CONTEMPORARY CONTROLS®

BAScontrol Series of BACnet/IP Controllers

USING SEDONA TO CREATE AN OPEN CONTROLLER

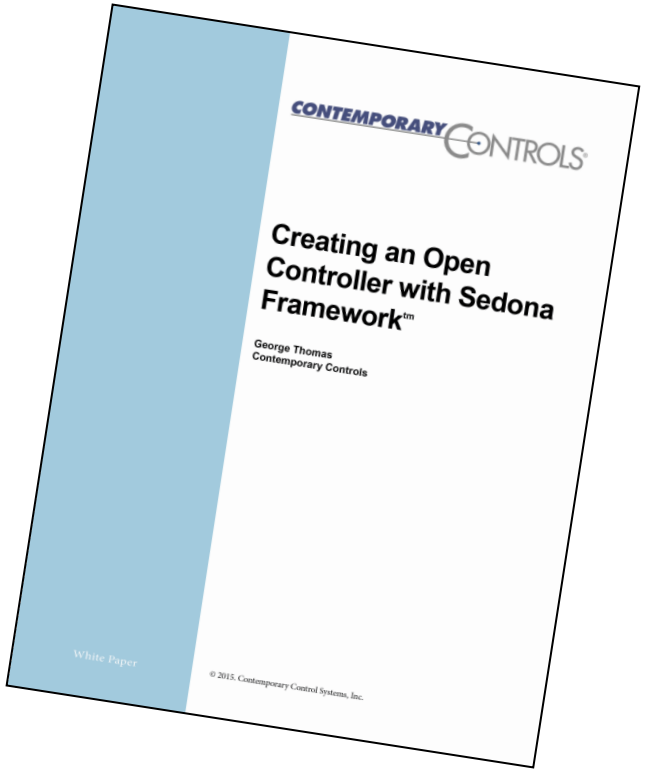
The Need for Open Controllers

- Open protocols such as BACnet do not provide control – only a standardized method for communications
- Even with BACnet compliance, a system integrator is not assured access to a BACnet site
  - Proprietary programming language requiring unique training or licensing
  - Restricted programming tool only available to “partners”
  - Contractor no longer has access to product line
  - Programs are not transferrable among different controllers
  - No access to passwords, diagrams, or the running program

An open protocol is necessary for an open controller but it is not sufficient for accessing existing systems.

We Wrote the Book on Open Controllers

"Having just BACnet is not good enough when you are locked out of a job due to a proprietary programming language and tool. What is needed is an open control technology and unrestricted programming tool."



Developed by Tridium, Sedona Framework is a software environment designed to make it easy to build smart, networked, embedded devices which are well suited for implementing control applications. Contemporary Controls is a Sedona community member and views this technology as the best hope in creating a truly open controller.

Short History of Sedona Framework

- Chief architect was Brian Frank at Tridium
- Early attempt of Internet of Things (IoT)
- Small IP controller operating wirelessly using 6LoWPAN in 100kB of memory
- *Powered by Sedona Framework* certification program began
- Honeywell purchases Tridium and eventually development ceases with Sedona 1.2

Contemporary Controls' BASremote was one of the first devices to be certified by Tridium as ***Powered by Sedona Framework****.*

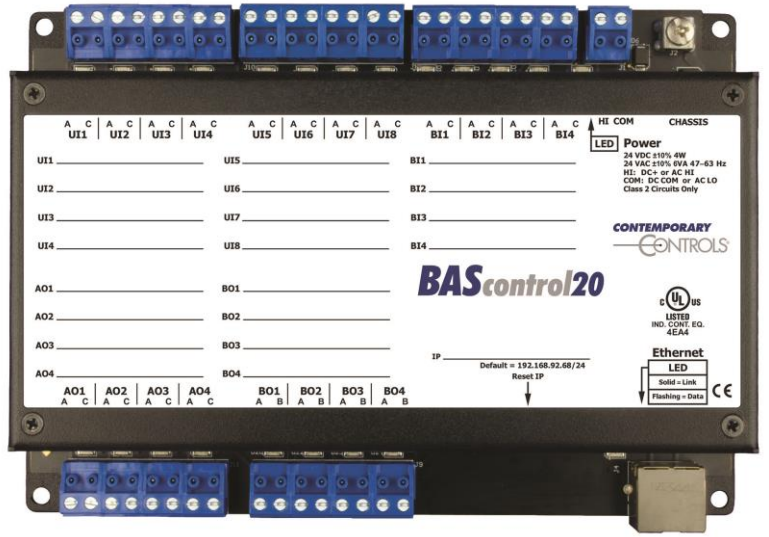
What Is BAScontrol?

- The BAScontrol series is Contemporary Controls' way of providing a truly open controller by having…
  - An open communications network in **IP Ethernet**
  - An open industry supported building automation protocol in **BACnet**
  - An open control language that is license-free in **Sedona Framework**
  - A programming tool that is available to all without restriction in the **Sedona Application Editor**
  - Access to a Sedona community where there is a sharing of development, know-how and applications for the common good

Contemporary Controls' products are available without restriction to systems integrators.

BAScontrol20 – 20-pt. BACnet/IP Unitary Controller

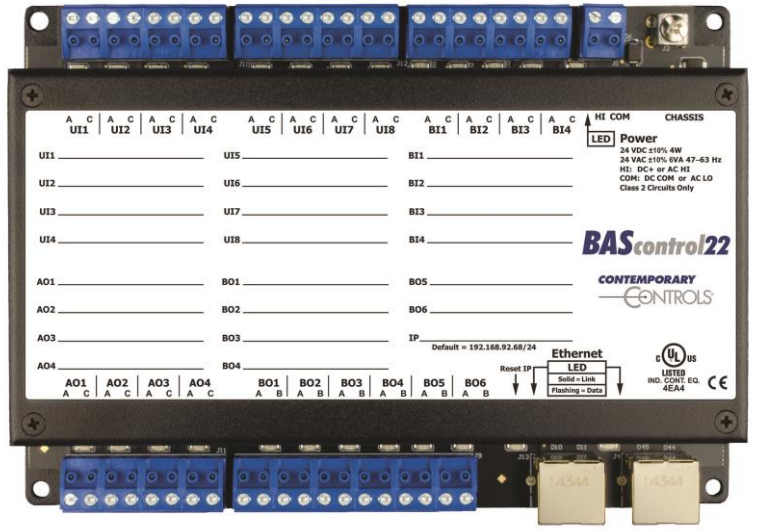
- Versatile Control Device
  - BACnet/IP compliant – B-ASC device profile
  - Web page point configuration
  - Direct connection to an Ethernet network
  - Powered by a Sedona Virtual Machine
  - Freely-programmable or configurable
  - Programmed via a Sedona tool
  - 24 VAC/VDC powered
- Flexible Input/Output – 20-points of I/O
  - Eight universal inputs
    - Thermistor, resistance, analog voltage, binary input, or pulse inputs
  - Four binary inputs
  - Four analog voltage outputs
  - Four relay or triac outputs



Intended for simple applications such as fan coil control.

