SeeBeyond ICAN Suite

e*Way Intelligent Adapter for CICS User's Guide

Release 5.0.5 for Schema Run-time Environment (SRE)

Monk Version

Contents

Chapter 1

Introduction

This chapter includes a brief description of IBM's Customer Information Control System (CICS), an overview of SeeBeyond Technology Corporation's (SeeBeyond™) e*Way Intelligent Adapter for CICS, as well as system requirements for using the e*Way.

1.1 Overview

The CICS e*Way is an interface that makes bidirectional calls to CICS transactional programs remotely. CICS is a transaction processor supporting a real-time distributed processing environment and also supports online transaction processing (OLTP).

IBM provides a CICS Client Gateway that has an API (the External Call Interface or ECI) to call CICS transactions on the mainframe. The ECI allows a non-CICS application program to call a CICS program in a CICS server. SeeBeyond's CICS e*Way uses this ECI method to connect to CICS.

The CICS e*Way includes a build tool, the Cobol Copybook Converter. This feature takes as input a Cobol Copybook file and creates e*Gate Event Type Definitions (ETDs) for use within the Monk environment. These Copybook file structures are passed into the CICS environment as the data buffer (COMMAREA).

The CICS e*Way has the following modes of operation:

- Inbound
- Outbound
- Request/reply

For more information, see **"Implementation" on page 33**. This user's guide explains how to install and configure the CICS e*Way.

1.1.1. Intended Reader

The reader of this guide is presumed to be a developer or system administrator with responsibility for maintaining the e*Gate system; to have expert-level knowledge of Windows operations and administration; to be thoroughly familiar with CICS and with Windows-style GUI operations.

1.1.2. Components

The CICS e*Way is comprised of the following components:

- The **stcewgenericmonk.exe** file, the executable component
- Configuration files, which the e*Way Editor uses to define configuration parameters
- Monk function scripts discussed in **CICS Functions** on page 50.

A complete list of installed files appears in **Table 1 on page 11**.

1.2 Supported Operating Systems

The CICS e*Way is available on the following operating systems:

- Windows 2000, Windows XP, and Windows Server 2003
- HP-UX 11.0 and 11i (PA-RISC)
- IBM AIX 5.1L and 5.2
- IBM z/OS V1.3 and V1.4
- Sun Solaris 8 and 9
- Japanese Windows 2000, Windows XP, and Windows Server 2003
- Japanese HP-UX 11.0 and 11i (PA-RISC)
- Japanese Sun Solaris 8 and 9
- Korean Windows 2000, Windows XP, and Windows Server 2003
- Korean HP-UX 11.0 and 11i (PA-RISC)

1.3 System Requirements

To use the CICS e*Way, you need the following:

- An e*Gate Participating Host.
- IBM's CICS Universal Client, version 3.0 or above, or IBM CICS Transaction Gateway version 4.0 with APAR PQ57730 applied, or IBM CICS Transaction Gateway 5.0.
- Either a TCP/IP or SNA connection:
  - CTG supports TCP/IP connectivity via TCP62 for all platforms.
  - IBM's Universal Client requires SNA communications software if running on AIX or Sun/Solaris.

- Additional disk space for e*Way executable, configuration, library, and script files. The disk space is required on both the Participating and the Registry Host. Additional disk space is required to process and queue the data that this e*Way processes; the amount necessary varies based on the type and size of the data being processed, and any external applications performing the processing.

The client components of CICS have their own requirements; see that system's documentation for more details.

1.4 External System Requirements

To enable the e*Way to communicate correctly with CICS, you need the following external requirements:

- CICS Transaction Server V1.3 or greater.

1.4.1. z/OS Configuration Requirements for the CICS Server

Full details on configuring z/OS for connection via TCP62 are available in the CICS Transaction Gateway, Client Administration manual for any specified platforms. These details are found in the chapter on "Setting Up Client/Server Communications."

The summarized requirements are as follows:

- Any of the VTAM AnyNet® releases must be installed.
- Install a TCP major node, which defines the AnyNet interface between TCP/IP and VTAM. For further information about how to do this, see the Guide to SNA over TCP/IP book, SC31-6527.
- Install a CDRSC major node, which defines the remote Client device and instructs VTAM to route any session requests through the TCP/IP Physical Unit (ALSLIST).
- Check that the Physical Unit (PU) for the AnyNet interface is active.
- On CICS, you must define an APPC connection to the client workstation. (The connection can be statically defined, or autoinstalled.)
- Add an entry to the VTAM logon mode (LOGMODE) table for the modename specified on the SESSIONS definition. This entry specifies the class of service required for the group of sessions.

Chapter 2

Installation

This chapter explains procedures for installing the CICS e*Way.

2.1 Windows Installation

2.1.1. Pre-installation

- Exit all Windows programs before running the setup program, including any anti-virus applications.
- You must have Administrator privileges to install this e*Way.

2.1.2. Installation Procedure

To install the CICS e*Way on a Windows system

1. Log in as an Administrator on the workstation on which you want to install the e*Way.
2. Insert the e*Way installation CD-ROM into the CD-ROM drive.
3. If the CD-ROM drive's Autorun feature is enabled, the setup application launches automatically; skip ahead to step 4. Otherwise, use the Windows Explorer or the Control Panel's **Add/Remove Applications** feature to launch the file **setup.exe** on the CD-ROM drive.
4. The InstallShield setup application launches. Follow the on-screen instructions to install the e*Way.

Be sure to install the e*Way files in the suggested **client** installation directory. The installation utility detects and suggests the appropriate installation directory. **Unless you are directed to do so by SeeBeyond support personnel, do not change the suggested "installation directory" setting.**

Once you have installed and configured this e*Way, you must incorporate it into a schema by defining and associating the appropriate Collaborations, Collaboration Rules, Intelligent Queues (IQs), and Event Types before this e*Way can perform its intended functions. For more information about any of these procedures, please see the online Help system.

2.2 UNIX

2.2.1. Pre-installation

You do not require root privileges to install this e*Way. Log in under the user name that you wish to own the e*Way files. Be sure that this user has sufficient privileges to create files in the e*Gate directory tree.

2.2.2. Installation Procedure

To install the CICS e*Way on a UNIX system

1. Log in on the workstation containing the CD-ROM drive, and insert the CD-ROM into the drive.
2. If necessary, mount the CD-ROM drive.
3. At the shell prompt, type

   cd /cdrom
4. Start the installation script by typing

   setup.sh
5. A menu of options will appear. Select the **Install e*Way** option. Then, follow the additional on-screen directions.

Be sure to install the e*Way files in the suggested **client** installation directory. The installation utility detects and suggests the appropriate installation directory. **Unless you are directed to do so by SeeBeyond support personnel, do not change the suggested "installation directory" setting.**

Note: *Once you have installed and configured this e*Way, you must incorporate it into a schema by defining and associating the appropriate Collaborations, Collaboration Rules, IQs, and Event Types before this e*Way can perform its intended functions. For more information about any of these procedures, please see the online Help system.*

2.3 Files/Directories Created by the Installation

The CICS e*Way installation process will install the following files, see the table **"Files Created by the Installation" on page 11**, within the e*Gate directory tree. Files will be installed within the **egate\client** tree on the Participating Host and committed to the **default** schema on the Registry Host.

Table 1 Files Created by the Installation

e*Gate Directory	File(s)
\bin\	stcewgenericmonk.exe stc_monkcics.dll
\configs\stcewgenericmonk\	stcewcics.def
\monk_library\ewcics\	cics-ack.monk cics-connect.monk cics-conn-shutdown.monk cics-exchange.monk cics-init.monk cics-nack.monk cics-notify.monk cics-outgoing.monk cics-shutdown.monk cics-startup.monk cics-verify.monk

Chapter 3

Configuration

You must configure the CICS e*Way before use. This chapter lists all the configuration parameters used by the e*Way together with all supporting information needed, including Monk configuration for connection to the external system.

3.1 e*Way Configuration Parameters

Set the e*Way configuration parameters, using the e*Way Editor.

To change e*Way configuration parameters

1. In the Schema Designer's Navigator/Component pane, select the e*Way you want to configure and display its properties.
2. Under **Configuration File**, click **New** to create a new file, **Find** to select an existing configuration file, or **Edit** to edit the currently selected file.
3. In the **Additional Command Line Arguments** text box, type any additional command line arguments that the e*Way may require, taking care to insert them *at the end* of the existing command-line string. Be careful not to change any of the default arguments unless you have a specific need to do so.

For more information about how to use the e*Way Editor, see the e*Way Editor's online Help or the *e*Gate Integrator User's Guide*.

This chapter explains the e*Way's configuration parameters under the following sections:

- General Settings
- Communication Setup
- Monk Configuration
- CICS Settings

3.1.1. General Settings

The General Settings control basic operational parameters.

Journal File Name

Description

Specifies the name of the journal file.

Required Values

A valid file name, optionally including an absolute path (for example, **c:\temp\filename.txt**). If an absolute path is not specified, the file is stored in the e*Gate **SystemData** directory. See the *e*Gate Integrator System Administration and Operations Guide* for more information about file locations.

