





MODULE 3.1: MODULARITY

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|  | Modularity | <p>... the use of individually <u>distinct functional units</u>, as in assembling an electronic or mechanical system</p> <p>... an approach to developing hardware or software that breaks projects into <u>smaller units</u> (or modules) that are deliberately designed as <u>standalone units</u> that can work with other sections of the program. The same module can perform the same task in another or several other programs or components.</p> <p>... a quality of a system where it consists of various parts which <u>separate cleanly</u> and <u>fit together well</u>.</p> |
|  | Objectives | <ul style="list-style-type: none"> ➤ Explain what a module is in Niagara and what it contains. ➤ Identify the Workbench tool used to install and update modules. ➤ Describe the advantages of Niagara's modular design. |
| Module | | <p>The most basic unit of software in the Niagara^{AX} framework</p> <p>Each module is a complete set of files and may include:</p> <ul style="list-style-type: none"> ⊕ Runtime files ⊕ User Interface files ⊕ Documentation ⊕ A lexicon (language file) ⊕ A palette – a library of available components <p>Every release of NiagaraAX includes a complete set of software modules that are installed on your workstation PC. These installed modules are located in the My Modules container on your workstation PC. Each module consists of only one compressed JAR (Java Archive Record) file.</p> <p>When the software is configured on a remote platform, such as a JACE, you typically would install only <u>those modules that you need</u>.</p> |
| Advantages | | <ul style="list-style-type: none"> ⊕ Makes it easier to track deployment & versioning of Niagara ⊕ Conserves storage space on remote devices ⊕ Improves system efficiency – install only the modules you need |
| Software Manager | | <p>Niagara^{AX} uses a Software Manager to:</p> <ul style="list-style-type: none"> ⊕ Release modules: used to <u>release new versions</u> of Niagara ⊕ Update modules: can be <u>distributed independently</u> between major software releases ⊕ Create new modules: can be <u>created</u> using a <i>New Module Wizard</i> |
|  | TOOLS | Software Manager |
|  | DEMO | Installing & Updating Modules Using the Software Manager |

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LAB



You will have opportunity to practice installing modules in the Niagara Technical Certification Program on-site training course.






QUESTIONS FOR REVIEW:

1. *Of how many JAR files does a module consist?*
2. *Which platform tool is used to install and/or update modules? Where is it located?*
3. *TRUE or FALSE? The entire set of Niagara modules is preinstalled in a customer's JACE.*

MODULE 3.2: EXTENSIBILITY

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|  | <p>Extensibility</p> <p>... a systematic measure of the ability to extend a system and the level of effort required to implement the extension</p> <p>... a system design to include hooks and mechanisms for expanding or enhancing the system with new capabilities without requiring major changes to the system infrastructure</p> |
|  <p>Objectives</p> | <ul style="list-style-type: none"> ➤ Explain why Niagara control points do not have the ability to collect alarming or historical trend data.. ➤ Define what extensions are and explain how Niagara uses them to add functionality and additional processing requirements to basic control points. ➤ Describe the 3 categories of extensions and identify where they are located. |
| <p>Extensions</p> | <p>Extensions provide building blocks to “extend” and change the behavior of individual control points, and they allow that behavior to be extended in a <u>consistent</u> manner.</p> <p>Extensions are Niagara’s way of <u>adding functionality and additional processing requirements to a control point</u>. They allow plug-in functionality to support features such as alarming, control and historical data collection.</p> <p>Basic control points have no provision for alarming or historical trending. This keeps control points as lean as possible.</p> <p><i>NiagaraAX provides an extensible component model and rich libraries to enable programmers to <u>extend</u> and <u>enhance</u> the Niagara Framework and build their own unique applications and products.</i></p> <p><i>These libraries are called palettes.</i></p> |
| <p>Point extensions</p> | <ul style="list-style-type: none"> ➤ Added as <u>dynamic properties</u> (slots) on a control point ➤ <u>Process and modify the value</u> of a control point whenever it executes ➤ Always invoked <u>in the order they are declared</u> |
| <p>Proxy points</p> | <p>A “<i>proxy</i>” is used to locally <u>represent a remote object</u> – e.g., a control data point from a remote smart device.</p> <p>A PROXY POINT is any of the 8 control points (or objects). A data point from a remote platform becomes a proxy point when it is “discovered” and added to the Station database. By creating proxy points, the Niagara Framework is able to accurately represent (and manipulate) the data points available from remote devices.</p> |
| <p>Location of points</p> | <p>Points for any remote device reside inside the appropriate Network container under the Drivers container. They can be viewed on the <u>Nav Tree</u> and also on other views such as the <u>Wire Sheet</u> view.</p> |
| <p>Extension Categories</p> | <p>There are 3 categories of extensions:</p> <ul style="list-style-type: none"> ▪ Control ▪ Alarm ▪ History |

