FOXBORO®

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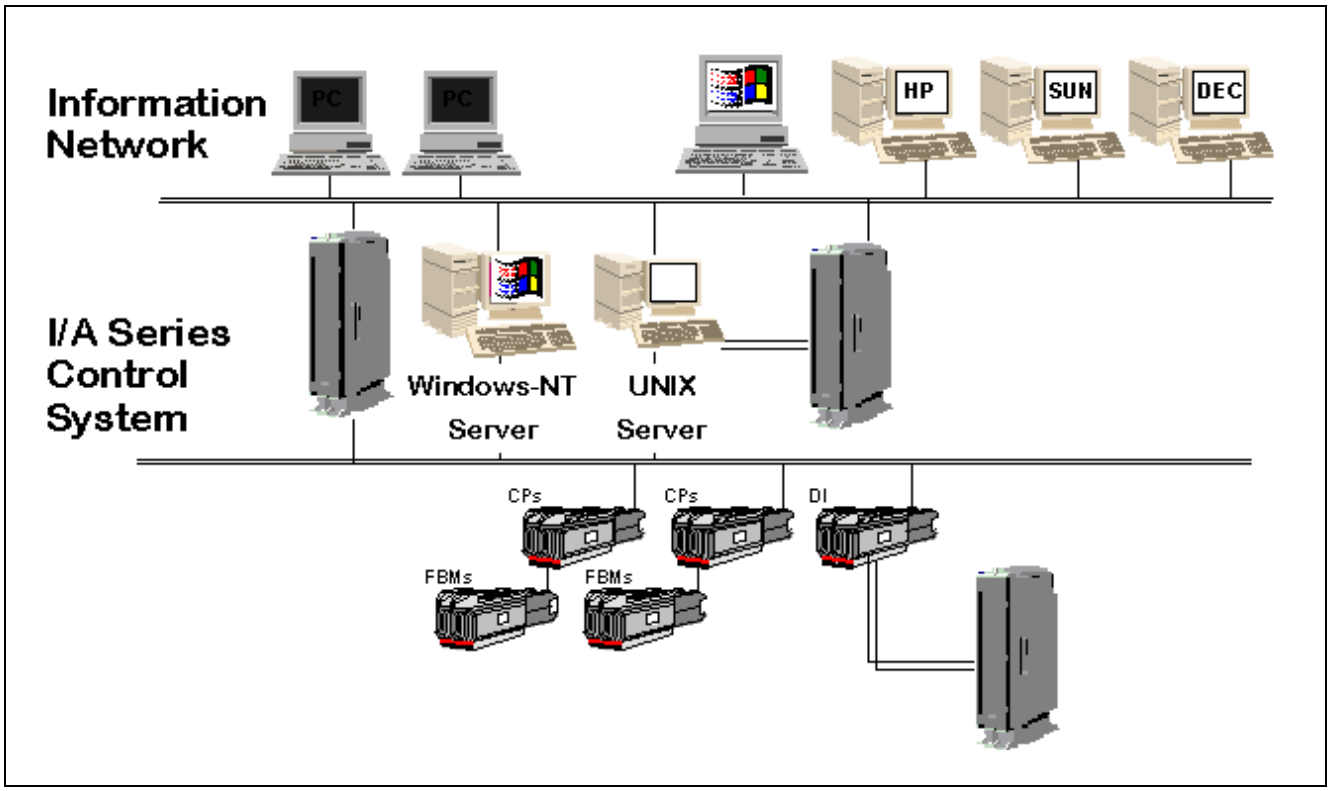
I/A Series® Software
FoxAPI and Networked FoxAPI Integration Software



I/A Series FoxAPI and Networked FoxAPI integration software provides a consistent interface for application development and integration with the wealth of real-time and historical information supplied by I/A Series systems.

OVERVIEW

I/A Series has always been more than just a capable control system - it is the foundation of a real-time plant information system. Looking to utilize the information in your automation systems to make more timely and effective business decisions, you will find Foxboro has unique enabling technology that lowers the cost and speeds the implementation of that integration. Some of our customers link their business systems and control systems in a bi-directional fashion whereby many of the business decisions relative to production capacity, inventory and human resources are coordinated electronically.