Additional Information

An Event is journaled for the following conditions:

- When the number of resends is exceeded (see **Max Resends Per Message** below)
- When its receipt is due to an external error, but Forward External Errors is set to **No**. (See **"Forward External Errors" on page 13** for more information.)

Max Resends Per Message

Description

Specifies the number of times the e*Way attempts to resend an Event to the external system after receiving an error.

Required Values

An integer between 1 and 1,024. The default is 5.

Max Failed Messages

Description

Specifies the maximum number of failed Events that the e*Way allows. When the specified number of failed messages is reached, the e*Way shuts down and exits.

Required Values

An integer between 1 and 1,024. The default is 3.

Forward External Errors

Description

Selects whether error messages that begin with the string "DATAERR," which are received from the external system is queued to the e*Way's configured queue. See **"Exchange Data with External Function" on page 27** for more information.

Required Values

Yes or **No**. The default value, **No**, specifies that error messages are not forwarded. See **"Schedule-driven Data Exchange Functions" on page 21** for more information about how the e*Way uses this function.

Communication Setup

The Communication Setup parameters control the schedule by which the e*Way obtains data from the external system.

The schedule you set using the e*Way's properties in the Schema Designer controls when the e*Way executable file runs. The schedule you set within the parameters discussed in this section, using the e*Way Editor, determines when data is exchanged. Be sure you set the "exchange data" schedule to fall within the "run the executable" schedule.

Start Exchange Data Schedule

Description

Establishes the schedule to invoke the e*Way's **Exchange Data with External** function.

Required Values

One of the following values:

- One or more specific dates/times
- A single repeating interval (such as yearly, weekly, monthly, daily, or every *n* seconds).
- **Also Required —** If you set a schedule using this parameter, you must also define all three of the following functions:
  - **Exchange Data With External**
  - **Positive Acknowledgment**
  - **Negative Acknowledgment**

If you do not do so, the e*Way terminates execution when the schedule attempts to start.

Additional Information

When the schedule starts, the e*Way determines whether it is waiting to send a positive or negative acknowledgment to the external system (using the **Positive Acknowledgment** and **Negative Acknowledgment** functions) and whether the connection to the external system is active.

If no acknowledgment function is pending, and the connection is active, the e*Way immediately executes the **Exchange Data with External** function. Thereafter, the **Exchange Data with External** function is called according to the **Exchange Data Interval** parameter until the **Stop Exchange Data Schedule** time is reached.

See **"Exchange Data with External Function" on page 27**, **"Exchange Data Interval" on page 15**, and **"Stop Exchange Data Schedule" on page 14** for more information.

Stop Exchange Data Schedule

Description

Establishes the schedule to stop data exchange.

Required Values

One of the following values:

- One or more specific dates/times
- A single repeating interval (such as yearly, weekly, monthly, daily, or every *n* seconds).

Exchange Data Interval

Description

Specifies the number of seconds the e*Way waits between calls to the **Exchange Data with External** function during scheduled data exchanges.

Required Values

An integer between 0 and 86,400. The default is 120.

Additional Information

If **Zero Wait Between Successful Exchanges** is set to **Yes** and the **Exchange Data with External Function** returns data, the **Exchange Data Interval** setting is ignored, and the e*Way invokes the **Exchange Data with External Function** immediately.

If this parameter is set to zero, there is no exchange data schedule set and the **Exchange Data with External Function** is never called.

See **"DownTimeout" on page 15** and **"Stop Exchange Data Schedule" on page 14** for more information about the data-exchange schedule.

DownTimeout

Description

Specifies the number of seconds that the e*Way waits between calls to the **External Connection Establishment** function. See **"External Connection Establishment Function" on page 28** for more information.

Required Values

An integer between 1 and 86,400. The default is 15.

Up Timeout

Description

Specifies the number of seconds the e*Way waits between calls to the **External Connection Verification** function. See **"External Connection Verification Function" on page 29** for more information.

Required Values

An integer between 1 and 86,400. The default is 15.

Resend Timeout

Description

Specifies the number of seconds the e*Way waits between attempts to resend a Event (message) to the external system, after receiving an error message from the external system.

Required Values

An integer between 1 and 86,400. The default is 10.

Zero Wait Between Successful Exchanges

Description

Selects whether to initiate data exchange after the **Exchange Data Interval** or immediately after a successful previous exchange.

Required Values

Yes or **No**. If this parameter is set to **Yes**, the e*Way immediately invokes the **Exchange Data with External** function if the previous exchange function returned data. If this parameter is set to **No**, the e*Way always waits the number of seconds specified by **Exchange Data Interval** between invocations of the **Exchange Data with External** function. The default is **No**.

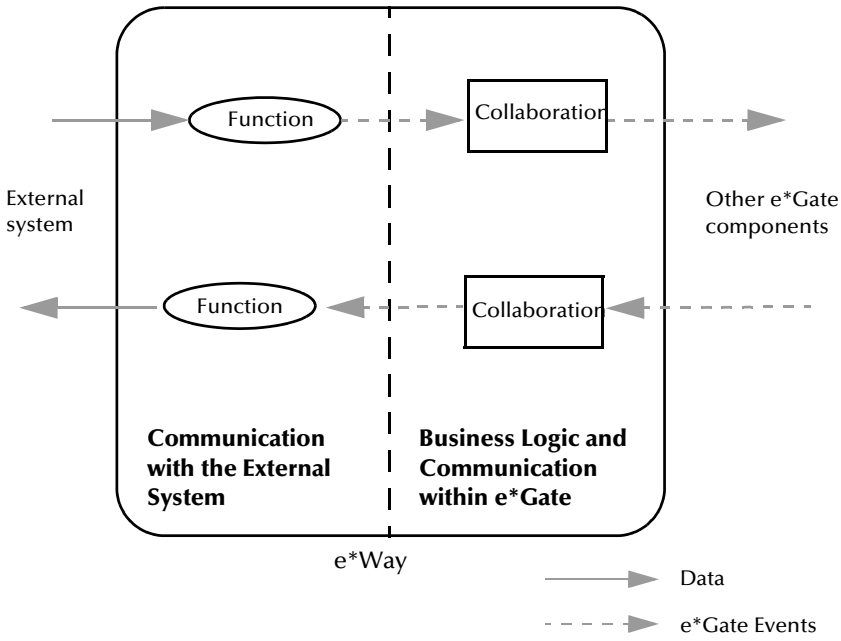
See **"Exchange Data with External Function" on page 27** for more information.

3.1.2. Monk Configuration

The parameters in this section help to set up information required by the e*Way to utilize Monk for communication with the external system.

Conceptually, an e*Way is divided into two halves. One half of the e*Way (shown on the left in **Figure 1 on page 17**) handles communication with the external system; the other half manages the Collaborations that process data and subscribe or publish to other e*Gate components.

Figure 1 e*Way Internal Architecture



The communications side of the e*Way uses Monk functions to start and stop scheduled operations, exchange data with the external system, package data as e*Gate Events and send those Events to Collaborations, and manage the connection between the e*Way and the external system. The **Monk Configuration** options discussed in this section control the Monk environment and define the Monk functions used to perform these basic e*Way operations. You may create and modify these functions using the SeeBeyond Collaboration Rules Editor or a text editor (such as **Notepad** or UNIX **vi**).

The communications side of the e*Way is single-threaded. Functions run serially, and only one function can be executed at a time. The business logic side of the e*Way is multi-threaded, with one executable thread for each Collaboration. Each thread maintains its own Monk environment; therefore, information such as variables, functions, path information, and so on cannot be shared between threads.

Operational Details

The Monk functions in the communications side of the e*Way fall into the groups shown in **Table 2 on page 18**. A series of figures following the table illustrates the interaction and operation of these functions.

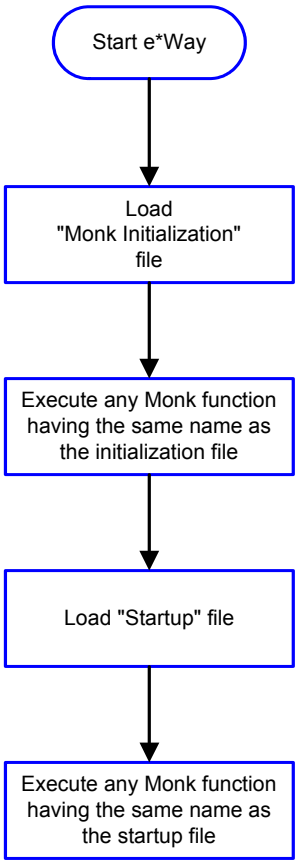
Table 2 Monk Functions, Communications Side

Type of Operation	Name
Initialization	**Startup Function** on page 26 (also see **Monk Environment Initialization File** on page 26)
Connection	**External Connection Establishment Function** on page 28 **External Connection Verification Function** on page 29 **External Connection Shutdown Function** on page 29
Schedule-driven Data Exchange	**Exchange Data with External Function** on page 27 **Positive Acknowledgment Function** on page 30 **Negative Acknowledgment Function** on page 30
Shutdown	**Shutdown Command Notification Function** on page 31
Event-driven Data Exchange	**Process Outgoing Message Function** on page 27

Initialization Functions

Figure 2 on page 19 illustrates how the e*Way executes its initialization functions.