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| Control extensions | <p>There are 3 types of control extensions:</p> <ul style="list-style-type: none"> ▪ DiscreteTotalizerExt: tracks runtime and change of state count on equipment ▪ NumericTotalizerExt: accumulates numeric total using minutely or hourly totalization ▪ ProxyExt: indicates how a point's data originates, including details specific to the point's network and driver <p><i><u>EXAMPLE:</u> If you want to <u>track runtime on a pump</u>, you would add an extension to the object representing the pump inside a Niagara station.</i></p> <p><i>Control extensions can be found in the <u>control palette-Extensions folder</u>.</i></p> |
| Alarm extensions | <p>Use an alarm extension for any control point you want to <u>monitor</u> for off-normal values, and <u>show alarm indication</u> when a limit or value is met or exceeded. Examples include:</p> <ul style="list-style-type: none"> ▪ OutOfRangeAlarmExt ▪ BooleanChangeOfStateAlarmExt ▪ BooleanCommandFailureAlarm <p>An important point to remember is that alarm extension types <u>must</u> match their parent component types. So, for example, you could not use a Boolean Change-of-State alarm extension that provides alarming based on a change of state – like ON or OFF – to alarm if pump discharge pressure drops below a specific value. In such a case, you WOULD use a Numeric Out-of-Range alarm extension.</p> <p><i><u>EXAMPLE:</u> If you want an alarm to sound in the event that no pump is running, you could add an alarm extension to either the pump object or the discharge pressure object. In this example, the extension – an Out-of-Range Alarm extension – originates inside the Alarm palette – under the “Extensions” folder.</i></p> <p><i>Alarm extensions can be found in the <u>alarm palette—Extensions folder</u>.</i></p> |
| History extensions | <p><i><u>EXAMPLE:</u> If you want to collect trend data every time a pump's discharge pressure changes significantly, you would add an extension to the object representing the pump's discharge pressure. In this example, use a Numeric Change-of-Value or COV – extension.</i></p> <p><i>History extensions can be found in the <u>history palette—Extensions folder</u>.</i></p> |
|  TOOLS | <p>Palettes: control, alarm, history</p> <p>History Extension Manager</p> <p>History Chart Builder</p> <p>Alarm Service</p> |
|  DEMO | <p>Adding Extensions to a Control Point</p> |
|  LAB | <p><i>You will have opportunity to practice adding extensions in the Niagara Technical Certification Program on-site training course.</i></p> |



QUESTIONS FOR REVIEW:

1. *Which Workbench function allows easy access to various libraries of objects?*
2. *The purpose of extensions is to add _____ and to change the _____ of individual _____.*
3. *TRUE or FALSE? Point extensions are always invoked in the order in which they were declared.*
4. *TRUE or FALSE? Proxy points enable Niagara to accurately represent data points available from remote devices.*
5. *What type of extension would track runtime using a totalizer? Where would you find it?*
6. *What type of extension would collect trend data? Where would you find it?*
7. *What type of extension would monitor off-normal values? Where would you find it?*

MODULE 3.3: FLEXIBILITY



Flexibility

... the ability to adapt to different circumstances or when external changes occur

By design, the Niagara Framework is very flexible. A **wide variety of hardware and software options** make it possible for you to design a system that fits your or your customer's changing requirements.



Objectives

- Describe the variety of software and hardware **options available** for designing a custom system.
- Explain the difference between a **completely custom-designed** solution and a **customizable appliance** with simple options.

SOFTWARE

Niagara Station

Some business owners need a **completely custom-designed** control and monitoring solution for each individual building or system. This custom solution is called a **Niagara Station**, and is different for each unique application. It is fully programmable for ANY solution and requires a high level of programming expertise.

