Honeywell

Experion

SIM-ACE

User's Guide

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Notices and Trademarks

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About This Document

This document covers placing the ACE FB in simulation and other procedures for interacting with the ACE simulation functionality.

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References

The following list identifies all documents that may be sources of reference for material discussed in this publication.

Document Title

Contacts

World Wide Web

The following Honeywell web sites may be of interest to Process Solutions customers.

Honeywell Organization	WWW Address (URL)
Corporate	*http://www.honeywell.com*
Honeywell Process Solutions	*http://hpsweb.honeywell.com*

Telephone

Contact us by telephone at the numbers listed below.

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Elsewhere	Call your nearest Honeywell office.	

Symbol Definitions

The following table lists those symbols used in this document to denote certain conditions.

Symbol	Definition
	**ATTENTION:** Identifies information that requires special consideration.
	**TIP:** Identifies advice or hints for the user, often in terms of performing a task.
	**REFERENCE -EXTERNAL:** Identifies an additional source of information outside of the bookset.
	**REFERENCE - INTERNAL:** Identifies an additional source of information within the bookset.
CAUTION	Indicates a situation which, if not avoided, may result in equipment or work (data) on the system being damaged or lost, or may result in the inability to properly operate the process.
	**CAUTION**: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices. **CAUTION** symbol on the equipment refers the user to the product manual for additional information. The symbol appears next to required information in the manual.
	**WARNING**: Indicates a potentially hazardous situation, which, if not avoided, could result in serious injury or death. **WARNING** symbol on the equipment refers the user to the product manual for additional information. The symbol appears next to required information in the manual.

Symbol	Definition
	**WARNING, Risk of electrical shock**: Potential shock hazard where HAZARDOUS LIVE voltages greater than 30 Vrms, 42.4 Vpeak, or 60 VDC may be accessible.
	**ESD HAZARD:** Danger of an electro-static discharge to which equipment may be sensitive. Observe precautions for handling electrostatic sensitive devices.
	**Protective Earth (PE) terminal**: Provided for connection of the protective earth (green or green/yellow) supply system conductor.
	**Functional earth terminal**: Used for non-safety purposes such as noise immunity improvement. NOTE: This connection shall be bonded to Protective Earth at the source of supply in accordance with national local electrical code requirements.
	**Earth Ground**: **Functional earth connection.** NOTE: This connection shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.
	**Chassis Ground**: Identifies a connection to the chassis or frame of the equipment shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.

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SIM-ACE Purpose

SIM-ACE is the off-process ACE application in simulation mode. It does not support simulation of an on-process ACE application due to potential safety concerns. You can use the SIM-ACE to capture a debug version of a CAB program in an ACE controller for editing and debugging. You can save the edited CAB to the ERDB, and use it as a CAB instance in Control Builder.

Performance capability

Common features of SIM-ACE and ACE

ACE and SIM-ACE controller share the following features:

- SIM-ACE and ACE use the same system template and executable
- Upgrade of the ACE software also upgrades SIM-ACE
- SIM-ACE support for inter-cluster peer-peer communication is similar to ACE.
- SIM-ACE has the same performance specifications as ACE. See the CEE-base Controller Specification and Technical Data for details.

SIM-ACE and Experion integration considerations

The following are things you should consider when integrating a SIM-ACE with an Experion system.

- SIM-ACE and ACE require separate licenses
- You determine the mode of the CEEACE block through the Simulation Enable (SIMENABLE) parameter on its Properties form in Control Builder as follows:

If you set…	Then, ACE is in…
SIMENABLE = FALSE (Off)	On-process mode
SIMENABLE = TRUE (On)	Simulation mode

- You confirm the simulation state of the CEEACE block through the simulation state (SIMSTATE) parameter on its Properties form in Control Builder as follows:

If SIMSTATE is…	Then this means it is…
SIMNONE	An on-process ACE, no simulation

SIMRUN	SIM-ACE is running
SIMFREEZE	SIM-ACE execution is freezed

- SIM-ACE requires Experion-PKS Server and Station to support Operator Interface, History, and other functions, just like the ACE.
- Using more SIM-ACE's than shown below, can deteriorate the performance of the system and is not advisable.

If processor system is…	Then, recommeded quantity of SIM-ACE's should not exceed…
Single	2
Dual	4

- SIM-ACE establishes peer-to-peer communication with other SIM-ACE's on the same node as well as on other nodes, as long as thery are associated with the same server.
- Peer-to-Peer communication between simulation and non-simulation environment is restricted such that the Non-Simulation environments never consume data from the Simulation environments. (OPC is an exception).
- SIM-ACE can be connected to ControlNet to facilitate peer-to-peer communication with a C200 controller on a ControlNet supervisory network.
- CEE notifications displayed in the station's Alarm display can be optionally disabled at CEE level either during configuration or when the CEE is idle.
- CAB instances (supported by SIM-ACE) are source level debugged using Visual Studio 7.0. Only one Visual Studio debug session at a time can be attached to a SIM-ACE for CAB.
- All the blocks that are executing in SIM-ACE supports Dynamic Snapshot Save/Restore (CAB instances are the exception).

SIM-ACE Planning and Design

SIM-ACE network connections

SIM-ACE Ethernet connection types

SIM-ACE can be connnected to:

- FTE
- Experion redundant Ethernet
- Experion non-redundant Ethernet

Experion redundant Ethernet connections are automatically utilized between the Experion Server and a SIM-ACE. This connection is similar to the Experion Server's connection to the C200 and is used for:

- operator display
- notification, and
- history access

Connectiong to a network

REFERENCE

Refer to the Fault Tolerant Ethernet Bridge Implementation Guide for more information about FTE network connections.

Refer to the Ethernet Implementation Guide [hyperlink to be added] for more information on Ethernet connection.

Connecting to ControlNet supervisory network

SIM-ACE can be connected to ControlNet. This allows peer-to-peer communication to C200 and other environments on ControlNet. This option is invoked in the ACE function block and is used to configure the MACID of the PCIC interface card and is a common function for both ACE and SIM-ACE.