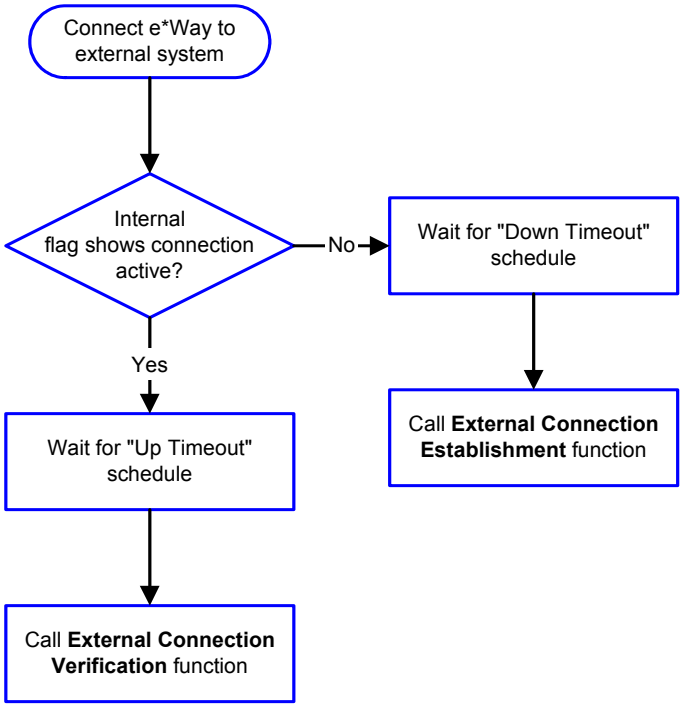
Figure 2 Initialization Functions



Connection Functions

Figure 3 on page 20 illustrates how the e*Way executes the connection establishment and verification functions.

Figure 3 Connection Establishment and Verification Functions

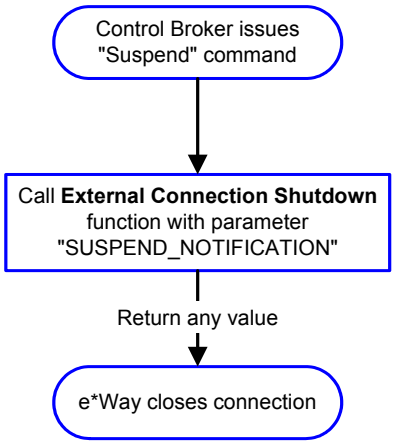


Note: *The e*Way selects the connection function based on an internal* ***up/down*** *flag rather than a poll to the external system. See* **Figure 5 on page 22** *and* **Figure 7 on page 24** *for examples of how different functions use this flag.*

User functions can manually set this flag using Monk functions. See **send-external-up** *on page 47 and* **send-external-down** *on page 46 for more information.*

Figure 4 illustrates how the e*Way executes its **connection shutdown** function.

Figure 4 Connection Shutdown Function



Schedule-driven Data Exchange Functions

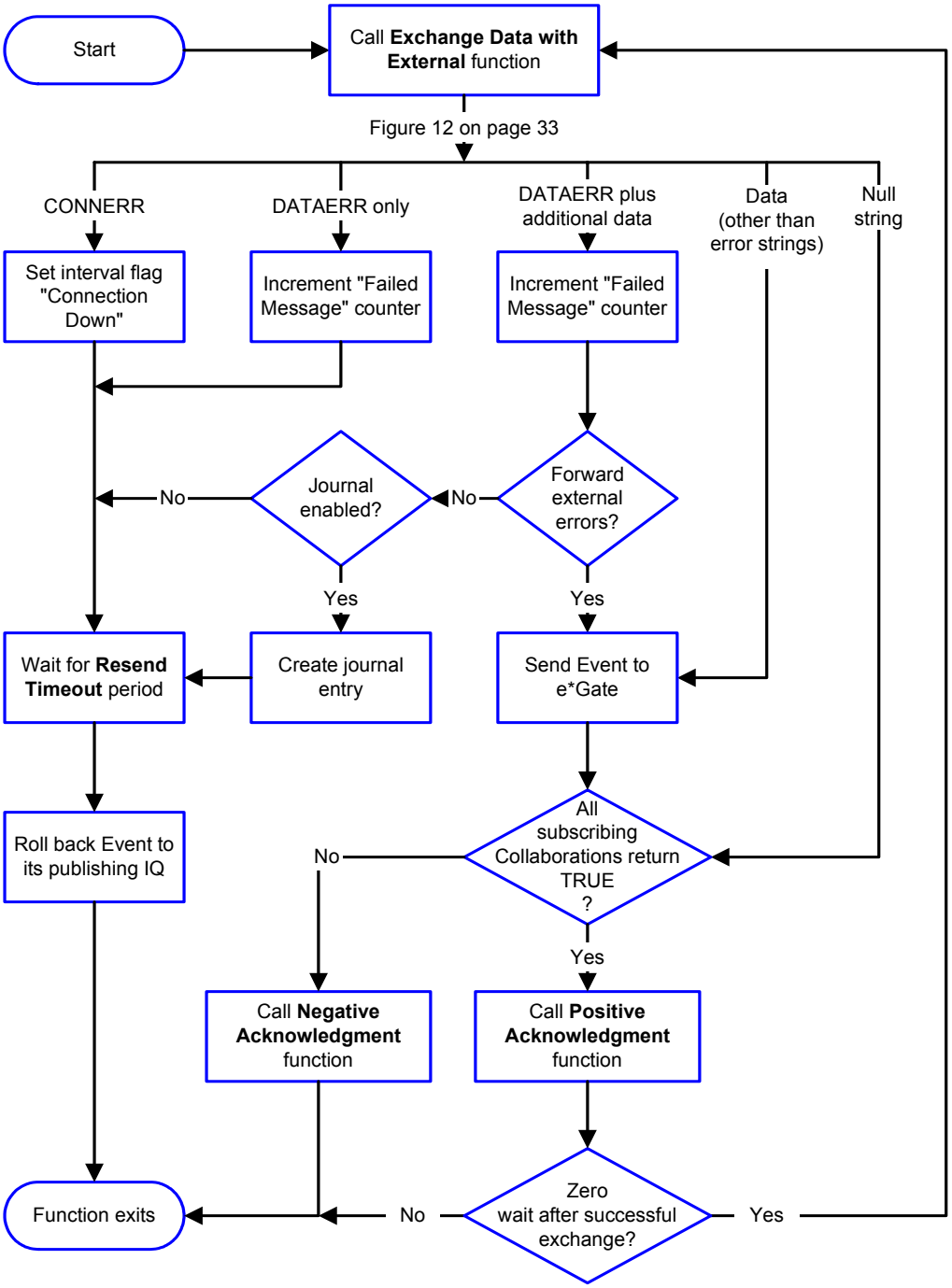
Figure 5 on page 22 illustrates how the e*Way performs schedule-driven data exchange using the **Exchange Data with External Function**. The **Positive Acknowledgment Function** and **Negative Acknowledgment Function** are also called during this process.

"Start" can occur in any of the following ways:

- The **Start Data Exchange** time occurs
- Periodically during data-exchange schedule (after **Start Data Exchange** time, but before **Start Data Exchange** time), as set by the **Exchange Data Interval**
- The **start-schedule** Monk function is called

After the function exits, the e*Way waits for the next start schedule time or command.

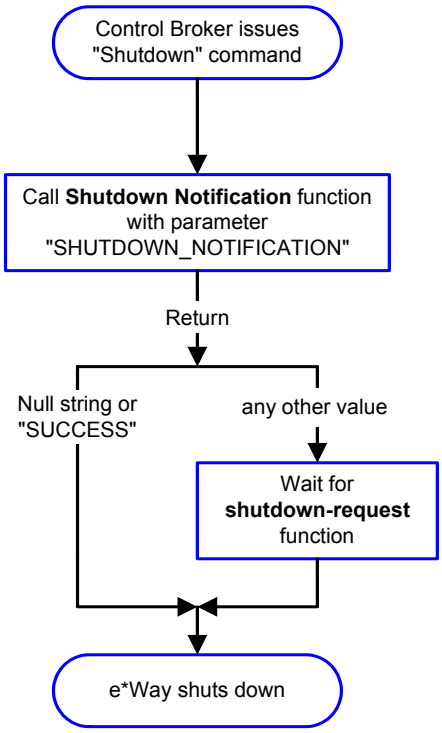
Figure 5 Schedule-driven Data Exchange Functions



Shutdown Functions

Figure 6 below illustrates how the e*Way implements the **shutdown-request** function.

