Foxboro Evo™ Process Automation System

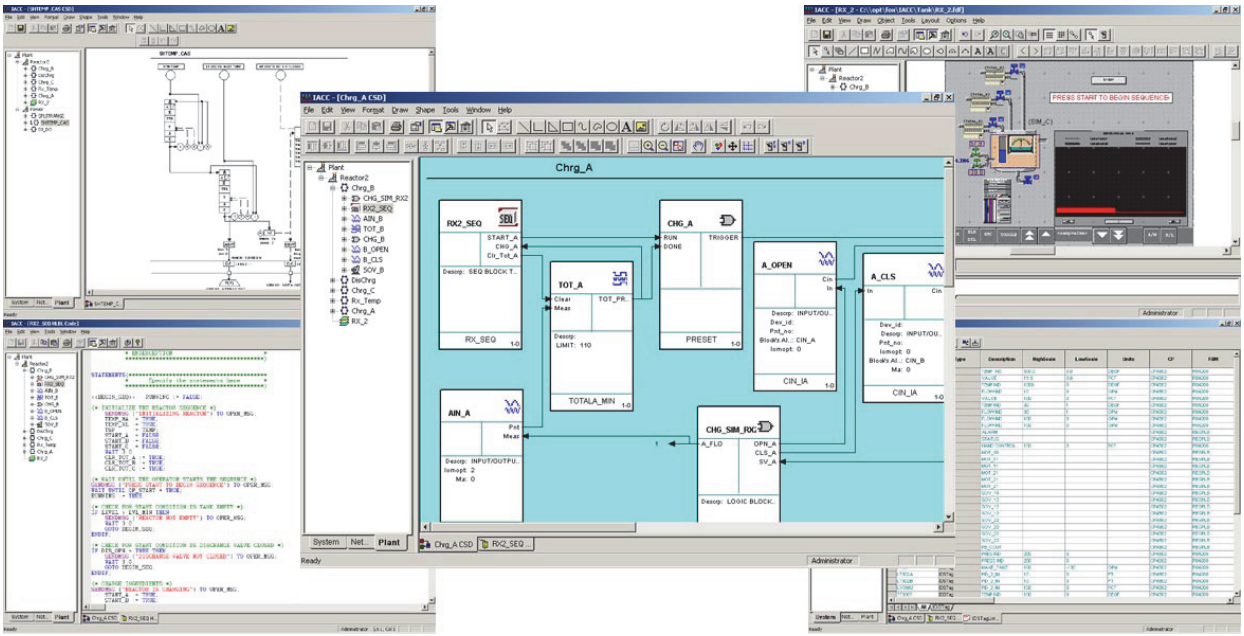
Product Specifications

Foxboro®

by Schneider Electric

PSS 31S-10IACC

I/A Series® Configuration Component (IACC) Engineering Package for Windows 10 and Windows Server 2016



IACC provides a powerful and integrated engineering environment for designing and maintaining control strategies, creating composite display objects, and configuring the Foxboro Evo™ Control Core Services.

FEATURES

- Highly graphical configuration environment
- Integrates system, display and control configuration activities in a single environment
- Easy to use for small and large scale bulk configuration activities
- Ability to define and bulk generate loops from pre-engineered templates
- Live control strategy displays for loop testing and checkout
- Intelligent Design Studio library offering over 30 frequently encountered control strategies.

OVERVIEW

The I/A Series Configuration Component (IACC) software offers substantial productivity and quality gains made possible by using its rich set of intuitive and extensible engineering tools for project engineering and life-cycle maintenance. It works with Foxboro Evo Control Core Services and Control Software. A control strategy diagram (CSD) is developed by first dragging Foxboro DCS blocks from a palette and then dropping them onto an editing canvas. These blocks are then linked together to form a control loop by drawing a line between the appropriate output parameter of a source block and the input parameter of the sink block. The CSD is then completed by finishing the parameter

assignments using each block's property table.