BAScontrol22 – 22-pt. BACnet/IP Unitary Controller

- Versatile Control Device
  - BACnet/IP compliant – B-ASC device profile
  - Web page point configuration
  - Dual Ethernet ports via built-in switch
  - Powered by a Sedona Virtual Machine
  - Freely-programmable or configurable
  - Programmed via a Sedona tool
  - 24 VAC/VDC powered
- Flexible Input/Output – 22-points of I/O
  - Eight universal inputs
    - Thermistor, resistance, analog voltage, binary input, or pulse inputs
  - Four binary inputs
  - Four analog voltage outputs
  - Six relay outputs



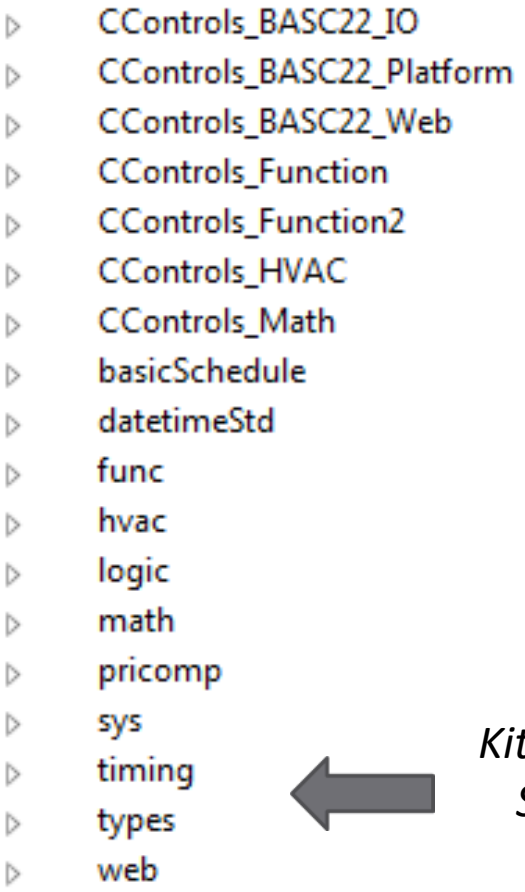
Intended for constant volume air handlers with analog or staged heating/cooling.

Open Programming Language for Control

- The Sedona language is similar to Java or C# allowing developers the opportunity to create custom components
- These components are deployed in kits and can be assembled into applications by non-programmers using simple graphical methods
- A Sedona Virtual Machine (SVM) on the Sedona device executes the application program
- Sedona applications can be made to be portable to other Sedona devices
- Sedona is open source – there are no royalties or commercial licenses required to develop and use Sedona components

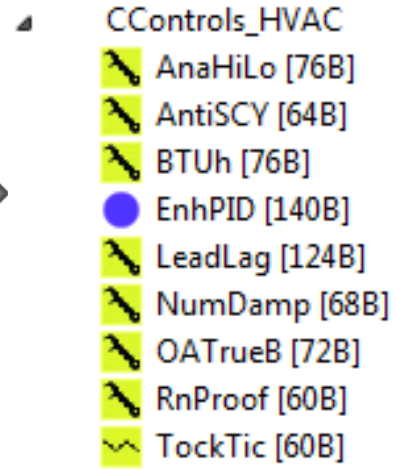
Originally developed by Tridium, Sedona has a similar look-and-feel as Niagara.

Components are Deployed in Kits



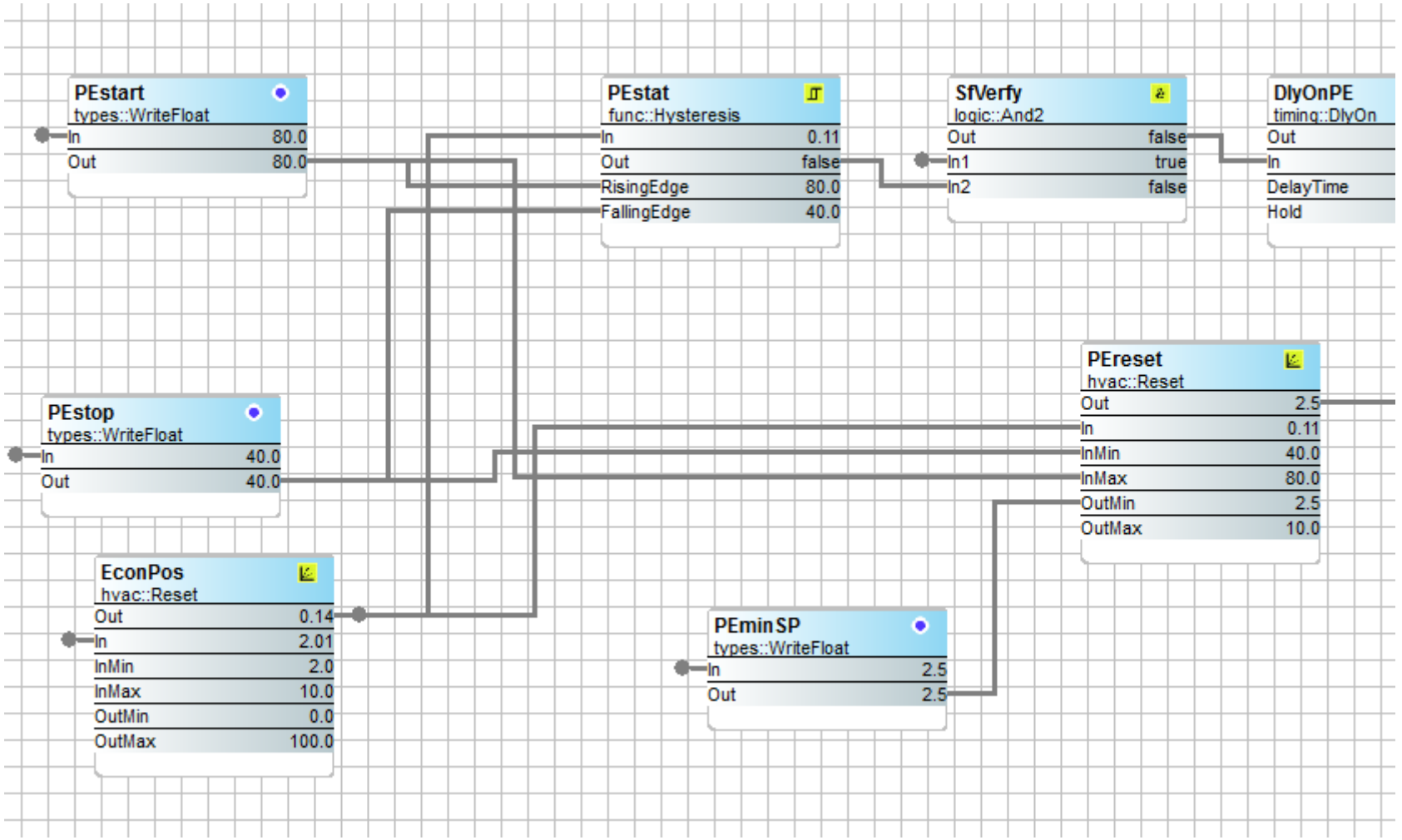
Kits with a vendor name identify the owner of the custom kits containing components with advanced functionality or linkage to platform-specific I/O.

Expanding the kits exposes the components that can be dragged onto the wire sheet, configured and linked to other components to form applications.



Kits with no vendor name are Tridium kits from the Sedona 1.2 release which are provided without modification.

Applications are Created by Linking Components



Using a drag-and-drop methodology, Sedona components are placed onto a wire sheet, configured, and linked together to create an application. Once placed on the wire sheet, components immediately begin execution thereby allowing for application debugging in real-time.

Why We Like Sedona

- The graphical experience of selecting components, configuring parameters, and linking components to create applications is easy to do and to explain to others
- The technology is open source, royalty-free and supported by several companies so the opportunity exists to share experiences
- A community exists of users who create applications and developers who make components and virtual machines
- The opportunity exists to share in the exchange of custom components and kits within the community
- Program debugging is fast because the affect of any change is seen instantly

For those familiar with Tridium's Niagara Framework, learning Sedona Framework will require minimal effort.