Prerequisites

The following state should exist, representing a fully functional, active ACE node running in simulation (SIM-ACE):

- ACE node is running in simulation (SIM-ACE)
- CEEACE function blocks are loaded
- CM/SCM with strategies built are loaded and active

Use the following procedure to invoke the ControlNet connection for ACE in simulation mode:

Step	Action
1	From the **Project** tab, double-click the **CEEACE** icon. The CEEACEFB Configuration form appears with the **Main** tab forward.
2	In the **ACE Location** field, configure: • the supervisory node IP address • the ControlNet Connection by checking the checkbox, and • the ACE MAC Address (MACID)

Reviewing SIM-ACE licensing

Licensing check

With the Experion R210 release, ACE/SIM-ACE has its own license. Configuration and loading of ACE/SIM-ACE is based on the available quantity licenses.

Refer to the following table for impact on configuration and loading when insufficient license quantities exist.

Activity	Result
Configure more ACE/SIM-ACE than available licenses	Warning is issued, stating you are using more features than current quantity of licenses permit.
Load more ACE/SIM-ACE than available licenses	Error is issued, stating you are using more features than current quantity of licenses permit.

Note: It is possible to have a simulation only environment, for example,

- no ACEs and 2 SIM-ACEs

Licensing information on displays

There is licensing information on both Control Builder and Station displays. The following table defines the information available.

Location	License information
Controller Builder – Engineering Tools License Display	Limit – amount available Configured – amount configured Loaded – amount loaded
Station – System License Options Display	Amount available

Reviewing peer-to-peer communications

Communication rules for peer-to-peer

The following are rules for peer-to-peer and simulation/non-simulation communications:

Type	Peer-to-peer communication	
ACE	Can write to another ACE Can read from another ACE	Can write to SIM-ACE Cannot read from SIM-ACE
SIM-ACE	Can write to another SIM-ACE Can read from SIM-ACE	Cannot write to ACE Can read from ACE

Notes:

- On a given node, only SIM-ACEs associated with the same engineering database must be configured.
- SIM-ACEs communicates with other SIM-ACEs over FTE or Ethernet provided that both must be in the same domain.
- Peer-to-peer between SIM-ACE and IOLIM/SIOLIM cannnot be configured.

Subscription periods for SIM-ACE

You can configure different subscription periods can be defined for each peer. If you configure an invalid subscription period, you are notified at the load of the ACE function block and the load fails.

SIM-ACE Installation and Upgrades

Refer *Software Installation and Upgrade Guide* for further details.

SIM-ACE Configuration

Activating SIM-ACE

Creating and configuring SIM-ACE

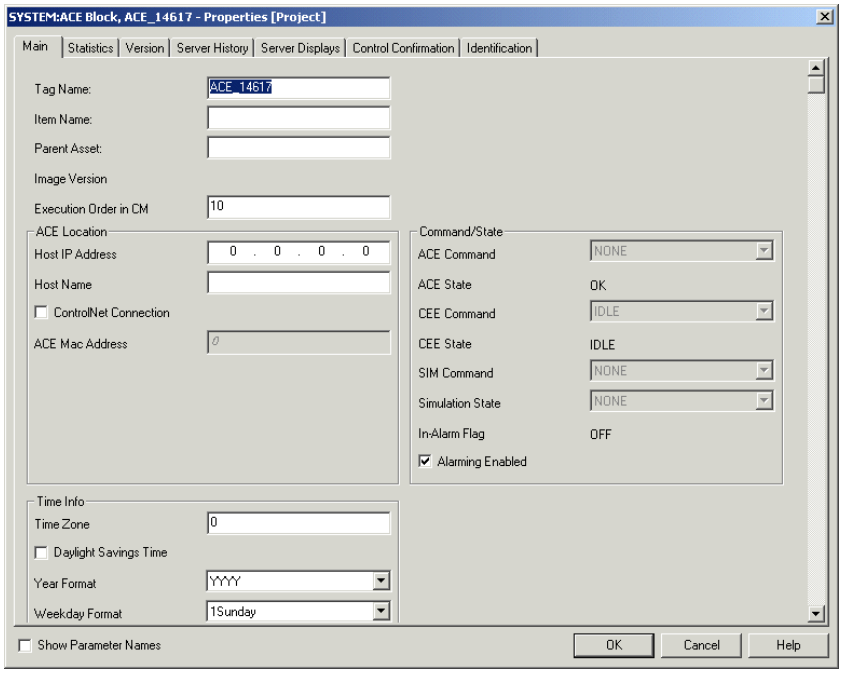
The following two procedures show how to:

- create the ACE controlller
- configure the ACE controller as SIM-ACE

Creating the ACE controller

Use the following procedure to place the ACE in simulation mode (create the SIM-ACE):

Step	Action	Result
1	Click File -> New -> Controllers -> ACE – Application Control Environment.	Calls up the ACE Block configuration form with Tag Name field highlighted.

Step	Action	Result
		
2	Key in desired name of up to 16 characters or accept the default. Press <Tab>.	Moves the cursor to the Item Name field.
3	Enter the Item Name. Press <Tab>.	Moves the cursor to the Parent Asset field.
4	Enter the Parent Asset name. Press <Tab>.	Moves the cursor to the Execution Order in CM.
5	Enter the Execution Order in CM value. Press <Tab>.	Moves the cursor to the Host IP Address field. 

Step	Action	Result
	TIP Host name and Host IP Address are interactive entries. We recommend that you key in the Host IP Address first and let the system determine the Host Name automatically. This is especially true if you are configuring the ACE block with the ACE node offline. In this case, entering the: • Host IP address first generates a Warning message, but • entering the Host Name first generates an error message. When keying in an IP address, use the mouse or the left and right arrow keys to move the cursor to locations within the field. Do not press the <Tab> key until the complete address is keyed in.	
6	Key in the host pc IP address for the ACE node. Press <Tab>. Or, press <Tab> to skip this field and enter Host Name instead. Acknowledge any error message prompts.	System automatically determines the Host Name, when ACE node is online, and moves cursor to Host Name field.  (Valid IP address entry results in system automatically determining the Host Name, when ACE node is online.)
7	If Host Name has been automatically determined, press <Tab>. Or, Key in name assigned to the host pc for the ACE node. There is a 255-character limit on this field. Press <Tab> (Valid Host Name entry results in system automatically determining the Host IP Address, when ACE node is online.)	Moves cursor to ControlNet Connection field. 
8	Leave the box unchecked, if ACE is not connected to the ControlNet network. Check the box, if ACE is connected to the ControlNet network. Press <Tab>.	If the ControlNet Connection box is unchecked, cursor moves to Time Zone field, since the preceding fields are unavailable. Go to Step 10. If the box is checked, cursor moves to ACE Mac Address field.