All or a portion of a CSD can be copied onto a user-defined palette and later used to create new CSDs which share all or a part of the behavior of the original CSD. The user can, therefore, create reusable libraries of block constructions by storing them in user-defined palettes.

IACC also enables the user to create CSD templates. These templates can be used to create instances of themselves. Each instance inherits the structure, linkages, and default parameter settings from the template. Any subsequent change to the template can then be propagated to all of its instances. This feature enables organizations to create standards that will efficiently update all instances of the template when it is updated.

A CSD can also be associated with multiple FoxDraw™ composite display objects. Specific block parameters within this CSD can be associated with aliases defined in the construction of the FoxDraw composite display objects. Once done, a fully resolved rendering of the FoxDraw composite display object can be created simply by invoking the FoxDraw editor from within IACC and dragging the representation of a downloaded CSD from the Navigator Pane onto the FoxDraw editing canvas. If more than one composite display object is assigned to the CSD, a dialog box displaying the choices will first be displayed. Once the composite display object is picked, a fully resolved rendering of the display object appears on the FoxDraw canvas. This improves both the efficiency of display construction and the coordination of control and display strategy designs.

IACC also supports the bulk generation of a project database from templates and a TagList object containing the information pertaining to each instance of a template that is to be created.

Libraries of new block types can be derived from standard or derived Foxboro Evo block types. These new block types inherit the properties of their parent.

The user, therefore, can create a new derived block type called TANK by starting with the general purpose CALCA block type. A new block type called STIR_TANK can then be created from the TANK block type, and the user only needs to add the functionality required for its enhanced features. A project engineer is then able to use instances of CALCA, TANK, and/or STIR_TANK in the creation of CSDs.

IACC also enables portions of control strategy designs to be exported and imported, thereby allowing the sharing of intellectual property between sites or between an engineering center and production facilities.

IACC includes the Intelligent Design Studio library with over 30 frequently encountered control strategies.

EASE OF USE

IACC enables the user to construct simple control strategy diagrams from predefined control block types. It allows the user to characterize these block types to meet specific project requirements and to associate the loop with field equipment. A group display consisting of faceplates and trends associated with the newly constructed loop can be built and dispatched to the appropriate workstations. Complex loops are constructed in the same manner as simple loops.

NAVIGATION

The IACC Graphical User Interface Window is comprised of nine components. These are:

- Title Bar
- Menu Bar
- Toolbar
- Project Navigator Pane
- [Drawing] Editor Pane
- Palette Pane

- Tab Selection Row
- Output Pane
- Status Bar.

Panes

The individual panes make up the majority of the display area. These expose different aspects of the design project and are typically coordinated to offer different aspects of the same project or application. The Project Navigator Pane, Palette Pane, and Output Pane are resizable and can be made visible or invisible from ToolBar button picks. Both the Palette Pane and the Output Pane are dockable. This enables the user to better control the available display area of the Editor Pane where most of the editing is accomplished.

The Project Navigator Pane

The Project Navigator provides a tree view of the entire database organized with three different views (see Figure 1):

System View – Lists all those components from which instances of configuration objects can be created.

Network View – Lists all the Foxboro Evo hardware and software components managed by IACC as well as the control elements (blocks and compounds).

Plant View – Provides a user-defined representation of the plant areas with the various categories representing various levels. Users can view compounds, CSDs, and displays within the plant tree.

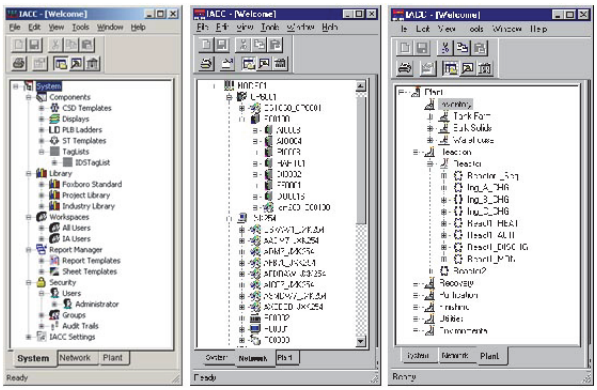


Figure 1. Navigational Views of the Database

The Editor Pane and Control Strategy Diagrams

All graphical constructions are accomplished in the Editor Pane. These include building CSDs and CSD templates, building FoxDraw displays and display symbols, and creating new appearances for derived block types.