We Even Started the Sedona Alliance

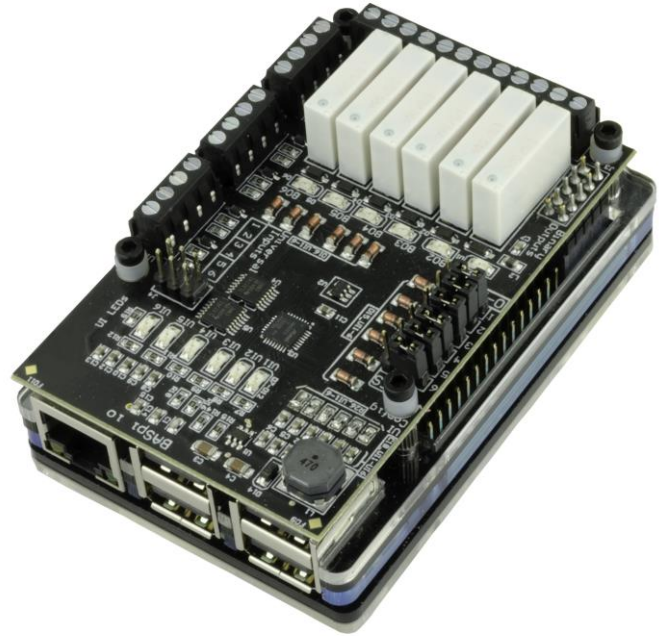
- Sedona technology is available to all under an Academic Free License (AFL) so it is open source and royalty-free
- Tridium owns the copyright *Sedona Framework* but you are allowed to say *Built on the Sedona Framework* if you use the technology
- The technology is fast, reliable and working on thousands of controllers today so why not use it
- It is portable to other platforms – including Raspberry Pi

The goal of the Alliance is to represent the interests of the Sedona community by keeping the technology open for all to use.

Sedona Alliance

BASpi – Sedona on a Raspberry Pi 2 or 3

- Versatile Control Device
  - BACnet/IP compliant – B-ASC device profile
  - Web page point configuration (plus jumper)
  - Direct connection to an Ethernet network
  - Powered by a Sedona Virtual Machine
  - Freely-programmable or configurable
  - Programmed via a Sedona tool
  - 5 VDC powered
- Flexible Input/Output – 12-points of I/O
  - Six universal inputs
    - Thermistor, resistance, analog voltage, binary input, or pulse inputs
  - Six relay outputs



Intended for home automation, prototyping and training

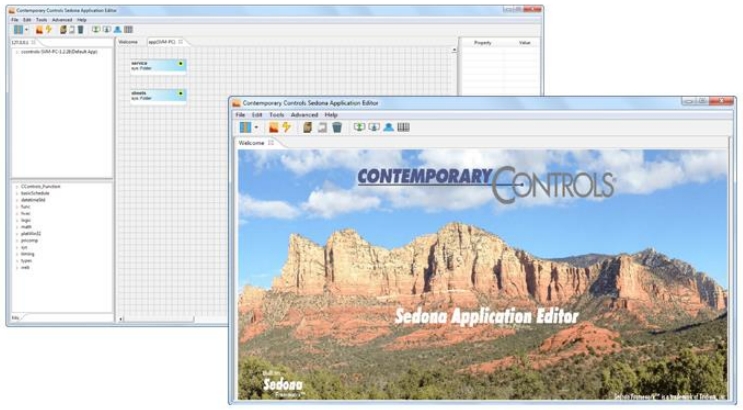
We Even Made Our Own Sedona Tool

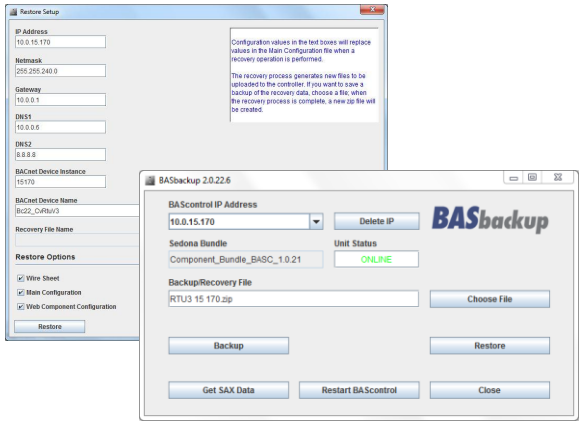
- Available free via download from the Contemporary Controls website – Sedona Application Editor (SAE)
- Includes all the necessary platforms, kits and manifests required for Contemporary Controls' controllers
- Works with a BASemulator that runs on a PC that can be programmed with the SAE for testing
- Can be used with other Sedona devices as long as the proper platforms, kits and manifests are added to the Sedona Data Folder
- Intended for the Sedona community

BAScontrol Toolset – All You Need is FREE

- BASemulator – *for controller emulation on a PC*
- Sedona Applications Editor – *for Sedona programming*
- BASbackup – *for BAScontrol project archiving*

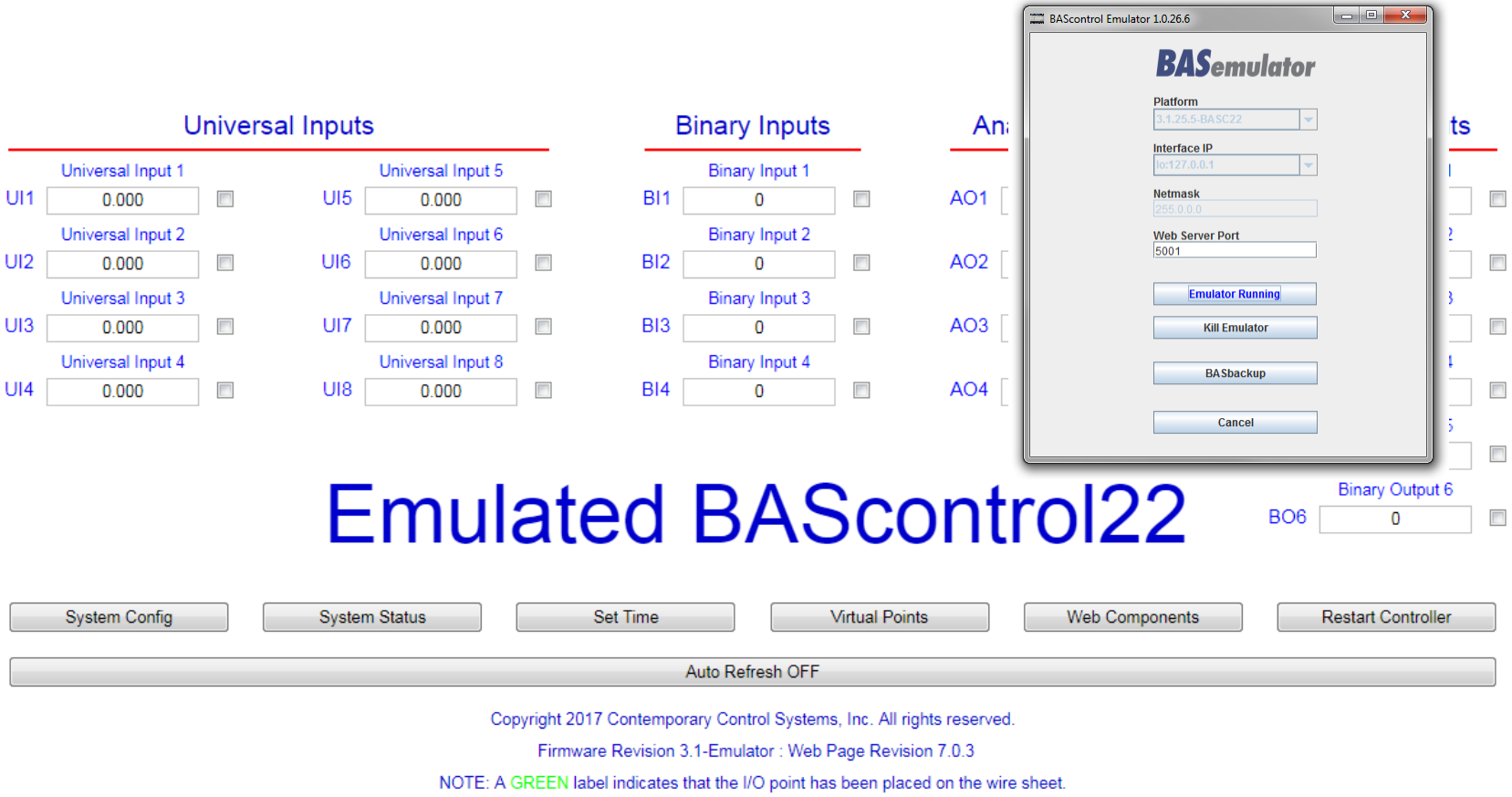
BAScontrol Toolset is available FREE via download from Contemporary Controls' web site. The toolset and a web browser are all you need to do a BAScontrol project even without having a real controller.





