

I/A Series[®] Control Suite Connoisseur[™] Bridge



The Connoisseur Bridge for Foxboro I/A Series systems, part of the I/A Series Control Suite, is a software package that provides full integration between Foxboro I/A Series systems and Connoisseur model predictive control software. It supports all phases of advanced control workflow, from plant response testing through operation and maintenance. It acts as a single point which manages and automates all related configuration information for both Connoisseur and I/A Series software.

The Connoisseur Bridge also serves to integrate the I/A Series system with host-based Connoisseur control applications. This includes automatic creation of I/A Series CRT displays which allow operators and engineers to view complete Connoisseur controller status using I/A Series FoxView[™] or Display Manager displays. As needed, these CRT displays are automatically regenerated, so that they continuously match the on-line Connoisseur software configuration.

Full integration of all Connoisseur variables with an I/A Series system via Object Management services, allows the Connoisseur information to be available by

object name anywhere on the I/A Series system and accessible to other applications in the I/A Series system and via the plant network.

Introducing the Connoisseur Bridge

Connoisseur Bridge is a powerful software package that provides an integrated capability to develop, implement, and support model predictive control (MPC) and optimization strategies. These strategies help you obtain improved economic performance from your process through improved control of key variables and by operating the process, as a whole, closer to its optimum economic operating point.



The Connoisseur Bridge is a platform-independent product. It runs on a variety of computing platforms and integrates with many different distributed control system (DCS) and programmable logic controller systems. The Connoisseur control engine is also implemented in the I/A Series Control Processor 60 (CP60) for embedded MPC applications.

The Connoisseur Bridge serves to integrate hostbased Connoisseur applications with Foxboro I/A Series systems. Further, the Bridge provides key support for all steps required in developing a Connoisseur control application with I/A Series software. This allows advanced process control engineers to become highly productive when applying Connoisseur software on I/A Series systems. The Connoisseur Bridge enables engineers to focus their attention on model predictive control rather than on application integration and networking concerns.

System Configurations using the Connoisseur Bridge

The Connoisseur Bridge can benefit any MPC application for an I/A Series system where the Connoisseur software is running on a network server or on an I/A Series server (Application Workstation 51 [AW51] and so forth). The Connoisseur Bridge also provides improved productivity for process response testing and initial commissioning of embedded CP60 Connoisseur applications.

I/A Series Displays Generated by the Bridge

There are two user interfaces for viewing the operation of Connoisseur. Connoisseur itself provides the first. Connoisseur has a set of displays, which may be used for both configuration and operation. Connoisseur can also export these displays to other stations on the information network. Normally, engineering personnel use this interface, although it also supports normal operations such as variable trending and status monitoring. One such Connoisseur CRT display is shown in Figure 1.

The operator interface for Connoisseur MPC is provided by I/A Series software. This I/A Series user interface is generated and supported by the Connoisseur Bridge. The Connoisseur Bridge provides standard I/A Series CRT displays for all host-based Connoisseur controllers configured with the Bridge. Like any other displays, they may appear on any workstation in the I/A Series system. They may also be exported to a non I/A Series host via the information network. Two such displays are shown in Figure 2 and Figure 3.



Figure 1. Trending and Status Monitoring

The Bridge also generates default displays for each variable within the Connoisseur controller. These displays are activated when the operator selects individual loops from the Connoisseur Summary CRT display.



Figure 2. Connoisseur Controller Summary Display



Figure 3. Connoisseur Message CRT Display

Components of the Connoisseur Bridge

The Connoisseur Bridge consists of two sets of components: First, a set of components that run on a personal computer or workstation under Microsoft[™] Office (Excel[™] 97). These components serve to manage the databases required for Connoisseur, for the I/A Series system, and for I/A Series CRT displays (Figure 2 and Figure 3 show some of these displays). All elements required of these databases are automatically generated, not just managed, by the Connoisseur Bridge.

The second component is a set of executables and scripts that run on I/A Series servers. These collect information concerning the existing configuration of the I/A Series system, generate CRT displays, and provide communication services for the on-line control application.

Support for MPC Project Workflow

The design and implementation of an MPC application involves several steps. The major steps are:

- 1. Unit Response Testing
- 2. Process Model Identification
- 3. Control System Design/Simulation
- 4. Installation and Commissioning
- 5. Integration of MPC with the DCS.

