPT   (5) /* encrypt message (RECEIVE)     */
#define ETB_SEC_DECRYPT   (6) /* decrypt message (SEND)        */
```

```
 char id[3];                /* I:ID e.g. W01 for worker task 1 */
 void *pNetAddr             /* I: pointer to network address   */
} ETB_SECPAR;
```

Parameter	Direction	Description
version	I	The interface version number.
type	I	Unsigned long type.
char id	I	Identifier for the task.
pNetAddr	I	Pointer to the network address. A TCP/IP address contains 0001 in the first two bytes, followed by the actual address in the next four bytes. If the pointer is 0000, there is no address.

Layouts of Type-dependent Security Parameter Blocks

This section describes the following security parameter blocks:

- DECRYPT
- LOGOFF
- LOGON
- NEWST
- REG
- SEND

```
typedef struct _ETB_SECPAR_

 /* decrypt message of sender           */
{
 unsigned char *pSecTok;                /* I:   Security Token            */
 unsigned char *pBufECry;               /* I:   Encrypted buffer          */
 unsigned char *pBufDCry;               /* O:   Decrypted buffer          */
 long *plBufECry;                       /* I:   length of encrypted buffer*/
 long *plBufDCry;                       /* I/O: length of decrypted buffer*/
} ETB_SECPAR_DECRYPT;

typedef struct _ETB_SECPAR_

 /* encrypt message for receiver        */
{
 unsigned char *pSecTok;                /* I:   Security Token            */
 unsigned char *pBufDCry;               /* I:   Decrypted buffer          */
 unsigned char *pBufECry;               /* O:   Encrypted buffer          */
 long *plBufDCry;                       /* I:   length of decrypted buffer*/
```

```
 long *plBufECry;                        /* I/O: length of encrypted buffer*/
} ETB_SECPAR_ENCRYPT;

typedef struct _ETB_SECPAR_

 /* destroy security environment         */
{
 char *pUid;                             /* I: UserID                      */
 unsigned char *pSecTok;                 /* I: Security Token              */
 unsigned long *pnSecHndl;               /* I: Security handle             */
} ETB_SECPAR_LOGOFF;

typedef struct _ETB_SECPAR_

 /* user authentication                   */
{
 char *pUid;                      /* I:   UserID                           */
 unsigned char *pPasswd;          /* I:   Password (encoded)              */
 unsigned char *pNewPasswd;       /* I:   New Password (encoded)          */
 unsigned char *pSecTok;          /* I/O: Security Token                   */
 unsigned long *pnCode;           /* I:   Character set of user            */
 unsigned long *pnSecHndl;        /* O:   Security handle                  */
} ETB_SECPAR_LOGON;

typedef struct _ETB_SECPAR_

 /* reauthentication due to new         */
                                  /* physical user ID                     */
{
 char *pUid;                      /* I:   UserID                           */
 unsigned char *pPasswd;          /* I:   Password (encoded)              */
 unsigned char *pNewPasswd;       /* I:   New Password (encoded)
*/
 unsigned char *pSecTokOld;       /* I:   Previously used security token */
 unsigned char *pSecTokNew;       /* I/O: New security token               */
 unsigned long *pnCode;           /* I:   Character set of user            */
 unsigned long *pnSecHndl;        /* I/O: Security handle                  */
} ETB_SECPAR_LOGON;

typedef struct _ETB_SECPAR_

   /* reauthentication due to new         */
                                  /* Sec. Tok.                            */
{
 char *pUid;                      /* I:   UserID                           */
 unsigned char *pPasswd;          /* I:   Password (encoded)              */
 unsigned char *pNewPasswd;       /* I:   New Password (encoded)          */
 unsigned char *pSecTokOld;       /* I:   Previously used security token */
 unsigned char *pSecTokNew;       /* I/O: New security token               */
 unsigned long *pnCode;           /* I:   Character set of user            */
 unsigned long *pnSecHndl;        /* I/O: Security handle                  */
} ETB_SECPAR_LOGON;
```

```
typedef struct _ETB_SECPAR_

   /* REGISTER authorization              */
{
 char *pUid;                        /* I:   UserID                          */
 unsigned char *pSecTok;            /* I:   Security Token                  */
 char *pSrvCls;                     /* I:   Server Class                    */
 char *pSrvName;                    /* I:   Server Name                     */
 char *pService;                    /* I:   Service                         */
 unsigned long *pnSecHndl;          /* I:   Security handle                 */
} ETB_SECPAR_REG;

typedef struct _ETB_SECPAR_

    /* SEND authorization                 */
{
 char *pUid;                        /* I:   UserID                          */
 unsigned char *pSecTok;            /* I:   Security Token                  */
 char *pSrvCls;                     /* I:   Server Class                    */
 char *pSrvName;                    /* I:   Server Name                     */
 char *pService;                    /* I:   Service                         */
 unsigned long *pnSecHndl;          /* I:   Security handle                 */
} ETB_SECPAR_SEND;
```

Required/ Recommended Actions in the Exit (depending on Security Type)

Security Type	Required Action	Recommended Action	Note
ETB_SEC_ENCRYPT	Copy decrypted to encrypted buffer and set the length of encrypted buffer. This is necessary because exit is called whether the receive data has to be encrypted or not.	Encrypt receive data if needed.	The size of the buffer cannot be changed in this exit.
ETB_SEC_DECRYPT	Copy encrypted to decrypted buffer and set the length of decrypted buffer. This is necessary because exit is called irrespective of whether send data is encrypted or not.	Decrypt receive data if needed.	The size of the buffer cannot be changed in this exit.
ETB_SEC_LOGON		Decrypt the password and check combination of user ID and password against the security system. Generate a context token according to the credentials of the user and EntireX Broker. Create a	

Security Type	Required Action	Recommended Action	Note
		security handle for a user session (e.g. ACEE on z/OS).	
ETB_SEC_LOGOFF	None	Delete the security handle of the user session.	
ETB_SEC_NEWPUID	None	An application has changed the physical user ID between two calls. If necessary, a new security token can be created.	
ETB_SEC_NEWST	None	For some reason, the security token of an application has changed and no longer matches the original. The security token should be recalculated and approved or the application should be rejected.	
ETB_SEC_REGISTER	None	Check whether user_id is authorized to offer the requested SERVICE (check security_token data if necessary).	
ETB_SEC_SEND	None	Check whether user_id is authorized to offer the requested SERVICE (check security_token data if necessary).	

V

10 EntireX Broker Tutorial

EntireX Broker is delivered with a Natural tutorial. This tutorial is written in the programming language Natural but is useful even if you are using another programming language. Natural is required for installation of the tutorial.

Introduction to Tutorial

The Natural tutorial shows you how to actively use EntireX Broker by

- allowing you to specify values for the fields in the ACI, which allows you to issue all types of requests and test use of EntireX Broker. See ***ACI Test Tool: Single Broker Request***.
- allowing you to measure throughput and response time of EntireX Broker. See ***Stress Mode***.
- offering several example client and appropriate server programs for programming language Natural; see ***Examples for EntireX Broker Tutorial***. All programs can be displayed, edited and executed. Help texts are available for each program to explain the purpose of the program, indicate typical usage, and illustrate the logical program flow.

Under UNIX and Windows, use the Natural SYSOBJH utility to install the EntireX Broker Tutorial (the Natural-based tutorial application `SYSETB` that is provided with EntireX). See *Object Handler* in the Natural Tools and Utilities documentation for more information.

Calling the Tutorial Menu

To activate the online tutorial, log on to library `SYSETB` in your Natural environment and issue the `MENU` command. This displays the online tutorial menu, which consists of a list of the client and server example programs:

```
18:54:34                  *** ENTIREX BROKER TUTORIAL ***           07-11-15
VERSION 8.0

    Client   Server
   --------  --------   NON CONVERSATIONAL EXAMPLES ------------------------
__ EXCL01CP  EXCL01SP   Single Requests without Reply
__ EXCL03CP  EXCL03SP   Single Requests with Reply
   --------  --------   Conversational Examples ----------------------------
__ EXCN01CP  EXCN01SP   Long running Service - Non-blocked Client
__ EXCN02CP  EXCN02SP   Transfer messages from Server to Client
__ EXCN04CP  EXCN04SP   Transfer messages from Client to Server
__ EXCN05CP  EXCN05SP   Server with multiple parallel Conversations
   --------  --------   Special Features -----------------------------------
__ EXDM01CP  EXDM01SP   Send messages with HOLD - delayed delivery
__ EXDM02CP  EXDM02SP   Remove Service while Conversations exist
__ EXDM03CP  EXDM03SP   Server for multiple Services
   --------  --------   Customized Client/Server computing -----------------
```

```
__ EXRQ01-P  EXRQ01-P   Single Broker Requests
__ NATEX1CP  NATEX1SP   Model to write Client/Server programs API Version 1
__ NATEX2CP  NATEX2SP   Model to write Client/Server programs API Version>1

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      HELP  GLOB  EXIT                   UP    DOWN
```

The example programs are grouped according to the following types:

- *Non-conversational Examples*
- *Conversational Examples*
- *Special Features*
- *Getting Started*

Meaning of the information in the columns:

Column	Source
Client	Name of the client program
Server	Name of the server program followed by a description of the example.

Function keys available from the main menu:

PF Key	Function	Description
PF9	HELP	A general help is displayed.
PF2	GLOB	Prompts for global defaults to be used for the current session.
PF3	EXIT	Leave the online tutorial.
PF7	UP	Scroll up.
PF8	DOWN	Scroll down.

Global Defaults for the Tutorial

The following pop-up window is displayed when you press PF2 from the tutorial main menu:

```
18:54:34                  *** ENTIREX BROKER TUTORIAL ***           07-11-15
VERSION 8.0

    Clie    +-----------------------------------------------------------+
   -----    !  Please modify defaults or press ENTER to continue ... ! ---
__ EXCL0    !                                                         !
__ EXCL0    !  Broker ID ..... ETBxxx                                 !
   ----     !  Server Class .. ETB                                    ! ---
__ EXCN0    !  Server Name ... Tutorial                               !
__ EXCN0    !  Broker Stub ... BROKER                                 !
```

```
__ EXCNO    !  User ID ....... ILGWBU                                  !
__ EXCNO    !  Token .........                                         !
   -----    !  Node .......... Node: MVS/ESA Name put into send data ! ---
__ EXDMO    !  Msg Length .... 64 Length of send/receive data        !
__ EXDMO    !  Wait Time ..... 45S Time blocked SEND/RECEIVE         ! ---
__ EXDMO    !  SDPA Version .. 5 1, 2, 3, 4, 5, 6.                   !
   -----    !  Locale String..                                       !
__ EXRQO    !  Arch Byte ..... (rarely used)                         !
__ NATEX    !  Force Logon ... ' ' or 'N' or 'Y'                     !
__ NATEX    !  Encrypt Level.. ' ' or '1' or '2'                     !
            +-------------------------------------------------------+

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      HELP  GLOB  EXIT                    UP    DOWN
```

The following global default settings can be modified and will be valid for the current session:

Default	Meaning
Broker ID	ID of the Broker in use.
Server Class	Server class in use for every example.
Server Name	Server name in use for every example.
User ID	User ID in use when running an example.
Token	Token in use when running an example.
Node	Node name put into send data.
Msg Length	Message length used for the `SEND-LENGTH` and `RECEIVE-LENGTH`.
Wait Time	Timeout value used for blocked `SEND` and `RECEIVE` calls.
SDPA version	Version of Broker control block (formerly SDPA) to select usage of old or new EntireX Broker Interface layout.

Tutorial Commands

From the tutorial menu you can execute, list and edit example programs. You can also display several help texts on each program.

You can perform a function by entering the appropriate line command in the input field preceding the client program name. To display a list of available line commands, enter an asterisk in the input field preceding the client program name.

The table below lists the available line commands:

Command	Meaning
XC	Execute client program.
XS	Execute server program.
SH	Shut down server.
H	Help for the example as a whole.
HC	Help for client program.
HS	Help for server program.
LC	List (display) client program.
LS	List (display) server program.
EC	Edit client program.
ES	Edit server program.

The examples are also documented in *Examples for EntireX Broker Tutorial*.

Using the Tutorial Help

The tutorial help facility provides help texts for each client and server example program. To display the online help text, issue the appropriate line command, H, HC or HS, for the selected example on the online tutorial menu.

The following screen shows the online help for the server of the example "Single Requests without Reply" (line command HS):

```
19:08:25              *** ENTIREX BROKER Tutorial ***               03-05-15
                    Server: Single Requests without Reply

Descr. : This server establishes a service which is able to collect
         simple messages from clients that require no reply.
         A REGISTER is necessary to inform the Broker of the availability
         of the service. The DEREGISTER, issued as the last action, informs
         the Broker of the unavailability of the service served by this
         server.
         The server wants to wait for a client message and therefore uses
         a blocked RECEIVE, that is, a RECEIVE with W=nS is issued to the
         Broker.

Coding : LOGON    ------> logon to Broker
         REGISTER ------> offer service
         repeat
            RECEIVE,W=nS,CID=NEW ------> wait for message
         until ...
         DEREGISTER ------> deregister service
         LOGOFF ------> logoff from Broker
```

```
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      HELP        EXIT                                 Expml  Cln  Srv
```

The following functions are available from the help screen. You can execute a function by pressing the appropriate PF key:

PF Key	Function	Description
PF1	HELP	Display general help.
PF3	EXIT	Leave the help screen.
PF9	EXMPL	Display general help screen specific to example.
PF10	CLN	Display client help screen specific to example.
PF11	SRV	Display server help screen specific to example.

Note: You can use PF10 and PF11 to toggle between the client and server help screens.

Using the Example Programs

Use of the example "client/server programs" is the same for each example. You need to start two sessions in order to "play" with EntireX Broker, one by executing the server program and the other by executing the client program.

As the first session, start the server by entering XS in the input field preceding the program name, for example in the line for Single Requests without Reply. This displays the following startup parameter pop-up window:

```
9:11:38            *** ENTIREX BROKER TUTORIAL ***                 07-11-15
                             VERSION 8.0
    Client   Server
   -------- --------  NON CONVERSATIONAL EXAMPLES -----------------------
xs EXCL01CP  +-------------------------------------------------------+
__ EXCL03CP  !  Please enter values or press ENTER to continue ...   !
   --------  !                                                       ! ----
__ EXCN01CP  !  Mode ......... 1 1=Step 2=Stress 3=Silent            !
__ EXCN02CP  !                                                       !
__ EXCN04CP  !  Server Class . ETB                                   !
__ EXCN05CP  !  Server Name .. Tutorial                              !
   --------  !  Service ...... NcNoReply                            ! ----
__ EXDM01CP  !                                                       !
__ EXDM02CP  !  User ID ...... ILGWBU                               !
__ EXDM03CP  !  Token ........                                       !
   --------  !                                                       ! ----
__ EXRQ01-P  !  Msg Length ... 64                                   !
__ NATEX1CP  !                                                       ! n 1
__ NATEX2CP  +-------------------------------------------------------+ n>1
```

```
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      HELP  GLOB  EXIT                    UP   DOWN
```

The fields in this window are listed in logical groups. The first group controls the execution of the example and contains the mode parameter; for clients, end criteria to stop the execution is also displayed. Valid mode parameters are ***Step Mode***, ***Stress Mode***, ***Silent Mode***. The other fields show some global defaults which you can overwrite for this particular client/server run. Note, however, that the Broker ID and Wait Time values can only be modified in the Global Defaults window (see above).

When using an example for the first time, you are recommended to select Step mode.

Step Mode

In this mode, the example is executed step by step. This means that every broker call is displayed on your screen and must be explicitly issued by pressing PF5. Upon return, the response from the broker is displayed in the Errtxt field together with the next meaningful broker call, ready for execution. You can always view previous Broker calls using the trace facility (PF4), which provides "before and after" images of every call issued to the broker.

If you select Step Mode and press ENTER, a screen similar to the following is displayed for every example:

```
Press PF5 to issue Request ...
19:13:53                     *** ENTIREX BROKER TUTORIAL ***          03-05-15
                            Server: Single Requests without Reply

Errtxt .....
Send Data .. ____________________________________________________________________
Rcve Data ..

Type/Vers .. 1 / 5
Broker ID .. ETBxxx            Send Len ..... 64
Function ..* LOGON___________  Rcve Len ..... 64
Option ....* ________________  Errtx Len .... 40
Wait ......* _________         Rtrn Len ..... 0

Class ...... ETB_____________  User ID ...... ILGWBU_____________________________
Name ....... Tutorial________  Token ........ ________________________________
Service .... NcNoReply_______  Password ..... ________________________________
Conv ID ...* ________________  New Password . ________________________________
User Data .. ________________  Sec Token .... ________________________________
Conv Stat .. Environment ..    ____________________________
                               Client UID ...