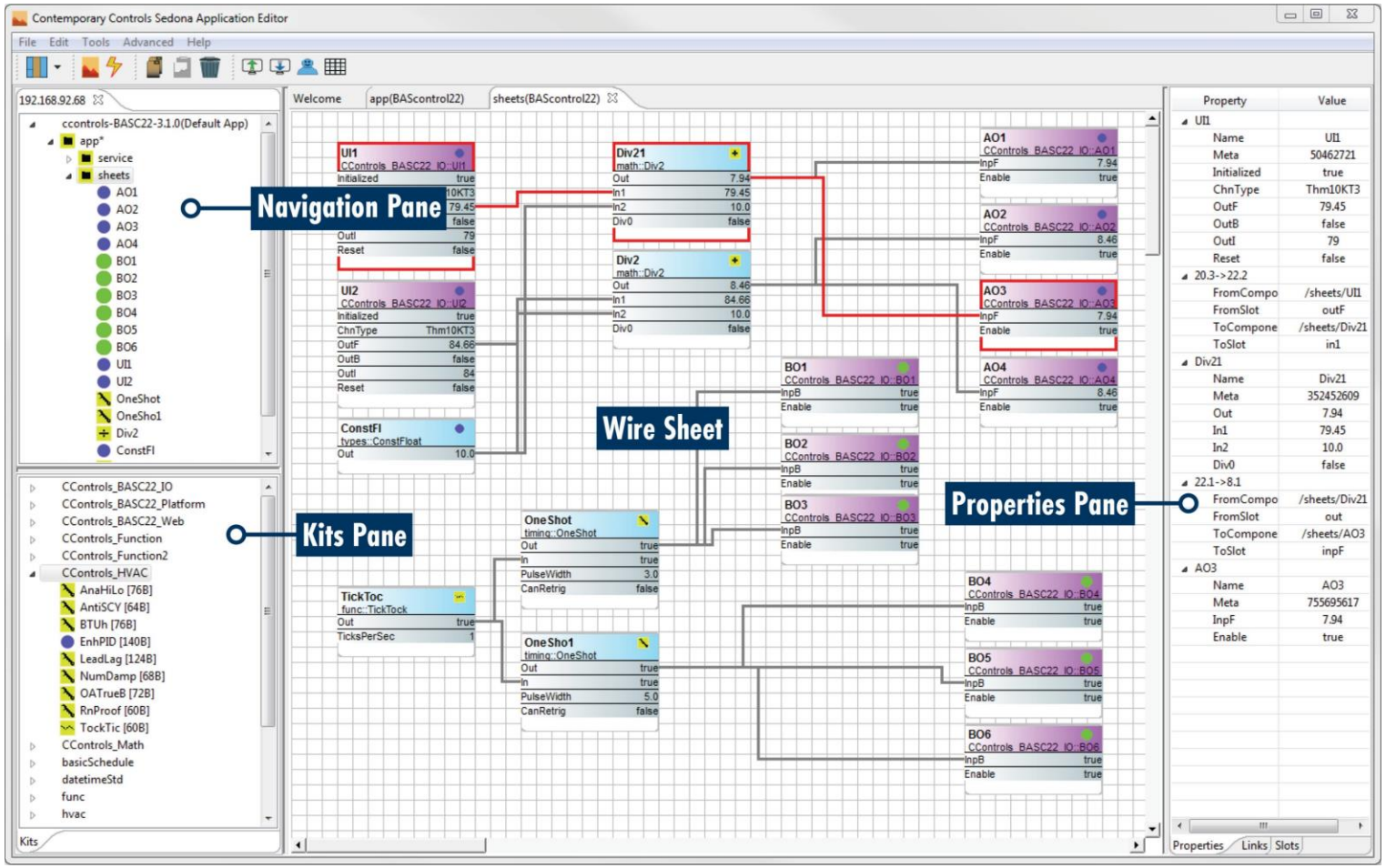
BASemulator – BAScontrol Emulation on a PC

- Very handy in learning Sedona and cloning real controllers
- Works on the same Windows PC as SAE and BASbackup
- Emulates all BAScontrol models



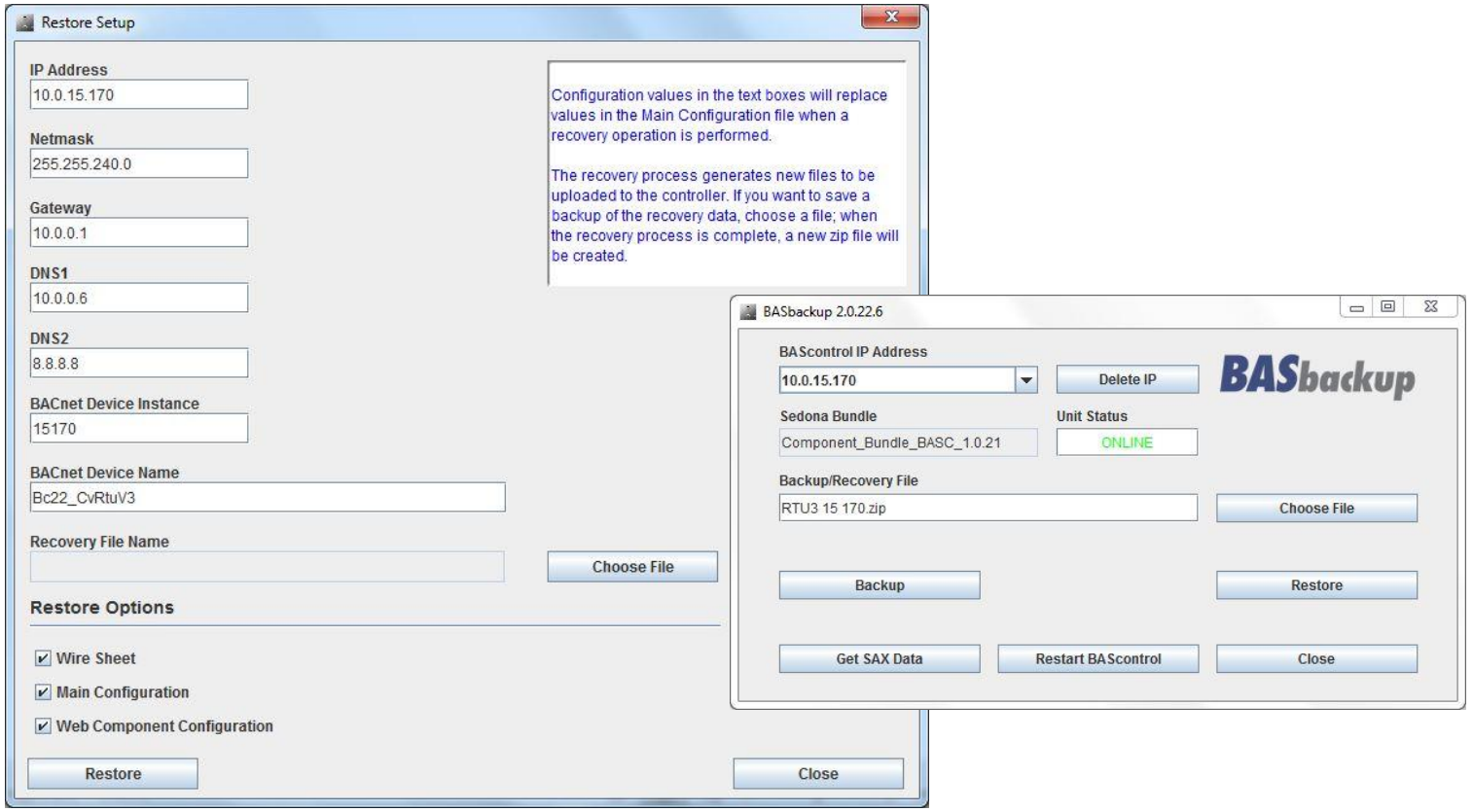
Our Sedona Tool – Sedona Application Editor