Integrating information across the enterprise (be it the unit, plant/shop, national, or international level) is not an easy task. FoxAPI and Networked FoxAPI (Net FoxAPI) were developed to reduce that effort. With common “on-and-off platform” functionality, field-proven FoxAPI provides the freedom of choice to migrate and/or integrate applications between various generic computing platforms and the I/A Series system. Driven by particular requirements (such as performance, personnel, plant-standards, system-administration, or maintenance issues) you are able to match applications and computing platforms.

BENEFITS

There are several benefits provided by FoxAPI and Net FoxAPI:

- Insulates you from platform changes - eliminates re-engineering applications.
- Common interface for applications - location independent (e.g., SUN, HP, IBM, and DEC hosts).
- FoxAPI based applications are easily moved between computing platforms utilizing FoxAPI and Net FoxAPI.
- Net FoxAPI software based applications behave like local I/A Series applications.
- Protocol-specific details are transparent to Net FoxAPI based applications.

The key benefits of using FoxAPI and Net FoxAPI are ease of program integration and protection: protection against underlying platform, system, and low-level API modifications/changes. As the I/A Series and other networked computing platforms continue to evolve, improve, and upgrade, your application(s) need not change. This applies not only to Foxboro and user-developed programs, but third-party applications using FoxAPI as well.

FoxAPI is the “on-platform” API for 50 Series AP/AWs and 70 Series AWs. Net FoxAPI includes 50 Series or 70 Series server support, networking support (using standard networking protocols such as TCP/IP and DECnet) and client software which is native to a particular plant computing platform. Clients currently supported by Net FoxAPI are:

- Sun (Solaris) TCP/IP
- Dec VAX (VMS) TCP/IP or DECnet
- Dec Alpha (OpenVMS) TCP/IP or DECnet
- HP RISC (HP-UX) TCP/IP
- IBM (RS 6000) TCP/IP.

FoxAPI and Net FoxAPI Integration Software

The FoxAPI and Net FoxAPI Integration Software provides access to:

- Connection Services
- General Information
- Grouping I/A Series Data Objects
- I/A Series Data Object Access
- Change Driven eXtensions (CDX)
- Compound Summary Access (CSA)
- Historian Access
- I/A Series Files (Read/Write)
- FoxAPI Configuration Information
- Initialization File Access
- Error Logging Control.

Connection Services

Typically, a client application opens a connection to a server, sends and receives data, then closes the connection. A client may simultaneously have open connections to multiple servers, governed by user configuration at the client. Additionally, a server may maintain simultaneous connections with multiple clients. This is controlled by authorization at the server. The following functions provide this type of service:

an_close_server	Close connection to server
an_exit	Gracefully close application
an_get_server	Get current server
an_open_server	Open connection to a server
an_set_server	Set current server.

General Information

This set of routines enables the client application to obtain general information related to the state of the current client and server:

an_get_client_info	Get client information
an_get_server_info	Get server information.

Grouping I/A Series Data Objects

I/A Series data objects may be grouped together forming sets of data objects. The following functions are utilized for the maintenance of object data sets:

clsset	Close a set
getidx	Translate data object name to index
getmidx	Translate multiple data object names to indexes
getnam	Get number of data objects in set, read change deltas, and data object names
getscn	Get number of data objects in set, read scan rate, write scan rate, and write change deltas
get_set_name	Get data set name
get_set_num	Get data set number
gsinfo	Get call type, queue#, number of data objects in set, value types, and data object indexes
gsnent	Get number of data objects in set
put_set_name	Name a set
readnam	Translate data object index to name
sbopen	Open a set without continuous update
scopen	Open a set with continuous update
sqopen	Open a set with continuous update and queuing of changes.