Control strategy diagrams, shown in Figure 2, are built in the Editor Pane by dragging the default control block types from the standard Palette Panes or dragging user-defined derived block types, sets of connected blocks, or an entire CSD from a user-defined Palette Pane onto the CSD Editor Pane canvas. A new instance of the object type is created once it is dropped onto the canvas.

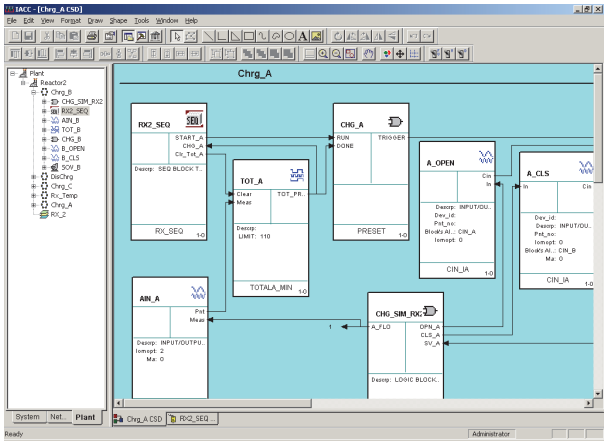


Figure 2. Control Strategy Diagrams

Physical I/O is associated with the CSD, as shown in Figure 3, by dragging the equipment control block (ECB) object of the appropriate I/O module represented in the Navigator Pane onto the CSD drawing in the Editor Pane. Once the ECB object is dragged, the parameters from the referenced ECB can be connected to the appropriate parameters in the I/O function blocks on the CSD.

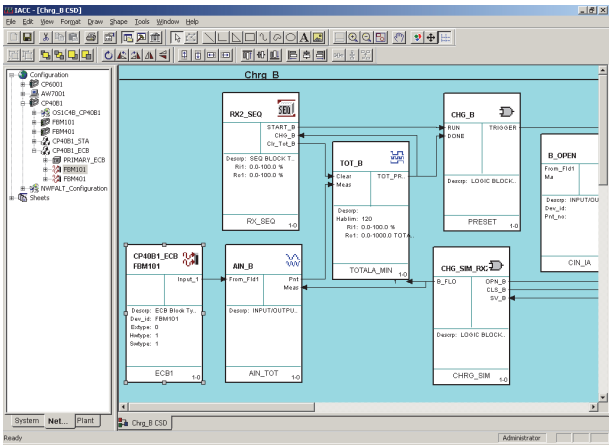


Figure 3. Physical I/O

Property editors are typically invoked by selecting a block on the CSD, right-clicking it, and selecting its property sheet. Tabs on the property sheet categorize the properties into related groupings, each containing the pertinent subset of the parameters in that category.

DERIVED BLOCK TYPES AND INHERITANCE

IACC enables you to develop a hierarchy of new block types derived from the standard set of blocks that are part of the Foxboro Evo system. The hierarchy can be used to define increasingly more specialized blocks that you frequently use. Examples include:

- A set of specialized input signal block types, like thermocouple block types, can be derived from the standard AIN block type.
- Specialized calculations, such as, mass flow of a gas, viscosity of a liquid, a log mean temperature difference (LMTD) heat transfer rate or a set of simple simulator block types, can be derived from the CALCA, LOGIC or MATH block types.
- A specialized controller type, such as the SAMA(1) controller shown in Figure 4, can be derived from the more generalized PIDA block type. The appearance of the derived block type can be modified by the use of the Block Appearance Editor to resemble a standard SAMA diagram.