Step	Action	Result
		
9	Key in the Media Access Control (MAC) address assigned to the PCIC card installed the ACE node for ControlNet connections. Press <Tab>.	Moves cursor to the Time Zone field, since the ACE Command field is unavailable in the Project mode and the ACE State field is read only. Must be configured for each CEE. 
	**TIP** The time zone represents the offset value from the Greenwich Mean Time (GMT) based on your geographical location. For example, the time zone value for a CPM located in the Eastern time zone of the United States that is currently not observing daylight savings time would be -05.0 or -5. Always use the offset value that is not adjusted for daylight savings time as the entry for the Time Zone field. For example, the adjusted offset value for the Eastern time zone of the United States is -04.0, but use the unadjusted value of -5 instead. You may want to visit the http://www.worldtimeserver.com/ website, if you have a question about the appropriate offset value for your given location.	
10	Key in the appropriate time zone offset value for the location where the ACE is installed. Press <Tab>.	Moves cursor to Daylight Savings Time check box. Must be configured for each CEE. 
11	Leave box unchecked, if Daylight Savings Time is not currently being observed at your location. Or, Check the box, if Daylight Savings time is currently being observed at your location. Press <Tab>.	Moves cursor to Year Format field. 
12	Accept default or click  down-arrow button and select desired format from the list. Press <Tab>.	Moves cursor to Weekday Format field. 

Step	Action	Result
13	Accept default or click  down-arrow button and select desired format from the list. Click the Server History tab.	Calls up the Server History configuration form.

Continue defining other tabs. Refer to the *Control Builder User Guide* for additional tab configuration information.

Configuring the ACE controller as SIM-ACE

Use the following procedure to place the ACE in simulation mode (create the SIM-ACE):

Step	Action
1	From the Project tab, double-click the CEEACE FB and the **Main** tab appears forward. Select **Simulation Enable** by checking the checkbox (SIMENABLE = TRUE). Select **Inhibit Notifications – CEE and Contents** to inhibit notifications. Refer to Inhibiting SIM-ACE notifications for additional information. Note: To switch between simulation and non-simulation modes, the ACE FB execution needs to: • shutdown and loaded, toggling the **SIMENABLE** parameter

Loading SIM-ACE

Prerequistes

- This procedure assumes that the ACE controller software is installed and the ACE node is capable of communicating with the Server.

Use the following procedure to load the ACE block with simulation enabled to the ACE controller:

Step	Action
1	Click the desired SIM-ACE block icon in the Project tab.
2	From the **Load/Upload** menu, select **Load** or click the Load button in the toolbar.
3	The **Load Dialog** appears, click **OK**. This initiates the load and calls up the

Step	Action
	load progress dialog. NOTE: After loading, the icon color is blue. After the CEERUN command is run, the icon is the color green.

Successful load of SIM-ACE

Use the following procedure to check for a successful load of SIM-ACE:

Step	Action
1	From the **Monitoring** tab, double-click the **CEEACE** icon. The CEEACEFB Configuration form appears with the **Main** tab forward and • CPMSTATE = CEEIDLE • CEESTATE = IDLE

Load fails for SIM-ACE

If the SIM-ACE Host computer (HOST) configuration does not identify an accessible computer with ACE software already installed, the ACE/CEEACE FBs load fails. The ACE and CEEACE blocks do not appear in the Monitoring tab of Control Builder.

Use the following procedure to correct the SIM-ACE load failure:

Step	Action
1	SIM-ACE node software installation must be completed, refer to the *Software Installation and Upgrade Guide.*
2	The SIM-ACE Host computer configuration must be corrected and the load should be re-attempted. Refer to Reloading SIM-ACE.

NOTE: A new ACE block does not have to be created in order to make the SIM-ACE Host computer correction. The previously configured ACE template is used to make the correction.

If the ACE host m/c configuration changes, then the CM/SCM's assigned to this ACE, needs to be re-loaded This is necessary because the SIM-ACE communication path was changed, which causes the relative communication paths from other peers to SIM-ACE, to also change. The relative communication path is computed at load-time; therefore, the re-load is required.

Reloading SIM-ACE

Prerequisites

- To reload ACE/CEEACE FBs, the CEEACE must be in an Idle state.

Use the following procedure to reload the SIM-ACE:

Step	Action
1	From the **Monitoring** tab, double-click the **CEEACE** icon. The CEEACEFB Configuration form appears with the **Main** tab forward.
2	Change the CEE State to **Idle.** This is for both the ACE and SIM-ACE controller.
3	ACE/CEEACE FBs must be reloaded. The CM/SCM's assigned to this ACE or SIM-ACE must also be reloaded Refer to Loading SIM-ACE to oad SIM-ACE.

Creating and loading OPC Server FB

Prerequisites

- The OPC Server FB should be loaded prior to loading any strategies that contain references to the OPC Server FB.