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      Help Strss  Exit  Trace Exec                          SBuff RBuff
```

The following functions are available from this screen. You can execute a function by pressing the appropriate PF key:

PF Key	Function	Description
PF1	HELP	Display the help screen on the example program. See *Using the Tutorial Help*.
PF2	STRSS	Change execution mode to Stress.
PF3	EXIT	Leave sample program.
PF4	TRACE	Invoke the *The Tutorial Trace Facility*.
PF5	EXEC	Issue broker call.
PF10	SBUFF	See *Display/Modify Send Buffer*.
PF11	RBUFF	See *Display/Reset Receive Buffer*.

Stress Mode

In this mode, the example is executed without further user interaction. Every Broker call issued is also displayed on the screen to allow you to see the activity of the client or server. Execution terminates in different ways:

- **For clients:**
  Further end criteria (such as number of messages and number of conversations) are supplied in the startup parameter window of the client example. When the specified values are reached, processing stops.
- **For servers:**
  Servers run until they are shut down by a special shut down message sent to the server (SH command from the tutorial main menu).

When execution in Stress mode is stopped, the following summary of client/server activity is displayed:

```
Waiting for Request ...
20:54:37                  *** ENTIREX BROKER TUTORIAL ***               03-05-15
                       Server: Single Requests without Reply
+-------------------------------------------------------------------------------+
!                                                                               !
!   00200216 API: Invalid BROKER-ID                                             !
!   OP System .. MVS                              Load Count Max                !
!   TP System .. CICS                             ------------ -------- -------- !
!   Speed/Mode . 191.850 / 2                      Messages ...                  !
!   Msg Length . 64                               Conv .......                  !
!   ETB Calls .. 1                                Parallel CID                  !
!                                                                               !
!   Time/Call     Count  Ave     Min     Max     Time elapsed Absolute Relative !
!   ------------ ------ ------- ------- ------- ------------ -------- -------- !
!   Send non-blk                                  Total ...... 0.0       100  %  !
!   Send blocked                                  Executing .. 0.0       83.5 %  !
```

```
!   Rcve non-blk                                  Waiting                          !
!   Rcve blocked                                  Transport . 0.0        16.4 %    !
!   EOC ........                                  Partner ... 0.0             %    !
!   Undo .......                                                                   !
!   Register ...                                                                   !
!   Deregister .                                                                   !
+-------------------------------------------------------------------------------+
   Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
         Help  Strss Exit Trace Exec                           Buff RBuff
```

Meaning of the fields:

Field	Meaning
OP	System Underlying operating system.
TP	System Underlying transaction monitor.
Speed	Indication of the performance of the environment, relative to the corresponding value of other environments.
Mode	Execution mode of the example.
Msg	Length of messages sent/received.
ETB	Number of calls issued to the broker.
Load	
Messages/Count	Number of messages sent/received.
Messages/Max	Number of messages used as criteria to stop execution.
Conv/Count	Number of conversations conducted.
Conv/Max	Number of conversations used as criteria to stop execution.
Parallel CID/Count	Highest number of parallel conversations reached.
Parallel CID/Max	Maximum number of parallel conversations allowed.
Time/Call	
Send non-blk/Count	Number of non-blocked SEND calls issued.
Send non-blk/Ave	Average elapsed time for a non-blocked SEND call.
Send non-blk/Min	Shortest elapsed time for a non-blocked SEND call.
Send non-blk/Max	Longest elapsed time for a non-blocked SEND call.
Send blocked	Same as above for blocked SEND calls.
Rcve non-blk	Same as above for non-blocked RECEIVE calls.
Rcve blocked	Same as above for blocked RECEIVE calls.
EOC	Same as above for EOC calls.
Undo	Same as above for UNDO calls.
Register	Same as above for REGISTER calls.
Deregister	Same as above for DEREGISTER calls.
Time elapsed	

Field	Meaning
`Total/Absolute`	Elapsed time in seconds between start and end for the run.
`Total/Relative`	Percentage of time between start and end for the run.
`Executing/Absolute`	Elapsed time in seconds when example is executing.
`Executing/Relative`	Percentage of time when example is executing.
`Waiting`	Time needed for transport plus execution time required by the partner.
`Transport/Absolute`	Elapsed time in seconds used for transport services. Transport means EntireX Broker and all other media involved such as SVCs, link routines, Entire Net-work, TCP/IC.
`Transport/Relative`	Percentage of time used for transport services.
`Partner/Absolute`	Elapsed time in seconds needed by the partner to execute the call. This is relevant only to blocked `SEND` calls, as this is the only call involving a partner.
`Partner/Relative`	Percentage of time needed by the partner to execute the call. This is relevant only to blocked `SEND` calls, as this is the only call involving a partner.

Note:

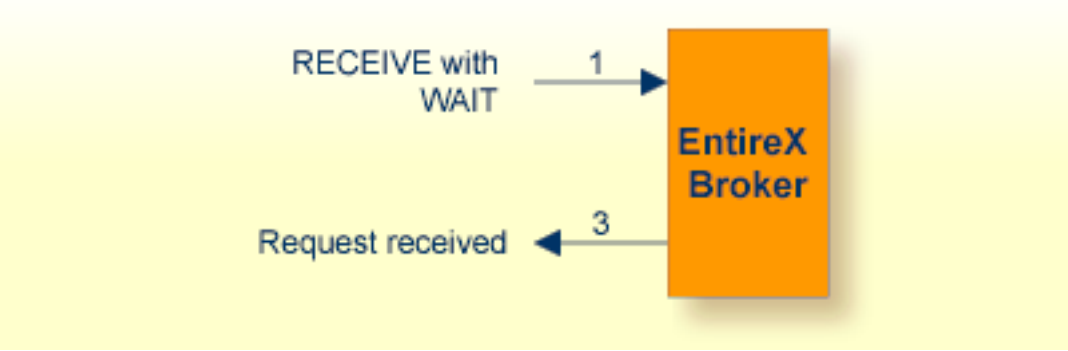
`Total/Relative=(Executing/Relative)+(Transport/Relative)+Partner/Relative=100%`

The waiting period of the different call types consists of the following times:

Blocked RECEIVE

For blocked `RECEIVE`s, the elapsed time is calculated from the following:

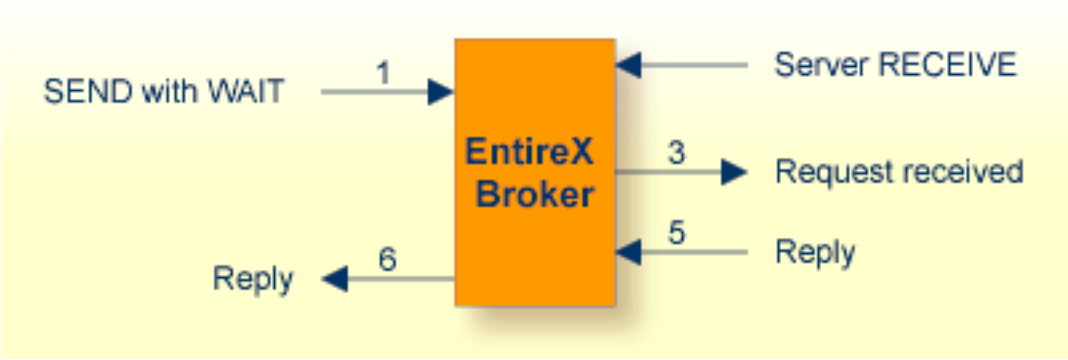
1. The time when the `RECEIVE` call was routed from the server to the broker.
2. A time of no activity during which there was no client request to be processed. This value may be high.
3. The time when an incoming client request was routed from the broker to the server.



Blocked SEND

For blocked SENDs, the elapsed time is calculated from the following:

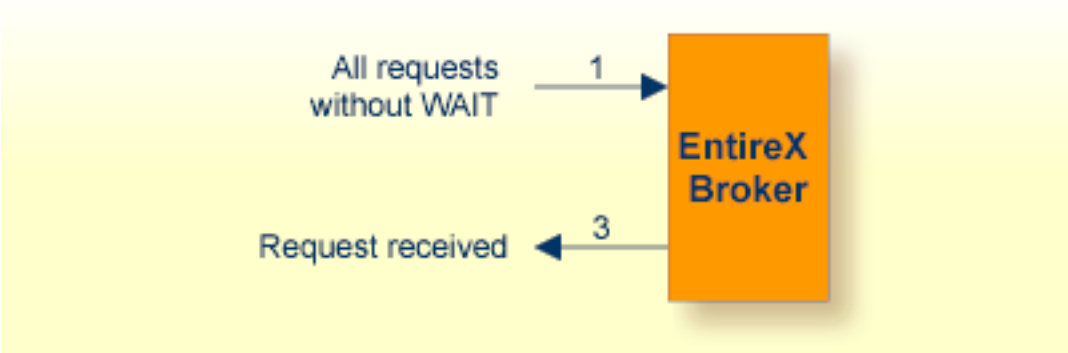
1. The time when the SEND call was routed from the client to the broker.
2. A time of no activity during which there was no server ready to process the request. This value may be high.
3. The time when the client request was routed from the broker to the server.
4. The time when the request was processed by the server.
5. The time when the response was routed from the server to the broker.
6. The time when the answer was routed from the broker back to the client.



All Other EntireX Broker Calls

For all other calls to the broker, the elapsed time is calculated from the following:

1. The time when the call was routed from the participant to the broker.
2. The time when the call was processed by the broker.
3. The time when the call was routed from the broker back to the participant.



Silent Mode

In this mode, the same applies as for Stress mode, except that no map I/Os are performed between broker calls. It is therefore not possible to view activities while the client and server example is running.

The Tutorial Trace Facility

The trace facility is activated by pressing the appropriate PF key after starting an example program. With the trace option on, "before and after" images of the last ten requests issued to the broker are made visible. When the trace option is selected, the most recent request is always displayed:

Use PF7 / PF8 to scroll to older / more recent requests. Scroll right with PF11 to display a second screen page for every request.

```
21:00:07              *** ENTIREX BROKER TUTORIAL ***                 03-05-15
------------ Image after call --------------- Image before call -    0 First
Type/Vers .. 1 / 5                            1 / 5
Errtext .... 00000000 Successful response
------------ -------------------------------- --------------------------------
Broker ID .. ETB233 ETB233
Class ...... ETB ETB
Name ....... Tutorial Tutorial
Service .... NcNoReply NcNoReply
Fct ........ LOGON LOGON
Option .....
Wait .......
Conv ID ....
Conv Status.
User Data ..
Client UID .
------------ -------------------------------- --------------------------------
Send Data .. 0000000000326891781
Rcve Data ..
------------ -------------------------------- --------------------------------

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      Help        Exit                   Up    Down        Left  Right
```

The following functions are available from this screen You can execute a function by pressing the appropriate PF key:

PF Key	Function	Description
PF1	HELP	Display a help screen on the example program.
PF3	EXIT	Leave trace.
PF7	UP	Scroll to older requests.
PF8	DOWN	Scroll to more recent requests.
PF10	LEFT	Scroll to first screen page.
PF11	RIGHT	Scroll to second screen page.

Display/Modify Send Buffer

Selecting this option by pressing PF10 after starting the example from the tutorial menu displays the send buffer contents in hexadecimal and character format:

```
21:01:28               *** ENTIREX BROKER TUTORIAL ***              03-05-15
                          Display/Modify Send Buffer

00016 0000000000081804 F0F0F0F0F0F0F0F0F0F0F0F8F1F8F0F4    Send Len .. 64
00032 070_____________ F0F7F040404040404040404040404040
00048 _______________ 40404040404040404040404040404040
00064 _______________ 40404040404040404040404040404040
00080 _______________ 40404040404040404040404040404040
00096 _______________ 40404040404040404040404040404040
00112 _______________ 40404040404040404040404040404040
00128 _______________ 40404040404040404040404040404040
00144 _______________ 40404040404040404040404040404040
00160 _______________ 40404040404040404040404040404040
00176 _______________ 40404040404040404040404040404040
00192 _______________ 40404040404040404040404040404040
00208 _______________ 40404040404040404040404040404040
00224 _______________ 40404040404040404040404040404040
00240 _______________ 40404040404040404040404040404040
00256 _______________ 40404040404040404040404040404040
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      Help        Exit              Top   Up    Down  Bot    Posit      Reset
```

Use PF6 to PF9 to scroll up or down as needed. Positioning to a specific offset is possible by pressing PF10. You can overwrite the send buffer contents in the character-oriented column. The send buffer is cleared with PF12.

Meaning of the information in the columns from left to right:

Column	Meaning
1	Send buffer offset decimal.
2	Send buffer contents displayed in character format.
3	Send buffer contents displayed in hexadecimal format.

The following functions are available from this screen. You can execute a function by pressing the appropriate PF key:

PF Key	Function	Description
PF1	HELP	Display a help screen on the example program.
PF3	EXIT	Leave send buffer display.
PF6	TOP	Position to first page.
PF7	UP	Scroll one up page.
PF8	DOWN	Scroll down one page.
PF9	BOT	Position to last page.
PF10	POSIT	Position to a specified offset in the send buffer.
PF12	RESET	Set the send buffer to low values.

Display/Reset Receive Buffer

Selecting this option by pressing PF11 after starting the example from the tutorial menu displays the receive buffer contents in hexadecimal and character format in the same way as for the send buffer. See See *Display/Modify Send Buffer*.

ACI Test Tool: Single Broker Request

This screen is an ACI test tool. An interface is provided which allows you to fill the broker ACI yourself and therefore issue all types of ACI requests in any sequence. You can use it

- for test purposes of EntireX Broker;
- for studying EntireX Broker functions and functionality;
- as counterpart of any client or server written in any programming language.

If you execute this program, (line command XC or XS), the user interface presents the broker ACI directly, which you can fill:

```
Press PF5 to issue Request ...
19:46:24                    *** ENTIREX BROKER TUTORIAL ***          03-05-15
                                : Single Broker Requests

Errtxt .....
Send Data .. ____________________________________________________________________
Rcve Data ..

Type/Vers .. 1 / 5
Broker ID .. ETBxxx             Send Len ..... 0
Function ..* ________________   Rcve Len ..... 0
Option ....* ________________   Errtx Len .... 40
Wait ......* ________           Rtrn Len ..... 0

Class ...... ETB_____________   User ID ...... ILGWBU_____________________________
Name ....... Tutorial________   Token ........ ____________________________________
Service .... Request_________   Password ..... ____________________________________
Conv ID ...* ________________   New Password . ____________________________________
User Data .. ________________   Sec Token .... ____________________________________
Conv Stat ..                    Environment .. ____________________________________
Client UID ...

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      Help        Exit Trace  Exec  Reg   Dreg  Send  Rcve  SBuff RBuff Reset
```

Press PF6 to PF9 to assign default values to the broker ACI for the selected function. A field help is available for fields marked with an asterisk (mark the field with the cursor and press PF1).

To issue a request to the broker, press PF5.

The following functions are available from this screen. You can execute a function by pressing the appropriate PF key:

PF Key	Function	Description
PF1	HELP	Display a help screen on this example program. If you press PF1 with the cursor on a field marked with an asterisk (*), a help window for the field is displayed.
PF3	EXIT	Leave the program.
PF4	TRACE	Invoke tracing of requests. See *The Tutorial Trace Facility*.
PF5	EXEC	Route a request to the broker.
PF6	REG	Assign defaults for REGISTER function to the ACI.
PF7	DREG	Assign defaults for DEREGISTER function to the ACI.
PF8	SEND	Assign defaults for SEND function to the ACI.
PF9	RCVE	Assign defaults for RECEIVE function to the ACI.
PF10	SBUFF	See *Display/Modify Send Buffer*
PF11	RBUFF	See *Display/Reset Receive Buffer*:
PF12	RESET	Set the ACI to low values.

11 Examples for EntireX Broker Tutorial

This chapter documents the examples provided in the *Online Tutorial for EntireX Broker*. The purpose of each example is outlined, the objective of the client and server parts of the example is explained, and the logical program flow is illustrated. This should help you implement similar functionality using any of the supported programming languages. The Online Tutorial contains Natural example code to demonstrate these examples.

Non-conversational Examples

Example 1: Single Request without Reply

This example shows a client sending simple messages that do not require a reply from a server, for example feeding statistical performance data into a network-wide performance monitor. Since no reply is expected, the client does not have to wait for an answer and therefore issues a non-blocked `SEND` call to the broker. The established communication is non-conversational.

Such a client could be used as a trigger for a net management server from all servers in the network.

Client

The client issues simple messages to a server without expecting a reply. Because no reply is required (the server will not return any response), the client issues a `SEND` without wait (`W=NO`). This type of call is called non-blocked, and control is returned to the caller immediately. The client specifies non-conversational communication using "`NONE`" in the `CONV-ID` field of the ACI control block.

Server

The server establishes a service which is able to collect simple messages from clients that do not require a reply. A `REGISTER` is necessary to inform the Broker of the availability of the service. The `DEREGISTER`, issued as the last action, informs the Broker of the unavailability of the service served by this server.

The server wants to wait for a client message and therefore uses a blocked `RECEIVE` - that is, a `RECEIVE` with `W=nS` is issued to the Broker.

Coding

```
Client
LOGON ------> logon to Broker
repeat
   SEND,W=NO,CID=NONE ------> forward message to server
until ...
LOGOFF -----> logoff from Broker
_____________________________________________________

Server
LOGON ------> logon to Broker
REGISTER ------> offer service
repeat
   RECEIVE,W=nS,CID=NEW ------> wait for message
until ...
DEREGISTER ------> deregister service
LOGOFF ------> logoff from Broker
```

Example 2: Single Request with Reply

This example shows a client sending requests that require a reply from a server, for example a database access. Traditional remote procedure calls (RPCs) are also referred in this way. Since a reply is expected, the client uses a blocked `SEND` to issue the request to the server and wait for the reply. This is the equivalent of an implicit receive. The established communication is non-conversational.

Client

The client issues requests and expects a reply from the server. Because a reply is required and no conversation is built, a blocked `SEND (W=nS)` must be used. If the wait time elapses before the reply is received, there is no chance (in non-conversational mode) of getting the reply. However, you can retrieve the reply later in conversational mode by issuing a subsequent `RECEIVE`.

Server

The server establishes a service that is able to receive requests and return a reply to the client. Although the communication is non-conversational, the server gets a conversation ID with the incoming request. This ID must be retrieved and used when sending back the reply to the client.

The server must issue the `RECEIVE` call with `CID=NEW` in order to prevent unnecessary "Conversation ID timeout" messages.

Coding

```
Client
LOGON ------> logon to Broker
repeat
   SEND,W=nS,CID=NONE ------> send and wait for reply
until ...
LOGOFF -----> logoff from Broker
_____________________________________________________

Server
LOGON ------> logon to Broker
REGISTER ------> offer service
repeat
   RECEIVE,W=nS,CID=NEW ------> wait for request
   SEND,W=NO,CID=1234 ------> reply to client
until ...
DEREGISTER ------> deregister service
LOGOFF ------> logoff from Broker
```

Conversational Examples

Example 3: Long Running Service - Non-blocked Client

This example shows a client dealing with a long-running service. The server process is initiated with a non-blocked `SEND` request. Later on, the client checks the processing status with a non-blocked `RECEIVE` request. However, the client retains control in all broker calls and is never blocked. The established communication is conversational. This example applies to any background processing in which the client should retain control.

Client

The client issues a non-blocked `SEND` to initiate a conversation with the desired service. With the subsequent non-blocked `RECEIVE` requests, the process is checked to see if it is still running or has finished.

Server

The server provides a service which takes some time to finish. It demonstrates a non-blocked client example. The long running processing is simulated by a wait of 30 seconds done with a blocked `RECEIVE` to a dummy `WAIT` service.

Coding

```
Client
LOGON ------> logon to Broker
repeat
   SEND,W=NO,CID=NEW ------> initiate process/conversation
   repeat
      RECEIVE,W=NO,CID=1234 ------> check for process status
      decide on ERROR-CLASS
         VALUE 0 successful response - retrieve reply
         VALUE 3 processing ended
         VALUE 74 wait some time and retry
   until ...
until ...
LOGOFF ----> logoff from Broker
_____________________________________________________________

Server
LOGON ------> logon to Broker
REGISTER ------> offer service
repeat
   RECEIVE,W=nS,CID=NEW ------> wait for new conversation
   wait 30 seconds - simulate long running processing
   SEND,OP=EOC,W=NO,CID=1234 -----> reply and EOC
until ...
DEREGISTER ------> deregister service
LOGOFF ------> logoff from Broker
```

Example 4: Transfer Messages from Server to Client

This example shows a client retrieving a large amount of data from a server within a conversation, for example a `GET <file>` command of a file transfer system. The transfer of messages/data to the client is done by the server with non-blocked `SENDs`. This is important because the server can work independently from the client, that is, forward the data/messages to the client and is then quickly free to process the next conversation. The established communication is conversational.

Client

The client receives a large amount of data/messages from a server. The `SEND` initiates a conversation with the desired service. Following the `RECEIVE`, the client retrieves data/messages from the connected server until the conversation is ended by the server.

Server

The server is able to send a large amount of data/messages to the client. The data/messages are transferred with non-blocked (W=NO) SENDs. The last transfer terminates the conversation with a non-blocked SEND and option EOC.

Coding

```
Client
LOGON ------> logon to Broker
repeat
   SEND,W=nS,CID=NEW ------> initiate conversation
   repeat
      RECEIVE,W=nS,CID=1234 ------> receive data/message
      decide on ERROR-CLASS
         VALUE 0 successful response
         VALUE 3 conversation ended
   until ...
until ...
LOGOFF -----> logoff from Broker
_____________________________________________________________