- **Navigation** shows order of execution
- **Kits** show what kits are installed in the controller
- **Wire Sheet** is the work area
- **Properties** show the attributes of the selected component



BASbackup – BAScontrol Project Utility

- **Backup** a project
- **Restore** a project
- **Clone** a project to multiple controllers while insuring uniqueness of the cloned controllers
- **Obtain SAX** data from files or controllers



Indispensable tool in that it makes a complete backup/restore of all BAScontrol files and not just the Sedona app.

Classes of Controllers

- A configurable controller executes a defined application that cannot be easily modified but allows for parameter configuration that address unique process settings such as setpoints
- A freely-programmable controller allows for an application to be developed “from scratch” by utilizing the building block functionality available in the controller

The BAScontrol series is freely-programmable but can be made into a configurable controller by installing one of Contemporary Controls’ pre-built applications. Configuration can then be accomplished via web pages.

Five Versions of Constant Volume RTU Applications

Contemporary Controls' has developed five versions of constant volume AHU or RTU (CvRTU) applications available via download from the company's web site that are free to registered system integrators.

CvRTU Version	Power Exhaust (Rfan)	Cooling	Heating	Economizer	Vent
V1	CV or Variable	0-10VDC AO	0-10VDC AO	DBulb or Enthalpy	Fixed% or CO2
V2	CV or Variable	2-stage DO	2 stage DO	DBulb or Enthalpy	Fixed% or CO2
V3	CV or Variable	2-stage DO	2 stage DO	DBulb or Enthalpy	Fixed%
V4	None	2-stage DO	2 stage DO	DBulb or Enthalpy	Fixed%
V5	None	2-stage DO or 0-10VDC AO	2-stage DO or 0-10VDC AO	None	None

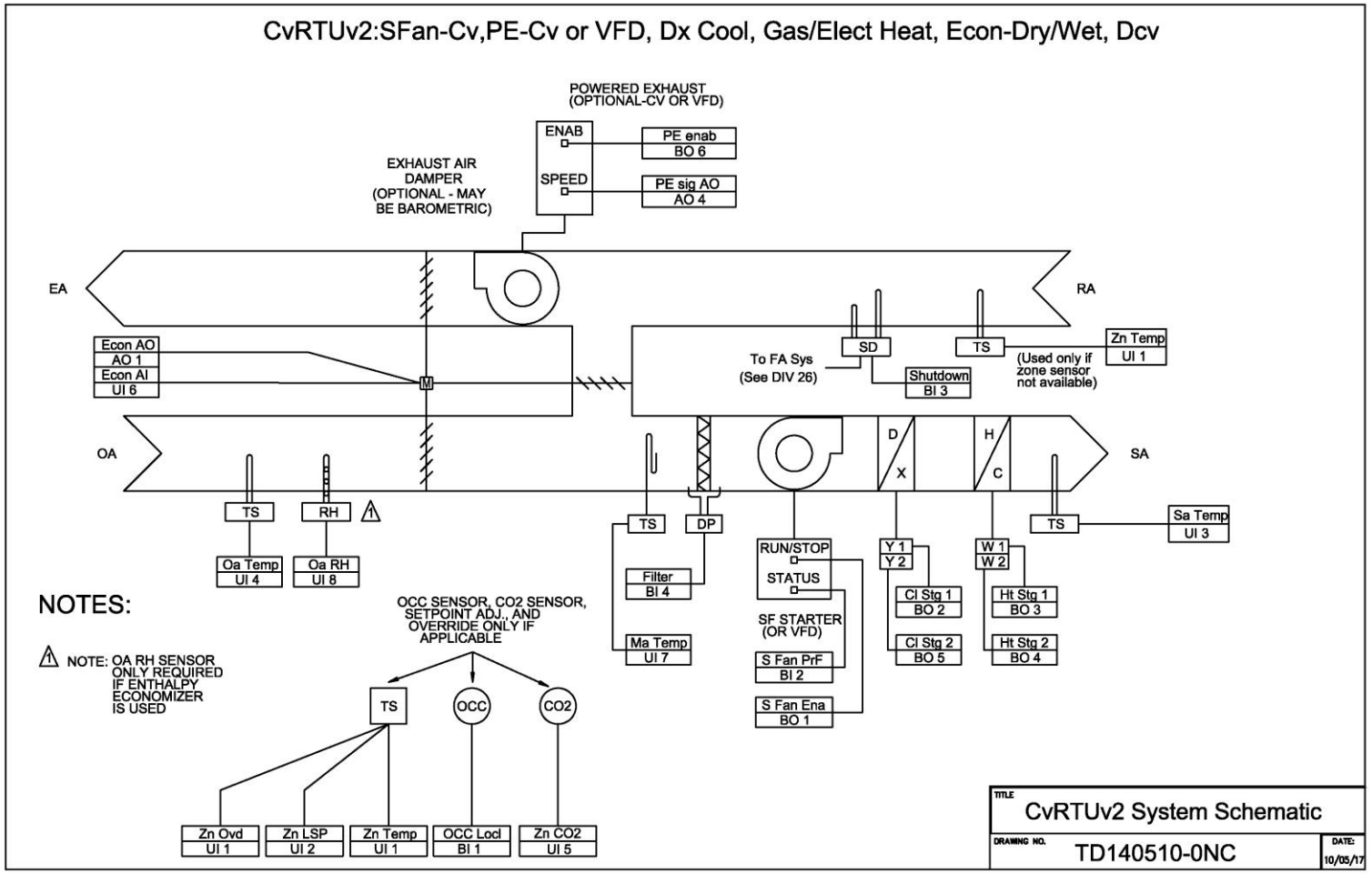
CvRTU Package Includes Everything for the SI

- The Sedona application along with the necessary kits in a zip file that can be loaded using BASbackup
- Sequence of Operation (SOO) In Word format for job submittal
- Points list in Excel format for BACnet integration
- Sample electrical wiring diagram to aid in panel design
- System schematic showing control points and devices

Equipment Summary	
Fan(s)	Sfan-Cv, PExh-Cv or Variable
Cooling	DX-1 or 2 stage
Heating	Elect/Gas – 1 or 2 stage
Humidification	None
Dehumidification	None
Economizer	Dual Dry Bulb or Enthalpy
Ventilation	Fixed% or DCV – CO2 sensor

The system integrator can select from five different equipment summaries to meet the needs of the application.