Figure 6 Shutdown Functions



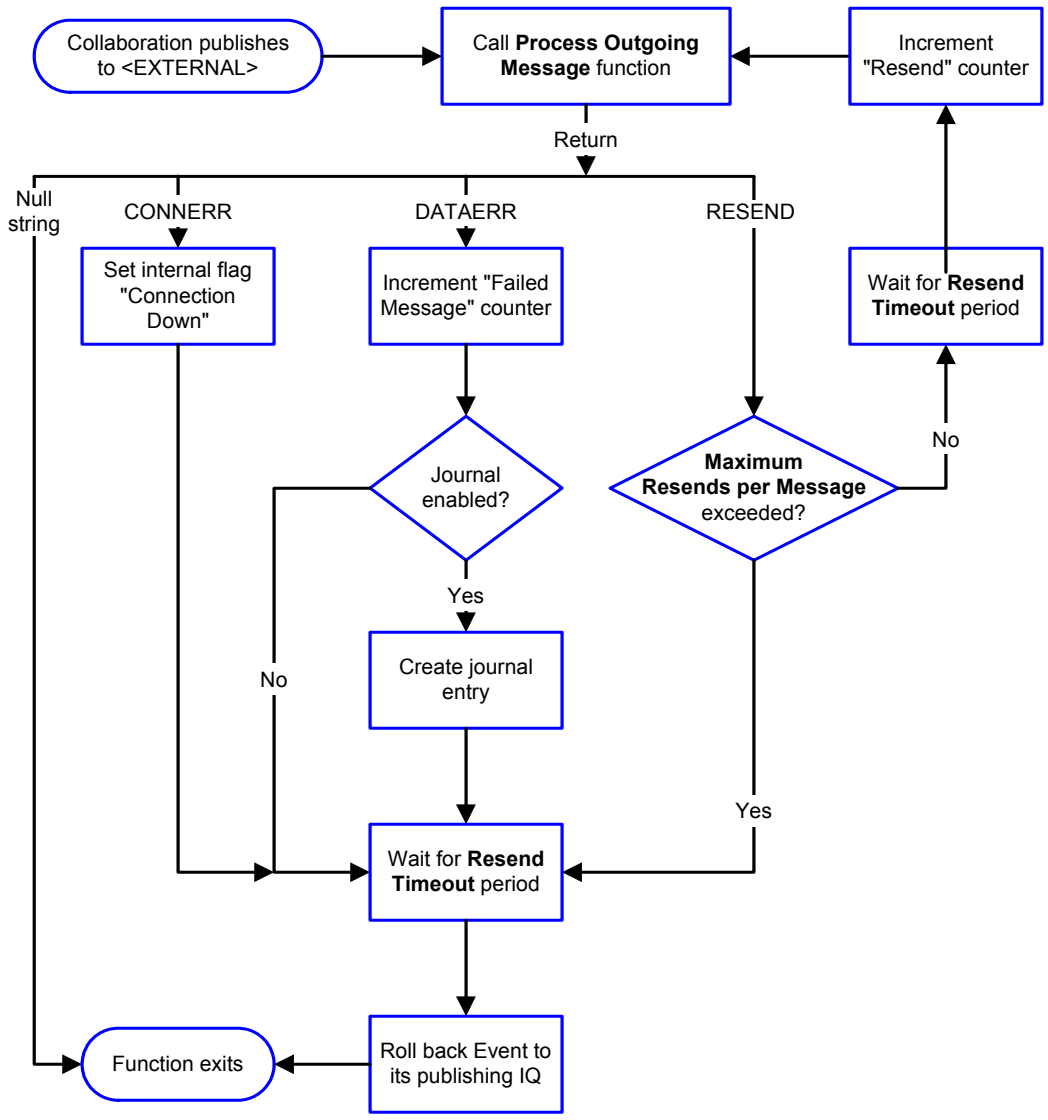
Event-driven Data Exchange Functions

Figure 7 below illustrates Event-driven Data Exchange using the **Process Outgoing Message** function.

Every two minutes, the e*Way checks the **Failed Message** counter against the value specified by the **Max Failed Messages** parameter. When the **Failed Message** counter exceeds the specified maximum value, the e*Way logs an error and shuts down.

After the function exits, the e*Way waits for the next outgoing Event.

Figure 7 Event-driven Data Exchange Functions



How to Specify Function Names or File Names

Parameters requiring the name of a Monk function accept either a function name or a file name. If you specify a file name, be sure that the file has one of the following extensions:

- **.monk**
- **.tsc**
- **.dsc**

Additional Path

Description

Specifies a path to be appended to the load path, the path Monk uses to locate files and data (set internally within Monk). The directory specified in **Additional Path** is searched after the default load paths.

Required Values

A path name, or a series of paths separated by semicolons. This parameter is optional and may be left blank.

Additional Information

The default load paths are determined by the **bin** and **Shared Data** settings in the **.egate.store** file. See the *e*Gate Integrator System Administration and Operations Guide* for more information about this file.

To specify multiple directories, manually enter the directory names rather than selecting them with the **File Selection** button. Directory names must be separated with semicolons, and you can mix absolute paths with relative e*Gate paths, for example:

```
monk_scripts\my_dir;c:\my_directory
```

The internal e*Way function that loads this path information is called only once, when the e*Way first starts up.

Auxiliary Library Directories

Description

Specifies a path to auxiliary library directories. Any .**monk** files found within those directories are automatically loaded into the e*Way's Monk environment. This parameter is optional and may be left blank.

Required Values

A path name, or a series of paths separated by semicolons.

Additional Information

To specify multiple directories, manually enter the directory names rather than selecting them with the **File Selection** button. Directory names must be separated with semicolons, and you can mix absolute paths with relative e*Gate paths, for example:

```
monk_scripts\my_dir;c:\my_directory
```

The internal e*Way function that loads this path information is called only once, when the e*Way first starts up.

The default is **monk_library/ewcics**.

This parameter is optional and may be left blank.

Monk Environment Initialization File

Specifies a file that contains environment initialization functions, which are loaded after the auxiliary library directories are loaded. Use this feature to initialize the e*Way's Monk environment (for example, to define Monk variables that are used by the e*Way's function scripts).

Required Values

A file name within the load path, or file name plus path information (relative or absolute). If path information is specified, that path is appended to the load path. See **"Additional Path" on page 25** for more information about the load path.

Additional Information

Any environment-initialization functions called by this file accept no input, and must return a string. The e*Way loads this file and tries to invoke a function of the same base name as the file name (for example, for a file named **my-init.monk**, the e*Way would attempt to execute the function **my-init**).

Typically, it is a good practice to initialize any global Monk variables that may be used by any other Monk Extension scripts.

The internal function that loads this file is called once when the e*Way first starts up (see **Figure 2 on page 19**).

Startup Function

Description

Specifies a Monk function that the e*Way loads and invokes upon startup or whenever the e*Way's configuration is reloaded. This function should be used to initialize the external system before data exchange starts.

Required Values

The name of a Monk function, or the name of a file (optionally including path information) containing a Monk function. This parameter is optional and may be left blank.

Additional Information

The function accepts no input, and must return a string.

The string "FAILURE" indicates that the function failed; any other string (including a null string) indicates success.

This function is called after the e*Way loads the specified Monk Environment Initialization file and any files within the specified auxiliary directories.

The e*Way loads this file and try to invoke a function of the same base name as the file name (see **Figure 2 on page 19**). For example, for a file named **my-startup.monk**, the e*Way would attempt to execute the function **my-startup**.

Process Outgoing Message Function

Description

Specifies the Monk function responsible for sending outgoing Events (messages) from the e*Way to the external system. This function is Event-driven (unlike the **Exchange Data with External** function, which is schedule-driven).

Required Values

The name of a Monk function, or the name of a file (optionally including path information) containing a Monk function. *You may not leave this field blank.*

Additional Information

The e*Way invokes this function when one of its Collaborations publishes an Event to an **<EXTERNAL>** destination, as specified within the Schema Designer (see **Figure 7 on page 24** for more details).

This function requires a non-null string as input (the outgoing Event to be sent) and must return a string as follows:

- Null string — Indicates that the Event was published successfully to the external system.
- "RESEND" — Indicates that the Event should be resent.
- "CONNERR" — Indicates that there is a problem communicating with the external system.
- "DATAERR" — Indicates that there is a problem with the Event (message) data itself.
- If a string other than the following is returned, the e*Way creates an entry in the log file indicating that an attempt has been made to access an unsupported function.

Note: *If you wish to use **event-send-to-egate** to enqueue failed Events in a separate Intelligent Queue (IQ), the e*Way must have an inbound Collaboration (with appropriate IQs) configured to process those Events. See* **"event-send-to-egate" on page 44** *for more information.*

Exchange Data with External Function

Description

Specifies a Monk function that initiates the transmission of data from the external system to the e*Gate system and forwards that data as an inbound Event to one or more e*Gate Collaborations. This function is called according to a schedule (unlike the **Process Outgoing Message** function, which is Event-driven).

Required Values

The name of a Monk function, or the name of a file (optionally including path information) containing a Monk function. This parameter is optional and may be left blank.

