

BASPi **Controller with Haystack powered by Raspberry Pi**

Zach Netsov **Contemporary Controls**



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SONTEMPORARY CONTROLS

BASpi GUI/GR Controller

Data. Smart Devices. Smart Buildings. Smart Business.

Raspberry Pi

Raspberry Pi 3 base board system characteristics

- 4x 1.2GHz CPU
- 1GB LPDDR2 RAM
- Linux OS
- Ethernet connected
- Wi-Fi connected
- 4x USB ports
- 40x pin GPIO interface
- FCC and CE compliance









BASPi

24VAC/VD

Haystack Connect

Smart Devices, Smart Buildings, Smart Business

Binary/Analog Outputs

24VAC/VDC

BASPi

Universal Inputs

BASpi is a controller powered by Raspberry Pi 3

• 12 points of **resident I/O** with options for:

6 Universal Inputs, 6 Relay Outputs or 6 Universal Inputs, 4 Relay Outputs, 2 Analog Outputs

24VAC/VDC power in a 4U DIN rail enclosure and 508 pitch screw terminals

Project Haystack + BACnet + Sedona + Azure +

BASPi Expansion

BASpi Expansion I/O units

• 12-point expansion I/O units with options for:

6 Universal Inputs, 6 Relay Outputs or 6 Universal Inputs, 4 Relay Outputs, 2 Analog Outputs

 Up to 2 BASpi Expansion units connected by 6 inch USB cables for up to 24 additional points (up to 36 points total)







BASpi Sedona programmable controller

- Resident Sedona Virtual Machine
- Free software tools for programming, emulation, and archiving provided in the *BAScontrol Toolset*
 - Sedona Application Editor program BASpi wire sheet logic
 - *BASemulator* emulates BASpi on your PC for programming and configuration
 - BASbackup project archive and restore utility backup/restore all configuration + Sedona wire sheet logic + Haystack tags to one project.zip file





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Now adding Haystack to BASpi

- Web page configurable over IP connection using **Ethernet** or **Wi-Fi**
- Haystack server over Ethernet or Wi-Fi
- Haystack histories
- Haystack tagging on all resident and expansion I/O points (up to 36)

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	L	Inivers	al Input	5		E	Binary	Outputs		
	Universal Input 1			Universal Input 4		Binary Output 1			Binary Output	4
UI1	0.000		UI4	0.000	BO1	0	10	BO4	0	
	Universal Input 2			Feedback Signal		Binary Output 2			Binary Output	5
UI2	0.000	123	UI5	0.013	BO2	1		BO5	0	
	Universal Input 3			Zone Temperature		Binary Output 3			Binary Output	6
UI3	0.000	12	UIG	80.840°F	803	0		806	0	10
Config		System Sta	atus	BA	Sp	İ				Restart Controlle
_			_		Haystack C	omguration			- 1	
_			_	Site Name					_ [
				-	Site	Name				
				Equipment Name	Equipme	ot Nama				
			NO	Equipment Display Te	ext	int Name			_	
-		_		Equipment proping in	Equipment	Display Text			- I	111
				Tags					_	
				ahu						
					Po	ints			A	
				UI1 Display Text: Kind: Units: Type:	Universal Input 1 Number DEGREES_FAHR sensor	ENHEIT		1	ĺ	
			1.1	Tags discharge_air.tem	p					

Haystack tagging configuration

 Web page configurable Haystack tagging

Hays	tack Configuration
Fauinment	Points
	Add Point Tag
Tag	Value
fcu	▼
elecPanelOf	
elecReheat enable energy	Add New Tag
entering	
enum	nt Taos
equipRef	i i i i go
evaporator	
export	•
faceBypass	
fan fanPowered	
fcu	
filter	
flow	
freezeStat	
freq	•

2019 Haystack Connect

Canned applications pre-tagged with Haystack

- Canned (ready) applications with pre-tagged Haystack points, Sedona logic, and configuration for a variety of applications
- Canned applications are loaded using BASbackup project utility
- Simply load and deploy

Haystack Co	onfiguration
Equipment	Points
VT1 Display Text: Virtual Point 1 Kind: Number Units: FAHRENHEIT Type: sp	
Point Tags	0
fcu	
fan	Ū 🖉 .