Server
LOGON ------> logon to Broker
REGISTER ------> offer service
repeat
   RECEIVE,W=nS,CID=NEW ------> wait for new conversation
   SEND,W=NO,CID=1234 ------> acknowledge conversation
   repeat
      SEND,W=NO,CID=1234 ------> transfer data/message
   until end of data
   SEND,OP=EOC,W=NO,CID=1234 -----> last data/message and EOC
until ...
DEREGISTER ------> deregister service
LOGOFF ------> logoff from Broker
```

Example 5: Transfer Messages from Client to Server

This example shows a client transferring a large amount of data to a server using conversational communication, for example, a PUT <file> command of a file transfer system. Once the conversation is established, the server depends on the client's activity, because the client always sends the messages/data and finishes the conversation, thus tying the server to one conversation for a long time. This might in some circumstances be unacceptable. The situation can be improved when multiple servers for this service are started simultaneously.

Client

The client transfers a large amount of data/messages to the server. The first blocked `SEND` initiates a conversation with the server. The server acknowledges the conversation with a reply. Subsequent non-blocked SENDs then transfer the data/messages to the server. The last transfer terminates the conversation with a non-blocked `SEND` and option `EOC`.

Server

The server retrieves a large amount of data from the client. The server depends on the client at the second `RECEIVE` for the data/messages, because the call is blocked.

Coding

```
Client
LOGON -----> logon to Broker
repeat
   SEND,W=nS,CID=NEW ------> initiate conversation
   repeat
      SEND,W=NO,CID=1234 ------> transfer data/message
   until ...
   SEND,OP=EOC,W=NO,CID=1234 ------> last data/message and EOC
until ...
LOGOFF ----> logoff from Broker
_____________________________________________________________

Server
LOGON ------> logon to Broker
REGISTER ------> offer service
repeat
   RECEIVE,W=nS,CID=NEW ------> wait for new conversation
   SEND,W=NO,CID=1234 ------> acknowledge conversation
   repeat
      RECEIVE,W=nS,CID=1234 ------> receive data/message
   until ...
until ...
DEREGISTER ------> deregister service
LOGOFF ------> logoff from Broker
```

Example 6: Server with Multiple Parallel Conversations

This example shows a server which is able to process multiple conversations in parallel. To build such a server, the states of active conversations must be maintained in order to know where processing continues when the next request/message for the conversation is retrieved. Be aware that this can lead to complicated programs (multiplexing servers in environments where it is not feasible to have one server process per client).

A simpler and more convenient way to build a server environment which is able to process multiple conversations is to start replicates of the server. However, multiplexing servers may be appropriate in environments with restricted resources (for example, limited number of tasks).

The established communication is conversational.

Client

This client is used to demonstrate a server which is able to process multiple conversations in parallel. The first blocked `SEND` initiates the conversation. The server always acknowledges the conversation with a reply to the client. With the subsequent calls, requests/replies are transferred within the established conversation. The conversation is terminated by issuing an EOC.

Server

The server processes multiple conversations in parallel. At the `RECEIVE` with `CID=ANY`, client requests are retrieved, which belong either to existing or new conversations. All known conversations are stored in an array. When conversations finish, these entries are freed. When the last entry is used, `CID=OLD` is issued, preventing the retrieval of new conversations.

Coding

```
Client
LOGON ------> logon to Broker
repeat
   SEND,W=nS,CID=NEW ------> initiate conversation
   repeat
      SEND,W=nS,CID=1234 ------> ongoing conversation
   until ...
   EOC,CID=1234 ------> end of conversation
until ...
LOGOFF -----> logoff from Broker
_____________________________________________________________
Server
LOGON ------> logon to Broker
REGISTER ------> offer service
repeat
   RECEIVE,W=nS,CID=ANY/OLD ------> OLD if max parallel reached
   decide on ERROR-CLASS
      VALUE 0 successful response
```

```
         SEND,W=NO,CID=1234 ------> new or ongoing conversation
      VALUE 3 conversation ended
until ...
DEREGISTER ------> deregister service
LOGOFF ------> logoff from Broker
```

Special Features

- Example 7: Send Messages with HOLD - Delayed Delivery
- Example 8: Remove Service while Conversations Exist
- Example 9: Server for Multiple Services

Example 7: Send Messages with HOLD - Delayed Delivery

This example demonstrates the `HOLD` facility of EntireX Broker. Data/messages are set in hold by the `SEND` with the option `HOLD`. This prevents the partner from retrieving the data/messages until a `SEND` without the HOLD option is issued. Held data/messages are always under control of the sender until they are released. With the function `UNDO`, the sender can remove held data/messages.

The `HOLD` option is useful if a packet of data has to be delivered that does not fit in one request. Either the whole request packet has to be shipped, or nothing (minimum transaction support). The established communication is conversational. To set data/messages in hold only makes sense in conversational communications.

Client

This client demonstrates the hold mechanism used by the server. The data/messages are set in hold by the server and released with the last data/message sent. The client does not recognize this.

Server

The server sends data using the `HOLD` facility. Data is set in hold with `SEND` and option `HOLD`.

Coding

```
Client
LOGON ------> logon to Broker
repeat
   SEND,W=nS,CID=NEW ------> initiate conversation
   repeat
      RECEIVE,W=nS,CID=1234 ------> receive data/messages
      decide on ERROR-CLASS
         VALUE 0 successful response
         VALUE 3 conversation ended
   until ...
```

```
until ...
LOGOFF ------> logoff from Broker
_____________________________________________________________

Server
LOGON ------> logon to Broker
REGISTER ------> offer service
repeat
   RECEIVE,W=nS,CID=NEW ------> wait for new conversation
   SEND,W=NO,CID=1234 ------> acknowledge conversation
   repeat
      SEND,OP=HOLD,W=NO,CID=1234 ------> set data in hold
   until ...
   if error
      UNDO ------> remove accumulated data
   endif
   SEND,OP=EOC,W=NO,CID=1234 -----> release data in hold
until ...
DEREGISTER ----> deregister service
LOGOFF ------> logoff from Broker
```

Example 8: Remove Service while Conversations Exist

This example demonstrates a server that deregisters while conversations still exist. The conversations continue. With the option `QUIESCE` used on the `DEREGISTER` function, servers are able to remove their services in a smooth way. Established conversations are allowed to continue until ended with `EOC` by any partner. This mechanism is needed to shut down a server without aborting existing conversations.

New conversations are not accepted for servers that have removed their services and will be connected by the broker to other servers if available, or else rejected.

The established communication is conversational.

Client

The client establishes a conversation with a blocked `SEND`. After retrieving an acknowledgment from the server, subsequent requests/replies are transferred within this conversation. However, the service is deregistered while the conversation continues.

Server

After a new conversation is retrieved, the server removes the service in a smooth way by issuing a DEREGISTER with option QUIESCE. The established conversation continues until ended by the client.

Coding

```
Client
LOGON ------> logon to Broker
SEND,W=nS,CID=NEW ------> initiate conversation
repeat
   SEND,W=nS,CID=1234 ---> ongoing after deregistration
until ...
EOC,CID=1234 -----------> end of conversation
LOGOFF -----> logoff from Broker
_____________________________________________________________
Server
LOGON ------> logon to Broker
repeat
   REGISTER ------> offer service
   RECEIVE,W=nS,CID=NEW ------> wait for new conversation
   DEREGISTER,OP=QUIESCE ------> deregister service
   SEND,W=NO,CID=1234 ------> acknowledge new conversation
   repeat
      RECEIVE,W=nS,CID=1234 ------> ongoing conversation
      SEND,W=NO,CID=1234 ------> reply to client
   until 3 conversation ended
until ...
LOGOFF ------> logoff from Broker
```

Example 9: Server for Multiple Services

This example demonstrates a server offering multiple services. It is possible to issue a RECEIVE to the broker and specify the service name with an asterisk(*) in any of the fields SERVER-CLASS, SERVER-NAME and SERVICE. This enables clients to wait for multiple services with one RECEIVE. The services waited for must all be previously registered. The asterisk(*) notation can also be used in DEREGISTER calls.

This feature is useful for alias service names or multipurpose servers. For example, a server might be able to retrieve data from a database, to add data and to remove data. A way to implement this is to register three different services.

The established communication is non-conversational.

Client

This client demonstrates a server which is able to offer multiple services. The name of the service the message is routed to is alternately switched between Service 1 and Service 2.

Server

The server demonstrates how to offer multiple services. With the `REGISTER` call, two services are established. With the `RECEIVE` call using the asterisk notation for the service (`SV=*`), the server can process any request for any of the services it has registered. The actual service name to which the request belongs is returned in the `SERVER-CLASS`, `SERVER-NAME` and `SERVICE` fields by the Broker. This allows the server to offer multiple services with a single `RECEIVE` call.

With the `DEREGISTER` call, all previously registered services are removed using the asterisk notation for the service name (`SV=*`).

Coding

```
Client
LOGON ------> logon to Broker
repeat
   SEND,SV=SV1,W=nS,CID=NONE ------> send to first service
   SEND,SV=SV2,W=nS,CID=NONE ------> send to second service
until ...
LOGOFF -----> logoff from Broker
_____________________________________________________

Server
LOGON ------> logon to Broker
REGISTER,SV=SV1 ------> offer first service
REGISTER,SV=SV2 ------> offer second service
repeat
   RECEIVE,SV=*,W=nS,CID=NEW ------> wait for any service
   SEND,W=NO,CID=1234 ------> reply to client
until ...
DEREGISTER,SV=* ------> deregister all services
LOGOFF -----> logoff from Broker
```

Getting Started

Example 10: ACI Test Tool: Single Broker Requests

This screen is an ACI test tool. An interface is provided which allows you to fill the broker ACI yourself and therefore issue all types of ACI requests in any sequence. You can use it

- for test purposes of EntireX Broker;
- for studying EntireX Broker functions and functionality;
- as counterpart of any client or server written in any programming language.

Example 11: Model to write Client/Server Programs API Version 1

This example shows a simple client/server communication. It implements *Single requests with Reply* (see also this example in the tutorial). The client issues a simple request and waits for a reply from the server.

The established communication is non-conversational.

The programs for this example do not need any other Natural object (maps, data areas etc.) for execution.

You can copy the programs to any Natural library and use them as models to write your own client/server programs.

Client

This client issues requests and expects a reply from the server. Because a reply is required and no conversation is built, a blocked `SEND (W=nS)` must be used (see also the example *Single Requests with Reply* in the tutorial).

You can copy this program to any Natural library and use it as model to write your own client programs.

Server

This server establishes a service which is able to collect simple messages from clients that do not require a reply. Although the communication is non-conversational the server gets a conversation ID with the incoming request. This ID must be used when sending back the reply to the client (see also the example *Single Requests with Reply* in the tutorial). You can copy this program to any Natural library and use it as a model to write your own server programs.

Coding

```
Client
repeat
   SEND,W=nS,CID=NONE ------> send and wait for reply
until ...
_____________________________________________________

Server
REGISTER ------> offer service
repeat
   RECEIVE,W=nS,CID=NEW ------> wait for request
   SEND,W=NO,CID=1234 ------> reply to client
until ...
DEREGISTER ------> deregister service
```

Example 12: Model to write Client/Server programs API Version 2

This example shows a simple client/server communication. It implements *Single requests with Reply* (see also this example in the tutorial). The client issues a simple request and waits for a reply from the server.

The established communication is non-conversational.

The programs for this example do not need any further Natural object (maps, data areas etc.) for execution.

You can copy the programs to any Natural library and use them as models to write your own client/server programs.

Client

This client issues requests and expects a reply from the server. Because a reply is required and no conversation is built, a blocked `SEND (W=nS)` must be used (see also the example Single Requests with Reply in the tutorial).

You can copy this program to any Natural library and use it as model to write your own client programs.

Server

This server establishes a service which is able to collect simple messages from clients that do not require a reply. Although the communication is non-conversational the server gets a conversation ID with the incoming request. This ID must be used when sending back the reply to the client (see also the example *Single Requests with Reply* in the tutorial). You can copy this program to any Natural library and use it as a model to write your own server programs.

Coding

```
Client
LOGON ------> logon to Broker
repeat
   SEND,W=nS,CID=NONE ------> send and wait for reply
until ...
LOGOFF -----> logoff from Broker
_____________________________________________________

Server
LOGON ---------> logon to Broker
REGISTER ------> offer service
repeat
   RECEIVE,W=nS,CID=NEW ------> wait for request
   SEND,W=NO,CID=1234 --------> reply to client
until ...
DEREGISTER ----> deregister service
LOGOFF --------> logoff from Broker
```

Attach Manager Interface

Example 13: Demonstration of the Attach Manager Interface

An Attach Manager is a server that is able to start server. If no server is found for a client request, the Broker informs the Attach Manager to start the desired server. To be informed by the Broker, the Attach Manager must previously register all servers for which it is responsible using the option `ATTACH`.

Coding

```
LOGON ------> logon to Broker
REGISTER ----------------------> Attach Manager main service
REGISTER,OP=ATTACH,SV=SV1 ------> attachable service
repeat
   RECEIVE,W=nS,CID=NEW ---------> wait for any service
until ...
DEREGISTER,SV=* ------> deregister all services
LOGOFF -----> logoff from Broker
```

Non-blocked Server

- Example 14: Single Requests without Reply - A Polling Server
- Example 15: Single Requests with Reply - A Polling Server

Example 14: Single Requests without Reply - A Polling Server

Demonstration of Attach Manager Interface:

This example shows a server collecting simple messages from clients that do not require a reply. The server polls for a message at the `RECEIVE`, i.e. the `RECEIVE` is not blocked. This enables the server to do other work, even if no message is available for processing. The client uses a non-blocked `SEND` because no reply is expected from the server. The communication is non-conversational.

Example

A Server collecting cyclic statistical data from various input media, e.g. mainframe console, job management systems, databases and client messages from the broker.

Client

This client issues simple messages to a server without expecting a reply. Because no reply is required - the server will not return any response - the client issues a `SEND` without wait (`W=NO`). This type of call is called non-blocked because it is not blocked and control is returned immediately to the caller. With a value of "NONE" in the `CONV-ID` field of the ACI control block the client specifies non-conversational communication.

Server

This example shows a server collecting simple messages from clients that do not require a reply. The server polls for a message at the `RECEIVE`, i.e. the `RECEIVE` is not blocked. This enables the server to do other work, even if no message is available for processing. The client uses a non-blocked `SEND` since no reply is expected from the server. The communication is non-conversational.

A Server collecting cyclic statistical data from various input media, e.g. mainframe console, job management systems, databases and client messages from the broker.

Coding

```
Client
LOGON ------> logon to Broker
repeat
   SEND,W=NO,CID=NONE ------> forward message to server
until ...
LOGOFF ----> logoff from Broker
_____________________________________________________________

Server
LOGON ------> logon to Broker
REGISTER ------> offer service
repeat
RECEIVE,W=NO,CID=NEW ------> poll for message
decide on ERROR-CLASS
   VALUE 0 successfull response
   VALUE 74 no message available - so free for other work
until ...
DEREGISTER ------> deregister service
LOGOFF ------> logoff from Broker
```

Example 15: Single Requests with Reply - A Polling Server

This example shows a client sending requests/messages and expecting a reply from the server. The established communication is non-conversational. Because a reply is expected, the client uses a blocked `SEND` call to the broker. The server polls for a request at the `RECEIVE`, i.e. the `RECEIVE` is non-blocked. This enables the server to do other work, even if no request is available for processing.

Client

This client issues requests/messages and expects a reply from the server. Because a reply is required and no conversation is built, a blocked `SEND (W=nS)` must be used. If the wait time elapses before the reply is received, there is no chance in non-conversational mode of getting the reply. However, you can do this in conversational mode by issuing a subsequent `RECEIVE`.

Server

This server establishes a service that is able to receive requests/messages and return a reply to the client. The server works non-blocked at the `RECEIVE`, that is, a `RECEIVE` with `W=NO` is issued to the Broker. Because of this non-blocked call, control is retained, allowing the server to do other work.

Coding

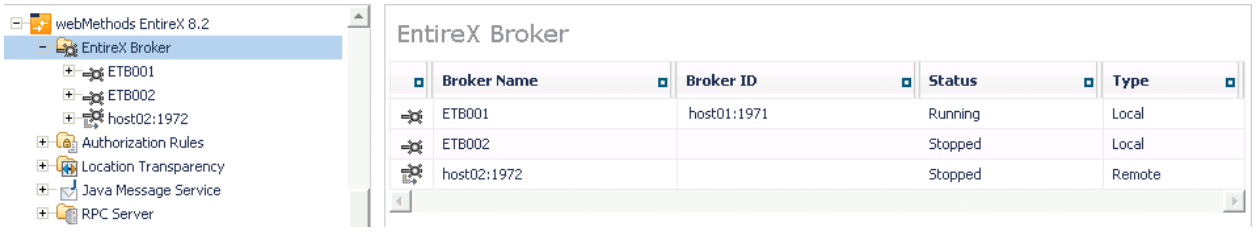
```
Client
LOGON ------> logon to Broker
repeat
   SEND,W=nS,CID=NONE ------> send and wait for reply
until ...
LOGOFF -----> logoff from Broker
_____________________________________________________________