Considerations

The following are considerations to create and load the OPC Server FB:

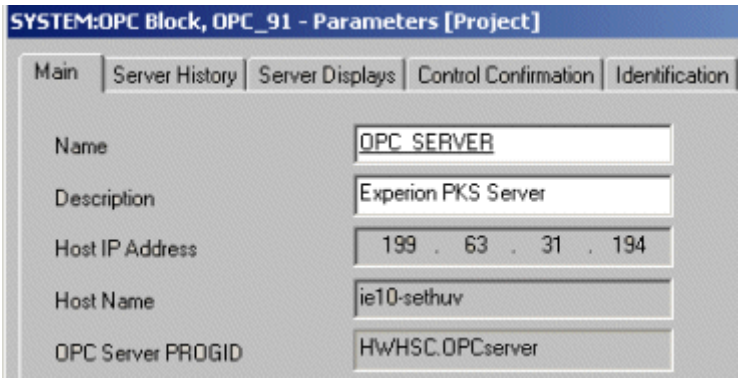
- the OPC Server FB should be loaded prior to loading any strategies that contain references to the OPC Server FB

  If the OPC Server FB is not loaded before stratgeies that reference OPC Server data, then:

  - Control strategies can not communicate with the OPC Server
  - Fail-safe values are substituted for Gets of OPC Server data
  - Attempted Stores to the OPC Server fails

Note: The field Host IP Address, Host name, and the OPC Server PROGID of the OPC FB in the OPC Server FB system template are grayed, when the OPC FB instance is in the monitoring part of the database and the system template is opened in the project side.

To change any of the above-mentioned fields, the OPC FB must be deleted from the monitoring side of the database. This also applies to ACE for HOSTIPPRI, HOSTNAMEPRI, and CNETCONNECT.



OPC –Server configuration form with grayed out boxes

Use the folowing procedure to create and load an OPC Server:

Step	Action
1	From the **File** menu, select **New**, **External Servers**, and **OPC – Server.** The OPC configuration form appears with the **Main** tab forward.
2	On the **Main** tab of the OPC FB configuration form, define the following fields: • Tag Name – default name is displayed • Item Name • Parent Asset • Description – default description is displayed • Host IP Address • Host name • OPC Server PROGID

Creating and loading Control Module FB

The scenario described below applies for both standard FBs and CCL FBs.

- An unassigned Control Module is assigned to a CEEACE, and
- if an already assigned CM is changed and saved,

CM contents are checked to see if any of the contained basic blocks are not supported by the SIM-ACE or ACE platform.

For example, it can be attempted to assign a CM with an AI Channel FB to a CEEACE that is associated with an ACE FB. When this mismatch is discovered, the assignment or save operation is not completed.

If the above build-time validation does not catch this error, the load of a CM that contains basic blocks, not supported by the SIM-ACE or ACE platform fails.

Use the following procedure to create and load an CM FB:

Step	Action
1	From the **File** menu, select **New**, and **Control Module.**
2	From the **Projects Tab**, right-click the Control Module, selecting **Module Properties…** from the pull-down menu. On the **Main** tab of the CM FB configuration form, define the following fields: • Tag Name – default name is displayed • Description – default description is displayed

Defining simulation command SIMCOMMAND settings

ATTENTION

To access SIMCOMMAND requires the ShadowPlant application. This is a licensed apllication.

SIMCOMMAND considerations

Shadow Plant or Engineer can issue SIMCOMMAND only when the SIMENABLE is TRUE. SIMCOMMAND has PointBuild and Engineer access lock.

If SIMCOMMAND is	Then
SIMFREEZE	This commands a freeze of CEEACE and simulation is stopped. This command is issued for a save/restore, dynamic data snapshot, or for Single/Multi-Step execution.
SIMRUN	This commands a start of CEEACE and simulation begins from where it previously stopped.
SIMDISABLE	The Engineer uses this command to unfreeze the simulation. On receiving this command SIMSTATE = SIMRUN.
NONE	The engineer has not commanded CEEACE, or the SIMCOMMAND has not been processed.

Defining simulation state (SIMSTATE) settings

SIMSTATE considerations

SIMSTATE parameter is used within the Experion to identify whether an execution environment is in simulation or not.

The following are the SIMSTATE settings and descriptions.

If SIMSTATE is	Then
SIMFREEZE	Indicates that ACE had finished executing single or multiple step or a commanded FREEZE to Save/Restore snapshot was issued.
SIMRUN	Indicates that ACE is in Simulation mode and the blocks are being executed.
SIMNONE	Indicates that ACE is not running in simulation mode

Use case scenario

The following table reflects user actions, the required setting, and the link to accomplish the action.

Step	Action	SIM setting	Link to do activity
1	User needs to Save/Restore a dynamic snapshot – SIM-ACE execution needs to stop	SIMFREEZE	Freezing simulation
2	User needs to restart simulation - SIM-ACE execution needs to run	SIMRUN	Successful load of SIM-ACE

If SIMFREEZE command is issued, then the Engineer can command SIMDISABLE to unfreeze the execution resulting in SIMSTATE being set to SIMRUN.

Note: In SIM-ACE the SIMSTATE is never SIMNONE, and in on-process ACE, SIMSTATE = SIMNONE.

SIMSTATE transitions in CEEACE

The table shown below depicts what happens when Shadow Plant issues SIMCOMMAND and how it affects the SIMSTATE.

SIMCOMMAND	Command issued by	Previous SIMSTATE	SIMSTATE after issuing SIMCOMMAND
SIMFREEZE	ShadowPlant	SIMRUN or SIMFRREZE	SIMSTATE = SIMFREEZE All the blocks stop executing their algorithms. But the parameter requests continue to be processed.
SIMRUN	ShadowPlant	SIMFREEZE	SIMSTATE = SIMRUN All the blocks start executing their algorithms based on the CEESTATE. The parameter requests continue to be processed
SIMRUN	ShadowPlant	SIMRUN	No change since SIMSTATE = SIMRUN already.
SIMDISABLE	ShadowPlant or Engineer	SIMRUN or SIMFRREZE	SIMSTATE = SIMRUN SIMDISABLE is used when ShadowPlant exits, leaving SIMSTATE in SIMFREEZE. If SIMSTATE = SIMRUN then there is no change.

Defining simulation levels using SIMMODE

SIMMODEand SIMSTATE interdependencies

SIMMODE is available in the interface blocks UCNOUT, EHGOUT and HIWAYOUT FB. SIMMODE's settings are dependent on the setting of SIMSTATE, refer to table below.

If	Then
SIMSTATE = SIMNONE	SIMMODE is always NONE
SIMSTATE is not SIMNONE	SIMMODE can take the value NONE, INITDISABLE and DIRECTSUB. Refer to **ATTENTION** below.