These specialized derived block types simplify subsequent design efforts when creating CSDs. The user of these blocks then simply calls the newly derived block types from a user-defined palette, fills in the re-labeled property information, and connects the blocks to the loop to be tested. Because an instance of a derived block inherits all the properties of the parent, including appearance, connection labels, and parameter labels, the derived block is much easier to use for its end purpose.

The Block Appearance Editor

The appearance of a derived block type can be modified to describe its use more closely. One example is to create a block diagram modified as a SAMA representation of a PID block type with the high and low output clamps and auto manual transfer switch exposed as connections. Showing the block in SAMA notation makes it easier for the control engineer to use it. These appearance changes can be made by the user employing the drawing tools, available in the Appearance Editor, for that user-defined, derived block type.

(1) SAMA supported on IACC versions prior to v2.5.

NOTE

The Block Appearance Editor does not contain the tools to create a SAMA representation by default; this must be user-created.

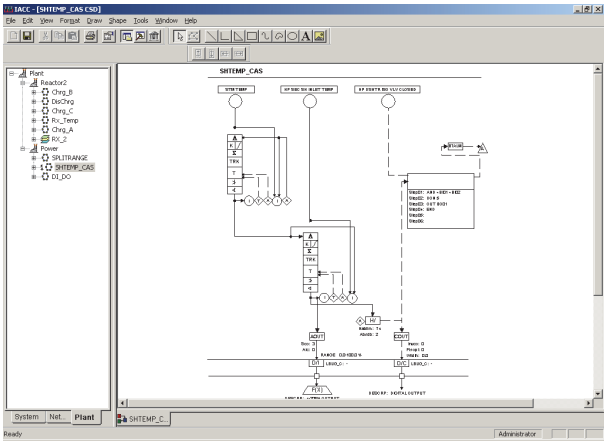


Figure 4. SAMA Representation

Automated Connection Generation

When a user connects the primary parameters of two blocks in a CSD, IACC automatically generates a set of additional connections between these block instances, if appropriate. This significantly reduces the number of connections a user needs to make in order to properly commission a loop. These additional connections typically include engineering units, scaling, and initialization information. The user is free to add and delete these connections, either by drawing or deleting connection lines between exposed parameters on the drawing or by adding or deleting entries in the Connection Dialog box associated with each block instance.

For example, when the user draws a connection from the output of a PIDA block to the remote set point of another PIDA block, IACC makes the additional connections shown in the Connection Dialog box depicted in Figure 5. This results in significantly reducing manual data entry and any conditions that might occur due to mistyping the data.

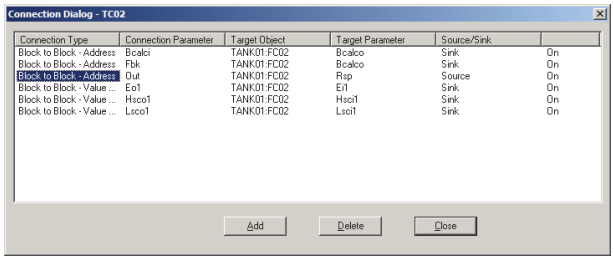


Figure 5. Connection Dialog Box

CREATING BATCH, LADDER AND SEQUENCE LOGIC

Foxboro Evo software provides a wide variety of block types for specifying batch, ladder and sequence logic. IACC enables the user to use three different methods for describing the logic:

- Sequential Function Charts (SFC/ST)
- Structured Text Language (HLBL)
- Ladder Logic Editor.

The editors for these languages are executed from within IACC.

Sequential Function Charts

The SFC/ST software package, a graphical user interface (GUI) based on sequential function charts and structured text, is integrated into IACC. It provides an alternate, advanced method of configuring and displaying Foxboro Evo system sequence control blocks (DEP, EXC, and IND). SFC/ST allows the user to create Structured Text Templates to provide re-usable code for similar process control applications. SFC/ST also allows the user to develop a library of re-usable text objects that contain ST code snippets.