Server
LOGON ------> logon to Broker
REGISTER ------> offer service
repeat
   RECEIVE,W=NO,CID=NEW ------> poll for request/message
   decide on ERROR-CLASS
      VALUE 0 successfull response
         SEND,W=NO,CID=1234 ------> reply to client
      VALUE 74 no message available - so free for other work
until ...
DEREGISTER ------> deregister service
LOGOFF ------> logoff from Broker
```

VI

12 Introduction to Broker Administration using SMH

Before you log in to the System Management Hub for the first time, see *Initial Login Considerations* in the System Management Hub for EntireX documentation. See also *Startup Daemon 'etbsrv'* in the UNIX administration documentation*Broker Service 'etbsrv'* under *Post-installation Steps under Windows*.

EntireX Broker instances are administered from the EntireX Broker System Management Hub node. The **EntireX Broker** node is located below the EntireX node in the System Management Hub tree view. When the **EntireX Broker** node is expanded, all of the brokers that are known to the current System Management Hub host are listed. The list consists of all the broker instances configured on the host running the System Management Hub ("local" brokers) and broker instances configured on other hosts that the user has defined to the System Management Hub ("remote" brokers). The node of a broker instance can be expanded if its broker is currently running. Below the node you can see the list of all Command and Information Services. The broker stub nodes allow a detailed runtime administration of the broker.



Note: The list of the known brokers is maintained by a special administrative service. The SMH agents communicate with it or directly with the listed brokers to perform all necessary actions. For more information see *Configuring the Administration Service*.

13 Managing the List of Brokers with SMH

See also *Administration Service Messages* under *Error Messages and Codes*.

Creating a Local Broker

To create a local broker

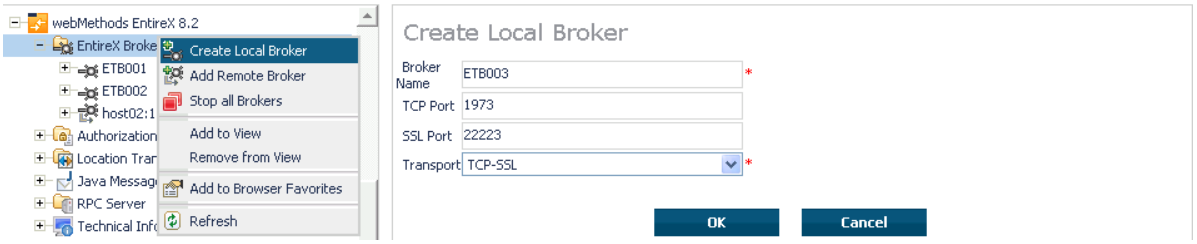
1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 From the context menu, choose **Create Local Broker**.

3 Enter **Broker ID**, **TCP Port Number**, and **SSL Port Number**. The valid port number range is 1024 - 65535.

4 Select a transport method.

5 Choose **OK**.



When a local broker is added using SMH, a working directory is created for the new broker in the EntireX directory *config/etb*. This directory contains an attribute file, and the SSL certificates from the EntireX directory *config/etb* are also copied to this directory. If the broker is to use its own SSL certificates, these must be replaced or the attribute file modified accordingly.

The attributes of the new broker are checked. If, for example, a broker already exists with the specified port, a corresponding error message is given.

Deleting a Local Broker

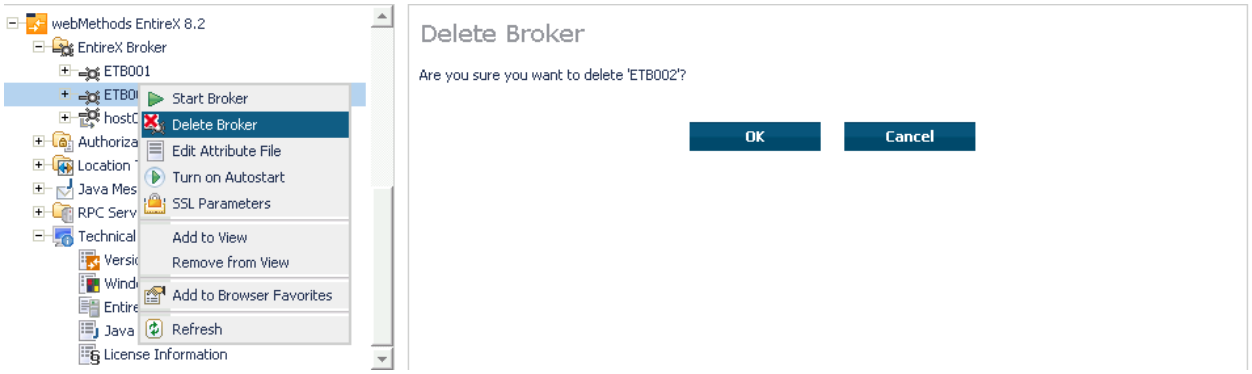
To delete a local broker

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the broker name to be deleted.

3 From the context menu, choose **Delete Broker**.

4 Choose **OK**.


webMethods EntireX 8.2
EntireX Broker
ETB001
Start Broker
Delete Broker
Edit Attribute File
Turn on Autostart
SSL Parameters
Add to View
Remove from View
Add to Browser Favorites
Refresh
License Information
Delete Broker
Are you sure you want to delete 'ETB002'?
OK
Cancel

Adding a Remote Broker Instance to System Management Hub

To add a remote broker instance to System Management Hub

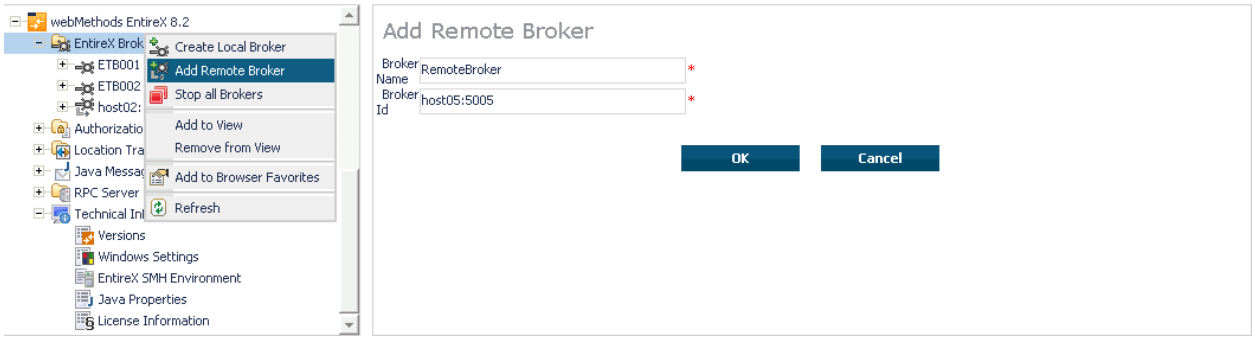
1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 From the context menu, choose **Add Remote Broker**.

3 In the field **Broker Name**, enter a valid name. Permitted characters are A-Z, a-z, 0-9.

4 In the field **Broker ID**, enter the ID of an existing broker. Permitted formats: host:port[:protocol], protocol://host:port[?sslparameters].

5 Choose **OK**.



Function **Add Remote Broker** creates a directory for a remote broker. The working directories for a remote broker start with "RB". This directory contains an attribute file with the URL of the remote broker. This directory will also be used for tranferring the log and attribute files to or from the remote broker. If the broker can only be addressed using the SSL protocol, the SSL certificates should also be stored in this directory. When a remote broker is added, the default SSL certificates from the EntireX *config/etb* directory are copied to the working directory of the remote broker. If this broker is to use other certificates, replace them manually.

Removing a Remote Broker Instance from System Management Hub

To remove a remote broker instance from System Management Hub

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the remote broker instance to be removed.

3 From the context menu, choose **Remove Definition**.

4 Choose **OK**.


webMethods EntireX 8.2
EntireX Broker
ETB001
ETB002
host02:19
Authorization
Location Trans
Java Message
RPC Server
Technical Infor
Versions
Windows Settings
EntireX SMH Environment
Java Properties
License Information
Remove Definition
Add to View
Remove from View
Add to Browser Favorites
Refresh
Remove Definition
Are you sure you want to remove the definition for 'host02:1972'?
OK
Cancel

Stopping All Local Brokers from System Management Hub

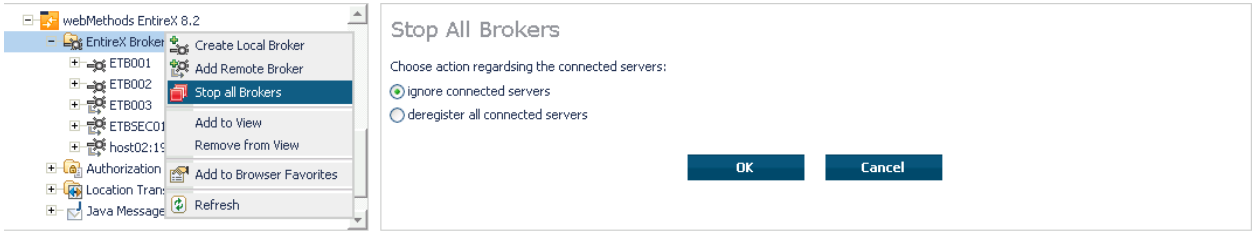
To stop all local brokers from System Management Hub

1 Select the **EntireX Broker** node below the **EntireX** node in **System Management**.

2 From the context menu, choose **Stop All Brokers**.

3 Choose the stop mode.

4 Choose **OK** to confirm deregistration.



Setting the User Credentials for a Broker Instance

Before a remote broker instance or instance of a local broker that uses LDAP authentication can be administered, user credentials (user ID and password) must be set.

To set user credentials

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

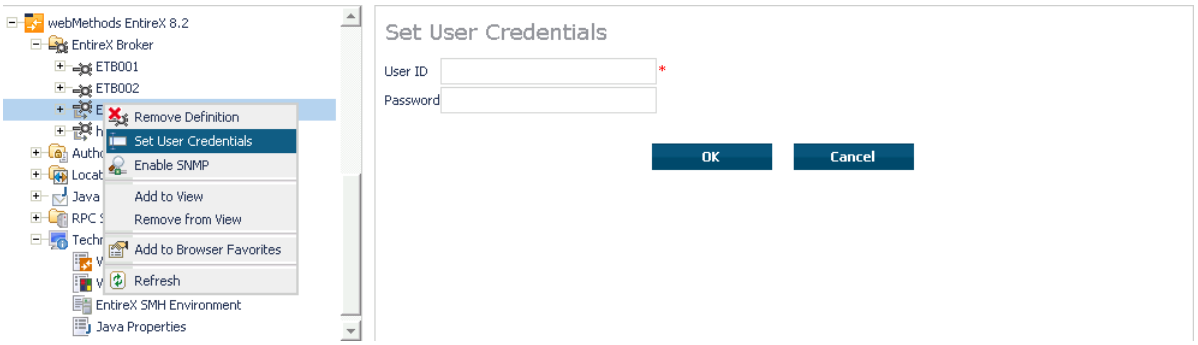
2 Select the broker instance.

3 From the context menu, choose **Set User Credentials**.

4 Enter a **User ID** and **Password** that are valid for the broker instance.

5 Choose **OK**.

6 Choose **OK** when the success message is displayed.



Clearing the User Credentials for a Broker Instance

Once a remote broker instance has been administered, the user credentials should be cleared.

To clear user credentials

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the broker instance.

3 From the context menu, choose **Clear User Credentials**. A confirmation screen will appear.

4 Choose **OK** or **Cancel**.

5 Choose **OK** when the success message is displayed.

Setting SSL or TLS Parameters

To edit a broker SSL file

1 Select the **EntireX Broker** node below the **webMethods EntireX** node in System Management Hub.

2 Select the broker name to be administered.

3 Choose **SSL Parameters**.

4 Make your changes.

5 Choose **Save**.

14 Configuring a Single Broker with SMH

Starting a Local Broker

To start a local broker

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the broker name to be started.

3 From the context menu, choose **Start Broker**.

Note: Before you start a local Broker, make sure that the Broker's etbsrv service or daemon is running and try again. See *Broker Service 'etbsrv'* under *Post-installation Steps under Windows*.See *Broker Instance Created Automatically during Installation* under *Post-installation Steps under UNIX* and *Startup Daemon 'etbsrv'* in the UNIX administration documentation.

A broker process is started in its working directory. The started broker establishes a connection to the local Administration Service and provides information such as the used and activated ports. The information is updated every 60 seconds. If an attribute file is modified after a broker has been started, this does not result in incorrect information. If a broker is started manually by a local user and the attribute file is not in the working directory under the EntireX directory *config/etb*, the broker can be administered only to a limited extent. It is only possible to stop this broker. Each local broker is displayed by the Administration Service in SMH. The brokers that were started manually have the status "Running: unmanaged Broker with restricted access" in SMH. If the broker is to be administered without restrictions, the working directory and attribute file must be located under the EntireX directory *config/etb*.

Restarting a Local Broker

To restart a local broker

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the broker name to be administered.

3 From the context menu, choose **Restart Broker**.

Stopping a Local Broker

To stop a local broker

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the broker name to be administered.

3 From the context menu, choose **Stop Broker**.

4 Choose **OK**.

Administering a Broker Attribute File

This section covers the following topics:

- Editing an Attribute File
- Uploading an Attribute File
- Downloading an Attribute File

Editing an Attribute File

To edit a broker attribute file

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the broker name to be administered.

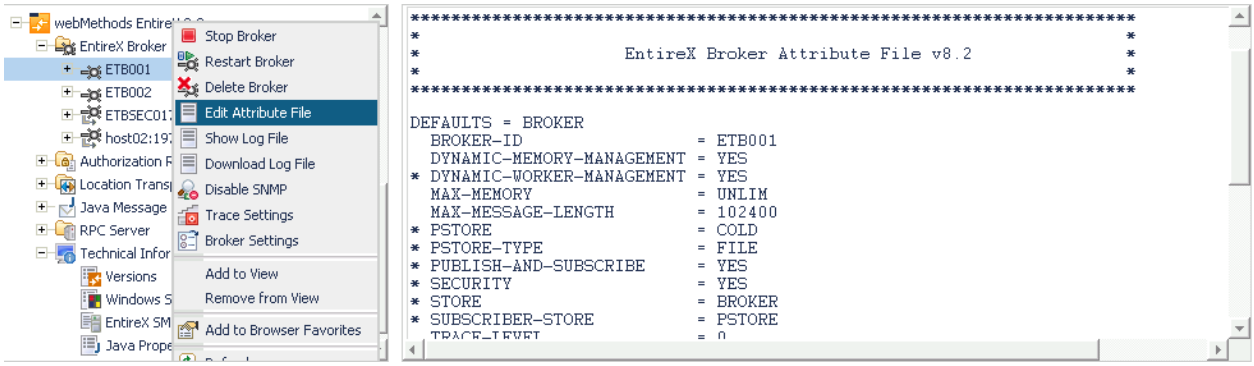
3 From the context menu, choose **Edit Attribute File**.

> **Note:** There is another vertical scrollbar for the editor itself. Scroll the horizontal scrollbar to the right in order to see it. In addition, you can use Ctrl Home and Ctrl End to get the first and the last pages, respectively.

4 Edit your changes.

5 Choose **Save**.

6 Choose **Restart** for the changes to take effect.



Uploading an Attribute File

To upload a broker attribute file

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the broker name to be administered.

3 From the context menu, choose **Edit Attribute File**.

4 Choose **Upload**.

5 Choose **Browse** and select the local attribute file.

As a result, the upload starts automatically followed by a message "Upload completed!".

Downloading an Attribute File

To download a broker attribute file

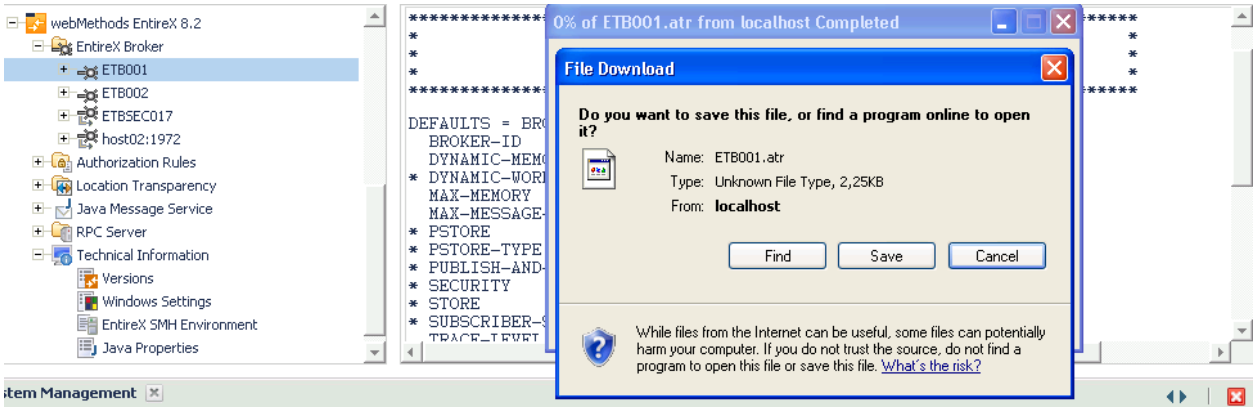
1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the broker name to be administered.

3 From the context menu, choose **Edit Attribute File**.

4 Choose **Download**.

In the ensuing dialog box, choose **Save**.



Administering a Log File

This section covers the following topics:

- Showing a Log File
- Downloading a Log File

Showing a Log File

To show a broker log file

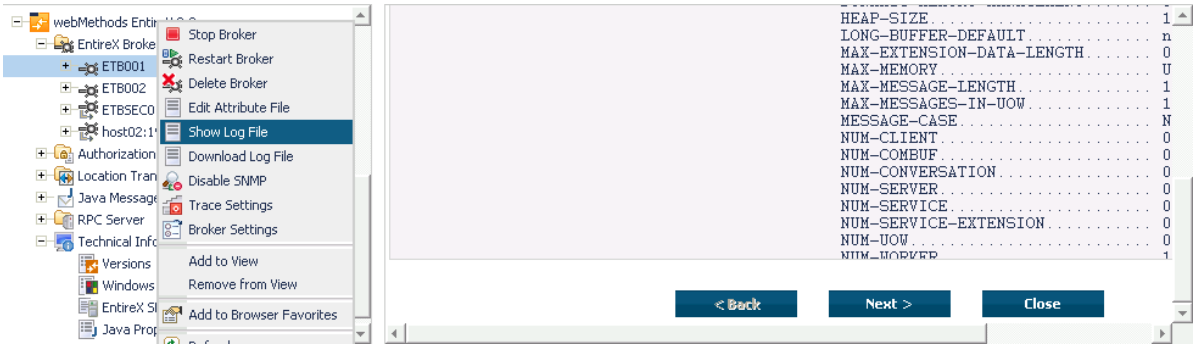
1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the broker name to be administered.

3 From the context menu, choose **Show Log File**.

Note: There is another vertical scrollbar for the editor itself. Scroll the horizontal scrollbar to the right in order to see it. In addition, you can use Ctrl Home and Ctrl End to get the first and the last pages, respectively.

4 Choose **Close**.



Downloading a Log File

To download a broker log file