A fully-programmable custom-designed solution:

- Can be programmed **in the field**
- Requires a high level of **programming expertise**
- Custom graphical interface with **few limitations**

EXAMPLE: Convenience Store system

Niagara Appliance

Other customers have a recurring requirement for a standardized control solution with **only a few easily customizable options** – a sort of “cookie-cutter” approach” to establishing a control system. This turn-key solution is called a **Niagara Appliance**.

An application-specific customizable appliance:

- **Is an out-of-the box** pre-configured solution; set up from a browser
- Requires no programming expertise; can be set up by a **technician**
- **Automatically configures** graphics, control logic, alarms and schedules

EXAMPLE: Car Wash appliance, Niagara Security appliance

Demo Station

Every instance of the **Workbench** software comes with a sample “**Demo**” station designed to demonstrate typical Niagara control and monitoring features and techniques:


- Custom menus
- Background visuals
- Building-specific floor plans
- Real-time display of data and system status

HARDWARE

Product data sheets

http://www.tridium.com/cs/library/ax_library

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| ^{AX}Supervisor | <p>The ^{AX}Supervisor is a flexible network server useful when multiple JACE controllers are networked together. The ^{AX}Supervisor software can be installed <u>on any PC</u> running Windows 2000, Windows XP Professional, or Windows 2003 Server, and can run a station, and provides a comprehensive, graphical engineering toolset for application development.</p> <p>The AXSupervisor serves real-time graphical information displays to standard web-browsers and provides server-level functions such as:</p> <ul style="list-style-type: none"> ▪ Centralized data logging ▪ Archiving ▪ Alarming ▪ Real-time graphical displays ▪ Master scheduling ▪ System-wide database management ▪ Integration with enterprise software applications |
| SoftJACE | <p>SoftJACE allows you to run a station on a PC, but <u>without</u> the <i>Workbench</i> engineering tools. It runs on <u>most</u> Microsoft XP Professional, Windows Server 2003 and other Windows-compatible computers.</p> <ul style="list-style-type: none"> ▪ Provides all of the capabilities of a programmable controller, multi-protocol adapter, network manager, web server (with optional Web User Interface), data logger and alarm system in a single software solution ▪ Communicates with external devices using Ethernet-based protocols ▪ Currently supports the industry's most common standard protocols: OPC, BACnet/IP, Modbus TCP, and SNMP |
| Web browsers | <p>Niagara stations can be accessed from most modern browsers.</p> <ul style="list-style-type: none"> • <u>Fully-featured</u> Java-enabled browser interface <p style="text-align: center;">OR</p> <ul style="list-style-type: none"> • <u>Simpler</u> browser-based interface with no Java plug-in and a reduced set of features <p>Browser-based access is possible on platforms for which the Web module has been licensed. Workbench functionality is also possible through a browser, and is licensed separately.</p> |
| JACE NXS  | <p><u>Most powerful</u> JACE controller, it comes with the embedded version of Windows XP. With a powerful processor and a 1 gB flash drive standard, this JACE has no moving parts, relying on convection fin cooling.</p> <ul style="list-style-type: none"> ▪ Physical: Steel chassis, Convection fin cooling, integral UPS ▪ Processor: 650 mHz Intel Celeron® CPU ▪ RAM: 512 mB ▪ OS: Windows XP ▪ Storage: 1 gB flash drive <u>OR</u> 40gB hard drive (optional) ▪ Power: 100 to 240 VAC ▪ Port Connections: Ethernet (2), USB (4), LON, RS232, RS485 ▪ Battery backup |

JACE-201



Designed to be used in conjunction with one or more I/O modules.

- **Physical:** Plastic, DIN-rail or screw mountable, air convection-cooled
- **Processor:** 250 mHz Power PC CPU
- **RAM:** 64mB SDRAM (dynamic)
- **Storage:** 64mB Serial Flash memory
- **OS:** QNX, J9 Java Virtual Machine, NiagaraAX
- **Port Connections:** RS232, RS485, Ethernet (2)
- **Battery backup**
- **NPM-based** (Niagara Processor Module)

The NPM-based JACEs are very popular due to competitive pricing, small form factor, and the flexibility inherent to multiple mounting options.