Refer to table below for impact of the SIMMODE setting.

If SIMMODE setting is	Then the mpact of this setting is	
NONE	SIMMODE = NONE, then OUT blocks are communicating with substitute or real OPC Server as usual. – OUT block can initiate read/write through OPC server FB. If SIMENABLE = FALSE then only real OPC is configured If SIMENABLE = TRUE then only substitute OPC Server is configured.	
		**ATTENTION** Real and substitute OPC servers cannot be distinguished. If the real OPC Server is configured with SIM-ACE, then Read and Write is possible**. This can lead to simulation environment writing to the Real environment.** The user should be careful that SIM-ACE (with untested strategies possibly) is not used with real OPC Server to control real devices.

If SIMMODE setting is	Then the mpact of this setting is
INITDISABLE	• OUT Blocks are prevented from initializing the primary block • Operator can directly write to the parameters EULO and EUSPAN100 in the SECDATA side of OUT blocks, which are passed to the primary block. • The Primary generates the value, regardless of the status of the OUT block. There is no need for OPC Function block or external simulators. Simulation is done in the Control Strategy within the ACE environment.
DIRECTSUB	When the SIMMODE = DIRECTSUB Shadow Plant reads and writes directly to SECDATA through Control Data Access since ShadowPlant is a CDA client. In this case OPC Function Block is not needed. ShadowPlant initiates read and write.

SIMMODE in on-process ACE

SIMMODE parameter is available in case of on-process ACE also. But it is not enabled. SIMMODE = NONE and its value cannot be changed.

SIM-ACE Operations

Startup and shutdown of SIM-ACE node

Startup and Shutdown

The SIM-ACE node needs to be powered on and booted up for use. The SIM-ACE does not support any startup functions.

Inhibiting SIM-ACE notifications

Active SIM-ACE and ACE notification

If ACE and SIM-ACE controllers exist as different nodes and are connected to the same Experion server, notifications from both SIM-ACE and ACE are displayed in Station's Alarm Display page. Allowing SIM-ACE to generate alarms in this environment, could lead to confusion. The NOTIFINHIBIT option in the SIM-ACE prevents the notifications from the SIM-ACE environment from being displayed in the station's alarm display page.

Prerequisites

- You defined a SIM-ACE controller.
  In on-process ACE, the NOTIFINHIBIT option is disabled.
  NOTIFINHIBIT parameter is not exposed in the CEEACE FB template when SIMENABLE is FALSE.
- The CEEACE icon appears in the Monitoring tab.
- The NOTIFINHIBIT parameter has an access lock of Engineer.
- NOTIFINHIBIT is configured in the project side.

Considerations

- On selecting NOTIFINHIBIT, the notifications generated by the execution environment will not be reported in the stations alarm display.
- NOTIFINHIBIT parameter will not affect the events and INALAM indication.

Use the following procedure to inhibit the displaying of alarm notifications:

Step	Action
1	From the **Monitoring** tab, double-click the **CEEACE** icon. The CEEACEFB Configuration form appears with the **Main** tab forward.
2	From the **Command/State** field, select **Inhibit Notifications – CEE and Contents** to inhibit notifications. NOTE: From the monitoring side, NOTIFINHIBIT can only be set/reset when the CEESTATE is IDLE. This is enforced because notifications are regenerated when the CEESTATE transition from IDLE to RUN.

Switching between SIM-ACE and ACE environment

Changing host IP address

Prerequisites

- ACE FB (ACE01 and ACE02) is loaded successfully in a simulation mode (SIMENABLE = TRUE) and both executing in the same hardware node.
- Suppose ACE01 needs to be switched to non-Simulation mode, then it needs to run on a different Hardware node. This needs to be done because SIM-ACE and ACE cannot run on the same node.

  Assume that you change the Hostname and IP Address and save the new configuration without deleting the loaded instance. The new configuration is updated in the ERDB. ERDB at this instance is inconsistent with ACE01 because ACE01 is executing in the host, rather than the host details in ERDB.

To avoid the inconsistency between the ERDB and the ACE01 process Host IP Address, Host name field and ControlNet connection option needs to be grayed in the ACE FB configuration form until the ACE01 is deleted in the monitoring part of the database.

This applies even when the ACE FB is in Shutdown state in the monitoring view in the Control Builder. In this case static/structural snapshot file is holding the inconsistent data. So irrespective of the state of ACE01 FB in the monitoring part of the database, ACE01 needs to be deleted in order to edit the Host info fields.

Considerations

- ACE01's host name and IP address need to be reconfigured in addition to setting SIMENABLE = FALSE.

Use the following procedure to change the host IP address:

Step	Action
1	From the **Monitoring** tab, double-click the **ACE FB** icon. The **Main** tab appears forward.
2	In the **ACE Location** group, change the Host IP Addess
3	On the CEEACE FB Main Tab, ensure **Simulation Enable** and **Inhibit Notifications – CEE and Contents** are unchecked.

Implications of changing a simulation controller to an on-process controller.

Active simulation controllers	Required activity
ACE01 ACE02 Both executing in same hardware node	a) **ACE01** needs to be switched to non-simulation mode • Then ACE01 is required to run on a different hardware node • ACE01's host name and IP address needs to be reconfigured • SIMENABLE = FALSE. This is required because SIM-ACE and ACE cannot run on the same node. ACE02 remains configured as previously defined. ACE01 FB in the monitoring part of the database needs to be deleted in order to edit the Host info fields.

	b) If you change the Hostname and IP Address and save the new configuration without deleting the loaded instance the following occurs • New configuration is updated in the ERDB • The ERDB at this instance is inconsistent with ACE01, because ACE01 is executing in host other than the host details in ERDB. – To avoid the inconsistency between the ERDB and the ACE01 process Host IP Address, Host name field and ControlNet connection option needs to be grayed in the ACE FB configuration form till the ACE01 is deleted in the monitoring part of the database. – This applies even when the ACE FB is in Shutdown state in the monitoring view in the Control Builder. In this case static/structural snapshot file is holding the inconsistent data. So irrespective of the state of ACE01 FB in the monitoring part of the database ACE01 needs to be deleted in order to edit the Host info fields.