Additional Information

The function accepts no input and must return a string (see **Figure 5 on page 22** for more details) as follows:

- Null string — Indicates that the data exchange was completed successfully. No information is sent into the e*Gate system.
- "CONNERR" — Indicates that a problem with the connection to the external system has occurred.
- "DATAERR" — Indicates that a problem with the data itself has occurred. The e*Way handles the string "DATAERR" and "DATAERR" plus additional data differently; see **Figure 5 on page 22** for more details.
- Any other string — The contents of the string are packaged as an inbound Event. The e*Way must have at least one Collaboration configured suitably to process the inbound Event, as well as any required IQs.

This function is initially triggered by the **Start Data Exchange** schedule or manually by the Monk function **start-schedule**. After the function has returned **true,** and the data received by this function has been acknowledged by the **Positive Acknowledgment** function or **Negative Acknowledgment** function respectively, the e*Way checks the **Zero Wait Between Successful Exchanges** parameter.

If this parameter is set to **Yes**, the e*Way immediately calls the **Exchange Data with External** function again; otherwise, the e*Way does not call the function until the next scheduled start exchange time or the schedule is manually invoked using the Monk function **start-schedule** (see **start-schedule** on page 49 for more information).

External Connection Establishment Function

Description

Specifies a Monk function that the e*Way calls when it has determined that the connection to the external system is down.

Required Values

The name of a Monk function, or the name of a file (optionally including path information) containing a Monk function. *This field cannot be left blank.*

Additional Information

The function accepts no input and must return a string as follows:

- "SUCCESS" or "UP" — Indicates that the connection was established successfully.
- Any other string (including the null string) — Indicates that the attempt to establish the connection failed.

This function is executed according to the interval specified within the **Down Timeout** parameter, and is *only* called according to this schedule.

The **External Connection Verification** function (see below) is called when the e*Way has determined that its connection to the external system is up.

External Connection Verification Function

Description

Specifies a Monk function that the e*Way calls when its internal variables show that the connection to the external system is up.

Required Values

The name of a Monk function. This function is optional; if no **External Connection Verification** function is specified, the e*Way executes the **External Connection Establishment** function in its place.

Additional Information

The function accepts no input and must return a string as follows:

- "SUCCESS" or "UP" — Indicates that the connection was established successfully.
- Any other string (including the null string) — Indicates that the attempt to establish the connection failed.

This function is executed according to the interval specified within the **Up Timeout** parameter, and is *only* called according to this schedule.

The **External Connection Establishment** function (see above) is called when the e*Way has determined that its connection to the external system is down.

External Connection Shutdown Function

Description

Specifies a Monk function that the e*Way calls to shut down the connection to the external system.

Required Values

The name of a Monk function. This parameter is optional.

Additional Information

This function requires a string as input, and may return a string.

This function is only invoked when the e*Way receives a **suspend** command from a Control Broker. When the **suspend** command is received, the e*Way invokes this function, passing the string "SUSPEND_NOTIFICATION" as an argument.

Any return value indicates that the **suspend** command can proceed and that the connection to the external system can be broken immediately.

Positive Acknowledgment Function

Description

Specifies a Monk function that the e*Way calls when *all* the Collaborations to which the e*Way sent data have processed and enqueued that data successfully.

Required Values

The name of a Monk function, or the name of a file (optionally including path information) containing a Monk function. This parameter is required if the **Exchange Data with External** function is defined.

Additional Information

The function requires a non-null string as input (the Event to be sent to the external system) and must return a string as follows:

- "CONNERR" — Indicates a problem with the connection to the external system. When the connection is re-established, the **Positive Acknowledgment** function is called again, with the same input data.
- Null string — The function completed execution successfully.

After the **Exchange Data with External** function returns a string that is transformed into an inbound Event, the Event is handed off to one or more Collaborations for further processing. If the Event's processing is completed successfully by *all* the Collaborations to which it was sent, the e*Way executes the **Positive Acknowledgment** function (otherwise, the e*Way executes the **Negative Acknowledgment** function).

Negative Acknowledgment Function

Description

Specifies a Monk function that the e*Way calls when the e*Way fails to process and queue Events from the external system.

Required Values

The name of a Monk function, or the name of a file (optionally including path information) containing a Monk function. This parameter is required if the **Exchange Data with External** function is defined.

Additional Information

The function requires a non-null string as input (the Event to be sent to the external system) and must return a string as follows:

- "CONNERR" — Indicates a problem with the connection to the external system. When the connection is re-established, the function is called again.
- Null string — The function completed execution successfully.

This function is only called during the processing of inbound Events. After the **Exchange Data with External** function returns a string that is transformed into an inbound Event, the Event is handed off to one or more Collaborations for further processing.

If the Event's processing is not completed successfully by *all* the Collaborations to which it was sent, the e*Way executes the **Negative Acknowledgment** function (otherwise, the e*Way executes the **Positive Acknowledgment** function).

Shutdown Command Notification Function

Description

Specifies a Monk function that is called when the e*Way receives a shutdown command from the Control Broker. This parameter is optional.

Required Values

The name of a Monk function.

Additional Information

When the Control Broker issues a shutdown command to the e*Way, the e*Way calls this function with the string "SHUTDOWN_NOTIFICATION" passed as a parameter.

The function accepts a string as input and must return a string as follows:

- A null string or "SUCCESS" — Indicates that the shutdown can occur immediately.
- Any other string — Indicates that shutdown must be postponed. Once postponed, shutdown does not proceed until the Monk function **shutdown-request** is executed (see **"shutdown-request" on page 48**).

Note: *If you postpone a shutdown using this function, be sure to use the (**shutdown-request)** function to complete the process in a timely manner.*

3.1.3. CICS Settings

The parameters in this section help you set up the information required by the CICS e*Way.

CICS User

Description

The name of the user on the default CICS system defined in the Universal Client configuration.

CICS User Password

Description

The password of the user on the default CICS system defined in the Universal Client configuration.

3.2 Environment Configuration

To support the operation of this e*Way, no changes are necessary

- In the Participating Host's operating environment
- In the e*Gate system

Note: *Changes to Monk files can be made using the Collaboration Rules Editor (available from within the Schema Designer) or with a text editor. However, if you use a text editor to edit Monk files directly, you* ***must*** *commit these changed files to the e*Gate Registry or your changes are not implemented.*

*For more information about committing files to the e*Gate Registry, see the Schema Designer's online Help system, or the* ***stcregutil*** *command-line utility in the e*Gate Integrator System Administration and Operations Guide.*

Chapter 4

Implementation

This chapter covers the modes of operation for the CICS e*Way and instructions for using the Cobol Copybook Converter, a build tool that takes a copybook specification as input and creates an Event Type Definition (ETD).

4.1 Implementation Overview

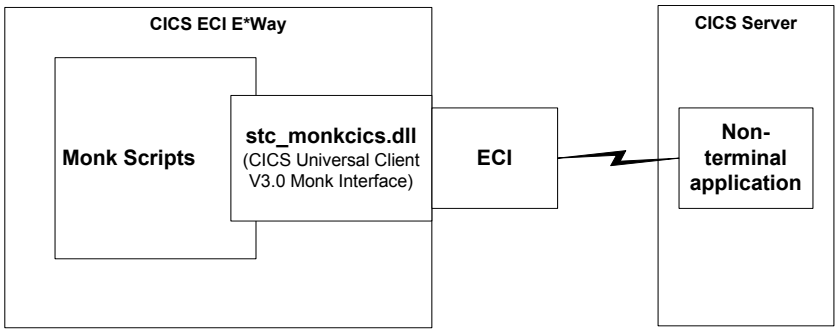
The ECI is an application programming interface (API) to call CICS programs running on a CICS server thereby allowing a non-CICS program to call a CICS program. The calls are the same as if made to a CICS program through the EXEC CICS LINK.

The application does not issue any CICS commands itself; the CICS commands are issued by the called program running in the server. The called program thus appears to have been called by the EXEC CICS LINK with the COMMAREA option, a shared-memory data structure passed between the CICS client application and the CICS transactional program.

The ECI requires that IBM's CICS Universal Client be running on the same computer. The CICS Universal Client version 3.0 and above provides the API to the Monk extension **.dll.**

Figure 8 below provides an overview of the architecture.

Figure 8 Architectural Overview



Data Flow

An inbound Event may be sent into the e*Gate environment requesting that a CICS program be called. The input is provided in either a prebuilt Cobol Copybook structure or a proprietary structure. The data is then transformed into an appropriate format and sent to the ECI.

The call returns with the reply from the CICS transaction program. If data is returned, it may be transformed into the necessary structure required by the requester. Finally the transformed data may be presented to the outbound Event.

The CICS e*Way is now ready to process the next request.

4.2 Modes of Operation

The CICS e*Way operates in one of the following modes:

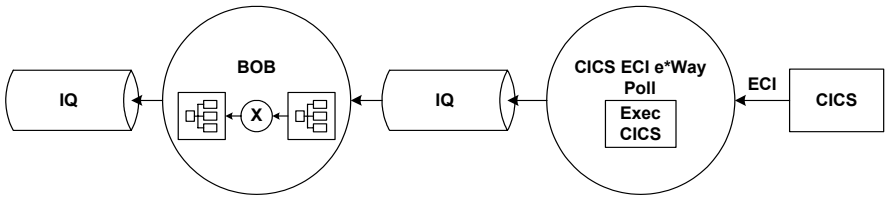
- Outbound to CICS only
- Inbound from CICS only
- Request/reply

This section explains the details of these modes.