- Complete HW/SW infrastructure for developing Internet-connected equipment
- Combines the Niagara Framework running on a low-cost plug-in card and operating system
- Complete OEM design package (including an *Evaluation Board Kit*) makes it easy to build your own embedded product
- **Expansion slots** (under the battery) can be filled with a LON card, additional RS-232 or RS-485 ports, an internal modem, or an optional wireless card.
- There are 4 indicator lights on the NPM. The “**heartbeat**” indicator (amber) light should blink steady when the JACE is operating properly.

JACE-403

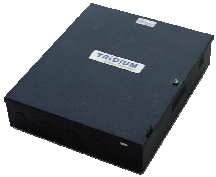







One of the true “workhorses” in the Tridium JACE controller line.

- **Physical:** Single board controller, metal enclosure
- **Processor:** 250 mHz Motorola RISC CPU
- **RAM:** 128 mB RAM – *expandable option*
- **Storage:** 32mB Serial flash memory – *expandable option*
- **OS:** QNX with Java Virtual Machine, NiagaraAX
- **Power:** 120VAC
- **Port Connections:** LON, RS232, RS485, Ethernet (1)
- **Battery backup**

Featuring an internal power supply and a battery backup, the JACE-403-AX has an array of **Niagara Direct Input/Output (NDIO) relays** physically mounted on the mother board.

- Allow direct connection and control of equipment (e.g., pump motor or temperature sensor) as an alternative to using an expensive smart controller
- Hard-wired directly to equipment

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| <p>JACE-545</p>  | <p>Equipped with an internal power supply and battery backup, and features two RS-232 ports with four RS-485 ports. Internal and external modem options exist, and either option will tie up an RS-232 port.</p> <ul style="list-style-type: none"> ▪ Physical: Single board controller, metal enclosure ▪ Processor: 250 mHz Motorola RISC CPU ▪ RAM: 128 mB RAM – <i>expandable option</i> ▪ Storage: 32mB Serial Flash memory – <i>expandable option</i> ▪ OS: QNX with Java Virtual Machine, NiagaraAX ▪ Power: 120VAC ▪ Port Connections: LON, RS232 (2), RS485 (4), Ethernet (1) ▪ Battery backup <p><i>Note that when you look up information for the JACE-545-AX in the Workbench, it will show “J404” as the model because it actually uses a series 4 circuit board.</i></p> |
| <p>JACE-601</p>  | <p>Designed to be used in conjunction with a Power Supply Module and one or more I/O modules.</p> <ul style="list-style-type: none"> ▪ Physical: Plastic, DIN-rail or screw mountable, air convection-cooled ▪ Processor: 524 mHz Power PC440 CPU ▪ RAM: 128mB DDR RAM ▪ Storage: 128 mB Serial Flash memory ▪ OS: QNX, J9 Java Virtual Machine, NiagaraAX ▪ Power: 120 VAC ▪ Port Connections: RS232, RS485, USB, Ethernet (2) ▪ Battery backup ▪ NPM-based (Niagara Processor Module) |
| <p>Security JACE</p>  | <p>Part of a complete hardware and software solution for the access control needs of a small building.</p> <ul style="list-style-type: none"> ▪ Physical: Plastic, DIN-rail or screw mountable, air convection-cooled ▪ Processor (CPU): 250 mHz Power PC405EP (JACE-201 platform), 524 mHz Power PC440 (JACE-601 platform) ▪ RAM: 128 mB SDRAM (JACE-201 platform), 256 mB DDR RAM (JACE-601 platform) ▪ Flash Storage: 64 mB (JACE-201 platform), 128 mB (JACE-601 platform) ▪ OS: QNX (w/ Java Virtual Machine, NiagaraAX) ▪ Power: 115 VAC ▪ Port Connections: RS232, RS485, Ethernet (2), USB (JACE-601 only) ▪ Battery backup <p>Together with a secure enclosure, battery backup, and remote card reader and input/output (I/O) modules, this system can control a total of 16 entry points (for JACE-201 based systems) and a total of 32 entry points (for JACE-601 based systems), as well as provide intrusion detection and alarming.</p> |



