

@niagara^{AX}

Product Model

Niagara^{AX} Product Model Overview

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Executive Summary

The purpose of this document is to provide an overview of the Niagara^{AX} product model.

Niagara^{AX} is a software framework and application development platform that solves the challenges associated with building Internet-enabled products, device-to-enterprise applications and distributed, Internet-enabled automation systems. Niagara^{AX} builds on the pioneering capabilities of Niagara R2 originally introduced in 1999, and the experience gained in deploying over 35,000 Niagara-based products.

Niagara R2 introduced the concept of a software framework that could normalize the data and behavior of diverse devices, regardless of manufacturer or communication protocol, to enable the implementation of seamless, Internet-connected, web-based systems.

The core concept of Niagara is its unique, patented component model that transforms the data in diverse external systems into uniform software components. These components form the foundation for building rich applications to manage and control the devices. In Niagara R2, the component model focused primarily on modeling data from the various external systems with to create a uniform data set for applications. The Niagara^{AX} component model goes beyond unifying protocols and data from diverse systems, to unify the entire development environment used to build applications.

The key application requirements that guided the development of Niagara^{AX} included:

- Creating a uniform software environment and component model across all layers of the device-to-enterprise solution stack;
- Providing open APIs to all system services, and an extensible component model to enable partners to develop their own applications, plug-ins and drivers independent of Tridium;
- Providing all-inclusive support for web-services data handling;
- Enabling large system scalability and a distributed processing architecture over the Internet.

Through its advanced, single seat application builder toolset, graphical programming and open APIs, Niagara^{AX} provides a method of modeling the data and attributes of diverse connected systems, while at the same time providing a method of modeling and creating the end applications delivered to the user. Niagara^{AX} integrates a wide range of services to enable partners to develop products and applications quickly and easily.

Niagara^{AX} Product Model

Instances of Niagara^{AX} software, which can run on a variety of hardware platforms, are referred to as “stations.” A station running on an embedded platform is referred to as a JACE[®] (Java Application Control Engine). Instances that run on a server platform are referred to as Supervisors. Depending on the platform used, a station can offer different features and capabilities and be complemented with different options. This section provides an overview of the Niagara^{AX} product model and the various standard functions and options available in the product line.

JACEs (4, 5, NX, SoftJACE)

Tridium offers a variety of hardware platforms suitable for use in wide-range of diverse monitoring, control, and M2M applications. These include the JACE-4 series, the JACE-5 series. The SoftJACE is a version of the software designed to be loaded on a standard windows XP-based PC or server. These hardware platforms, referred to as JACEs, have extensive field deployment history and are available with Niagara^{AX}. See the product data sheets for technical details on the various JACE platforms available.

Niagara^{AX} Supervisor (^{AX}Supervisor)

For those familiar with Niagara R2, this is the Niagara^{AX} version of Web Supervisor. It is used in applications with multiple JACEs. Key features that make it a valuable addition to multi-JACE projects include:

- Provisioning of multi-JACE systems (automated updating and installation of software modules)
- Support for integration with standard RDBMS (MS SQL, Oracle, DB2, etc)
- Platform for enterprise applications (Vykon Energy Suite) and others in the future
- Central database storage for attached JACEs
- Archive destination / repository for log and alarm data
- Central server of graphics and aggregated data (single IP address)

More detail of the features of the Supervisor is provided later in this document.

WorkPlace^{AX}

For those familiar with Niagara R2, this is the Niagara^{AX} version of WorkPlace Pro. This is the engineering tool that is used to create applications by defining components and wiring them together to create logic and displays. It allows the user to develop comprehensive applications for control, monitoring, alarming, data logging, reporting, and real-time data visualization using a single graphical tool. WorkPlace^{AX} can run as a standalone application on a PC, can be bundled with an ^{AX}Supervisor, or be served up to a browser from an embedded JACE platform.

Standard functions of a JACE or Supervisor (without optional packages):

In Niagara^{AX}, there is even less distinction between the capability of a station running in a JACE and a Supervisor than there was in Niagara R2. Here is a brief overview of the standard functions included with all stations.

- Control engine to implement control logic, math operations, business rules, etc.
- Ability to serve built-in web pages showing basic diagnostic information
- Ability to be programmed and configured by a WorkPlace^{AX} tool
- Mail service for alarming to email recipients
- Logging to local file system (but not archiving to a server or RDBMS)
- JACE 4, 5, NX, and SoftJACE are typically bundled to support a variety of standard open protocol field busses such as BACnet, LonWorks, Modbus TCP, SNMP (see price list for more specific details).