Configuration and operation views follow the IEC 61131-3 standard for both sequential function chart (SFC) elements and structured text (ST).

The Structured Text [HLBL] Editor

HLBL is a procedural language with real-time extensions such as RETRY, SENDCONF, SENDMSG, SET_SBXS, START_TIMER, STOP_TIMER, WAIT, and WHILE. Programs written in HLBL are connected to control strategy diagrams using the interface specification of one of the sequence block types, such as DEP, IND, EXC, MON or TIM. See Figure 6.

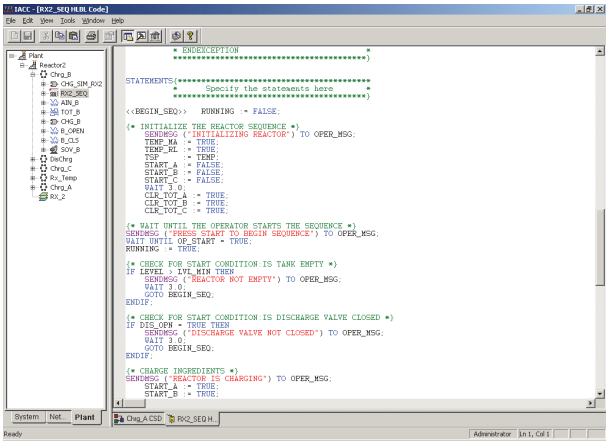


Figure 6. Structured Text Editor

The Ladder Logic Diagram Editor

Ladder and interlock logic can also be configured in IACC using ladder logic diagrams (LLD) loaded directly into Fieldbus Modules for fast execution. Once configured, the LLD is assigned to a Programmable Logic Block (PLB), which manages the interface to other blocks in the CSD as well as communications with the Fieldbus Module. See Figure 7.

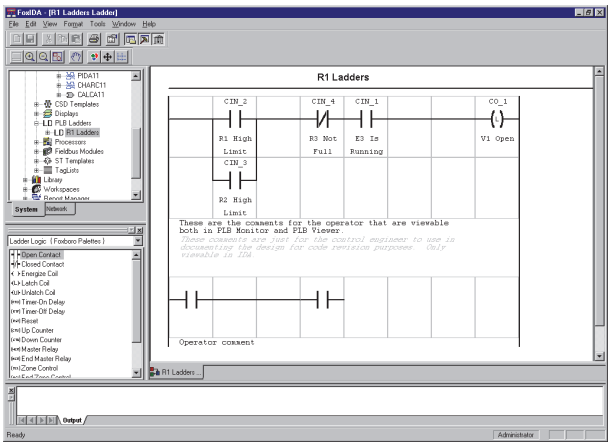


Figure 7. Ladder Logic Diagram Editor

FOUNDATION FIELDBUS SUPPORT

IACC provides advanced support for integrating Foundation fieldbus (FF) H1 devices with the Foxboro Evo system, including configuration of FF device function blocks. IACC interfaces with the DD Explorer application to link device descriptions with objects representing the FF objects. When the user connects these objects to the control strategy, IACC presents configuration choices based on the device descriptions, providing an effective and appropriate interface with the field devices. Figure 8 shows selection of a channel in an AI block properties sheet based on the connected transmitter object.