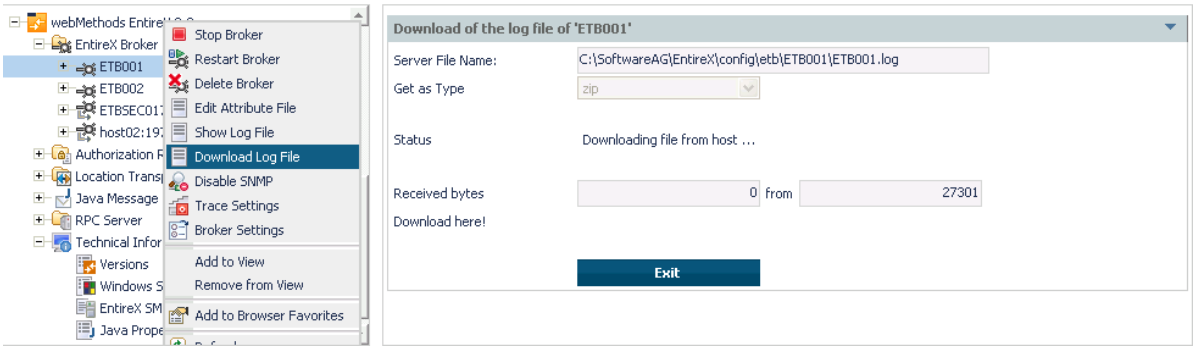
1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the broker name to be administered.

3 From the context menu, choose **Download Log File**.

A message "Download file from host" appears and after it a hyperlink labeled **Download**.

4 Follow the hyperlink **Download**.



5 Use the ensuing dialog box to save the log file on the local machine.

Setting the Local Broker Autostart Value

The autostart value of a broker instance determines whether it will be started when the computer is restarted.

To set the Autostart value

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the broker name to be administered.

3 If the broker instance is currently started automatically, only the **Turn off Autostart** command is visible; if the broker instance is currently *not* started automatically, the **Turn on Autostart** command is visible.

4 Choose either **Turn on Autostart** or **Turn off Autostart**.

Enabling the SNMP Plug-in

Before a broker can be administered by SNMP, the SNMP plug-in must be enabled. In addition, the SNMP Plug-in credentials (user ID and password) must be set.

To enable the SNMP plug-in

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

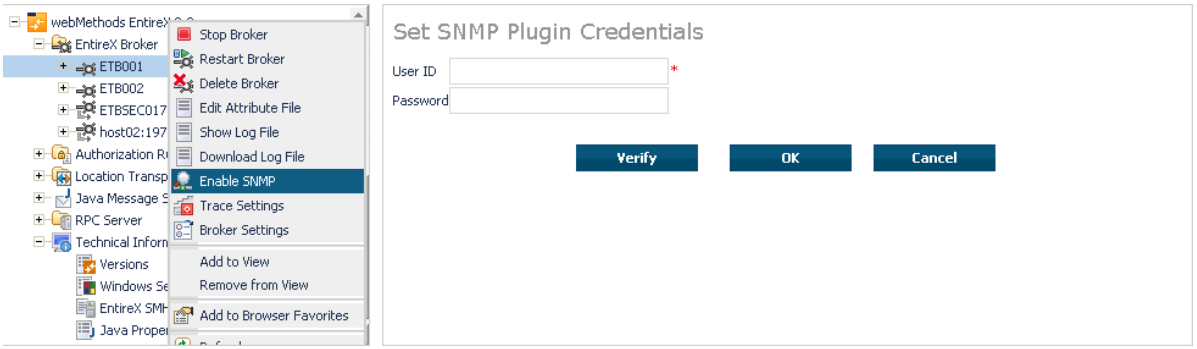
2 Select the broker.

3 From the context menu, choose **Enable SNMP**.

4 Enter a user ID and password that are valid for the broker instance.

5 Choose **Verify** to check if a logon to the broker is okay with the SNMP plug-in credentials, or click **OK** to save the SNMP plug-in credentials without any verification.

6 Choose **Close** when the Success message is displayed.


webMethods EntireX
EntireX Broker
ETB001
ETB002
ETBSEC017
host02:197
Authorization Ru
Location Transp
Java Message S
RPC Server
Technical Inform
Versions
Windows Se
EntireX SMH
Java Proper
Stop Broker
Restart Broker
Delete Broker
Edit Attribute File
Show Log File
Download Log File
Enable SNMP
Trace Settings
Broker Settings
Add to View
Remove from View
Add to Browser Favorites
Set SNMP Plugin Credentials
User ID
Password
Verify
OK
Cancel

Disabling the SNMP Plug-in

To disable the SNMP plug-in

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the broker.

3 From the context menu, choose **Disable SNMP**.

4 Choose **Close** when the Success message is displayed.

15 Using the Broker Information Service with SMH

Administering a Broker Instance

To administer a broker instance

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the broker instance to be administered.

3 If the broker instance is a remote broker instance (running on another node), see *Setting the User Credentials for a Broker Instance*.

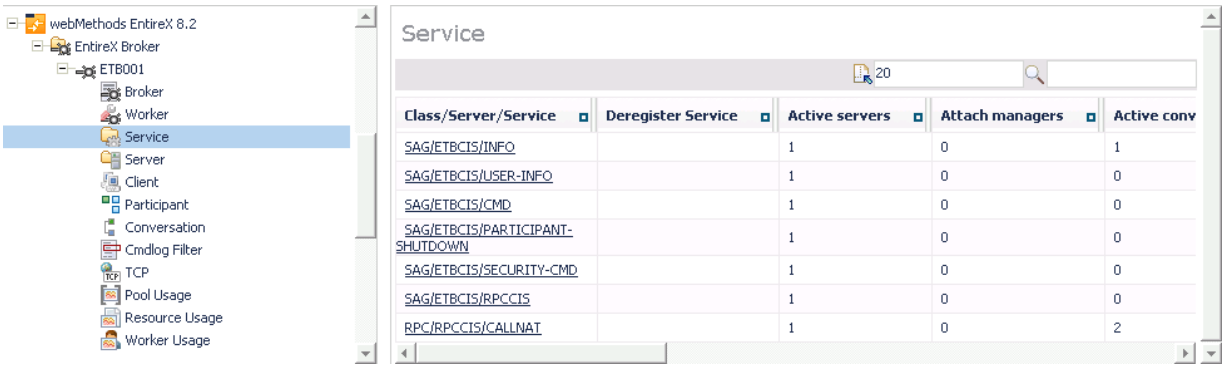
4 Expand the broker instance node to view and administer the properties for the following objects:

Object	Information Reply Structure	Summary View	Filter Results
Broker	*BROKER-OBJECT*		
Worker	*WORKER-OBJECT*		
Service	*SERVICE-OBJECT*	x	x
Server	*CLIENT-SERVER-PARTICIPANT-OBJECT*	x	x
Client	*CLIENT-SERVER-PARTICIPANT-OBJECT*	x	x
Participant	*CLIENT-SERVER-PARTICIPANT-OBJECT*	x	
Conversation	*CONVERSATION-OBJECT*	x	
Persistent Store	*PSF-OBJECT*	x	x
Persistent Store DIV	*PSFDIV-OBJECT*		
Persistent Store Adabas	*PSFADA-OBJECT*		
Persistent Store File	*PSFFILE-OBJECT*		
Persistent Store c-tree	*PSFCTREE-OBJECT*		
Topic	*TOPIC-OBJECT*		x
Subscriber	*SUBSCRIBER-OBJECT*	x	x
Publisher	*PUBLISHER-OBJECT*	x	x
Publication	*PUBLICATION-OBJECT*		x
Cmdlog Filter	*CMDLOG_FILTER-OBJECT*		
Security	*SECURITY-OBJECT*		
TCP	*TCP-OBJECT*		
SSL	*SSL-OBJECT*		
Net-Work	*NET-OBJECT*		
Pool-Usage	*POOL-USAGE-OBJECT*		
Resource-Usage	*RESOURCE-USAGE-OBJECT*		
Statistics	*STATISTICS-OBJECT*		

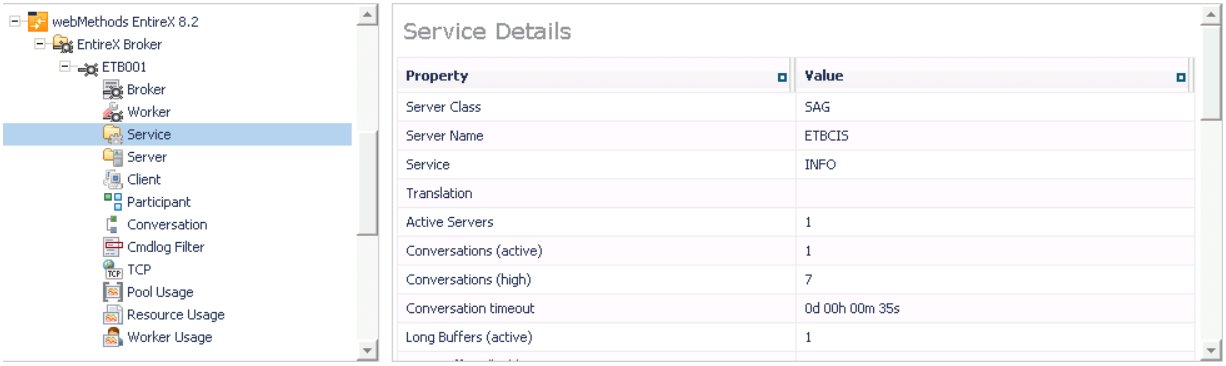
Object	Information Reply Structure	Summary View	Filter Results
User	*USER-OBJECT*	x	x
Worker-Usage	*WORKER-USAGE-OBJECT*		

Notes

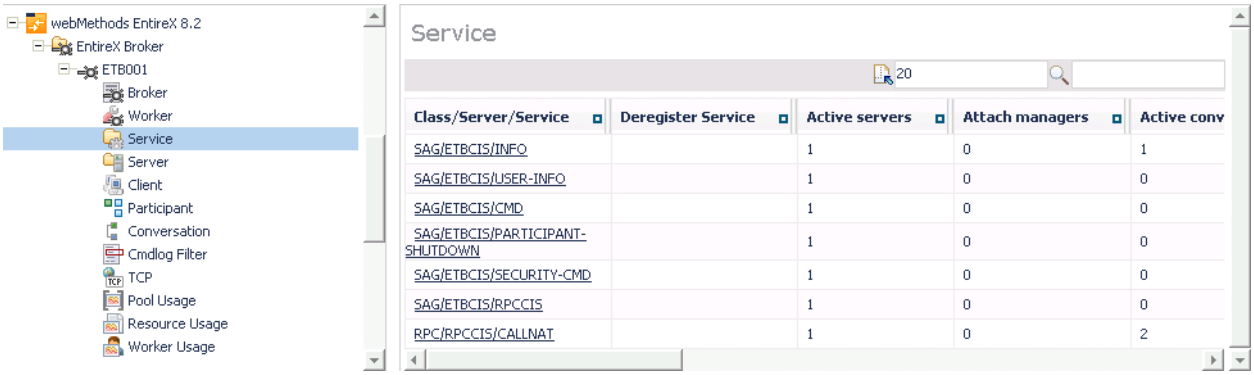
- For a summary view, expand the node and select the required object:



- For detailed information, select an item from the summary view:



- The items can be filtered. For an example, see *Filtering Services*.


webMethods EntireX 8.2
EntireX Broker
ETB001
Broker
Worker
Service
Server
Client
Participant
Conversation
Cmdlog Filter
TCP
Pool Usage
Resource Usage
Worker Usage
Service
20
Class/Server/Service
Deregister Service
Active servers
Attach managers
Active conv
SAG/ETBCIS/INFO 1 0 1
SAG/ETBCIS/USER-INFO 1 0 0
SAG/ETBCIS/CMD 1 0 0
SAG/ETBCIS/PARTICIPANT-SHUTDOWN 1 0 0
SAG/ETBCIS/SECURITY-CMD 1 0 0
SAG/ETBCIS/RPCCIS 1 0 0
RPC/RPCCIS/CALLNAT 1 0 2

Filtering Clients

To filter clients

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Click on the "+" sign of the broker name to be administered.

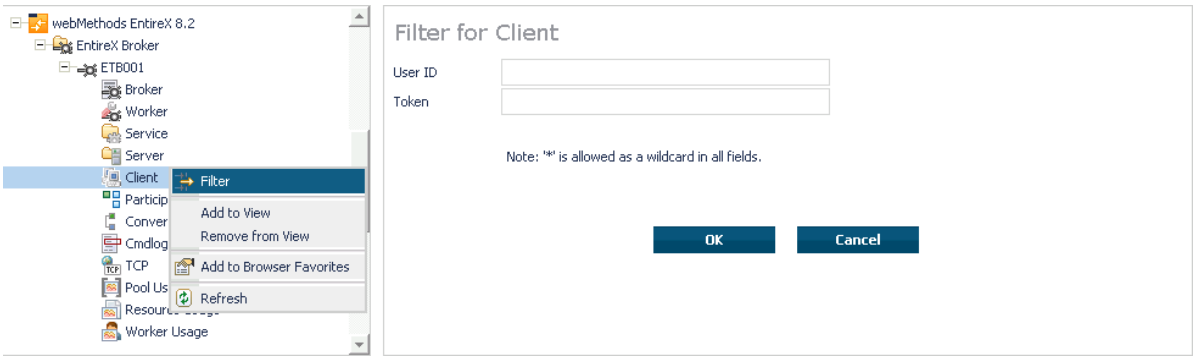
Note: The broker must be running in order to display the Client subtree.

3 Select **Client**.

4 From the context menu, choose **Filter**.

5 Enter the data for **UserID** or **Token** that you would like to filter.

6 Choose **OK**.



Filtering Conversations

To filter conversations

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Click on the "+" sign of the broker name to be administered.

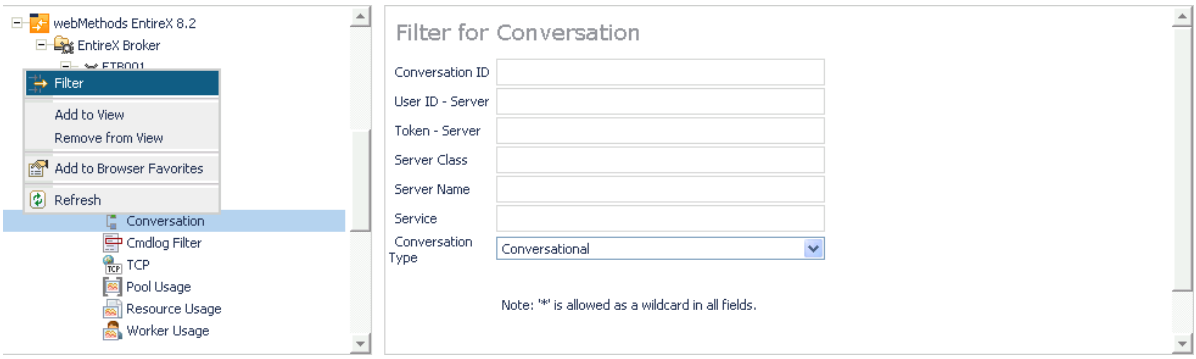
Note: The broker must be running in order to display the Client subtree.

3 Select **Conversation**.

4 From the context menu, choose **Filter**.

5 Enter the data for **UserID** or **Token** that you would like to filter.

6 Choose **OK**.



Filtering the User

To filter the user

1 Select the **EntireX Broker** node below the **EntireX** node in System Management.

2 Select the Broker instance on which the user is present.

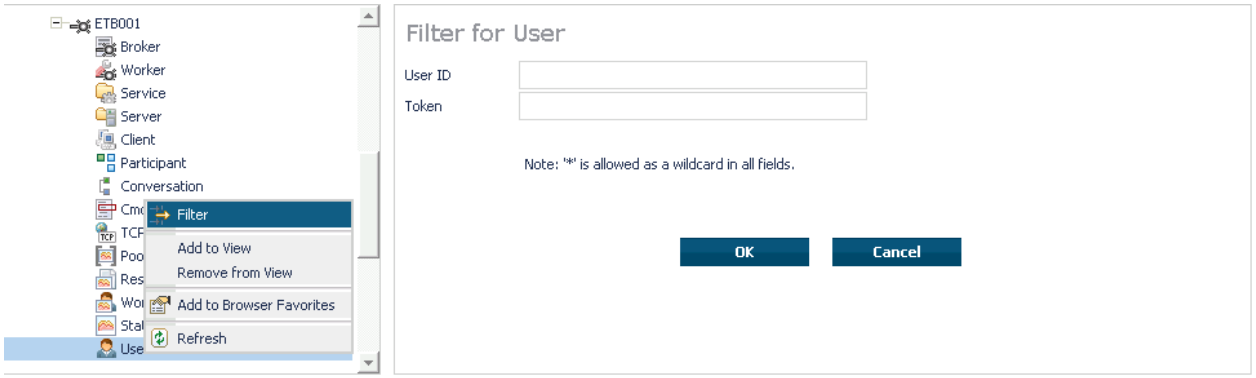
Note: The broker must be running in order to display the User subtree.

3 Select the user.

4 From the context menu, choose **Filter**.

5 Enter the data for User ID and Token that you would like to filter.

6 Choose **OK**.



Filtering Participants

To filter participants

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Click on the "+" sign of the broker name to be administered.

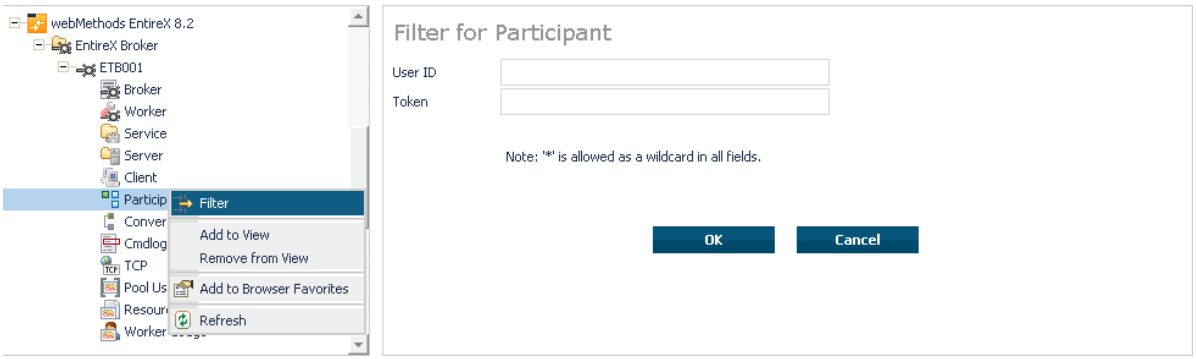
Note: The broker must be running in order to display the Client subtree.

3 Select **Participant**.

4 From the context menu, choose **Filter**.

5 Enter the data for **UserID** or **Token** that you would like to filter.

6 Choose **OK**.



Filtering the Persistent Store

To filter the persistent store

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the broker instance on which the unit of work is present. The persistent store attributes (such as `PSTORE`, `PSTORE-TYPE`, `STORE`, `DEFERRED`, and `UWSTATP` etc.) must be configured and the broker must be running in order to display the **Persistent Store**.

3 Select the **Persistent Store** node to display a summary list of units of work.

Note: A message box will pop up if the table is larger than 3,000 rows. You may prefer to apply a filter to your UOW table. See the filter command in the command menu. It might take several minutes to display all of the contents if you choose not to use the filter.

4 Choose **Filter**.

5 Click the check boxes for **Received**, **Accepted**, **Delivered**, **Backed Out**, **Processed**, **Cancelled**, **Timed Out** or **Discarded** that you would like to filter.

6 Choose **OK**.

Filtering the Publication

To filter the publication

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the Broker instance on which the publication is present.

> **Note:** Pub/Sub must be enabled in the Broker attribute file, a license file for Pub/Sub must be installed, the Broker must be running, and a user must be published for a topic in order to display the data for the publication.

3 Select **Publication**.

4 From the context menu, choose **Filter**.

5 Enter the data for **Topic**, **User ID** or **Token** and **Publication ID**.

6 Choose **OK**.

Filtering the Publisher

To filter the publisher

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the Broker instance on which the publisher is present.

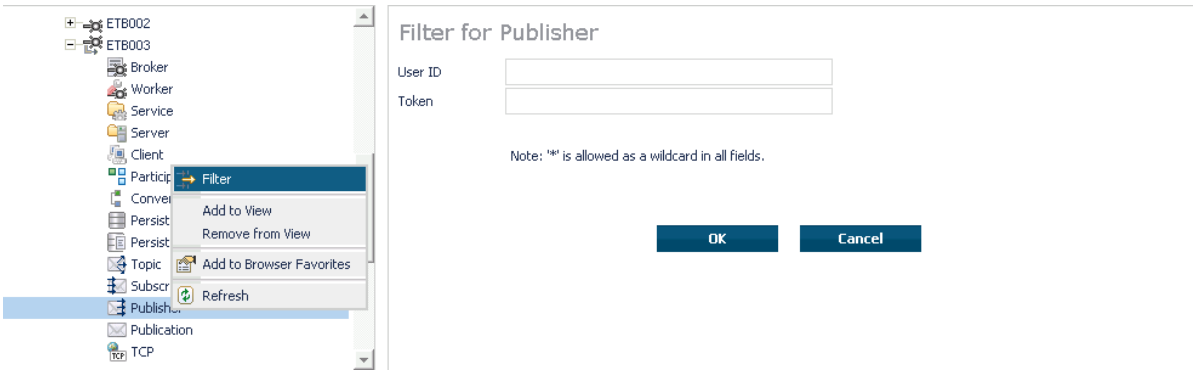
> **Note:** Pub/Sub must be enabled in the Broker attribute file, a license file for Pub/Sub must be installed, the Broker must be running, and a user must be published for a topic in order to display the data for the publisher.

3 Select **Publisher**.

4 From the context menu, choose **Filter**.

5 Enter the data for **User ID** and **Token** that you would like to filter.

6 Choose **OK**.



Filtering Servers

To filter servers

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Click on the "+" sign of the broker name to be administered.

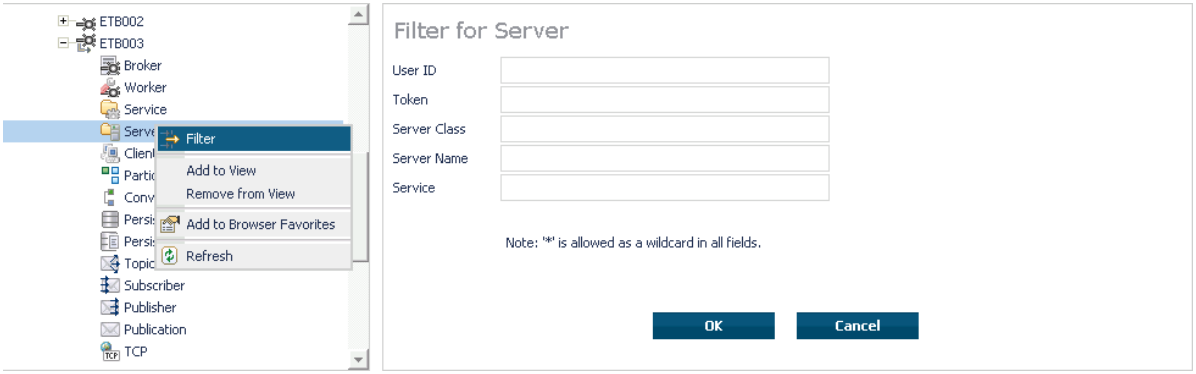
Note: The broker must be running in order to display the Server subtree.

3 Select **Server**.

4 From the context menu, choose **Filter**.

5 Enter the data for **UserID**,**Token**,**Server Class**,**Server Name** or **Service**.

6 Choose **OK**.



Filtering Services

To filter services

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Click on the "+" sign of the broker name to be administered.

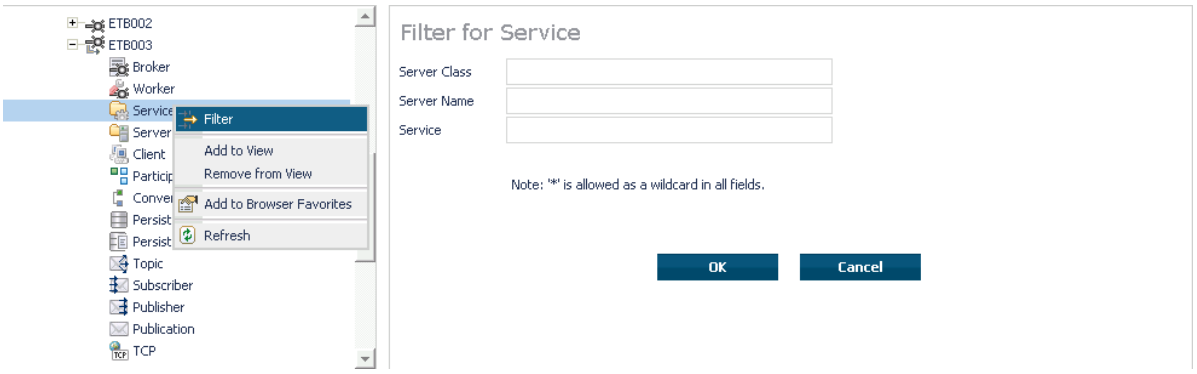
Note: The broker must be running in order to display the Service subtree.

3 Select **Service**.

4 From the context menu, choose **Filter**.

5 Enter the data for **Server Class**, **Server Name** and **Service**.

6 Choose **OK**.



Filtering the Subscriber

To filter the subscriber

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the Broker instance on which the subscriber is present.

> **Note:** Pub/Sub must be enabled in the Broker attribute file, a license file for Pub/Sub must be installed, the Broker must be running, and a user must be subscribed to a topic in order to display the data for the subscriber.

3 Select **Subscriber**.

4 From the context menu, choose **Filter**.

5 Enter the data for **Topic**, **User ID**, **Token**; select **Subscription Type**, **Active Subscriber** and **Swapped Out** that you would like to filter.

6 Choose **OK**.

Filtering the Topic

To filter the topic

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the Broker instance on which the topic is present.

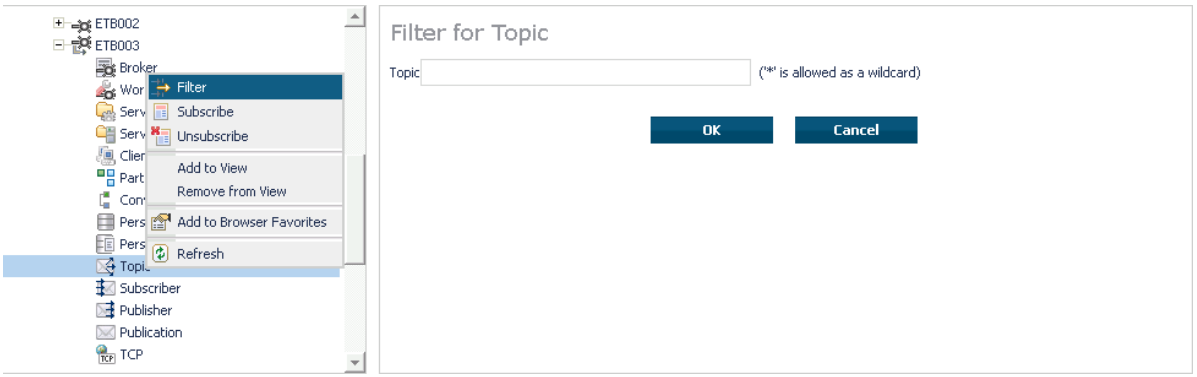
> **Note:** Pub/Sub must be enabled in the Broker attribute file, a license file for Pub/Sub must be installed, the Broker must be running, and a user must be subscribed to a topic in order to display the data for the topic.

3 Select **Topic**.

4 From the context menu, choose **Filter**.

5 Enter the data for the **Topic** that you would like to filter.

6 Choose **OK**.



16 Using the Broker Command Service with SMH

Connecting/Disconnecting Persistent Store

To connect or disconnect a Persistent Store

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

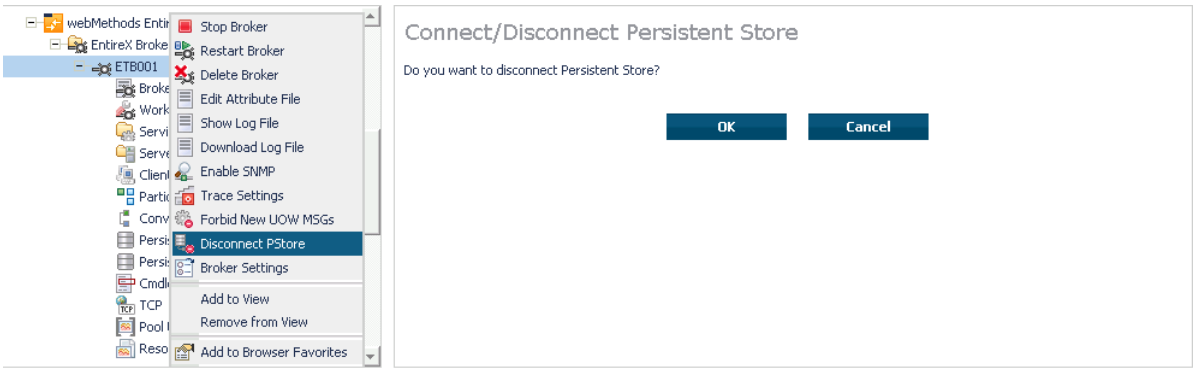
2 Select the broker instance to be administered.

3 To connect a persistent store, select **Connect PStore**.

4 To disconnect a persistent store, select **Disconnect PStore**.