Options available in a JACE

The following additional software services and features can be added to a JACE to meet application requirements. Options are offered in what we refer to as “station packs.”

User Interface Station Pack (UI-SP)

The UI-SP is an option, available on a JACE, which enables it to serve dynamic displays to a standard web-browser. (The UI-SP is similar to the WebUI option in R2 JACEs). The UI-SP is typically required when a JACE is applied in a standalone mode. The exception would be that even without the UI-SP option the WorkPlace^{AX} tool can be used to configure, manage, and interrogate a JACE.

Multi-JACE projects can be designed to serve browser-based displays via the Supervisor instead of being served by an individual JACE. In this case, the JACEs would need to have the EC-SP option (Enterprise Connectivity Station Pack) to enable them to communicate with the Supervisor or the supervisory JACE. Please see following section for more detail on the EC-SP.

The UI-SP feature is an option for the JACE, but the capability to serve dynamic data to web-browsers is included as a standard feature of the Supervisor.

Enterprise Connectivity Station Pack (EC-SP)

The EC-SP is a set of software features, sold as an option, which are added to JACEs to allow them to share data with each other, be members of a multi-station system, and connect to an ^{AX}Supervisor. This option is required for “station-to-station” communications (e.g., enabling JACEs to talk with each other and to a Supervisor). This option is required when multiple JACEs are going to be connected into a system. This package of features is an option for the JACE but is included as a standard feature of the Supervisor.

Services and features provided by the EC-SP include:

- Data Passing between stations via FOX, Tridium’s TCP/IP-based application protocol, or via BACnet IP.
Note: As a standard feature, JACE’s support BACnet IP client to enable them to communicate with BACnet IP based equipment and devices. EC-SP is not needed for BACnet IP client capability.
- Alarming routing (via FOX to other stations)
- Master/slave scheduling (via FOX among stations)
- Distributed “BQL” queries among stations. BQL is Tridium’s Baja Query Language - an advanced SQL-like database query language that includes higher level functions for data aggregation
- Support for oBIX (Open Building Information Exchange) to enable peer-to-peer communications between Niagara R2 and Niagara^{AX} systems (when released)

By offering these features at the JACE-level, it will be possible for customers to implement specialized multi-JACE systems without requiring a Supervisor in the architecture although the use of an ^{AX}Supervisor is highly recommended.

Embedded WorkPlace^{AX}

The embedded version of WorkPlace^{AX} allows a JACE to serve up the engineering tool directly from the JACE to a browser. This enables smaller sites to have the benefit of having the tools on site without requiring the use of an ^{AX}Supervisor.

Communications Drivers to Other Standard and Legacy Protocols

In addition to the open protocols that may be included as a standard feature on a JACE, numerous other communication drivers are offered as options. Check the Niagara^{AX} Communication Driver availability list for currently supported drivers.

Niagara^{AX} Supervisor

The ^{AX}Supervisor offers its own unique merits for management of multi-JACE projects, which include:

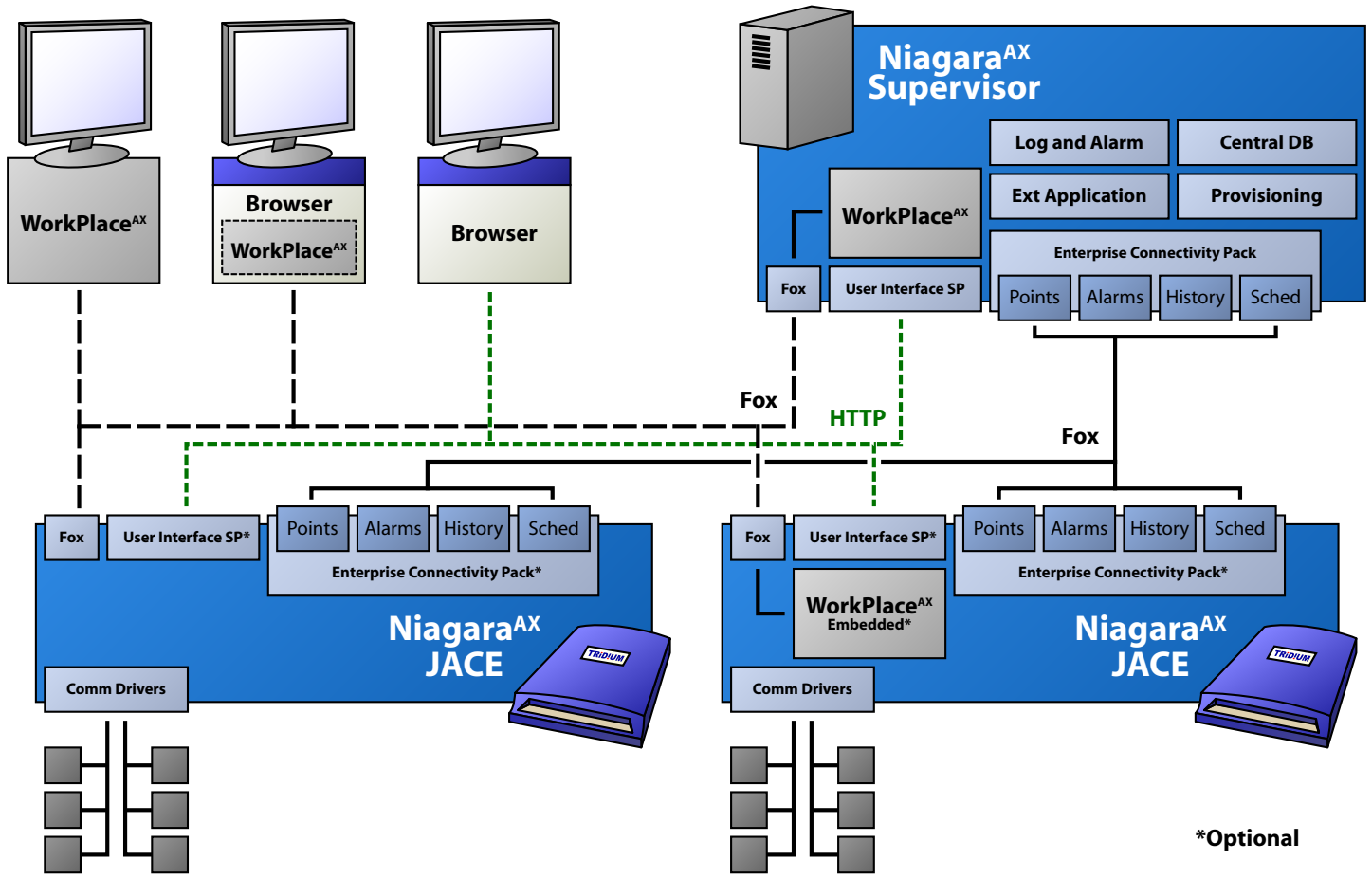
- Synchronization/storage of data in standard RDBMS such as MS SQL, Oracle, etc. Optional drivers are required to support these databases.
- Platform for add-on enterprise applications (ex: Vykon Energy Suite) and others in the future
- Central historical database storage for attached JACEs.
- Central server of graphics and aggregated data (single IP address)
- Includes a copy of Workplace^{AX} engineering tool

The approach of offering the EC-SP at the JACE level accommodates cases where customers want to use a third party enterprise server (Websphere, etc.). It also enables a JACE (an NX, a SoftJACE, or even a 5 or 4) to fill the role of a "system supervisor" for smaller projects. The supervisory JACE NX/J5/J4 would not do everything that the Supervisor would do (e.g., provide support provisioning of JACEs), and would have much more limited capacity for storage of data, but could be used as a single centralized server of graphics, alarms, and data as well as an archive repository (within its memory capacity) for a small network of JACEs.

Communications Drivers at The Supervisor

With Niagara^{AX} it is possible to support a wide variety of communications drivers directly at the Supervisor level. Standard IP-based protocols including BACnet, OPC, SNMP and MODBUS TCP are offered as options. This feature was first introduced in Niagara R2 with the BACnet Supervisor and OPC Supervisor. Pricing for these drivers is typically based on the number of points (tags) or devices connected. For example, BACnet (and OPC) support is priced based on the number of BACnet points defined in the Supervisor.

With the Niagara^{AX} driver development toolkit it is possible for partners to create their own drivers to external systems. In applications where the Supervisor is used to talk to external, non-Niagara devices, there is a capacity-related pricing model based on the number of non-Niagara devices connected to the Supervisor. Contact the factory for details.



Niagara^{AX} Product Model Diagram



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