Scenario – Switching ACE and SIM-ACE

Use the folloing procedure to switch from ACE on-process to SIM-ACE:

Step	Action
1	From the **Project** tab, double-click the **CEEACE** icon. The CEEACEFB Configuration form appears with the **Main** tab forward.
2	From the **Command/State** group, check **Simulation Enable** in its checkbox • This sets SIMENABLE = TRUE Note: On-process setting is SIMENABLE = FALSE
3	Shutdown and load the ACE FB. • Refer to the following sections: • Shutdown a SIM-ACE Loading SIM-ACE • The shutting down and reloading of the ACE FB sets:

Step	Action
	ACE FB to : CPMSTATE is CEEIDLE CEEACE FB to: CEESTATE is IDLE • If an attempt is made to switch between ACE & SIM-ACE online (i.e when ACE FB is loaded) then load fails and CPMSTATE of the ACE FB is set to NOCEE.
4	Set SIMCOMMAND - only ShadowPlant and an Engineer (access priviledge) can write to this parameter and command start and stop of execution. Once this parameter's value is accepted – it goes back to NONE. SIMCOMMAND selections – refer to Defining simulation command SIMCOMMAND settings for detailed information. • NONE no change • SIMFREEZE stops simulation • SIMRUN simulation starts (from previous location if it was in a SIMFREEZE state) • SIMDISABLE unfreezes simulation Note: Commands SIMRUN and SIMFREEZE can only be issued by Shadow Plant.
5	Set SIMSTATE is a read-only parameter.

Freezing simulation

SIM-ACE freezing simulation considerations

SIM-ACE can be placed in a freeze state by issusing a SIMFREEZE command.

A request to initiate a SIMFREEZE is made to the CEEACE FB SIMCOMMAND paramter and status checks are performed (prior to placing SIM-ACE in SIMFREEZE). These checks include:

- parameter value range checks
- access level range checks

Use the following procedure to place SIM-ACE in a freeze state:

Step	Action
1	Only the ShadowPlant application can freeze the simulation.
2	From theShadowPlant menu select the **Freeze/Unfreeze** icon. This issues a SIMFREEZE/SIMRUN SIMCOMMAND based on the previous state.
3	The SIMSTATE changes to SIMFREEZE, if the previous state was SIMRUN.

Use the following table to validate a succssful SIMFREEZE configuration:

Store status	SIMSTATE status	Result
Successful	SIMSTATE changes to SIMFREEZE	When block execution resumes, scheduler stops execution of all blocks
Unsuccessful	SIMSTATE stays at previous state	Error messages appear.

Shutdown a SIM-ACE

SIM-ACE shutdown considerations

To place a SIM-ACE in shutdown requires the CEESTATE is set to Idle. Follow the procedure in the table below.

Step	Action
1	On the SIM-ACE FB, select the **CEESTATE** checkbox, setting the state to **Idle**. After the shutdown the following occurs: • Processing is stopped on the SIM-ACE node • CDA-sp service continues to run • If the ACE FB still is displayed on the Monitoring tab, the following errors are indicated for the blocks associated with SIM-ACE: – ACE FB is yellow – CEEACE and CM/SCM are red These indicators are activated because communications with the FBs have been lost.

Deleting a SIM-ACE

Deleting SIM-ACE from the Project side

Prerequistes

The SIM-ACE can be deleted from the Project side when it:

- Does not exist on the Monitor tab
- The ACE FB (in similation) has no control strategies assigned to the CEEACE FB.

Use the folowing procedure to delete a SIM-ACE from the Project side:

Step	Action
1	Fom the **Project** tab, select the **ACE FB** to be deleted.
2	From the **Edit** menu, select **Execution Environment Assignment**. The Execution Environment Assignment dialog appears.
3	From the **Avaialble Module** are: • Click the "**Show All**" button. • Select the module assigned to the CEEACE controller.
4	From the **Assigned Modules** area: • Select the module that is assigned to your controller. • Click the **Unassign** button at the botton of the dialog. Note: On the **Project** tab, the module is placed back in the unassigned location. • Close the **Execution Environment Assignment** dialog.
5	Select the **ACE** controller on the Project tab.
6	From the **Edit** menu, select **Delete**. The **Deleted Selected object(s)** dialog box appears listing the objects to be deleted.
7	Click the **Deleted Selected object(s)** button.
8	The ACE controller is deleted from the **Project** tab.

Deleting SIM-ACE from the Monitor tab

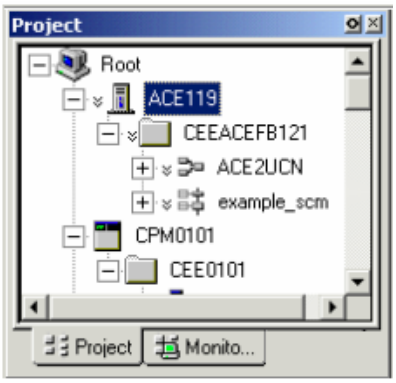
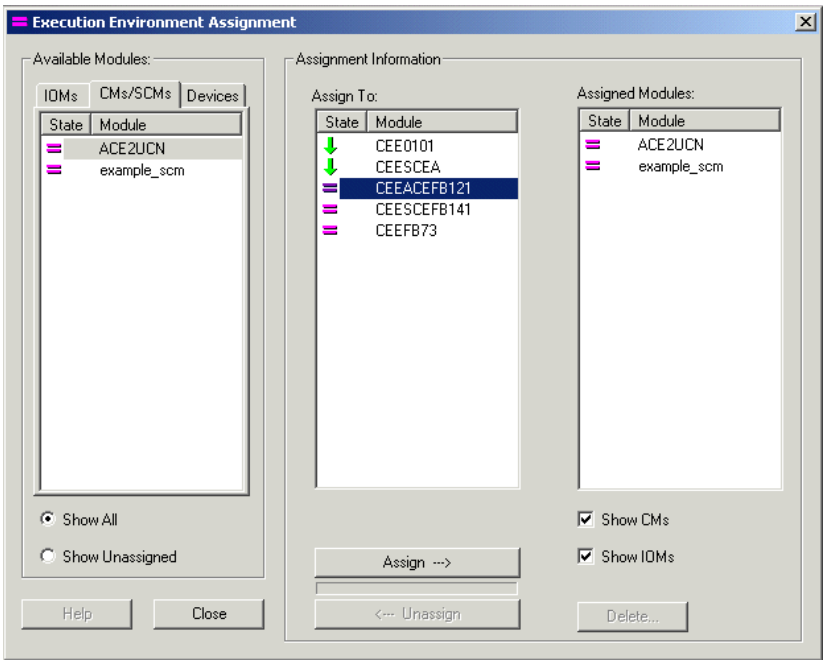
Prerequistes