I/A Series Data Object Access (Fast Access)

This access method is appropriate when I/A Series data objects are being accessed frequently. It is only useful for connectable data objects and consists of the following functions:

bread	Buffered read of a set of data objects
bwrite	Buffered write of a set of data objects
mreaidx	Read a value, status, and change count for multiple indexes
mreawidx	Read a write value, status, and write change count for multiple indexes
qread	Dequeue changes from a set's change queue
readccnt	Read number of change-driven updates received for this data object
readmnam	Translate multiple data object indexes to names
readnch	Return total number of change-driven updates received by FoxAPI since last restart
readnwr	Return total number of change-driven updates received by FoxAPI since last restart
readsta	Read a status
readval	Read a value
readwcnt	Read a number of writes to a data object
readwval	Read a write value
writccnt	Set read change count for a data object
writnch	Set read change count
writnwr	Set write change count
writwcnt	Set write change count for a data object
wrtval	Write data object value to shared memory.

I/A Series Data Object Access

This method is appropriate when I/A Series data objects are accessed infrequently. Both connectable and non-connectable data objects of all value types may be accessed. The following functions support this method:

sread	Read of a string object
swrite	Write of a string object
uread	Read of non-string objects
uwrite	Write of non-string objects.

Change Driven eXtensions (CDX)

The CDX mechanism is extended into the client application to enable change driven reads and/or writes with I/A Series Data Objects. In a networked situation, this mechanism significantly reduces traffic levels. The I/A Series data objects in the CDX are a subset of the I/A Series data objects in the FoxAPI data object sets in the 50 or 70 Series AP/AW. You specify an access type, read delta, read scan rate, and write delta for each I/A Series data object. The following functions support these services:

an_add_objects	Add data objects to CDX
an_dq_changes	Read the unsolicited updated values sent by the server (Client application has the option to wait indefinitely or time out)
an_get_current	Get current values for data objects in CDX
an_get_object_info	Get data object information for CDX
an_mod_objects	Modify data objects in CDX
an_poll_changes	Poll for changes
an_readccnt	Read a read change count
an_readnch	Read read change count total
an_readnwr	Read write change count total
an_readwcnt	Read a write change count
an_rem_all	Remove all data objects from CDX
an_rem_objects	Remove data objects from CDX
an_start_changes	Enable automatic change updates
an_stop_changes	Disable automatic change updates
an_writccnt	Set a read change count
an_write_objects	Set data objects in CDX
an_writnch	Set read change count total
an_writnwr	Set write change count total
an_writwcnt	Set a write change count
mwrtval	Write multiple data object values to the server.

Compound Summary Access (CSA)

CSA functions enable the user read access to I/A Series object information. The following function calls support this capability:

an_all_sta	Get name of all letterbugs, their host letterbugs, and their stations by type(s)
an_all_cmp	Get name of all compounds in specified station
an_all_blk	Get names of all blocks in specified compound
an_blk_info	Get parameter info for specified block type
an_obj_def	Get parameter info for specified C[:B].P object
an_obj_descr	Get block description for specified object.

Historian Access

The Historian access funcrions enables the user to read (and write Manual Data Entry - MDE) without knowing HOW the information is actually stored. The following function calls support this capability:

an_col_grp_names	Get name and description of all collection groups of specified type
an_col_grp_members	Get name and associated parameters of all members of specified group
an_red_grp_info	Get reduction operations and associated parameters for specified reduction group
an_mde_members	Get name and associated parameters of all members of specified MDE group
an_put_mde_data	Add, modify, or delete an MDE entry
an_hist_values	Get Historical data values (except messages)
an_get_msgs	Get Historical messages
an_num_hists	Get the number of Historians in the I/A Series system
an_num_hist_grps	Get the number of collection groups in the specified Historian
an_num_hist_pts	Get the number of collection points in the specified Historian
an_hist_names	Get the domain name of all Historians in the I/A Series system.
an_hist_lbug	Get the letterbugs of 50 Series stations containing the specified Historians
an_hist_pts	Get the name of all points being sampled by the specified Historian
an_pt_allhists	Get the domain name of all Historians associated with the specified point
an_pt_onhists	Get the domain name of the first Historian and the first “on” Historian associated with the specified points
an_pt_grps	Get the groups that a point is in for a specified historian
an_set_client_id	Set the client ID for client and server use in log file.
an_rread	Read object’s range.