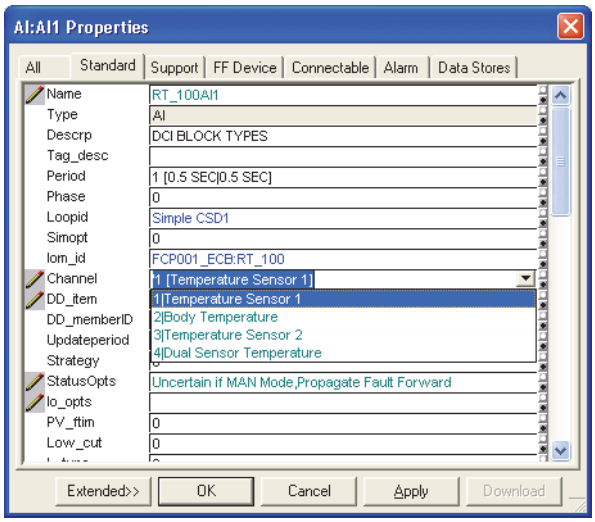


Figure 8. Device Specific Configuration Choices

CONTROL STRATEGY DIAGRAM TEMPLATES

A simple control strategy diagram (CSD) represents only a single instance of a loop. IACC can also be used to create a CSD template (CST), which provides the basis for creating multiple instances of a predefined or user-defined loop type. A template copies all its properties, such as connections and parameter settings, to each of its instances. In addition, any changes made to the template can be automatically propagated to each instance of the template.

A user can selectively override template settings on an instance-by-instance basis by modifying the selected parameters at the instance level. These instance level modifications will not be overridden if the parameters are modified at the template level.

An instance of a CSD template can also be disconnected from its CSD template definition, yielding a simple CSD that is identical to the original CST; however, it will no longer be modified as a result of future changes to the CST from which it was originally derived.

A CSD can also be converted into a template which can then generate instances of its loop type.

TEMPLATE IMPORT AND EXPORT

IACC enables control strategy diagram templates and their associated derived block types to be imported or exported from one project or library to another. This enables the proven designs developed at one site to be re-used at another. It also allows design specifications to be developed at a central location and deployed at many user sites.

The IDS Library

Intelligent Design Studio (IDS) is a default Loop Template Library which is included with IACC and provides:

- 3 Forms of PID Loop
- 3 Forms of Cascade Loop
- Split Range Controller (2 valves)
- Indicator and Hand Indicating Control Loop
- Differential Signal Indicator
- Ratio Control Loop
- 3 Forms of Totalizer Loop
- 4 Forms of Motor Loop
- 3 Forms of Solenoid Valve Loop
- 5 Control Loops employing Foundation fieldbus H1 devices
- Motor-Operated Valve
- Material Balance Control
- Contact Status and Alarm.

LINKING A CSD/CST TO A DISPLAY OBJECT

A control strategy diagram or template can be directly linked to one or more FoxDraw composite display objects. Once linked, instances of display objects can be created by simply dragging a downloaded CSD onto a FoxDraw canvas and all the references between the block parameters in the CSD are automatically resolved to their associated FoxDraw display object aliases. See Figure 9.

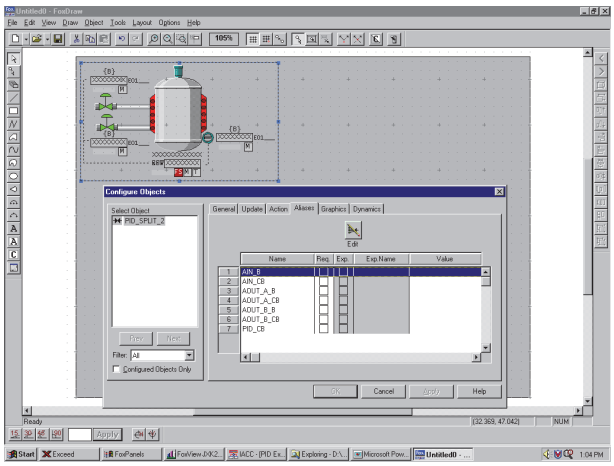


Figure 9. FoxDraw Display Objects

DYNAMIC DISPLAYS

IACC provides Animated Loop Diagrams (ALDs) and Quick View displays as convenient and powerful tools for control loop testing and commissioning. ALDs turn the Control Strategy diagram into a dynamic display, providing real time updates of block parameters. Users can additionally customize the appearance of blocks in the CSD to display the block parameters if needed for this activity.