Outbound-to-CICS Mode

The outbound e*Way operates in one direction, out of the e*Gate environment and into the CICS environment. No data is expected from the CICS side. See Figure 9 below.

Figure 9 Outbound Mode Example

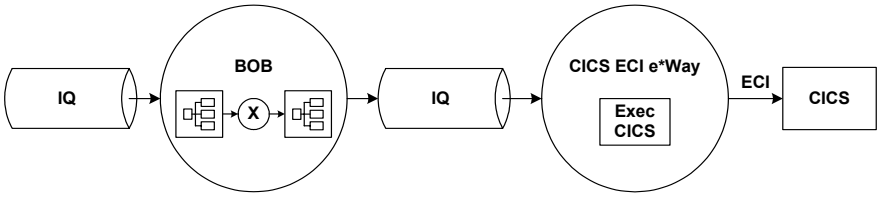


The e*Gate Business Object Broker (BOB) may take an Event from the e*Gate environment and convert it to the Cobol Copybook Event that was generated by Cobol Copybook Converter. The converted Event is then delivered via an Intelligent Queue (IQ) to the e*Way that inserts the copybook Event into the COMMAREA and executes the CICS transaction program. No output from CICS is generated or expected.

Inbound-from-CICS Mode

The inbound only mode uses a time-based polling mechanism to invoke the CICS transaction program. There is no outbound Event coming from the e*Gate environment in this scenario. See Figure 10 below.

Figure 10 Inbound Mode Example

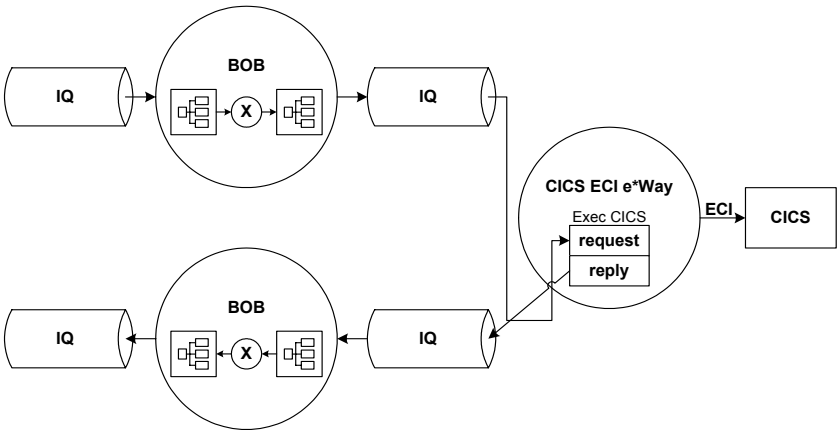


The timer Event triggers from within the e*Way which then signals the invocation of the CICS transaction program. If input was produced, the data is delivered to the inbound BOB via the IQ. The inbound BOB takes the Event and converts it to another format (if necessary) and then forwards the Event to the e*Gate environment.

Request/reply Mode

The request/reply mode is a combination of the inbound and outbound modes. It issues a call to the CICS transaction program then returns the response to the e*Gate environment. See Figure 11 below.

Figure 11 Request/reply Mode Example



This mode operates as follows:

- The outbound BOB takes the Event from the e*Gate environment and may convert it to a layout appropriate to the CICS program being used.
- The Event is sent via IQ to the e*Way that inserts it into the COMMAREA.
- The CICS transaction program is invoked.
- The input is delivered to the inbound BOB via the IQ.
- The inbound BOB takes the Event and converts it (if necessary) before sending it to the e*Gate environment.

4.3 Using the Cobol Copybook Converter

The Cobol Copybook Converter is a build tool that takes a Cobol copybook specification file as input and creates an ETD file, that is, an **.ssc** file. This feature has the following properties:

- You may run this command via the ETD Editor or from the command line.
- The system presents the copybook specification to the Cobol Copybook Converter in a flat file. The converter feature uses the 01 segment of the Cobol copybook as the root node of the ETD.

Note: *For this reason, the input Cobol file must have an 01 segment to operate correctly with the Cobol Copybook Converter.*

For example, after you have generated an ETD file, the e*Gate system can populate the file and present it into the COMMAREA for CICS calls. Similarly, the system can parse the output COMMAREA from CICS into ETDs created by the Cobol Copybook Converter feature.

Cobol Syntax

The input to the Cobol Copybook Converter must conform to standard Cobol syntax rules. Since Cobol's record and field definitions are column-dependent, you must download the input files as text files and preserve their column integrity when editing them with a text editor.

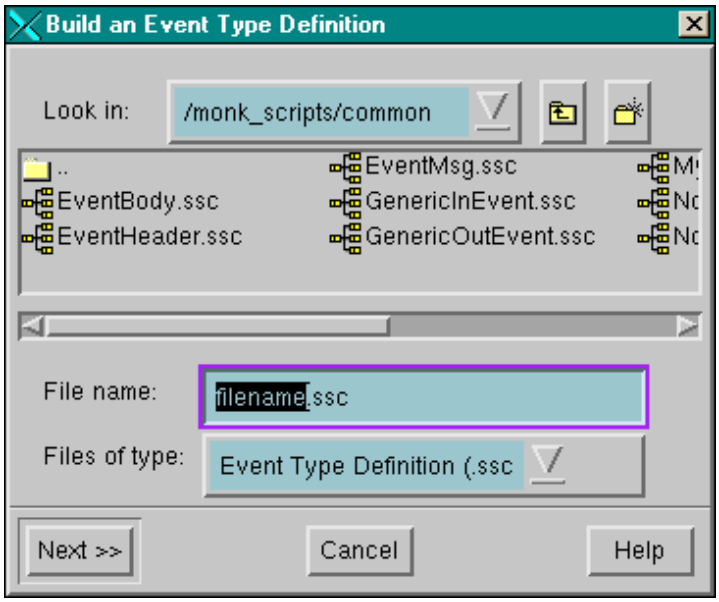
You may access the Cobol Copybook Converter feature via the ETD Editor. Use the procedure below to create an ETD based on the data your installation requires.

To create ETD files using the ETD Editor

1 On the ETD Editor window's Toolbar, click **Build**.

The first **Build an Event Type Definition** dialog box appears (see **Figure 12 on page 37**).

Figure 12 Build an Event Type Definition Dialog Box (Initial)



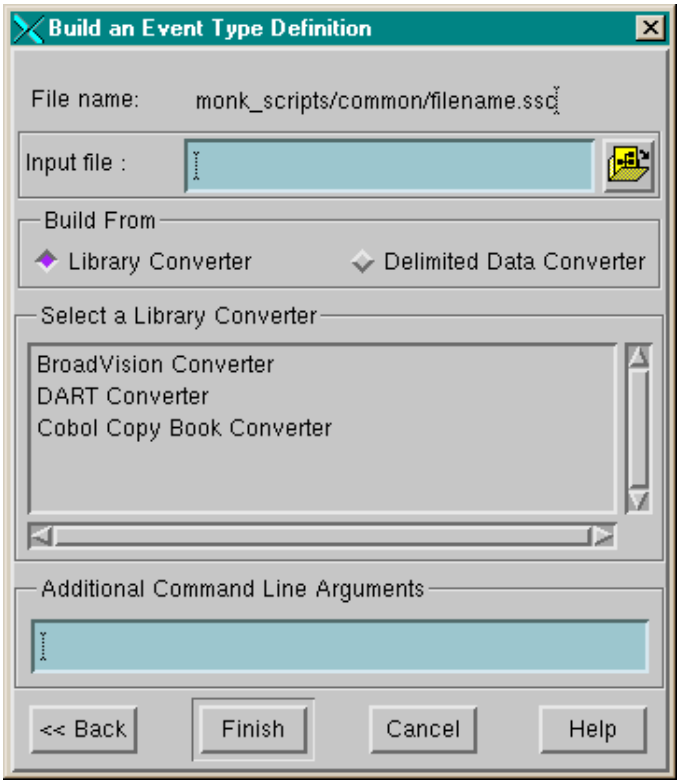
2 In the **File Name** box, type the name of the ETD file you wish to build. *Do not specify any file extension*. The Editor supplies the **.ssc** extension for you.

3 Under **Files of Type**, leave **Event Type Definition** selected.

4 Click **Next**.

The second **Build an Event Type Definition** dialog box appears (see **Figure 13 on page 38**).

Figure 13 Build an Event Type Definition Dialog Box (Second)



5 Type the **Input File** name and path or click the Browse button and navigate to the Input File.

6 Under **Build From**, select **Library Converter**.

7 Under **Select a Library Converter**, select **Cobol Copy Book Converter**.

8 Click **Finish**.

The dialog box closes, and the new ETD appears in the Workspace pane of the ETD Editor window. The conversion process is automatic.