As a result, a confirmation screen will appear.

5 Choose **OK** or **Cancel**.



Allowing and Forbidding new UOW Messages

To allow or forbid a Broker instance to accept new unit-of-work messages

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

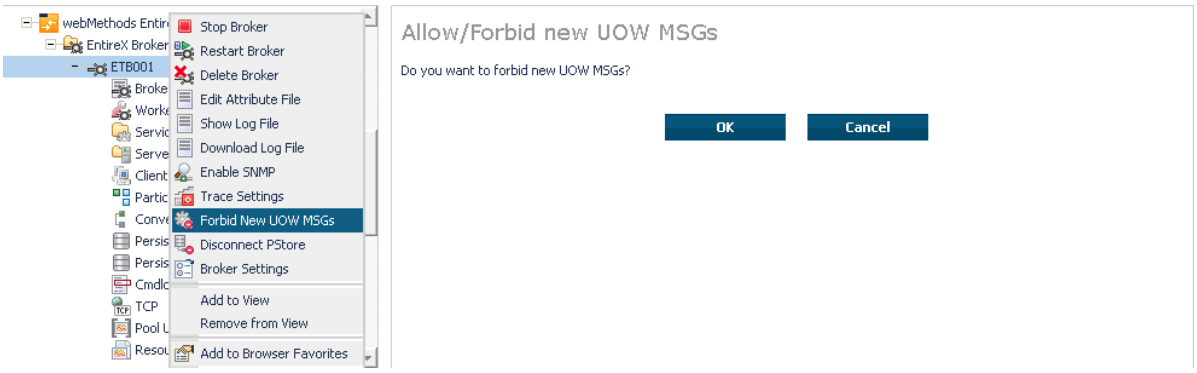
2 Select the broker instance to be administered.

3 To allow new unit-of-work messages, select **Allow new UOW MSGs**.

4 To forbid new unit-of-work messages, select **Forbid new UOW MSGs**.

As a result, a confirmation screen will appear.

5 Choose **OK** or **Cancel**.



Setting a Broker Instance's Trace Level

To set a broker instance's trace level

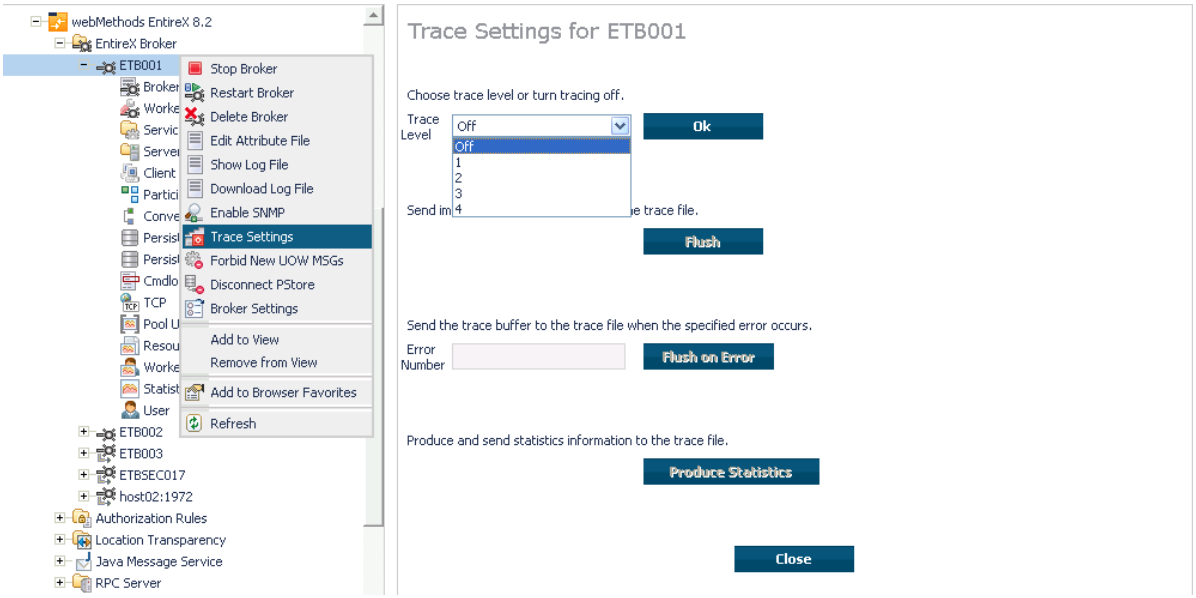
1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the broker instance to be administered.

3 Choose **Trace Settings**.

4 Select a **Trace Level** between 1 and 4 or off.

5 Choose **OK**.



Flushing a Broker Instance's Trace Buffer

To flush a broker instance's trace buffer

1 Select the **EntireX Broker** node below the **EntireX** node in **System Management**.

2 Select the broker instance to be administered.

3 Choose **Trace Settings**.

4 **Trace Level** must be between 1 and 4. Press **Flush** to confirm.

Flushing a Broker Instance's Trace Buffer on Error

To flush a broker instance's trace buffer

1 Select the **EntireX Broker** node below the **EntireX** node in **System Management**.

2 Select the broker instance to be administered.

3 Choose **Trace Settings**.

4 **Trace Level** must be between 1 and 4. Enter a number between 1 and 9999 in the **Error Number** field and press **Flush on Error**.

Producing Statistics of a Broker Instance

To produce statistics of a broker instance

1 Select the **EntireX Broker** node below the **EntireX** node in **System Management**.

2 Select the broker instance to be administered.

3 Choose **Trace Settings**.

4 **Trace Level** must be between 1 and 4. Press **Produce Statistics**.

Setting the Persistent Store Trace Level

To set the persistent store trace level

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

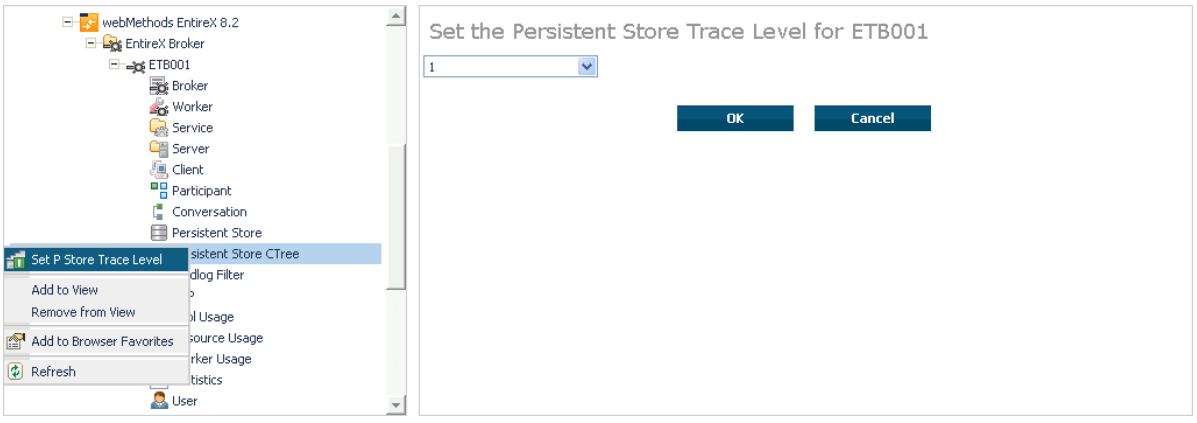
2 Select the broker instance to be administered.

3 Select a subnode of **Persistent Store** (either **Persistent Store ADA** or **Persistent Store CTree**).

4 Choose **Set Trace Level**.

5 Select a **Trace Level** between 1 and 4 or off.

6 Choose **OK**.



Setting the Security Trace Level

To set the security trace level

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the broker instance to be administered.

3 Select **Security**.

4 Set the security trace level by selecting a value between 1 and 4 in the **Set the Trace Level** box.

5 Choose **OK**.

Deregistering a Server

To deregister a server

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the broker instance on which the server is running.

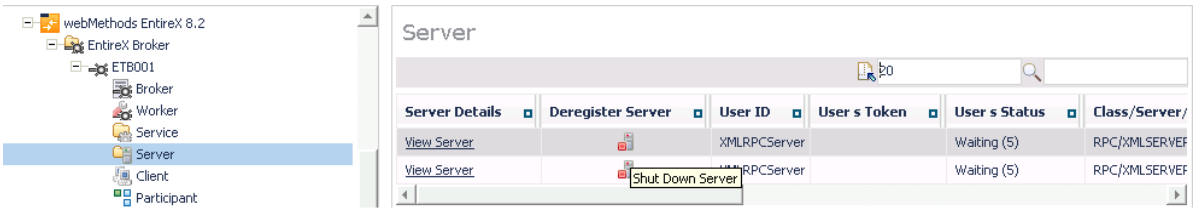
3 Select the **Server** node to display a summary list of servers.

4 From the column **Deregister Server**, choose icon **Shut Down Server**.

5 Choose the deregistration mode.

For deregister immediately, a server process will only be terminated if the server status is wait.

6 Confirm the deregistration by choosing **OK**.



Deregistering a Service

To deregister a service

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

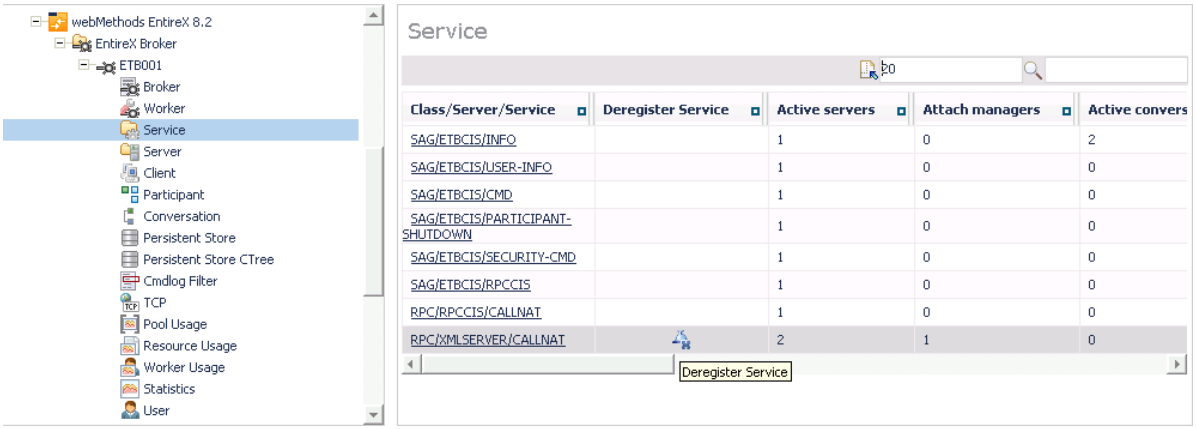
2 Select the broker instance on which the server is running.

3 Select the Service node to display a summary list of servers.

4 From the column **Deregister Service**, choose icon **Deregister Service**.

5 Choose the deregistration mode.

6 Confirm the deregistration by choosing **OK**.



Purging Unit(s) of Work

To purge a unit of work

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

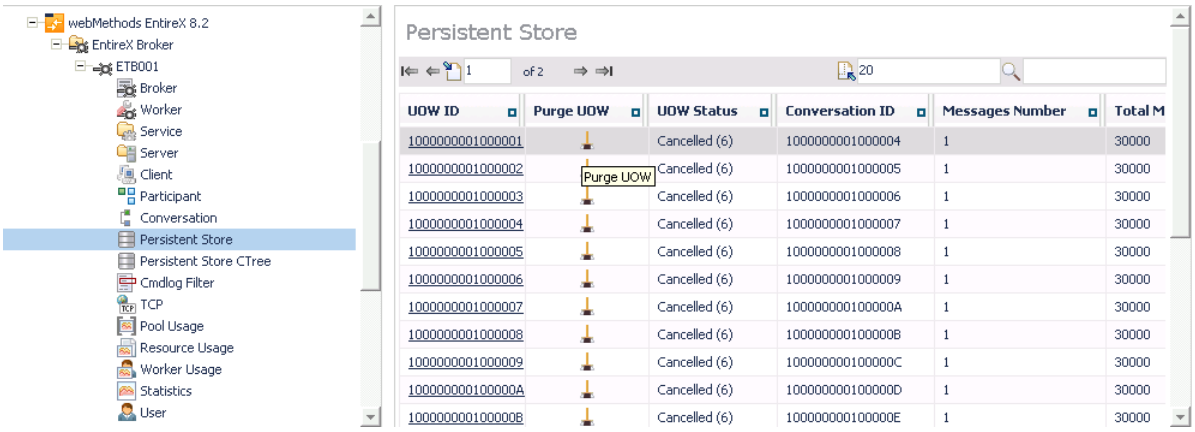
2 Select the broker instance on which the unit of work is present.

3 Select the **Persistent Store** node to display a summary list of units of work.

Note: A message box will pop up if the table is larger than 3,000 rows. You may prefer to apply a filter to your UOW table. See the filter command in the command menu. It might take several minutes to display all of the contents if you choose not to use the filter.

4 Choose **Purge**.

5 Choose **OK**.



To purge all units of work

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

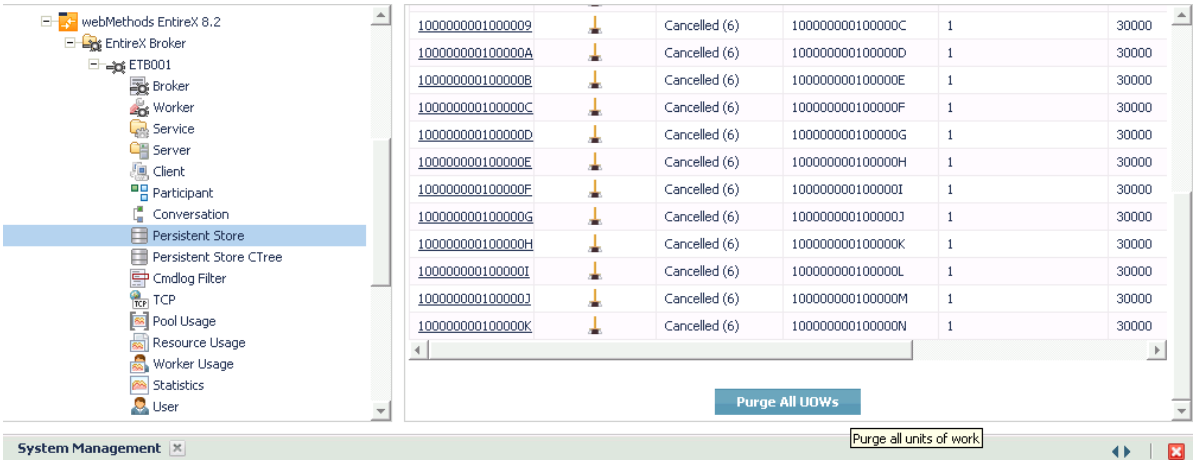
2 Select the broker instance on which the units of work are present.

3 Select the **Persistent Store** node to display a summary list of units of work.

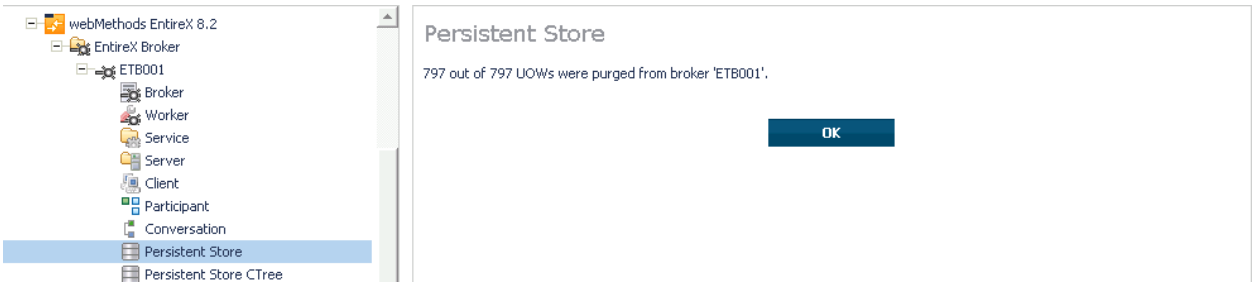
Note: A message box will pop up if the table is larger than 3,000 rows. You may prefer to apply a filter to your UOW table. See the filter command in the command menu. It might take several minutes to display all of the contents if you choose not to use the filter.

4 Choose **Purge All UOWs** at the bottom of the table. A confirmation message will appear.

5 Choose **OK** or **Cancel**.



All units of work will be purged. The number of purged UOWs is reported in a screen similar to the one below.



Subscribing a User

To subscribe a user

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the Broker instance on which the topic (or subscriber) is present.

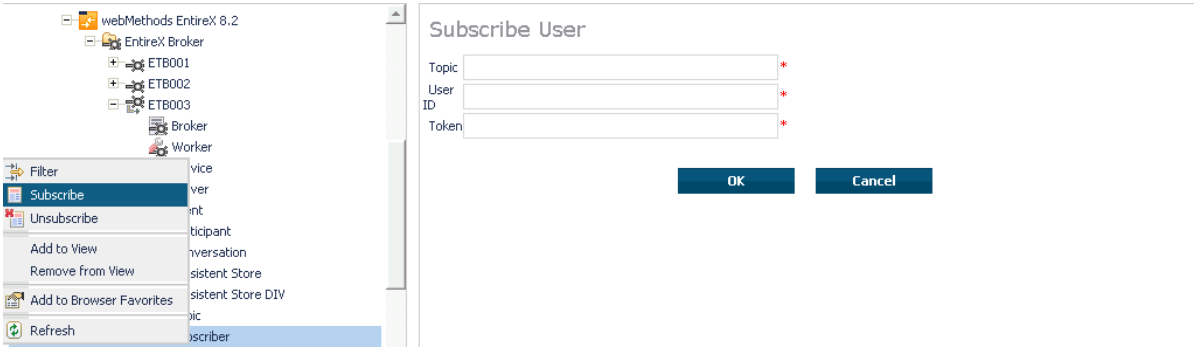
> **Note:** Pub/Sub must be enabled in the Broker attribute file, a license file for Pub/Sub must be installed, and the Broker must be running in order to display the topic (or subscriber).

3 Select **Topic** (or **Subscriber**).

4 From the context menu, choose **Subscribe**.

5 If you are on the **Topic** node, enter the data for **User ID** and **Token**; if you are on the **Subscriber** node, specify the topic that you would like to subscribe to.

6 Choose **OK**.



Unsubscribing a User

To unsubscribe a user

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the Broker instance on which the topic (or subscriber) is present.

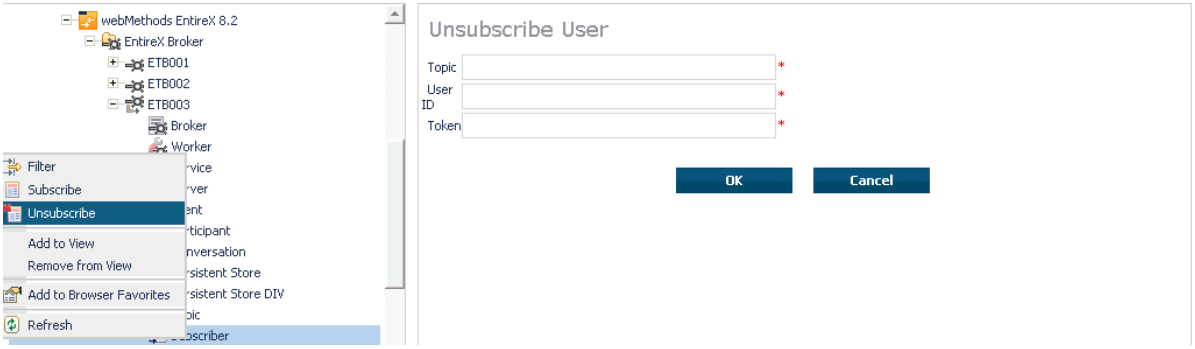
> **Note:** Pub/Sub must be enabled in the Broker attribute file, a license file for Pub/Sub must be installed, and the Broker must be running in order to display the topic (or subscriber).

3 Select **Topic** (or **Subscriber**).

4 From the context menu, choose **Unsubscribe**.

5 If you are on the **Topic** node, enter the data for **User ID** and **Token**; if you are on the **Subscriber** node, specify the topic that you would like to unsubscribe from.

6 Choose **OK**.



Logging Off a Subscriber

To log off a subscriber

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the Broker instance on which the subscriber is present.

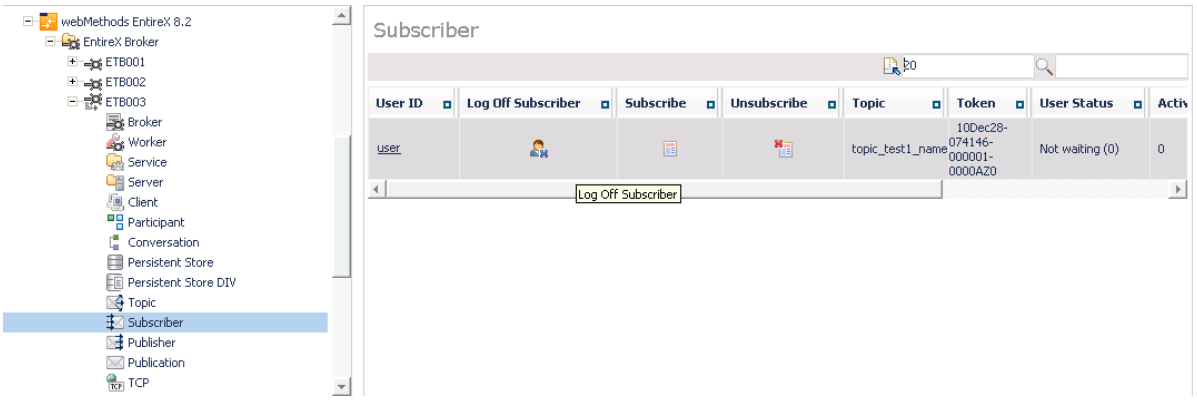
> **Note:** Pub/Sub must be enabled in the Broker attribute file, a license file for Pub/Sub must be installed, the Broker must be running, and a user must be subscribed to a topic in order to display the data for the subscriber.

3 Select **Subscriber**.

4 From the context menu, choose **Logoff**.

5 Choose the logoff mode.

6 Choose **OK**.



Logging Off a Publisher

To log off a publisher

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the broker instance on which the Publisher is present.

> **Note:** Pub/Sub must be enabled in the broker attribute file, a license file for Pub/Sub must be installed, the broker must be running, and a user must be published from a topic in order to display the data for the Publisher.

3 Select **Publisher**.

4 Choose **Logoff**.

5 Choose the logoff mode.

6 Choose **OK**.

7 After a Publisher is shut down successfully, it will be removed from the list.

Enabling/Disabling Cmdlog

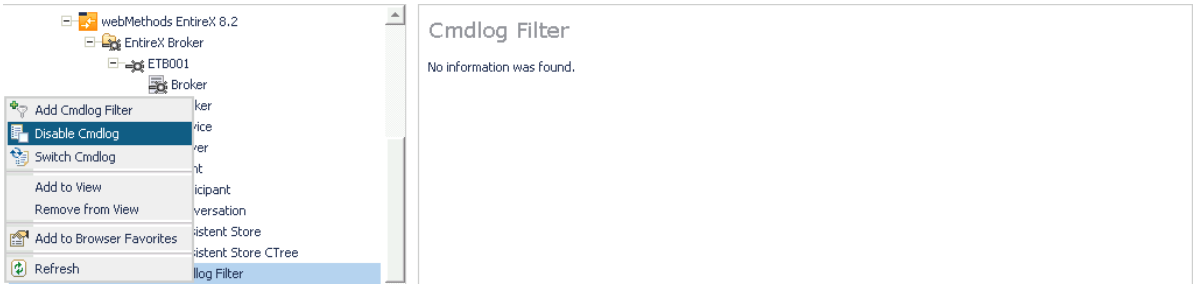
To enable/disable cmdlog

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the broker instance on which the Cmdlog filter is present. Cmdlog must be enabled in the broker attribute file and the broker must be running.

3 From the context menu, choose **Cmdlog Filter**.

4 Choose **Enable Cmdlog** or **Disable Cmdlog**.



Switching Cmdlog

To switch cmdlog

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the broker instance on which the Cmdlog filter is present. Cmdlog must be enabled in the broker attribute file and the broker must be running.

3 From the context menu, choose **Cmdlog Filter**.

4 Choose **Switch Cmdlog**.

Adding Cmdlog Filter

To add a cmdlog filter

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

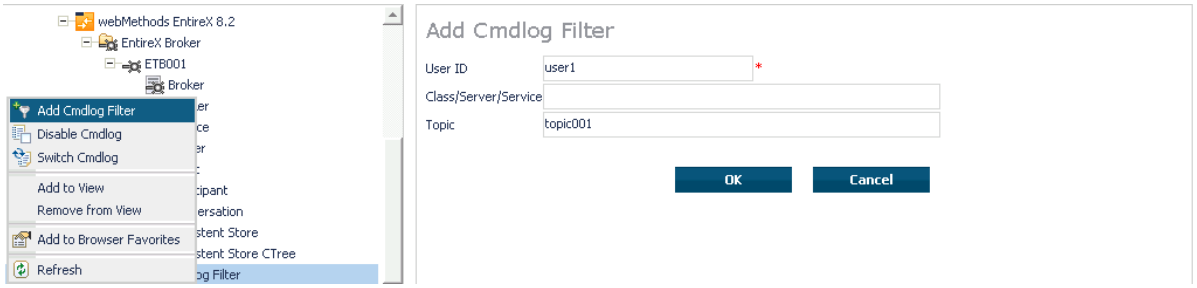
2 Select the broker instance on which the Cmdlog filter is present. Cmdlog must be enabled in the broker attribute file and the broker must be running.

3 From the context menu, choose **Cmdlog Filter**.

4 Choose **Add Cmdlog Filter**.

5 Enter the data for user ID and Class/Server/Service or Topic you would like to filter.

6 Choose **OK** to add a Cmdlog filter to the list.



Enabling/Disabling Cmdlog Filter

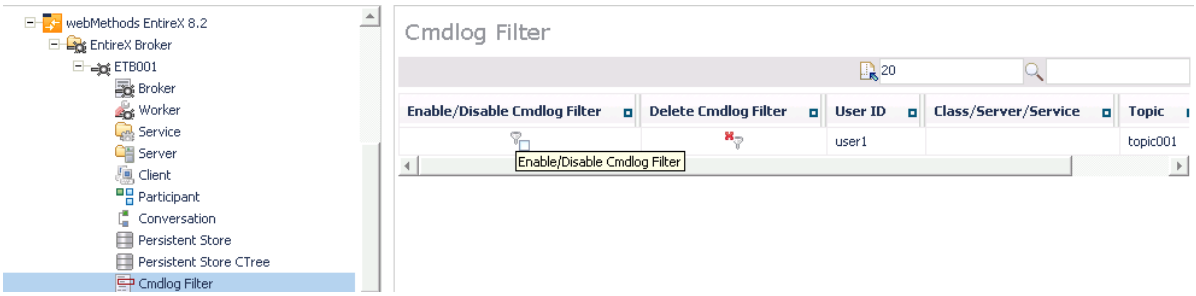
To enable/disable a cmdlog filter

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the broker instance on which the Cmdlog filter is present. Cmdlog must be enabled in the broker attribute file and the broker must be running.

3 From the context menu, choose **Cmdlog Filter**.

4 Choose **Enable Cmdlog Filter** or **Disable Cmdlog Filter**.



Deleting Cmdlog Filter

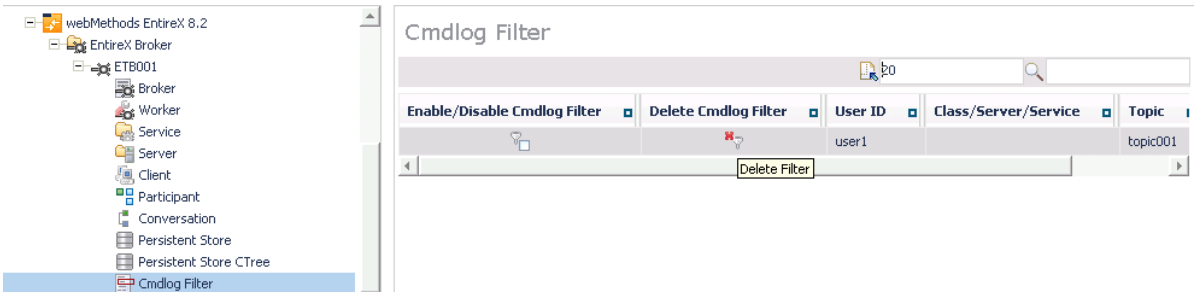
To delete a cmdlog filter

1 Select the **EntireX Broker** node below the EntireX node in **System Management**.

2 Select the broker instance on which the Cmdlog filter is present. Cmdlog must be enabled in the broker attribute file and the broker must be running.

3 From the context menu, choose **Cmdlog Filter**.

4 Choose **Delete Cmdlog Filter** to remove a Cmdlog filter from the list.



VII

17 EntireX Broker Reporting

This chapter details the reporting options of EntireX Broker.

Configuration Report

EntireX Broker reads configuration information from an attribute file during startup. In order to reduce the number of different attribute files, you may define a global attribute file and specify the individual settings within a variable definitions file. Thus unique attributes like `BROKER-ID` and `PORT` are kept as part of the variable definitions file, while other parameters such as service definitions can be shared among a group of Broker instances. This feature is described in detail in *Variable Definition File* under *Broker Attributes* in the administration documentation.

In the past there was a one-to-one relationship between Brokers and attribute files. To determine your Broker configuration, you could reference your attribute file. Now that you may create a global attribute file and substitute parameters at startup, it may not be clear what configuration was used to start your Broker. To see the exact configuration used at startup, you can now view the configuration report for each Broker. The configuration report will display exactly which values were used for each attribute at startup.

Here is a sample configuration report:

```
EntireX 8.0.0.12     Configuration Report      2007-10-02 08:56:23    Page     1

Variable definitions file:
   1: BID = ETB191
   2: N   = 113
   3: P   = HOT
   4: PCA = localhost:3938:SSL
   5: PT  = ADABAS
   6: RM  = STANDARD
   7: SP  = 3939
   8: TP  = 3930
   9: TR  = SSL-TCP-NET
EntireX 8.0.0.0     Configuration Report      2007-10-02 08:56:23    Page     2

Attribute file:
   1: ************************************************************************
   2: *                                                                      *
   3: *                    EntireX Broker Attribute File                     *
   4: *                                                                      *
   5: ************************************************************************
   6:
   7: ******************** Global section ***********************************
   8:
   9: DEFAULTS = BROKER
  10:   ABEND-MEMORY-DUMP              = NO
  11:   ACCOUNTING                     = NO
  12:   AUTOLOGON                      = YES
```

```
  13:   BROKER-ID                       = ${BID}
- - - - Substitution: ${BID} = ETB191
  14:   CLIENT-NONACT                   = 15M
```

The contents of the variable definitions file and the contents of the attribute file are copied to this configuration report. In addition, all variables in the attribute file will be appended by another line reporting the effective value for the variable. Thus, it's possible to keep track of the substitution procedure.

On UNIX and Windows, a file called `CONFIG.REPORT` is created in the current working directory of Broker. The environment variable `ETB_CONFIG_REPORT` may contain an alternative location. However, on z/OS, `DDNAME ETBCREP` is required to assign an output file for this report. Any failure will trigger a diagnostic message in the Broker log.

Load Module Report

The Load Module Report is created during startup of EntireX Broker on z/OS. All modules in all data sets concatenated to the `STEPLIB` chain for Broker execution are listed.