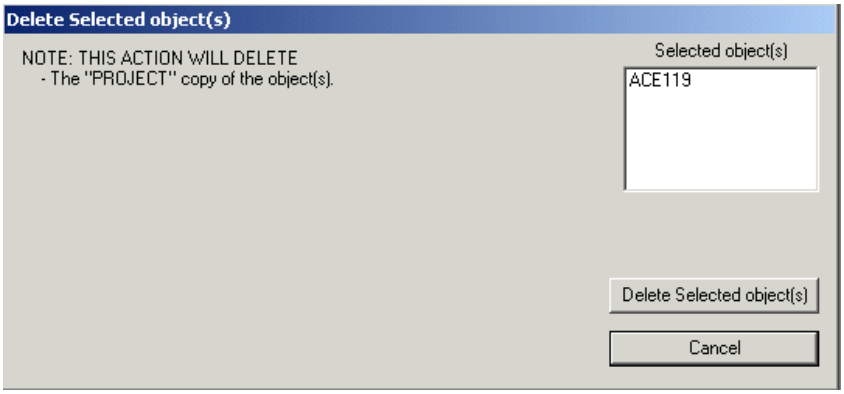
The SIM-ACE can be deleted from the Monitor tab when:

- CEECOMMAND is IDLE then, CEESTATE can be set to Idle
- The ACE FB (in similation) has no control strategies assigned to the CEEACE FB.

Use the following table to delete a SIM-ACE from the Monitor tab:

Step	Action	Result
1	In **Monitor** Mode, open root directory for ACE/CEEACE.	Exposes contents of the CEEACE.
2	Right-click the **CEEACE** block and select Inactivate->Selected CEE(s), IOMs, CMs, Applicable Function Blocks from the shortcut menu.	Inactivates all components including the CEEACE. Block icons turn blue.
	**TIP** If ACE/CEEACE and its assigned components have been loaded, you must first put the CEEACE in its Idle mode and delete all of its components in the Monitor mode before you can delete them from the Project mode.	
3	Select components contained in CEEACE and click  delete button in the tool bar.	Calls up **Delete Selected Objects** dialog.
4	Click the **Deleted Selected Object(s)** button.	Initiates the delete function and progress dialog tracks status until complete.
5	Click the ACE block and click the delete button in the tool bar.	Calls up **Delete Selected Objects** dialog.
6	Click the **Delete Selected object(s**) button.	Initiates the delete function and progress dialog tracks status until complete.
7	Click the **Project** tab.	Calls up the Project view.

Step	Action	Result
		
8	With ACE selected, click  assign button in the tool bar.	Opens the **Execution Environment Assignment** dialog box.
		

Step	Action	Result
9	Click module assigned to ACE in Available Modules list, select CEEACE in **Assign To** list, select all the modules listed in the Assigned Modules list and click the **Unassign** button.	Unassigns modules from CEEACE.
10	Click the **Close** button.	Closes dialog box and returns to Project view.
11	With ACE selected, click  delete button in tool bar.	Calls up **Delete Selected Objects** dialog.
		
12	Click the **Delete Selected object(s)** button.	Initiates the delete function and progress dialog tracks status until complete. 
13	This completes the deleting ACE/CEEACE procedure.	Stops the ace.exe on the ACE node, but the Control Data Access for supervisory platform (CDA-sp) continues to run.

Debugging CAB programs in SIM-ACE

REFERENCE - INTERNAL

To find the procedures to debug CAB programs in SIM-ACE, refer to the *CAB on ACE User Guide.*

ATTENTION

If the debugger is attached to the on-process ACE, the application shuts down or terminates.

You debug CAB programs in Simulation mode. You utilize the source level debug capabilities of the Microsoft Visual Studio 7.0 that includes:

- single step execution,
- break points that can be set and viewed directly within the source code and
- the ability to examine internal variables during break.

The debug build contains additional information to be used by the source level debugger and is different from the release build.

Site practice must control the services and applications that are allowed on an on-process ACE to ensure debugging does not impact an on-process system.

Local debugging

For complete procedural instructions on debugging CAB programs in SIM-ACE, refer to CAB on ACE User Guide.

Local debugging activities

The following are activities associated with local debugging:

- save the build to ERDB
- load an instance of a block to SIM-ACE. After loading the block, attach the Microsoft Visual studio debugger to the ACE process in a simulation mode
- you iterate through as many variations of the block type as needed to eliminate defects
- once the defects are removed, SIM-ACE debugging is complete

Other considerations

- Attaching a MSVS debugger inadvertently to an on-process ACE or any other on-process EPKS subsystem leads to serious user error with loss of control or view.
- To ensure safety, source level debugging can be used with SIM-ACE and ACE with debug build started as a debug console.
- You can set a release build option, to make a final build to the release target. This can be saved to ERDB and maintained as the useable block type.
- The precautionary measure below is taken care in ACE, SIM-ACE and CAB, against inadvertent setting of break points by end-users in on-process controllers.
  - ACE installation supports optional installation of MSVS remote debugging components with the warning that remote debugging components should only be installed on the nodes that are to host SIM-ACE.
- If the Machine Debug Manager (MDM) service is installed and running on a node which hosts on-process ACE, either in a cutover scenario or inadvertently, the ACE process determines the state of the service both at startup and periodically, and prevent the CEE transition to RUN.
  - An urgent priority system diagnostic alarm is generated.
  - The alarm message indicating “MDM Service running” is displayed in the station.
  - If you try to give the CEECOMMAND as ‘RUN’ when MDM service is running an error message is thrown indicating “CEE can’t be activated when the MDM service is running”. In this case to activate the CEE, you first stop the MDM service and try the CEECOMMAND ‘RUN’.