| JACE Expandability | JACE | RAM-FLASH MEMORY | EXPANDED MEMORY-UPGRADES |
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| | JACE-201 | 64 mB SDRAM, 64 mB flash memory | RAM upgrade to 128 mB SDRAM |
| | JACE-403-AX | 128 mB RAM, 32 mB flash memory | RAM option to 256 mB / 128 mB flash memory (EM) Auto-dial/auto-answer 56K modem |
| | JACE-545-AX | 128 mB RAM, 32 mB flash memory | RAM option to 256 mB / 128 mB flash memory (EM) Auto-dial/auto-answer 56K modem |
| | JACE-601 | 128 mB DDR RAM, 128 mB flash memory | RAM upgrade to 256 mB DDR RAM |
| | JACE-NXS | 512 mB RAM, 1 gB flash drive, 40 gB hard drive | N/A |
| | Security JACE | See JACE-201 & JACE-601 | See JACE-201 & JACE-601 |
| JACE Support Data | See JACE Support Data job aid. | | |
|  | TOOLS DEMO JOB AIDS | Platform Administration | |
|  | | Obtaining JACE Information Using Platform Admin | |
|  | | <ul style="list-style-type: none"> ▪ JACE Equipment ▪ JACE Support Data | |





QUESTIONS FOR REVIEW:

1. Which software allows you to run a station on a PC, but without the Workbench^{AX} engineering tools?
2. How is an "appliance" different than a station?
3. Which JACE contains an embedded version of Windows XP?
4. Which JACE offers a low-cost solution that allows you to connect through an array of Niagara Direct Input/Output (NDIO) devices?
5. Which JACEs have a Niagara Processor Module (NPM) that can be inserted into a modified controller socket to custom-design a Niagara solution?
6. Which JACE has a series 4 circuit board and is identified in the Workbench as a model "J404?"
7. Which JACE(s) has (have) a USB port installed on the circuit board?
8. TRUE or FALSE? A Niagara solution can either be a complete custom-designed station to meet specific business or operational requirements, or a customizable cookie-cutter type appliance with a limited interface.



MODULE 3.4: SCALABILITY

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|  | Scalability | <p>... the ability to <u>expand</u> (change the size or scope) to support larger or smaller volumes of data and more or less users</p> <p>... how well a hardware and software system can <u>adapt</u> to increased demands</p> <p>... the ability of a system and/or application to <u>grow</u> incrementally larger without total replacement of hardware or software, and without the need to re-engineer the process</p> |
|  | Objectives | <p>➡ Recognize how Niagara^{AX} can be scaled depending on a client's needs.</p> |
| Fully scalable | | <p>The Niagara Framework is <u>fully scalable</u>. It can be run on platforms spanning the range from small embedded devices to enterprise-class servers.</p> |
| Multi-JACE solution | | <p>As your customer's requirements change, the challenge of increasing the system's capabilities is as simple as adding additional JACEs and networking them together.</p> <p>For large installations, adding an AX-Supervisor permits the establishment of a centralized database for Alarms and Trend Data collection, as well as a single point of entry for all browser-based users.</p> |

MODULE 3.5: REUSABILITY

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|  | Reusability | <p>... the degree to which a software module or other work product can be used in <u>more than one application</u></p> |
|  Objectives | | <ul style="list-style-type: none"> ➔ Recognize the value of reusing work in new projects that you've already completed to increase productivity and improve quality. ➔ Demonstrate how to create and access a personal palette of pre-configured control solutions. ➔ Identify where to locate a personal palette for storing and viewing. |
| Reusing work | | <p>Once you have designed a custom solution for yourself or your customer, you have the option to reuse your work product to meet the needs of other projects with similar requirements.</p> |
| Personal palettes | | <p>Niagara gives you the ability to save previously developed solutions into "personal" palettes that can even be shared with co-workers.</p> <p>A personal palette allows you to save:</p> <ul style="list-style-type: none"> ▪ Niagara objects ▪ Collections of objects ▪ Configurations ▪ Values ▪ Views ▪ Devices ▪ Widgets |
| Recommended location | | <p><i>My File System → Sys Home–users–your user folder</i></p> <p>This enables you to <u>copy your palette forward</u> whenever you update to a newer release of Niagara^{AX}.</p> |
| Creating a personal palette | | <ol style="list-style-type: none"> 1. Open up the <i>My File System – Sys Home – users</i> folder. 2. Right-click on your user folder. 3. Select New – PaletteFile.palette. 4. Rename the file |
| Viewing & using your personal palette | | <ol style="list-style-type: none"> 1. Open the Palette Side Bar by clicking on the <u>left Side Bar icon</u> in the Tool Bar. Select <u>Palette</u>. 2. Click on the Open Palette button on the Palette Side Bar. 3. The Open Palette dialogue box appears. Click Browse to search for your palette in the File Space under the user folder. 4. A separate File Chooser window pops up. Drill down into My File System – Sys Home – users to your user folder. 5. Click Open to insert/view your personal palette in the Palette Side Bar. <p>Your personal palette will always be available in the Palette Side Bar, along with any standard module palettes (e.g., alarm, control, history) that you previously opened.</p> |