```
Operating System: z/OS 06.00
Node Name:        DAEF
IPL Date:         2007-10-02
IPL Time:         07:19:21
CPU Model:        2096

EntireX 8.0.0.12     Load Module Report 2007-10-02 08:56:23    Page     1
Total  Module   Date       Time  VRSPP Build number     Alias Level CurNo
                Steplib level 0: SAG.EXB731.LOAD
    1  ADAACK                                            NO      0     1
    2  ADABSP                                            NO      0     2
    3  ADACDC                                            NO      0     3
    4  ADACLU                                            NO      0     4
    5  ADACLX                                            NO      0     5
    6  ADACMO                                            NO      0     6
    7  ADACMP                                            NO      0     7
    8  ADACMR                                            NO      0     8
    9  ADACMU                                            NO      0     9
   10  ADACNS                                            NO      0    10
   11  ADACNV                                            NO      0    11
...
  156  ETBCMD   2007-10-01 15.48 73012 2007-10-01 15:01   NO      0   156
  157  ETBINFO  2007-10-01 15.48 73012 2007-10-01 15:01   NO      0   157
  158  ETBMISC                                           NO      0   158
  159  ETBNATTR 2007-10-01 15.48 73012 2007-10-01 15:01   NO      0   159
  160  ETBNUC   2007-10-01 15.48 73012 2007-10-01 15:01   NO      0   160
```

This report provides STEPLIB level, date, and time stamps if a certain pattern is used for the module structure. `DDNAME ETBMREP` must be assigned to get this report.

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.

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

z/OS

`DDNAME ETBSREP` assigns the report file. Format `RECFM=FB, LRECL=121` is used.

UNIX and Windows

Broker creates a file with the name *STORAGE.REPORT* in the current working directory. If the environment variable `ETB_STORAGE_REPORT` is supplied, the file name specified in the environment variable will be used. If Broker receives the command-line argument `-r`, the token following argument `-r` will be used as the file name.

BS2000/OSD

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

z/VSE

Logical unit `SYS015` and logical file name *ETBSREP* are used. Format `RECORD-FORMAT=FB, RECORD-LENGTH=121` is used.

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.

Persistent Store Report

You can create an optional report file that provides details about all records added to or deleted from the persistent store. This section details how to create the report and provides a sample report.

- Configuration
- Sample Report

Configuration

To create a persistent store report, use Broker's global attribute `PSTORE-REPORT` with the value `YES`.

When the attribute value `YES` is supplied, all created or deleted persistent records will be reported if the output mechanism is available.

If the value `NO` is specified, no report will be created.

The report file is created using the following rules:

BS2000/OSD

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

UNIX

Broker creates a file with the name *PSTORE.REPORT* in the current working directory. The file name *PSTORE.REPORT.LOAD* will be used if Broker is started with `RUN-MODE` = `PSTORE-LOAD`.

The file name *PSTORE.LOAD.UNLOAD* will be used if Broker is started with `RUN-MODE` = `PSTORE-UNLOAD`.

If the environment variable `ETB_PSTORE_REPORT` is supplied, the file name specified in the environment variable will be used.

If Broker receives the command-line argument `-p`, the token following argument `-p` will be used as the file name.

Windows

Same as UNIX.

z/OS

`DDNAME ETBPREP` assigns the report file. Format `RECFM=FB, LRECL=121` is used.

z/VSE

Logical unit `SYS003` and logical file name *ETBPREP* are used. Format `RECORD-FORMAT` = `FB`, `RECORD-LENGTH` = `121` is used.

Sample Report

The following is an excerpt from a sample `PSTORE` report.

```
EntireX 8.0.0.00     PSTORE Report      2008-02-21 17:18:38    Page     1

Identifier        Elements  Total length  Record Type   Date       Time          ↩
Action
10000000D000016        5          1148   Conversation  2008-02-21 17:18:57.190  ↩
Created
10000000D000017        5          1148   Conversation  2008-02-21 17:18:57.654  ↩
Created
10000000D000018        5          1148   Conversation  2008-02-21 17:18:58.122  ↩
Created
10000000D000019        5          1148   Conversation  2008-02-21 17:18:58.590  ↩
Created
10000000D00001A        5          1148   Conversation  2008-02-21 17:18:59.054  ↩
```

```
Created
100000000D00001B        5          1148   Conversation  2008-02-21 17:18:59.518  ↩
Created
100000000D00001C        5          1148   Conversation  2008-02-21 17:18:59.982  ↩
Created
100000000D00001D        5          1148   Conversation  2008-02-21 17:19:00.538  ↩
Created
100000000D00001E        5          1148   Conversation  2008-02-21 17:19:01.002  ↩
Created
100000000C000001        0             0   Conversation  2008-02-21 17:19:30.676  ↩
Deleted
100000000C000002        0             0   Conversation  2008-02-21 17:19:31.675  ↩
Deleted
100000000C000003        0             0   Conversation  2008-02-21 17:19:32.675  ↩
Deleted
100000000C000004        0             0   Conversation  2008-02-21 17:19:33.675  ↩
Deleted
100000000C000005        0             0   Conversation  2008-02-21 17:19:34.675  ↩
Deleted
100000000C000006        0             0   Conversation  2008-02-21 17:19:35.675  ↩
Deleted
```

The following fields are provided in the report:

- `Identifier` provides the UOWID (record ID).
- `Elements` gives the number of messages per UOW when creating or loading records.
- `Total Length` gives the size of the raw record when creating or loading records.
- `Record Type` describes the type of the data. Following types are currently supported:
  - `Cluster`: a special record for synchronization purposes
  - `Conversation`: a unit of work as part of a conversation
  - `Master`: a special record to manage the persistent store
  - `Publication`: a record containing a publication for a durable topic
  - `Subscription`: a record containing subscriber data (if `SUBSCRIBER-STORE` = `PSTORE`) is defined
- Date and time of the action
- `Action` describes the action of Broker. The following actions are currently supported:
  - `Created`: record is created
  - `Deleted`: record is deleted
  - `Loaded`: record is loaded (Broker instance with `RUN-MODE` = `PSTORE-LOAD`)
  - `Unloaded`: record is unloaded (Broker instance with `RUN-MODE` = `PSTORE-UNLOAD`)

License Report

The License Report is created during broker startup on the respective platform. It contains the contents of the license file itself and some machine data.

z/OS

DDNAME `ETBLREP` must be assigned to get this report. See *Step 2: Edit the Broker Startup Procedure* in the z/OS installation documentation.

BS2000/OSD

`LINK-NAME ETBLREP` must be assigned to get this report.

18 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 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.

Under UNIX and Windows, the startup options `-y` and `-z` are evaluated by executable `etbnuc`. These options are used to specify the command log file names. Startup script/service assign these files by default.

Under z/OS, the file requirements are two equally sized, physical sequential files defined with a record length of 121 bytes, i.e. `DCB=(LRECL=121,RECFM=FB,BLKSIZE=nnnn)`. We recommend you allocate files with a single (primary) extent only. For example `SPACE=(CYL,(30,0))`. The minimum file size is approximately 3 cylinders of 3390 device. Alternatively, the dual command log files can be allowed in USS HFS file system.

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. Under UNIX and z/OS you can also use command line tool `etbcmd`. 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.

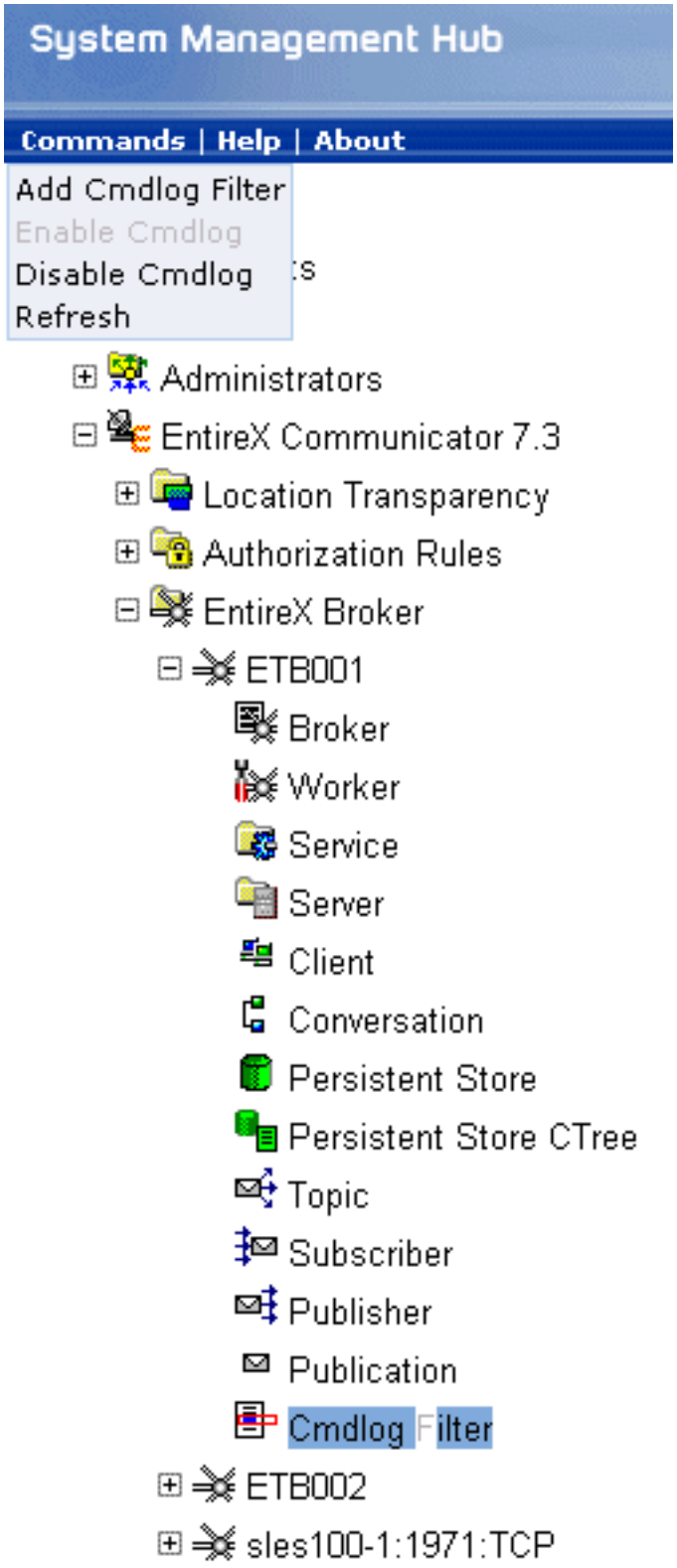
If this field is set, the accompanying request and the Broker's response to this request is logged to the command log file.

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

Command Log Filtering using System Management Hub

Setting up your Environment

In order to process filters using System Management Hub, Broker attribute `CMDLOG` must be set to "YES" and the log files must be defined. See *Command Log Files* above. If this is the case, the **CmdlogFilter** node will be visible in the SMH tree.


System Management Hub
Commands | Help | About
Add Cmdlog Filter
Enable Cmdlog
Disable Cmdlog
Refresh
Administrators
EntireX Communicator 7.3
Location Transparency
Authorization Rules
EntireX Broker
ETB001
Broker
Worker
Service
Server
Client
Conversation
Persistent Store
Persistent Store CTree
Topic
Subscriber
Publisher
Publication
Cmdlog Filter
ETB002
sles100-1:1971:TCP

Adding a Filter

To add a filter

1 In the SMH tree view, select the **CmdlogFilter** node and, with the context menu, choose **Add Cmdlog Filter**.

2 In the **Add Cmdlog Filter** screen, add values for User ID, Class/Server/Service or Topic. Confirm with **OK**.

Managing Filters

The following **Cmdlog Filter** screen shows four filters. Use this screen to

- delete a filter
- disable a filter
- enable a disabled filter

Cmdlog Filter (Global Cmdlog currently enabled)

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Delete Button	Enable/Disable Button	User ID	Class/Server/Service	Topic	Enabled
Delete	Disable	USER_1	SAG/ETBCIS/SAGCCV5		Y
Delete	Disable	USER_1	SAG/ETBCIS/SAGCIV5		Y
Delete	Enable	USER_1	RCP/SAGCCV5/CALLNAT		N
Delete	Disable	USER_1	RPC/SAGCIV5/CALLNAT		Y

Items 1 to 4 of 4

Note: You cannot change the values for User ID, Class/Server/Service or Topic in the **Cmdlog Filter** screen. Instead, delete the command log filter and add a new one with the required values.

Command Log Filtering using Command-line Interface ETBCMD

The examples assume that Broker has been started with the attribute `CMDLOG=Y`.

- Disabling and Enabling a Filter

Setting Filters

Filters need to be set before running the stub applications whose commands are to be logged.

UNIX

Command	Description
`etbcmd -blocalhost:1970:TCP -cSET-CMDLOG-FILTER -dBROKER -xuser -nACLASS/ASERVER/ASERVICE`	This command sets filters on `ACLASS/ASERVER/ASERVICE`. All ACI calls issued by *all* users to this service will be logged.
`etbcmd -blocalhost:1970:TCP -cSET-CMDLOG-FILTER -dBROKER -xuser -nACLASS/ASERVER/ASERVICE -Usaguser1`	This command set filters on `ACLASS/ASERVER/ASERVICE` and user ID `saguser1`. All ACI calls to this service *as well as* those issued by `saguser1` will be logged.
`etbcmd -blocalhost:1970:TCP -cSET-CMDLOG-FILTER -dBROKER -xuser -TNYSE -Usaguser1`	This command set filters on topic `NYSE` and user ID `saguser1`. All ACI calls to this topic *as well as* those issued by `saguser1` will be logged.

z/OS

Command	Description

`//ETBCMD EXEC PGM=ETBCMD,`
`// PARM=('/-blocalhost:1970:TCP ↩`
`-cSET-CMDLOG-FILTER -xuser ',`
`//  '-dBROKER ↩`
`-nACLASS/ASERVER/ASERVICE')`
	This command sets filters on `ACLASS/ASERVER/ASERVICE`. All ACI calls issued by *all* users to this service will be logged.

`//ETBCMD EXEC PGM=ETBCMD,`
`// PARM=('/-blocalhost:1970:TCP ↩`
`-cSET-CMDLOG-FILTER -xuser ',`
`//  '-dBROKER -nACLASS/ASERVER/ASERVICE ↩`
`-Usaguser1')`
	This command sets filters on `ACLASS/ASERVER/ASERVICE` and user ID `saguser1`. All ACI calls to this service *as well as* those issued by `saguser1` will be logged.

`//ETBCMD EXEC PGM=ETBCMD,`
`// PARM=('/-blocalhost:1970:TCP ↩`
`-cSET-CMDLOG-FILTER -xuser ',`
`//  '-dBROKER -TNYSE -Usaguser1')`
	This command sets filters on topic `NYSE` and user ID `saguser1`. All ACI calls to this topic *as well as* those issued by `saguser1` will be logged.

Note: If more than one service or topic is set as a filter, all ACI calls sent to any of these services or topics will be logged. Identical filters cannot be set. Attempts to set a second filter that matches an existing filter will be rejected. Similarly, the maximum number of filters that can be added is defined in `NUM-CMDLOG-FILTER`. If the maximum number of filters is already being used, delete an existing filter to make room for a new filter.

Deleting Filters

The following provides an example of how to delete an existing filter on a service.

To delete a filter

- Enter the following command.

  Under UNIX:

```
etbcmd -d BROKER -b localhost:1970:TCP -c CLEAR-CMDLOG-FILTER ↩
-nACLASS/ASERVER/ASERVICE -U saguser1
```

  Under z/OS:

```
//ETBCMD  EXEC PGM=ETBCMD,
// PARM=('/-blocalhost:1970:TCP -cCLEAR-CMDLOG-FILTER -xuser ',
//       '-dBROKER -nACLASS/ASERVER/ASERVICE')
```

  If the filter does not exist, the command will return an error.

Disabling and Enabling a Filter

Filters can be set and still be disabled (made inactive).

To disable a filter

- Enter the following command.

  Under UNIX:

```
etbcmd -blocalhost:1970:TCP -cDISABLE-CMDLOG-FILTER -dBROKER -xuser ↩
-nACLASS/ASERVER/ASERVICE -Usaguser1
```

  Under z/OS:

```
//ETBCMD  EXEC PGM=ETBCMD,
// PARM=('/-blocalhost:1970:TCP -cDISABLE-CMDLOG-FILTER -xuser ',
//       '-dBROKER -nACLASS/ASERVER/ASERVICE -Usaguser1')
```

  Note: A disabled filter will not bring down the count of filters in use.

To enable a filter

- Enter the following command to enable the disabled filter.

Under UNIX:

```
etbcmd -blocalhost:1970:TCP -cENABLE-CMDLOG-FILTER -dBROKER -xuser ↩
-nACLASS/ASERVER/ASERVICE -Usaguser1
```

Under z/OS:

```
//ETBCMD  EXEC PGM=ETBCMD,
// PARM=('/-blocalhost:1970:TCP -cENABLE-CMDLOG-FILTER -xuser ',
//       '-dBROKER -nACLASS/ASERVER/ASERVICE -Usaguser1')
```

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.

Under UNIX, the startup script uses file names `CMDLOGR1` and `CMDLOGR2`.

Under Windows, the keys `ETB_CMDLOG1` and `ETB_CMDLOG2` are entered in the Registry with values `CMDLOGR1` and `CMDLOGR2`.

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`.

To switch log files on demand, using `etbcmd` | `ETBCMD`

- An open command log file can be forcibly closed even before the size limit is reached. Enter the following command.

  Under UNIX:

```
etbcmd -blocalhost:1970:TCP -cSWITCH-CMDLOG -dBROKER -xuser
```

  Under z/OS:

```
//ETBCMD  EXEC PGM=ETBCMD,
// PARM=('/-blocalhost:1970:TCP -cSWITCH-CMDLOG -xuser ',
//       '-dBROKER')
```

  The command above will close the currently open file and open the one that has been dormant.