The Connoisseur Bridge provides valuable assistance to engineers in Steps 1, 4, and 5 above. The other two steps are performed off-line using the Connoisseur Plant Analysis System. Note that the Connoisseur Bridge is more than just a tool for "gluing" an APC application to the I/A Series DCS (Step 5 above). Rather, it provides assistance in all phases of the application that involve the I/A Series software. This can provide important benefits during testing and commissioning, the longest and most expensive parts of the MPC project. For example, the CRT displays in Figure 2 and Figure 3 can easily be made available to plant operators during response testing and commissioning, providing both operator training and better coordination and communication between process engineers and operators during unit testing and APC commissioning.

In addition, the Excel 97 component of Connoisseur Bridge provides on-line instructions and enforces a consistent methodology during the work. Major processing steps and generation of all configuration files for Connoisseur Bridge are performed automatically by macro instructions, and the results are, therefore, consistent. This eliminates manual operations and iterations of the installation process.

Support for Unit Testing and Data Collection

During plant testing, Connoisseur and I/A Series software must be configured to gather test data. Connoisseur Bridge components residing on I/A Series systems collect the existing I/A Series configuration information which is imported into an Excel 97 worksheet (see Figure 4).



Figure 4. Signal Configuration for Connoisseur

The engineer selects from the list of available signals those signals that are to be manipulated/recorded during plant testing. The Bridge then generates signal database files for Connoisseur software. These files are imported using Connoisseur's "read .cs* file" menu. A typical input file for Connoisseur is shown in Figure 5. The Bridge generates three files for Connoisseur software which define all the inputs, outputs, and status indications that Connoisseur software uses during testing. These signals are preconfigured for on-line analysis within Connoisseur, so that preliminary process model identification can begin as soon as enough test data is available.

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After plant testing is completed and a Connoisseur controller has been designed, the Bridge is used to generate the on-line configuration required to support its installation. The "Controller Configuration" worksheet within the Bridge is used for this purpose (see Figure 6). The engineer enters the signals selected as controlled variables, manipulated variables, and feedforward variables. Descriptions, engineering units, and other parameters are automatically fetched from the existing I/A Series system configuration data.



Figure 6. Controller Configuration Worksheet

Typical Connoisseur Bridge installations may have multiple controllers working under one or more optimizers. Each Controller Configuration worksheet supports up to 17 controllers. When the controller data entry is complete, the Bridge generates the controller "channels" for Connoisseur software. This step automatically creates named signals for Connoisseur software as well as a matching set of object specifications for the I/A Series system. These results are exported to files. The files are transferred to the execution platform for Connoisseur and read using Connoisseur's "read" menu selection. Files containing object definitions for the I/A Series system are transferred to the I/A Series host. There a script executes to create these objects, and also to create the operator displays for each Connoisseur controller.

Note that the I/A Series object definitions, the I/A Series display definitions, and the Connoisseur signal database were all generated from the same workbook datastore. This provides not only automation, but assurance that each of these configurations contains consistent data without requiring manual intervention. As the number of signals and objects is large for most applications, this saves a lot of time. Typically, several hundred signals are configured for Connoisseur Bridge, several hundred objects are configured for I/A Series software, and each controller CRT display references over 200 objects. Manual maintenance of this data represents a significant investment of time and a potential source of error.

Utility Services Provided by the Bridge

The Bridge provides utilities for editing Connoisseur Director calculations. Existing Director configurations can be imported and formatted for documentation purposes (see Figure 7). Utilities also import configuration information from existing Connoisseur software applications and can be used to configure non-standard controllers or data collection channels.

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Figure 7. Connoisseur Bridge Utilities

Bridge Performance and Sizing

The Bridge is used off-line, rather than on-line. It can generate databases for very large installations of Connoisseur Bridge (n x 102 variables) in a few seconds.

Required Microsoft Platforms

Microsoft Excel 97 or later is required for use of the Bridge. This software is supported by Microsoft on the Windows 95[™], Windows 98[™], Windows NT[™], and Windows 2000[™] operating systems. The Connoisseur Bridge can be used on any of these operating systems.

Supported I/A Series Platforms

Application Workstation 51, Styles B, C, D, E and Application Processor 51, Styles B, C, D, E

- Minimum of 64 MB RAM
- Minimum of 2 GB disk
- Solaris[™] 2.5 or later operating system

I/A Series Software

Release 4.3 or later

Connoisseur Versions Supported

Version 14.00.03 and later

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