Constant Volume RTU System Schematic



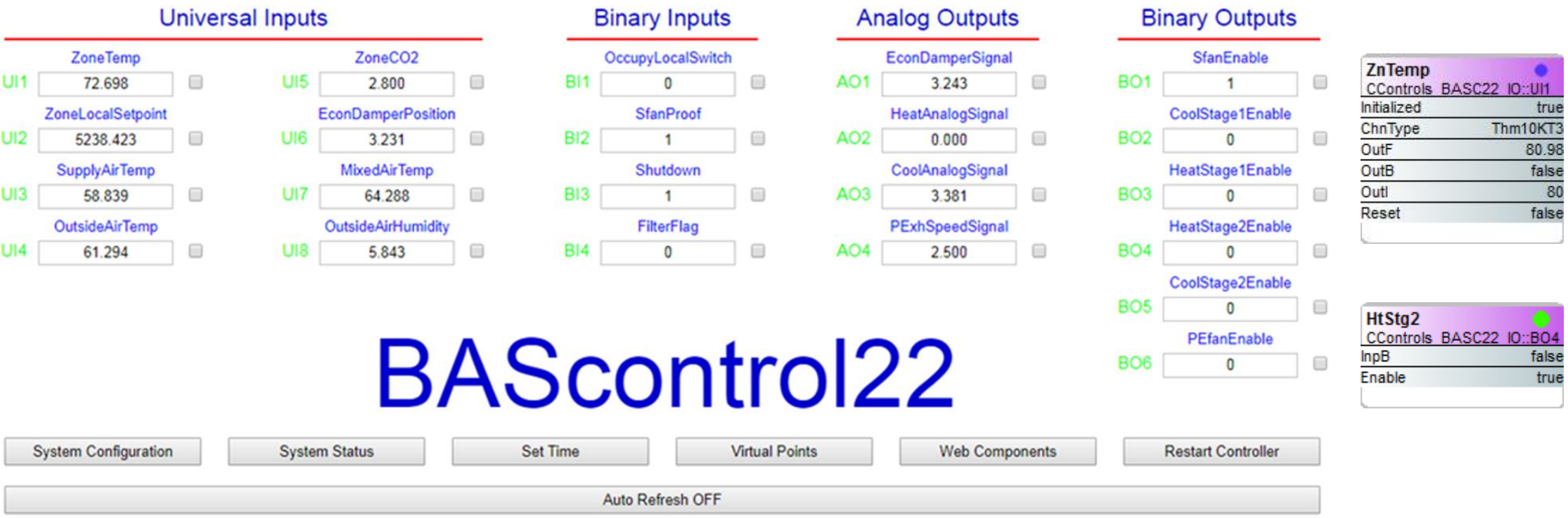
System schematic provided for each version in dxf format for editing. Physical point designators and BACnet names are shown on the schematic.

Excel Points List for BACnet Integration

I/O Point	Configured as	Sedona Tag	BACnet Object			
			Instance	Name	Type	Comments
UI1	10k T3	ZnTemp	1	ZoneTemp	AI	Space temperature thermistor
UI2	Resistance	ZnLSP	2	ZoneLocalSetpoint	AI	Two-wire potentiometer
UI3	10k T3	SaTemp	3	SupplyAirTemp	AI	Supply air thermistor
UI4	10k T3	OaTemp	4	OutsideAirTemp	AI	Outside air thermistor
UI5	0-10V	ZnCO2	5	ZoneCO2	AI	0-2000 ppm CO2 transmitter
UI6	0-10V	EconAI	6	EconDamperPosition	AI	OA damper position feedback
UI7	10k T3	MaTemp	7	MixedAirTemp	AI	Mixed air thermistor
UI8	0-10V	OaRH	8	OutsideAirHumidity	AI	Outside air humidity
BI1	contact	OccLocl	9	OccupyLocalSwitch	BI	Temporary occupancy switch
BI2	contact	SfanPrf	10	SfanProof	BI	Supply air fan proving sensor
BI3	contact	Shutdwn	11	Shutdown	BI	Shutdown occurs if open
BI4	contact	Filter	12	FilterFlag	BI	Filter requires changing
AO1	0-10V	EconAO	13	EconDamperSignal	AO	OA damper command signal
AO2	0-10V	HtAO	14	HeatAnalogOutput	AO	Heating analog output
AO3	0-10V	ClAO	15	CoolAnalogOutput	AO	Cooling analog output
AO4	0-10V	PEsigAO	16	PExhSpeedSignal	AO	Powered exhaust speed cmd.
BO1	contact	SfanEna	17	SfanEnable	BO	Engage supply fan
BO2	contact	ClStg1	18	CoolStage1Enable	BO	Engage stage 1 cooling
BO3	contact	HtStg1	19	HeatStage1Enable	BO	Engage stage 1 heating
BO4	contact	HtStg2	20	HeatStage2Enable	BO	Engage stage 2 heating
BO5	contact	ClStg2	21	CoolStage2Enable	BO	Engage stage 2 cooling
BO6	contact	PEenab	22	PEfanEnable	BO	Engage powered exhaust

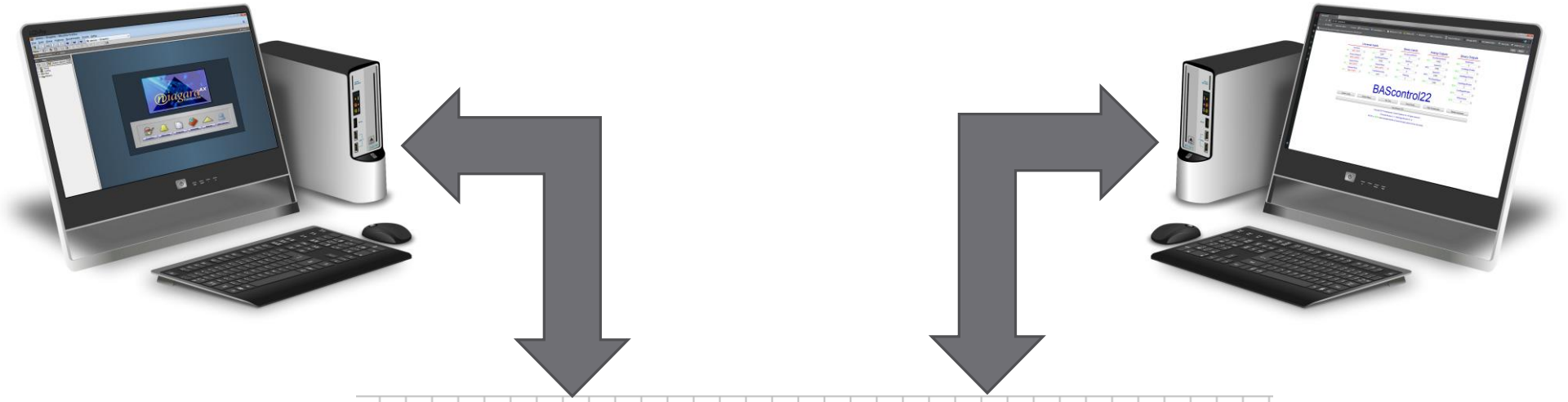
An Excel points list is provided for both real and virtual points. Both BACnet names and Sedona tags are provided.