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| Sharing your personal palette | <p>There are several ways to share your personal palette with others depending on the scenario:</p> <ul style="list-style-type: none"> ▪ <i>Multiple users on the <u>same</u> platform</i> ▪ <i>Multiple users on <u>different</u> platforms</i> |
| Multiple users on the <u>same</u> platform | <p>To copy an <u>entire palette</u> to another user:</p> <ol style="list-style-type: none"> 1. Select, drag & drop the palette onto the other user's folder. 2. The recipient can then select whichever parts of the palette they want or need, as shown in the example below. <p>To copy <u>parts of a palette</u> to another user:</p> <ol style="list-style-type: none"> 1. Create a new personal palette or open an existing one. 2. Open the Wire Sheet view (by double-clicking on the other palette). 3. Expand the personal palette to be copied in the Nav Tree. 4. <u>Drag</u> only those specific objects, widgets, devices, extensions, etc. that you want to share and <u>drop</u> onto the other person's wire sheet. |
| Multiple users on <u>different</u> platforms | <p>To copy an <u>entire palette</u> to another user:</p> <ol style="list-style-type: none"> 1. Open a connection to the <u>remote platform</u>. (We'll go over how to do this in <i>Module 4, Platforms & Stations</i>.) 2. Using the File Transfer Client in the <u>remote platform</u>, select the palette you wish to copy on your platform (left side), browse for the Niagara user's folder in the remote platform (right side), and copy (→) the palette. <i>(We'll discuss how to do this in Module 5, Niagara Platform Tools.)</i> <p><i>You CANNOT copy <u>parts of a personal palette</u> using the File Transfer Client. You must copy the entire file; the recipient can then copy whichever portions of it they want/need.</i></p> |
| Library of control solutions | <p>As you develop a library of preconfigured control solutions, you will find that the lead time required for a new project may be shortened, as well as the average labor required for full implementation of the customer's system.</p> <p>This is true for a couple reasons:</p> <ul style="list-style-type: none"> ▪ Increased productivity - resulting from the ability to "drag & drop" from a collection of ready-made components. ▪ Improved quality – resulting from the reuse of well-designed, field-tested, customer-approved components. <p>This translates into lower costs, higher profits, and customer satisfaction.</p> |
| Benefits | <p>The more pre-configured solutions you have saved in your personal palette, the higher the <u>reusability factor</u> and the greater the <u>overall benefits</u> (productivity and quality) to you and your organization.</p> |
|  | <p>TOOLS</p> <ul style="list-style-type: none"> ▪ Personal palette ▪ Palette sidebar |
|  | <p>LAB</p> <p><i>You will have opportunity to practice creating a personal palette in the Niagara Technical Certification Program on-site training course.</i></p> |



QUESTIONS FOR REVIEW:




1. *TRUE or FALSE? All standard module palettes can function as personal palettes once they are in the Palette Side Bar.*
2. *Where are personal palettes recommended to be stored? Why?*
3. *What can be saved to a personal palette?*
4. *Where can palettes be viewed and accessed in the Workbench?*
5. *What is the best way to copy an entire personal palette to multiple users on different platforms?*