I/A Series File Access

In addition to I/A Series data object access, functions are provided to support direct I/A Series file access (e.g., NO ftp or network file “mounting” required). The following functions provide for reading/writing all or part of an I/A Series file:

iarfil	Read a file from an I/A Series AP/AW
iawfil	Write a file to an I/A Series AP/AW
pfread	Read part of a file from an I/A Series AP/AW
pfwrit	Write part of a file in an I/A Series AP/AW.

FoxAPI Configuration Information

Configuration information related to FoxAPI sizing parameters is available via the following functions:

get_maxch	Get maximum number of changes in sqopen() change queue
get_maxds	Get maximum number of data sets
get_maxgw	Get maximum number of gateways
get_maxien	Get maximum number of entries in list
get_maxlst	Get maximum number of FoxAPI lists
get_maxobj	Get maximum number of data objects
get_maxqo	Get maximum number of sqopen() sets.

Initialization File Access

By default, a FoxAPI based client application automatically initiates an an_read_init function with the initialization file name of an_init.cfg. A function is provided to enable the client application to specify a different file name:

an_read_init	Read initialization file.

Error Logging Control

FoxAPI supports error and trace messages. Keywords for message logging are defined in the initialization file to support PrintErr and TraceLevel. Using this set of functions, a FoxAPI client application can enable or disable logging at will:

an_noprint_err	Disable printing of FoxAPI error messages
an_print_err	Enable printing of FoxAPI error messages.

Utilities and Services

Included with the Net FoxAPI libraries are a set of utilities and services to aid in implementation, configuration, and testing:

foxtst	Interactive terminal-based test program to exercise all functions in Net FoxAPI
an_ping	Return server access information (e.g., authorization, etc.).
an_setup	Net FoxAPI Server setup utility
sxopen	Open a Net FoxAPI data object set.

Supported I/A Series Server Platforms for FoxAPI

- 50 Series AP/AW
- 70 Series AW.

Supported I/A Series Server Platforms for Networked FoxAPI

- 50 Series AP/AW - TCP/IP or DECnet (with optional DECnet connectivity software)
- 70 Series AW - TCP/IP

Supported Client Platforms and Networks

- Sun - TCP/IP
  – Solaris (Version 2.2 or greater)
- Dec Vax - TCP/IP and DECnet
  – VMS (Version 4.7 or greater)
- Dec Alpha - TCP/IP and DECnet
  – OpenVMS
- HP-UX RISC based systems - TCP/IP
- IBM RS 6000 - TCP/IP

50 Series Server Requirements

- V3.x, V4.x or V6.x I/A Series software
- Optional information network port installed (e.g., Ethernet, token-ring, ATM, fast Ethernet, etc.).
- DECnet Connectivity Software Option (only required if client platform is using the DECnet protocol).

I/A Series AP/AW50 Sizing Information

- Up to 30 simultaneous client computing platforms connected to an I/A Series server.
- The maximum number of I/A Series servers connected to by a particular client computing platform is determined by the client platform and networking capability.
- The maximum size of a I/A Series server data object database is 32,000 data objects. The default is 5,000 data objects.
- At a rate of 500 data object changes per second, from the client computing platform, the 50 Series AP51/AW51 Style A server has a CPU load of 10% or less, Style B server has a CPU load of 5% or less, Style C server has a CPU load of 2.5% or less and Style E server has a CPU load of 1% or less.
- Up to 150 (Ethernet) packets per second (at 512 bytes per packet) has no significant impact on the general performance of the I/A Series server.

70 Series Server Requirements

- V6.x I/A Series software
- Optional information network port installed (e.g., Ethernet).

I/A Series AW70 Sizing Information

- Up to 30 simultaneous client computing platforms connected to an I/A Series server.
- The maximum number of I/A Series servers connected to by a particular client computing platform is determined by the client platform and networking capability.
- The maximum size of an I/A Series server data object database is 32,000 data objects. The default is 5,000 data objects.

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