Remote debugging

REFERENCE - INTERNAL

To find the procedures to debug CAB programs in SIM-ACE, refer to [hyerlink to CAB on ACE doc].

Remote debugging considerations

Remote debugging can be done only if MDM service is installed on the ACE node. This service is installed as part of remote debugging components setup during ACE installation, only if the CAB License exists.

Refer to *CAB on ACE User Guide* for additional information.

Saving non-structural data

Considerations

Saving a non-structural data snapshot translates into a command to all SIM-ACEs. This command is applicable to all SIM-ACE's in the system.

Following are considerations when saving non-structural data.

Action	Result
Control library interface checks if SIMSTATE = SIMFREEZE	If it is not SIMFREEZE, the command is rejected. • Save in this SIMSTATE is not allowed because the simulation database may not have been stopped or frozen. If it is SIMFREEZE, the command is accepted. • The control library then reads the latest values of DYNSTATE parameter from the controller. All the loadable parameters, as well as dynamic state variables, are stored in snapshot file on the machine where the Experion server is running.
Save operation is not successful if there is communication failure during save operation.	It is the responsibility of the engineer to restart the save operation.

Restoring non-structural data

Considerations

Restoring a non-structural data snapshot translates into a command to all SIM-ACEs. This command is applicable to all SIM-ACE's in the system. Snapshot save location is configurable from the ShadowPlant side.

Following are considerations when restoring non-structural data.

Action	Result
Control library interface checks if SIMSTATE = SIMFREEZE	If it is not SIMFREEZE, the command is rejected. • Restore in this SIMSTATE is not allowed because the simulation database may not have been stopped or frozen. If it is SIMFREEZE, the command is accepted. • Dynamic data snapshot files that were saved previously can be used to restore SIM-ACE. • All dynamic state variables are restored to the controller.
Restore operation is not successful if there is communication failure during save operation.	It is the responsibility of the engineer to restart the restore operation.
Events are reported when the non-structural data is restored. This means that the event journal always contains a record of when the snapshot was restored.	

SIM-ACE System Administration

Local SIM-ACE Node Administration

SIM-ACE node administration is done locally. Keyboard, mouse, and monitor should be available to connect to the SIM-ACE node, when reviewing/adjusting administration settings. Node administration function includes:

- checking status of node services,
- using node performance tools, or
- starting and stopping other applications on the node

ATTENTION

The system does not prevent the user from installing and executing other applications on the same node as SIM-ACE or Experion applications. For robust and reliable SIM-ACE control, it is highly recommended that only SIM-ACE related applications are hosted on the SIM-ACE node.

SIM-ACE Troubleshooting and Maintenance

Recovering from SIM-ACE node power failure

Prerequisites

The following state should exist, representing a fully functional, active ACE node running in simulation (SIM-ACE):

- ACE node is running in simulation (SIM-ACE)
- CEEACE function blocks are loaded
- CM/SCM with strategies built are loaded and active

Indications of failure

If the SIM-ACE loses power the following occurs:

- Loss of Communications with Controller event is generated
- Errors are indicated on the Monitoring tab icons for the ACE, CEEACE, and CM/SCM FBs assocaiated with SIM-ACE
- Lower level strategies dependent on the SIM-ACE for supervisory control sheds to their configured backup modes.

Recovering from node power failure

Use the following procedure to recover from a SIM-ACE power failure

Step	Action
1	Restore power to SIM-ACE node.
2	Boot up the SIM-ACE node (all necessary SIM-ACE processes starts automatically)
3	Select **ACE FB** from Monitoring tab. From the **Snapshot** menu, select **Restore Controller from Snapshot**.
4	Activate CEEACE and CMs/SCMs as required.

Recovering from SIM-ACE application failure

Prerequisites

The following state should exist, representing a fully functional, active ACE node running in simulation (SIM-ACE):

- ACE node is running in simulation (SIM-ACE)
- ACE/CEEACE function blocks are loaded
- CM/SCM with strategies built are loaded and active

Indications of failure

A SIM-ACE application failure occurs when the either the CDA-sp or EE component or both fail). If the SIM-ACE application fails the following occurs:

- Loss of Communications with Controller event is generated
- Errors are indicated on the Monitoring tab icons for the ACE, CEEACE, and CM/SCM FBs assocaiated with SIM-ACE

Recovering from application failure

Use the following procedure to recover from a SIM-ACE application failure:

Step	Action
1	Restore power to SIM-ACE node.
2	Boot up the SIM-ACE node (all necessary SIM-ACE processes starts automatically)
3	Select **ACE FB** from Monitoring tab. From the **Snapshot** menu, select **Restore Controller from Snapshot**.
4	Activate CEEACE and CMs/SCMs as required.

Recovering from OPC Server failure

Prerequisites

The following state should exist, representing a fully functional, active ACE node running in simulation (SIM-ACE):

- ACE node is running in simulation (SIM-ACE)
- ACE/CEEACE function blocks are loaded
- CM/SCM with strategies built are loaded and active
- OPC Server function block is successfully loaded
- SIM-ACE contains control strategies that reference the OPC Server
- Communication between the SIM-ACE and the OPC Server is normal

Indications of failure

An OPC Server failure happens if any of the following occurs:

- OPC Server component fails
- The single Ethernet connection to the OPC Server fails
- OPC Server loses power

If OPC Server fails the following occurs:

- Communication errors from SIM-ACE strategies that reference OPC Server data. Several process alarms can be reported as a result of:
  - fail-safe data substitution for Gets, and
  - failures for Stores

Recovering from OPC Server failure

Use the following procedure to recover from an OPC Server failure:

Step	Action
1	Restore power to OPC Server node, if power was lost.
2	Repair the failure in the communication link, if needed

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