MODULE 3.6: CONNECTIVITY

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|  | Connectivity | <p>... the capability of a system or device to be <u>attached</u> to other systems or devices without modification; the capability to attach a variety of functional units without modifying them</p> <p>... a perception related to using computer networks to <u>link</u> to people and resources</p> |
|  | Objectives | <ul style="list-style-type: none"> ➤ Demonstrate how to create a new network connection and add devices to that network. ➤ Identify where the Driver and Device Managers are located. ➤ Explain how to discover existing devices that are physically connected to a network. |
| Web browser connectivity Solving the connectivity challenge | | <p>Web browser connectivity is enabled by the Niagara Framework.</p> <ul style="list-style-type: none"> ▪ Niagara makes it possible to connect diverse devices into seamless systems. ▪ Protocol and vendor neutral, Niagara communicates with thousands of devices from hundreds of suppliers and transforms their information into normalized data components. ▪ Turning your entire facility into one easy-to-navigate web site, giving you anytime- anywhere access from a web browser. |
| Working “offline” | | <p>If you want to <u>plan ahead</u> before all of the controller hardware has been delivered and installed at your facility, you can add the networks and smart devices to your station database offline. Later, when the hardware has been installed, you just need to bind the actual controller to the database.</p> |
| Planning a network offline | | <p>Planning a network offline:</p> <ol style="list-style-type: none"> 1. First, establish the new network by entering it into the database. 2. Add new devices off-line. (Off-line indicates that the devices are not actually installed.) 3. Find any vendor-specific modules for the device profile information. Otherwise, you must configure each device manually. 4. Configure each device to be added to the network. 5. The network and associated device or devices are now loaded in the database. <p><i>When the actual devices are later physically connected in the system, it just a matter of allowing Niagara to <u>discover</u> the devices, <u>match</u> configuration data, and <u>drag & drop</u> the desired devices into the database.</i></p> |
| Working with existing networks | | <p>Sometimes, the hardware has already been installed and is fully functional before you begin the task of creating a web-based front-end. In this case, you would <u>connect</u> to the existing network, <u>discover</u> the actual smart devices and <u>add</u> them to the database.</p> |

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| Finding existing devices already installed | <p>Finding <u>existing devices</u> already installed:</p> <ol style="list-style-type: none"> 1. Establish the new network by entering it into the database. 2. Discover existing devices. 3. Add from a list of discovered devices into the database by DRAG & DROP. 4. Configure each device to be added to the network. 5. The network and associated device or devices are now loaded in the database. |
| Creating a new network connection | <p>For the most common communication protocols, establishing connectivity to smart devices is as easy as creating the appropriate network type and discovering the devices. If you need to talk to LON or Bacnet devices, you create a LON or Bacnet network and connect the discovered devices to the network.</p> <ol style="list-style-type: none"> 1. Drill down into the Station and open the <u>Config container</u>. Right-click on the <u>Drivers container</u>, select View—Driver Manager from the drop-down menu to open the Driver Manager. <i>(Or you can double-click on the <u>Drivers container</u> to open the Driver Manager.)</i> 2. Click on the New button or right-click in the Driver Manager space. 3. Click the down arrow to select the appropriate network to connect to the Driver Manager. Then click on the desired network. 4. Click OK. 5. Change the name of the newly assigned network to something appropriate, or accept the default. 6. Click OK to add the network to the Driver Manager. |
| Driver Manager view | <p>Station (JACE) – Config – Drivers → right-click → select <i>View – Driver Manager</i></p> |
| Connecting new devices to the network | <ol style="list-style-type: none"> 1. To find <u>existing devices</u> on a network, in the Device Manager, click the Discover button. 2. Wait briefly while Niagara learns what devices exist. The discovered devices will appear in the Discover pane. 3. DRAG & DROP from the <u>Discover pane</u> to the <u>Database pane</u> to insert the desired device(s) into the database. An Add dialogue box appears, allowing you to configure the device or accept the default settings. 4. <u>Configure</u> the device as needed, or accept the default settings and click OK. <p><i><u>Alternate method:</u> You can also drag a network or device from a palette directly onto the Database pane of the Driver Manager (for networks) or Device Manager (for devices).</i></p> <p><i>In the Palette Side Bar from your personal palette, you can also add pre-configured devices and networks into the database by simply dragging and dropping them directly onto the Database pane. This assumes that you have already added such devices and networks (e.g., bacnet, lonworks, modbusTcp, etc.) to your personal palette.</i></p> |