9 Click **Save** to save the new ETD.

To create ETD files using the command line

To run the Cobol Copybook Converter from the command line, as a batch utility, enter:

```
stccococo [-I] [-d] -i <copybook_file> <etd>.ssc
```

The following table explains these command options:

Command	Type	Description
-I	string	An optional parameter that indicates ICL data origin.
-d	string	An optional parameter that indicates DBCS input data mode.
-nls	string	Allows the conversion of Cobol files written in Japanese; currently the only string supported is SJIS (Japanese character set). Use of any other (or no) parameter defaults to English/ASCII.
-i	string	A mandatory parameter.
copybook_file	path	The relative path of the file to be used as the input (mandatory).
etd	string	The name of the ETD file you wish to create (mandatory).

Note: *If you enter* ***stccococo -h*** *at the command line, seeking help, you get the following message:*

USAGE: stccococo [-I] [-d] [-c control [-s section]] [-nls <character set>] -i copybook_file <etd> .ssc

-I indicates ICL data origin. -d indicates DBCS mode. Ignore references to the ***-c*** *and* ***-s*** *flags. They are for future use only and do not operate in the current system.*

For more information on how to use this feature, see the *Cobol Copybook Converter User's Guide*.

4.4 ECI Error Codes

Table 3 on page 40 contains a list of the possible error codes returned by the ECI. These codes are defined in the file **cics-init.monk** which is loaded when the CICS e*Way is initialized. For more information, see **"Monk Environment Initialization File" on page 26**.

For more information on the CICS ECI error codes, see *CICS Family: Client/Server Programming* by IBM Corp. (document number SC33-1435-03). This can be found at **http://publibz.boulder.ibm.com/cgi-bin/bookmgr_OS390/BOOKS/DFHZAD13/**.

Note: *The file **cics-init.monk** also initializes other values in addition to the error codes listed below. For a complete list of the values initialized by this function, use a text editor to view the **cics-init.monk** file.*

Table 3 ECI Error Codes

ECI Return Value	Error	Description
0	ECI_NO_ERROR	The call completed successfully.
-1	ECI_ERR_INVALID_DATA_LENGTH	The value in **eci_commarea_length** field is outside the valid range, or is inconsistent with the value in **eci_commarea**, being zero for a non-null **eci_commarea** pointer, or non-zero for a null **eci_commarea** pointer.
-2	ECI_ERR_INVALID_EXTEND_MODE	The value in **eci_extend_mode** field is not valid.
-3	ECI_ERR_NO_CICS	The client is unavailable, the server implementation is unavailable, or a logical unit of work was to be started (but the CICS server specified in **eci_system_name** is not available). No resources have been updated.
-4	ECI_ERR_CICS_DIED	A logical unit of work was to be started or continued, but the CICS server was no longer available. If **eci_extend_mode** was ECI_EXTENDED, the changes are rolled back, and the logical unit of work ends. If **eci_extend_mode** was ECI_NO_EXTEND, ECI_COMMIT, or ECI_BACKOUT, the application cannot determine whether the changes have been committed or rolled back, and must log this condition to aid future manual recovery.
-5	ECI_ERR_REQUEST_TIMEOUT	The time-out interval expired before the request could be processed, or the specified interval was negative.
-5	ECI_ERR_NO_REPLY	There was no outstanding reply.
-6	ECI_ERR_RESPONSE_TIMEOUT	The time-out interval expired while the program was running.
-7	ECI_ERR_TRANSACTION_ABEND	The CICS transaction that executed the requested program abended (ended abnormally). The abend code will be found in **eci_abend_code**. For information about abend codes and their meaning, consult the documentation for the server system to which the request was directed.

Table 3 ECI Error Codes

ECI Return Value	Error	Description
-8	ECI_ERR_EXEC_NOT_RESIDENT and ECI_ERR_LUW_TOKEN	The value supplied in **eci_luw_token** is invalid.
-9	ECI_ERR_SYSTEM_ERROR	An internal system error occurred. The error might have been in the client or in the server. The programmer should save the information returned in the **eci_sys_return_code** field, as this will help service personnel to diagnose the error
-10	ECI_ERR_NULL_WIN_HANDLE	An asynchronous call was specified with the window handle set to 0.
-12	ECI_ERR_NULL_MESSAGE_ID	An asynchronous call was specified with the message identifier set to 0.
-13	ECI_ERR_THREAD_CREATE_ERROR	The server implementation or the client failed to create a thread to process the request.
-14	ECI_ERR_INVALID_CALL_TYPE	The call type was not one of the valid call types.
-15	ECI_ERR_ALREADY_ACTIVE	An attempt was made to continue an existing logical unit of work, but there was an outstanding asynchronous call for the same logical unit of work.
-16	ECI_ERR_RESOURCE_SHORTAGE	The server implementation or the client did not have enough resources to complete the request.
-17	ECI_ERR_NO_SESSIONS	A new logical unit of work was being created, but the application already has as many outstanding logical units of work as the configuration will support.
-18	ECI_ERR_NULL_SEM_HANDLE	A null semaphore handle was passed when a valid handle was required.
-19	ECI_ERR_INVALID_DATA_AREA	Either the pointer to the ECI parameter block is invalid, or the pointer supplied in **eci_commarea** is invalid.
-21	ECI_ERR_INVALID_VERSION	The value supplied for **eci_version** was invalid.
-22	ECI_ERR_UNKNOWN_SERVER	The requested server could not be located. Only servers returned by **CICS_EciListSystems** are acceptable.
-23	ECI_ERR_CALL_FROM_CALLBACK	The call was made from a callback routine.

Table 3 ECI Error Codes

ECI Return Value	Error	Description
-24	ECI_ERR_INVALID_TRANSID	A logical unit of work was being extended, but the value supplied in **eci_transid** differed from the value used when the logical unit of work was started.
-25	ECI_ERR_MORE_SYSTEMS	There was not enough space in the List array to store the information. The supplied array has been filled and the systems parameter has been updated to contain the total number of systems found so that an array of suitable size can be allocated and the function can be retried.
-26	ECI_ERR_NO_SYSTEMS	No CICS servers can be located. In this case, the value returned in Systems is zero.
-27	ECI_ERR_SECURITY_ERROR	An invalid combination of user ID and password was supplied.
-28	ECI_ERR_MAX_SYSTEMS	Requests were made to more servers than the configuration allows. Consult the documentation for your client or server for information on controlling the number of servers that can be used.
-29	ECI_ERR_MAX_SESSIONS	There were not enough communication resources to satisfy the request. Consult the documentation for your client or server for information on controlling communication resources.
-30	ECI_ERR_ROLLEDBACK	An attempt was made to commit a logical unit of work, but the server was unable to commit the changes and backed them out instead.

Chapter 5

CICS e*Way Functions

The CICS e*Way's functions fall into the following categories:

- **Basic Functions** on page 43
- **CICS Functions** on page 50

The functions explained in this chapter control the CICS e*Ways basic operations, as well as those needed to interface with the CICS application.

Note: *These functions can only be used by the functions defined within the e*Way's configuration file. None of the functions are available to Collaboration Rules scripts executed by the e*Way.*

5.1 Basic Functions

The functions in this category control the e*Way's most basic operations.

The basic functions are:

event-send-to-egate on page 44

get-logical-name on page 45

send-external-down on page 46

send-external-up on page 47

shutdown-request on page 48

start-schedule on page 49

stop-schedule on page 50

event-send-to-egate

Syntax

```
(event-send-to-egate string)
```

Description

event-send-to-egate sends data that the e*Way has already received from the external system into the e*Gate system as an Event.

Parameters

Name	Type	Description
string	String	The data to be sent to the e*Gate system.

Return Values

Boolean

Returns true (**#t**) if the data is sent successfully; otherwise, returns false (**#f**).

Throws

None.

Additional information

This function can be called by any e*Way function when it is necessary to send data to the e*Gate system in a blocking fashion.

get-logical-name

Syntax

```
(get-logical-name)
```

Description

get-logical-name returns the logical name of the e*Way.

Parameters

None.

Return Values

string
Returns the name of the e*Way (as defined by the Schema Designer).

Throws

None.

send-external-down

Syntax

```
(send-external-down)
```

Description

send-external down instructs the e*Way that the connection to the external system is down.

Parameters

None.

Return Values

None.

Throws

None.

send-external-up

Syntax

```
(send-external-up)
```

Description

send-external-up instructs the e*Way that the connection to the external system is up.

Parameters

None.

Return Values

None.

Throws

None.

shutdown-request

Syntax

```
(shutdown-request)
```

Description

shutdown request requests the e*Way to perform the shutdown procedure when there is no outstanding incoming/outgoing event. When the e*Way is ready to act on the shutdown request, in invokes the Shutdown Command Notification Function (see**"Shutdown Command Notification Function" on page 31**). Once this function is called, the shutdown proceeds immediately.

Once interrupted, the e*Way's shutdown cannot proceed until this Monk function is called. If you do interrupt an e*Way shutdown, we recommend that you complete the process in a timely fashion.

Parameters

None.

Return Values

None.

Throws

None.

start-schedule

Syntax

```
(start-schedule)
```

Description

start-schedule requests that the e*Way execute the **Exchange Events with External** function specified within the e*Way's configuration file. Does not affect any defined schedules.