Main Web Page Showing all Real Points

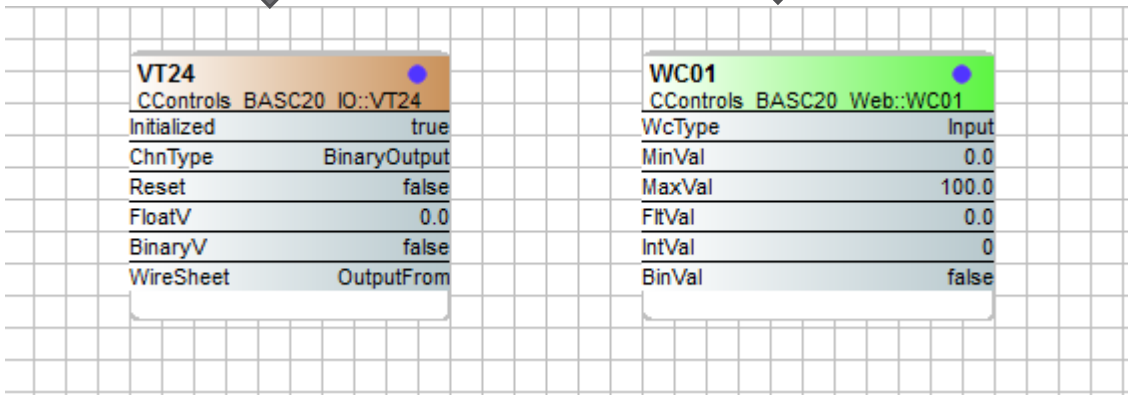


A common web browser is all that is needed to connect to the controller for configuration. Data points can be continuously refreshed. From this page you can launch into other pages.

BACnet Client and Web Browser Communication

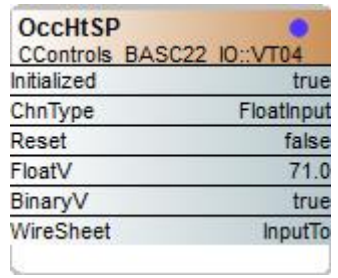


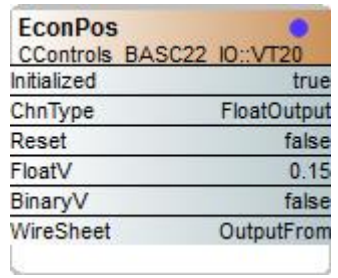
Virtual components facilitate supervisory control and monitoring between a BACnet client and the controller's wire sheet.



Web components facilitate Local configuration and monitoring between a web browser and the controller's wire sheet.

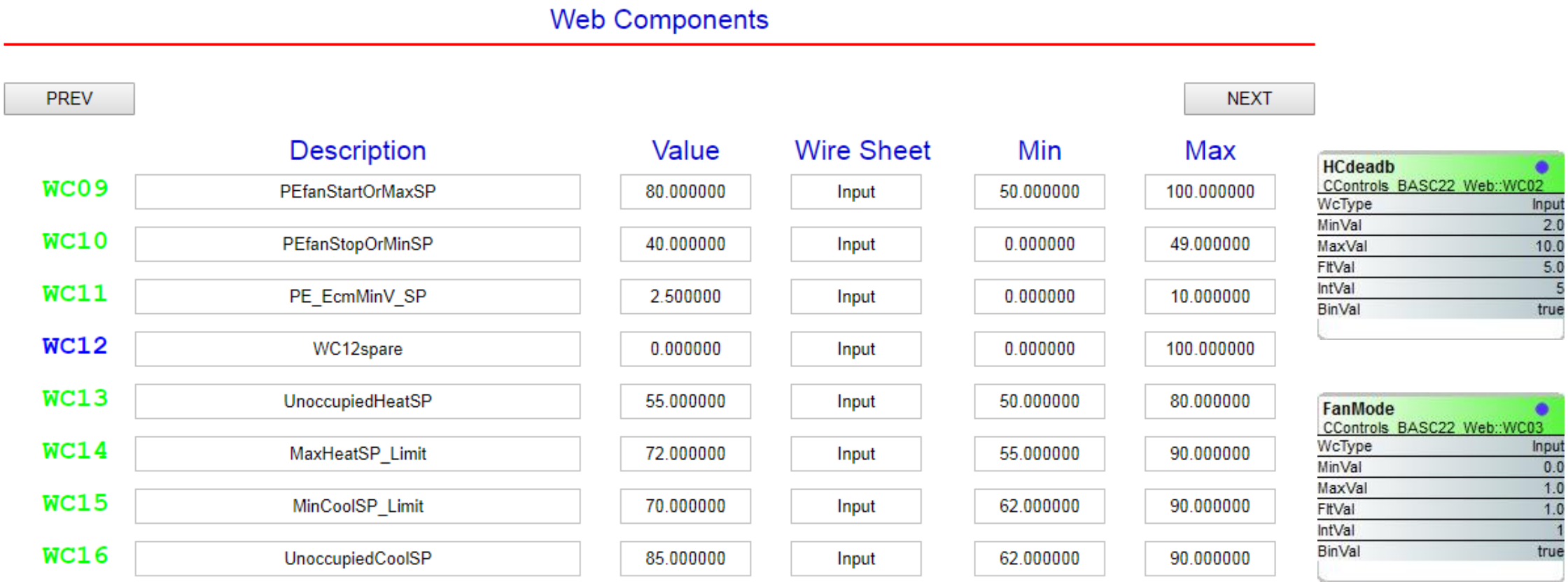
Virtual Points Communicate with BACnet Clients





Up to 24 virtual points exchange data between a BACnet client and the Sedona wire sheet.

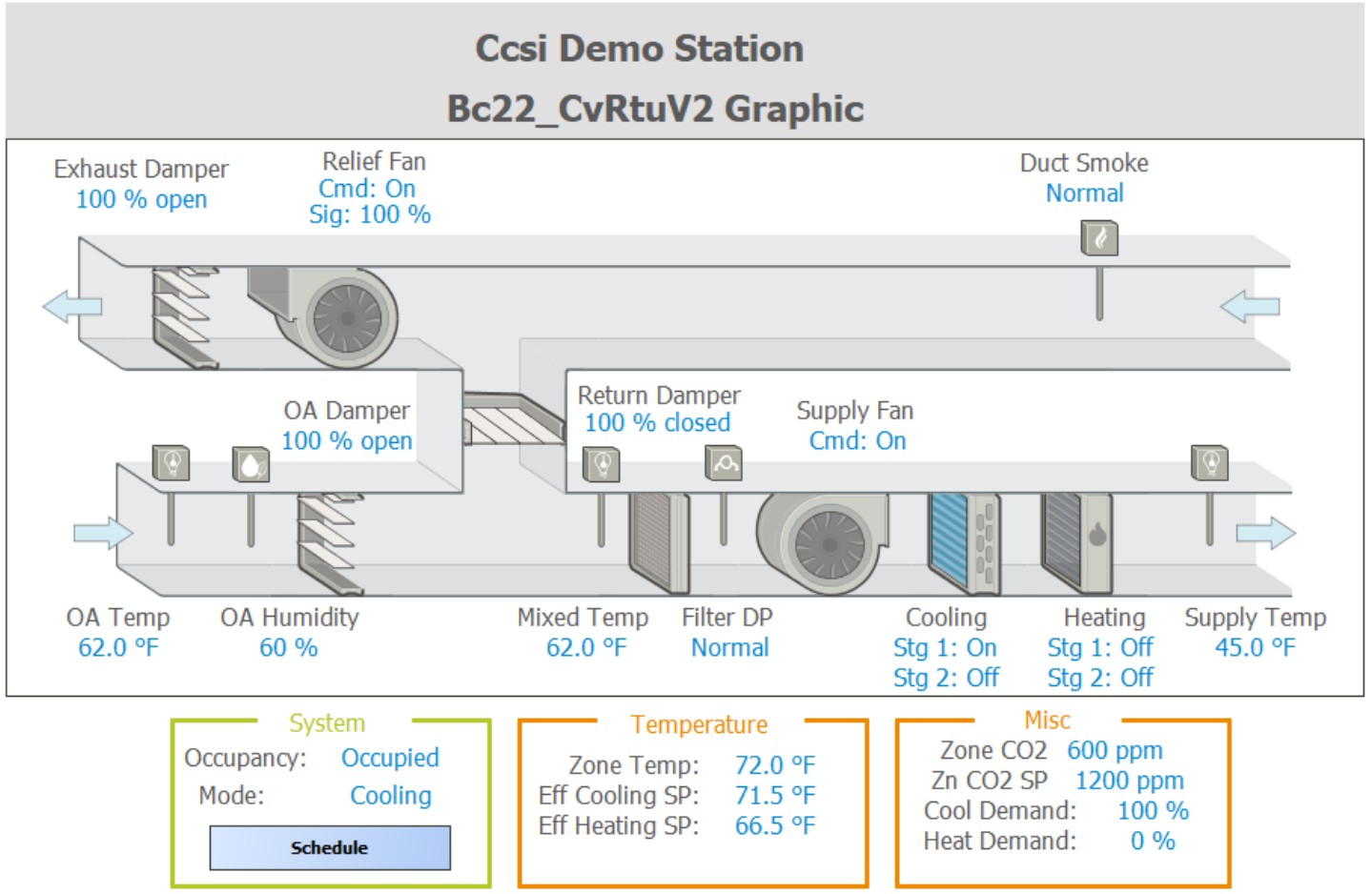
Web Components Communicate to Web Browsers