CBT Course Notes

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| Device Manager view | Station (JACE) – Config – Drivers – network created → right-click → select View – <i>Device Manager for that network (Niagara, NDIO, Bacnet, Lon, etc.)</i> | |
| Licensing required | Regardless of the configuration, the network and device drivers must be <u>licensed</u> and <u>installed</u> before networks or devices can be added in Niagara. | |
|  | TOOLS DEMO LAB | <ul style="list-style-type: none">▪ <i>Learn Mode (Discovery process)</i>▪ <i>Driver Manager</i>▪ <i>Device Manager</i> |
|  | | <ul style="list-style-type: none">▪ <i>Connecting New Smart devices</i>▪ <i>Connecting to a Network and Discovering Devices</i> |
|  | | <i>You will have opportunity to practice connecting to networks and devices in the Niagara Technical Certification Program on-site training course.</i> |


**QUESTIONS FOR REVIEW:**

1. Access to the Driver Manager can be found through which folder/container?
2. Access to a network's Device Manager can be found through which folder/container?
3. TRUE or FALSE? To create a network in the Drivers Manager, you can either drag and drop the network module from the Palette Side Bar or access the Driver Manager and select the New button.
4. TRUE or FALSE? To connect to a network or smart device in Niagara, it is not necessary to have the associated drivers actually installed.
5. TRUE or FALSE? All network types are capable of having their devices discovered.
6. What can be "discovered" using the Discover button?

MODULE 3.7: EFFICIENCY

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|  | Efficiency | <p>... the degree to which <u>outputs</u> are achieved in terms of <u>productivity</u> and <u>input</u> (resources allocated)</p> <p>...the extent to which <u>time</u> is well used for the intended task; the extent to which a <u>resource</u>, such as electricity, is used for the intended purpose</p> |
|  | Objectives | <p>➔ Explain how Niagara acts efficiently to save time, reduce costs, and minimize resources when building a network.</p> |
| Reduced implementation time | | <p>The inherent reusability of field-tested objects or collections of objects can dramatically reduce the amount of time to design a system. A library of pre-configured components can even be shared throughout your organization if you have identified a few <u>Best Practices</u>. Consider establishing:</p> <ul style="list-style-type: none"> • a baseline station structure • custom property configurations • object naming conventions • standard graphics views |
| Client or server | | <p>In the case of the Niagara network, which facilitates communication between Niagara devices, any station can function as a client or server, depending the type of transaction:</p> <ul style="list-style-type: none"> ▪ A station is acting as a client whenever it <u>requests</u> information from another station. ▪ A station is acting as a server whenever it <u>responds</u> to a request for information from another station. |
| Connectivity is not continuous | | <p>IN A STATION:</p> <ul style="list-style-type: none"> • In the Nav Tree, drill down into the Config container to the <u>Niagara network</u>. Right-click on the Niagara Network, select View—Station Manager from the drop-down menu to open the Station Manager. • Scroll to the right. Notice that both the Client and Server connections are “Not connected.” <p>Because a continuous connection is <u>not maintained</u> between stations, the level of network traffic is kept to a minimum.</p> |
| On-demand polling | | <p>On-demand polling is another feature of Niagara’s network architecture that improves bandwidth utilization. Based on the existence of certain conditions, Niagara will then update the data as needed.</p> <p>Regardless of network type or communication protocol, and no matter how many smart devices are integrated, the data from any particular point will <u>not be updated</u> unless one of the following conditions exists:</p> <ul style="list-style-type: none"> • real-time display of the data requires that it be frequently updated • the data is subject to continuous alarming or trending <p>This strategy enables the system to maintain ready access to a great deal of data with minimal network traffic <u>until the data is needed</u>.</p> |

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| Resource utilization | <p>Niagara's design automatically conserves resources in several ways:</p> <ul style="list-style-type: none"> ▪ You only install the modules you actually <u>need</u>. ▪ During installation, a module's contents can be <u>filtered</u> to remove unwanted UI or documentation files. ▪ Once installed, the modules remain in a <u>compressed</u> state. ▪ Alarming and history functions do not exist until you add the appropriate <u>extension</u> to an individual object. |
|  <div data-bbox="358 447 418 590"> TOOLS </div> | <p>Nav Tree Nav Tree sidebar Commissioning Wizard</p> |