Parameters

None.

Return Values

None.

Throws

None.

stop-schedule

Syntax

```
(stop-schedule)
```

Description

stop-schedule requests that the e*Way halt execution of the **Exchange Events with External** function specified within the e*Way's configuration file. Execution is stopped when the e*Way concludes any open transaction. Does not affect any defined schedules, and does not halt the e*Way process itself.

Parameters

None.

Return Values

None.

Throws

None.

5.2 CICS Functions

The two functions in the **.dll** file that can be invoked from Monk are:

EciListSystems on page 51

ExternalCall on page 52

EciListSystems

Syntax

```
(invoke obj "EciListSystems")
```

Description

EciListSystems determines which CICS servers are defined in the Universal Client configuration; ***obj*** is the Monk object returned from load-interface. See the example below.

Parameters

None.

Return Values

Vector of Monk strings

An IBM Universal client installation has a notion of a default CICS server, and this is guaranteed to be the first item in the return vector.

Throws

If no servers can be found, an exception is generated.

Example

The following printout shows an example of how to list all CICS servers in the Universal Client configuration:

```
(let ((cics (load-interface "stc_monkcics.dll" "init_cicsext"))) ;
Load DLL and initialize
    (let ((sv (invoke cics "EciListSystems"))) ; Invoke
EciListSystems
         (do ((i 0 (+ i 1))) ; Begin loop
             ((>= i (vector-length sv))) ; Loop control
                 (display (vector-ref sv i)) ; Display the specified
vector element
                 (newline) ; Write a newline character
                 )
         )
)
```

Note: *The existence of a CICS server does not guarantee that it can be contacted.*

ExternalCall

Syntax

```
(invoke obj "ExternalCall" eci_call_type eci_program_name eci_userid
eci_password eci_transid comm eci_extend_mode eci_luw_token
eci_version eci_system_name eci_tpn N)
```

Description

ExternalCall is the one and only interface to CICS using the External Call Interface (ECI) API.

Parameters

Parameter	Description	Required Values
eci_call_type	Specifies whether the ECI call type is Asynchronous or Synchronous. ▪ Synchronous Calls will wait for the transaction to complete, then return the contents of the COMMAREA. ▪ Asynchronous calls will not wait for the transaction to complete, so no data is returned.	Asynchronous or Synchronous. Synchronous is the configured default.
eci_program_name	Specifies the CICS program to be run on the server. Maximum length is eight characters.	An eight character or less CICS program name.
eci_userid	Specifies the ID of the CICS user. Maximum length is eight characters.	A valid CICS user ID, eight characters or less.
eci_password	Specifies the password for the CICS user. Maximum length is eight characters.	An eight character or less password for the user ID.
eci_transid	A four character optional field that specifies the CICS transaction ID. This field is sent to the server without conversion to uppercase. The purpose of this field is dependent upon the client. ▪ For Open System clients, this is a transaction name on the server associated with the DFHMIRS program used to service the request. ▪ For other environments the called program runs under the mirror transaction CPMI, but is linked under the eci_transid transaction name. The called program can use this name to query the transaction ID. Some servers determine security and performance attributes for the called program using the transaction ID. For those servers, use this parameter to control the processing of the called programs If this field is not used eci_tpn will be used instead if specified, or the default server transaction is used. If the ECI request is extended (see eci_extend_mode), then eci_transid is only significant for the first call in the unit of work.	A valid CICS transaction ID of four characters or less. If using less than four characters add spaces for the unused characters.
comm - comm area (send) data	A Monk object whose payload data (potentially binary) will be transmitted to the specified CICS program.	

Parameters

Parameter	Description	Required Values
eci_extend_mode	Specifies the extended mode to be requested of the CICS server. ▪ No (ECI_NO_EXTEND). IF the input eci_luw_token field is zero, this will be the only call for a logical unit of work. If the input eci_luw_token field is not zero, this will be the last call for the specified logical unit of work. In either case, changes to recoverable resources are committed by a CICS end-of-task syncpoint, and the logical unit of work ends. Yes (ECI_EXTENDED). If the input eci_luw_token field is zero, this will be the first call for a logical unit of work that is to be continued. If the input eci_luw_token field is not zero, this call will continue the specified logical unit of work. In either case the logical unit of work continues after the called program completes, and changes to recoverable resources remain uncommitted.	Yes or No. The configured default is No.
eci_luw_token	Specifies the logical unit of work to which a call belongs. This must be set to zero at the start of a logical work unit. The ECI will update the value on the first or only call of the logical work unit. If the unit of work is to be extended, this value should be used as input to all subsequent calls associated with the same logical work unit. If the return code is not ECI_NO_ERROR and a call is ending or continuing an existing logical work unit, then this field will be used to report the state of the logical work unit. If it is zero, the logical work unit has ended and updates have been backed out.If it is not zero, the value is the same as the input value. The logical work unit is continuing, and updates are still pending.	A valid integer in the range of 0 to 1000. The configured default is 0. This is a required input and output parameter.
eci_version	Version of ECI running on the CICS system in eci-system_name.	
eci_system_name	The CICS system on which the program that you want to send data to is running.	
eci_tpn	A four character field that specifies the identifier (ID) of the transaction used to process the ECI in the server. This must be defined in the server as a CICS mirror transaction. If this field is not set, the default mirror transaction, CPMI, is used. If the ECI request is extended (see eci_extend_mode), then this parameter is only significant for the first request. This field is only available when eci_version has the value ECI_VERSION_1A. IF this field is used, the contents of eci_transid are disregarded.	A valid CICS transaction ID of four characters or less. If using less than four characters add spaces for the unused characters.

Parameters

Parameter	Description	Required Values
N - Comm area length	Specifies the length (in bytes) of the communication area (COMMAREA) passed to the ECI.	An integer in the range of 1 to 32659. The configured default is 1000.

Note: *The online documents* ***Client/Server Programming*** *and the* ***CICS Universal Client Online Library*** *are available at the following URL:*

http://www.s390.ibm.com/bookmgr-cgi/bookmgr.exe/BOOKS/DFHZAD13/CONTENTS

For information on CICS Transaction Gateway Version 4.0 visit:

http://www-4.ibm.com/software/ts/cics/library/manuals

This function has the following properties:

- The **Comm area (send) data** and the **Comm area (receive) length** have to be specified separately because the behavior of the called program can only be known by the caller. SeeBeyond's implementation cannot determine whether a specified program requires data to be sent to it, or if it returns data (as in the example given at the end of this section) or possibly both.
- Internally, the **Comm area** is set to a size which is the larger of the value given in **Commarea length** and the size of the object in **Commarea (send) data**. It is therefore guaranteed to be large enough to accommodate both the data to be sent and any data returned.

Return Values

Vector of Monk strings

The vector returned by **ExternalCall** comprises the following elements:

- The status code returned by the C API function **CICS_ExternalCall**.

  If this value is equal to **ECI_NO_ERROR** the call has been successful. For detailed analysis, the Monk programmer should consider making comparisons against the other defined values with names beginning **ECI_ERR_.** For more information on ECI return codes, see **"ECI Error Codes" on page 39**.
- An abend code of four characters (space padded).
- The contents of the **comm area**.

  This may not be relevant; it depends on the behavior of the CICS program but it is always returned.
- The contents of **eci_sys_return_code**.

  This element only needs to be considered if the status code in element 1 is equal to **ECI_ERR_SYSTEM_ERROR**.
- The contents of **eci_luw_token**.

If a transaction is started by the most recent invocation of **ExternalCall**, this value is needed for subsequent calls within the same transaction.

Throws

An exception is thrown if:

- The number of parameters is incorrect
- Any parameters are of the wrong type or length
- If the size of the object in **Comm area (send) data** or the size specified in **Comm area length** is larger than the maximum size of the comm area, that is, 32,500 characters.
- The maximum length of a user ID or password is exceeded. User names and passwords are limited to eight characters in **ECI_VERSION_0**; otherwise they are limited to 16 characters.

See the sample printout under **Example** on page 55.

Example

```
(define ECI_VERSION_1A 2)
(define ECI_NO_EXTEND 0)
(define ECI_SYNC 516)

(let ((cics (load-interface "stc_monkcics.dll" "init_cicsext")))
    (let ((sv (cics "EciListSystems")))
        (display (cics "ExternalCall"
                ECI_SYNC           ; eci_call_type
                "ECPROG"           ; eci_program_name
                "sysad"            ; eci_userid
                "sysad"            ; eci_password
                "EC01"             ; eci_transid
                ""                 ; Comm area (send) data
                ECI_NO_EXTEND      ; eci_extend_mode
                0                  ; eci_luw_token
                ECI_VERSION_1A     ; eci_version
                (vector-ref sv 0)  ; eci_system_name
                ""                 ; eci_tpn
                18))               ; Comm area (receive) length
        (newline)
    )
)
```

In practice, a start-up Monk file is set up with the three defined values at the beginning of this example for all possible values needed to run in ECI mode.

Note: *For further detail, see the IBM publication* ***CICS Family: Client/Server Programming*** *(document number SC33-1435-03).*

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