Up to 48 web components exchange data between a web browser and the Sedona wire sheet.

System Graphic – Using niagara4

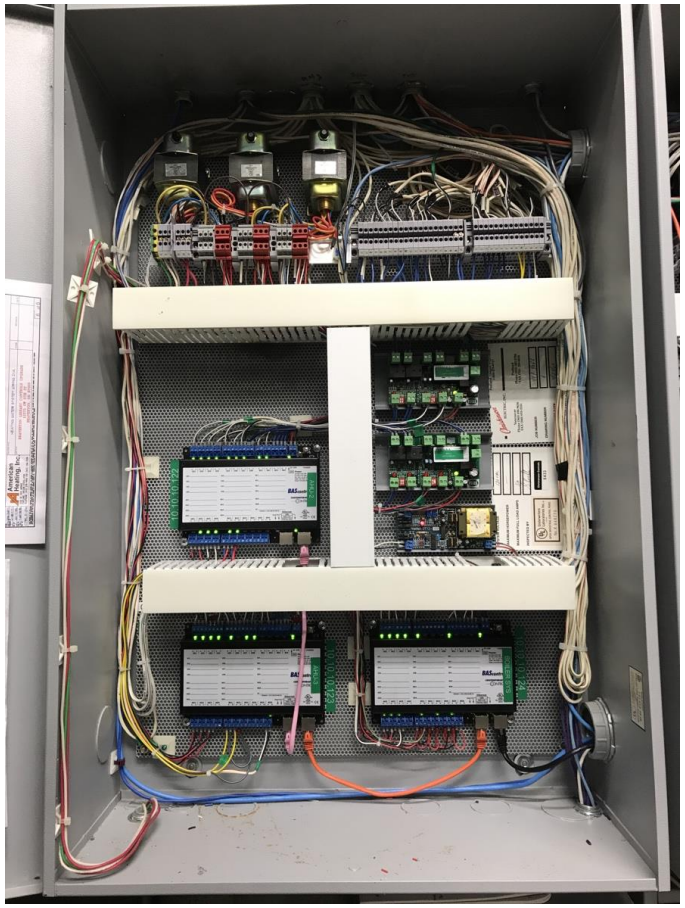
- An N4 demo station is available to demonstrate how BAScontrol points are accessed and displayed
- Points discovery is via BACnet with no reliance on an N4 Sedona driver



CvRTU Applied at CC's Rooftop Laboratory

Two RTUs are single-stage heating/cooling units while four RTUs are two-stage heating/cooling units with economizers. All six units are scheduled using a variety of head-ends for testing purposes.

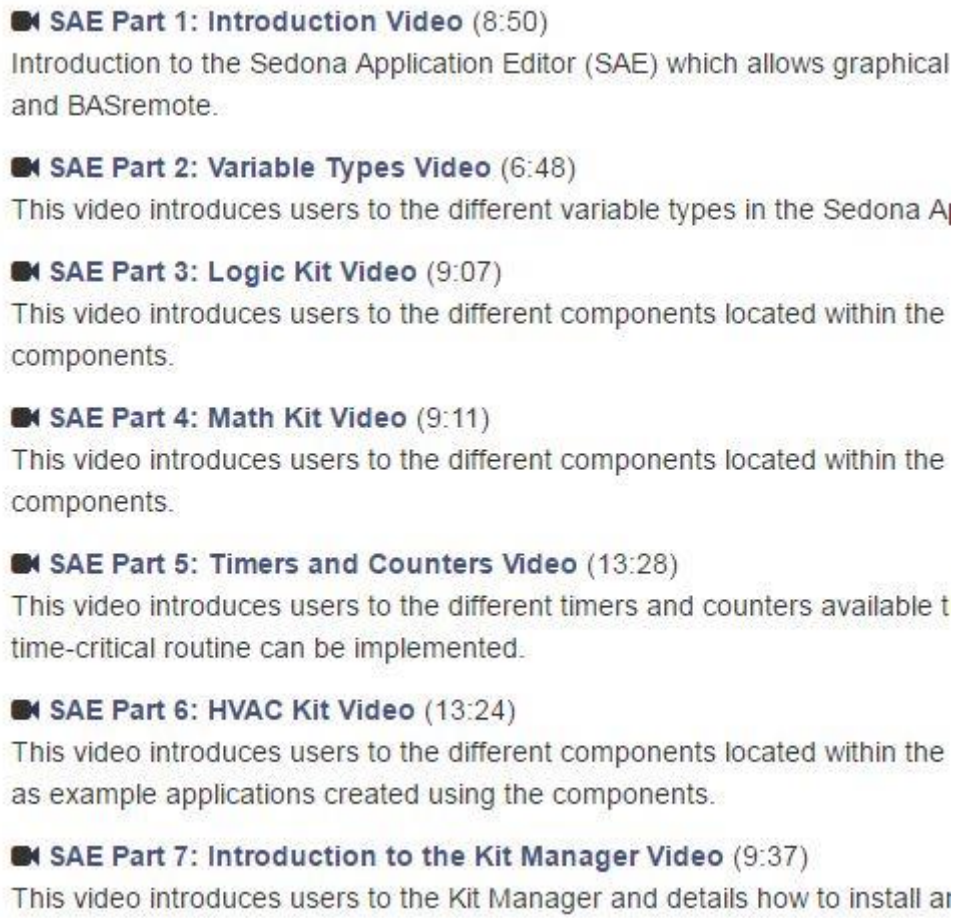
BAScontrollers Used in a Retrofit Project



- At the Beaverton library, BAScontrol22s replaced older controllers while connecting to a Niagara head-end over BACnet
- The BAScontrol22 supports daisy-chain Ethernet connections to a BACnet/IP client and to a common web browser for configuration
- The BAScontrol series can also withstand outdoor temperatures

Teach Yourself Sedona

- The best way to learn Sedona is to try it by downloading SAE to your Windows PC and connecting to the BASemulator and creating a program
- Contemporary Controls has a multi-part video series on its website devoted to SAE
- There is ample documentation on our web site that explains the functioning of the components
- Just try it – *Everything is FREE!*



Thank You

https://www.ccontrols.com