Quick View displays are FoxView™ faceplate displays that are automatically generated by IACC with a faceplate for each block in the CSD. The faceplates are fully functional and interactive with real-time updates and alarms. The displays can be customized with ad hoc information such as a trend display for additional functionality.

CHANGE TRACKING WITH FOXCTS

IACC provides an integration with FoxCTS Change Tracking software. All control configuration and ladder logic changes made via IACC are tracked by FoxCTS providing tracking of control system changes to help meet regulatory body requirements.

BULK GENERATION FROM TAGLISTS

The user can create an entire project database simply by building a TagList which references CSD templates defined by the user or imported from a library (see Figure 10). This process greatly reduces the time and cost to design the control strategies, complete the parameter tables, create the associated display objects, and test the installation.

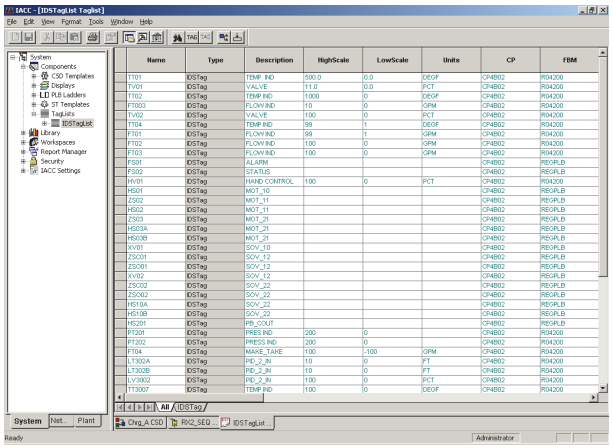


Figure 10. IACC TagLlist

Access Security

Access security in IACC is determined by groups. A group can be system administration, compliance office, plant engineering, plant maintenance, and so forth. Each group is assigned read, write, and/or download permissions to the object types managed by IACC. It is also granted permissions to the various editors and supported services. IACC can support as many groups as required, with specific permissions granted or denied to each group.

A user must log in to IACC to initiate a session by entering a user ID, and optionally, a unique password assigned only to that user. A user is assigned membership in one or more groups which determine the read/write/download permissions and suite of services granted to that user.

Network Communications

In the situation where the IACC software is installed on an off-platform Windows 10® or Windows Server 2016 based workstation, communications with the Windows or Solaris based Foxboro Evo workstations occur by using an alternate Ethernet connection that is separate from the control network for client/server access to download control strategies to control stations and deploy graphical displays to the workstation.

In the situation where the IACC Client and Server software reside on separate nodes, communication must occur via a second Ethernet connection, separate from the control network.

See Figure 11.

FOXBORO EVO SYSTEM CONFIGURATION

IACC software is also used to configure the system architecture as well as the various system components. This is done in a structured hierarchy where the user identifies the structure and the hardware and software components along with their properties for each level of the hierarchy in the following order:

- Network Topology
- Network Components
- Servers and Application Processors
- Workstations and Peripherals
- Control and Gateway Processors
- Field Signal Interface Modules.

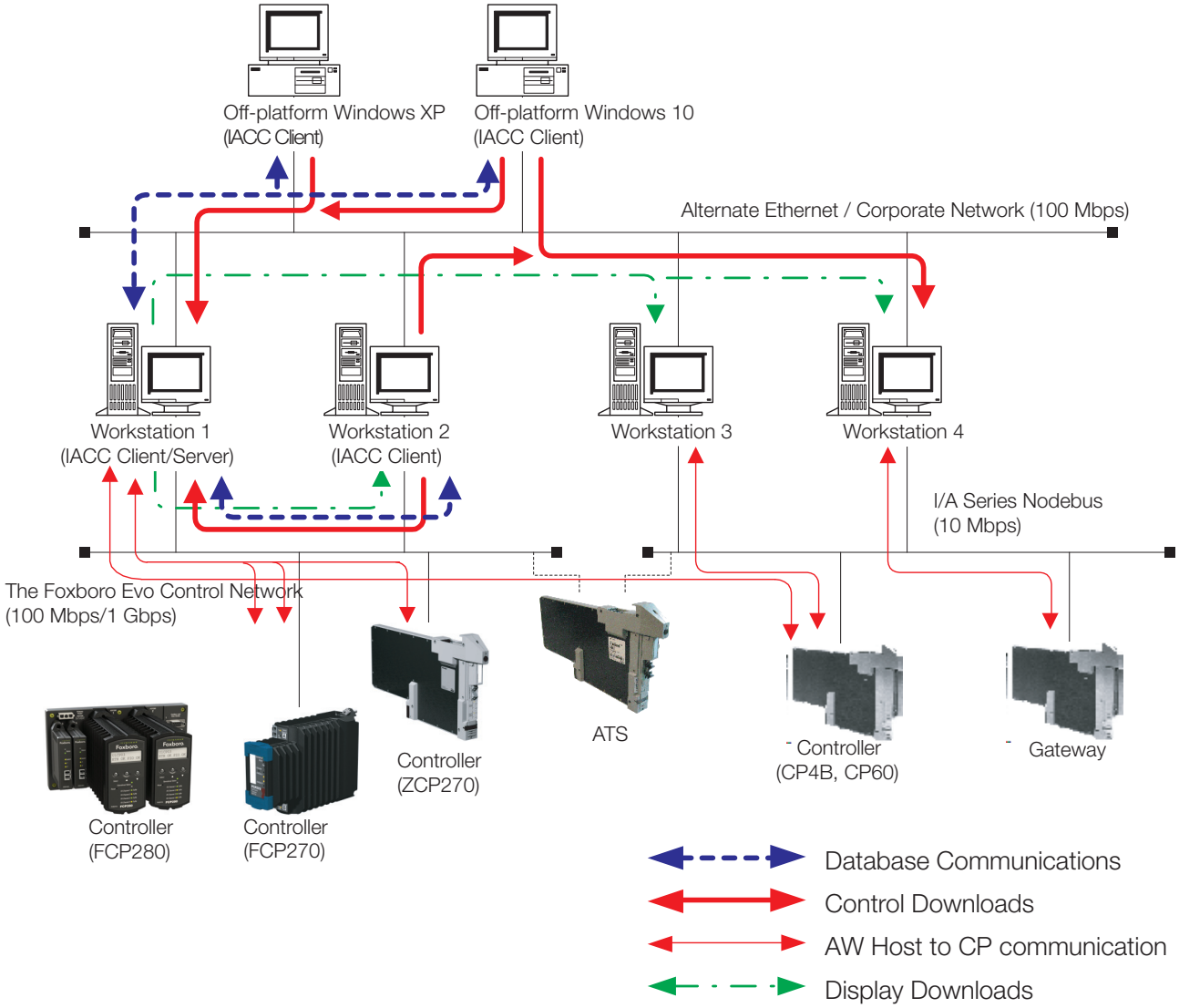


Figure 11. Example of IACC Communications

HARDWARE AND SOFTWARE REQUIREMENTS

IACC Server version 2.7 software can be installed on:

- A workstation with Control Core Services v9.4 or later or on an off-platform station with Microsoft Windows 10 or Windows Server 2016.
- A workstation with I/A Series software v8.8 or Control Core Services v9.0-v9.3 or on an off-platform station with Microsoft Windows 7 or Windows Server 2008.

NOTES:

IACC can be used to configure Foxboro Evo systems running I/A Series software v6.4, v6.5.x, v7.x, v8.x, or Control Core Services v9.x.

IACC Client and Server software can be installed on the same station platform.

Multiple IACC clients can access the same IACC server; only one client can access each IACC database at a time.

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