BASpi Haystack point tags in Niagara Workbench

						Haystan	ck Tags 23	
lame Type		Id	Enabled	Facets	Tuning Policy	Tag	Value 🕫	rsio
BASpi-FCU1-a N Hay	stack Number Point	@BASpi-FCU1-a	true	units=V	defaultPolicy	id	BASpi-FCU1-a	:
Name	BASpi-FCU1-a					curVal	1.0	
Туре	Cannotedit					dis	BASpi-FCU1-a	
Id	@BASpi-FCU1-a					equipRef	BASpi-FCU1	
Enabled	🔵 true 🔽					fan	~	
Facets	units=V ≫ 🤇	D -				fcu	1	
Tuning Policy Name	Default Polic	у				his	~	
Device Facets	» •					kind	Number	
Conversion	Default	~	Ĩ			point	1	
Fault Cause					⊷B A⊶	siteRef	BASpi	
Imported Tags	{tz:"Chicago"	point dis:"B	ASpi-FCU	1-a" far	his cur	tz	Chicago	
						unit	V	
				- 1			ОК	d l



BASpi Haystack history in Niagara Workbench







BACnet/IP server

- BACnet/IP server over Ethernet or Wi-Fi
- 24 BACnet R/W Virtual Points served to BACnet clients and/or supervisory controllers
- Free **BACnet Discovery Tool** for commissioning

	BACnet Discovery Tool v2.13.01 From Contemporary Contro	S
	Device 0009206: BASpi-EnclosedA02 of 192.168.92.4:bac0	Port Number (Decimal) [47808 Your JP Address
	Device 0009206: BASpi-EnclovedA02 at 192168.92.6tbac0	192.168.92.244 💌
		BBMD Address
	Device-9206 BASprExclosedA02 Analog Popular University Popula Analog Topular University Popula Objects Objects	Serbancy
	Analog Input-5 Universal Input 5 37 Analog Input-6 Space Temp 6 of Analog Output-7 Analog Output 1 37	Device Instance Range
Object Properties		Beginning End
Object None Spoon" errp 5 researt Value 07.72692 S. Nam Fault Oversidd	To Mu, uf, Seniors Rations	Search Devices Discovered
Winte Value		I* I⊽ Show Object Names
0::VT007	1 .	Save Discovered Devices
true	1. (MARK)	
FloatInput		Scan
false	Tanaka Value-214 Virtual Point 14	🔽 Scan All
57.63 true	Analog Value-216 Virtual Point 15 Analog Value-216 Virtual Point 15	Scan Time 100
InputTo		Store to File



VT007 CControls BASC

Initialized ChnType Reset FloatV BinaryV WireSheet

Weather

Init Ch Re Flo Bin

Weather services

- Weather API uses an account (API) key to a weather service, a location method and an Internet connection
- Web page configurable
- Weather data is tied to Sedona wire sheet by use of Virtual Points components – temperature humidity, atmospheric pressure, wind speed, direction

тс	07	•
Co	ntrols BASCBCC	O::VT007
ial	ized	true
nT	ype	Floatinput
se	t	false
ať	V	57.63
ar	уV	true
re	Sheet	InputTo
	VT008	•
	CControls BASCE	BCC_IO::VT008
	Initialized	true
	ChnType	FloatInput
	Reset	false
	FloatV	1018.0
	BinaryV	true
	WireSheet	InputTo
	VT009	•
	CControls B/	ASCBCC IO::VT009
	Initialized	true
	ChnType	Floatinpu
	Reset	false
	FloatV	62.0
j.	BinaryV	true
	WireSheet	InputTo
	L	

Poll R	ate	Units	A	PIKey				
60 DegF •				2738d7ee	ec3ae5a1	0e767	84fcc	Test
				Location	n Methor	d		
	City N	ame			(City ID		
0	Downers Grove			JS	0		48901	19
	Latitus	le	Longi	ngitude		US Zip Code 60515		
۰		41.79		-88.01	0			
VRTO	7 Na	wTempe	arature Pr	oint 7	VRT08	N	ame wPressu	ure Point 8
Poll	B	ACnet Type		VALUE 2	BACnet Type			
100		ANAL	OG_VAL			ANALOG_VALUE		
	Pr	operty				P	roperty	
	T	emperature		1		P	Pressure	
VPT	N	ame			VPTIC	N	ame	
VICIO		wHumi	idity Poir	it 9	VICTO	Special_V		rtual Point 10
Poll	BA	ACnet Type			Poll	B	BACnet Type	
		ANAL	OG_VAL	JE	8		ANALO	G_VALUE
	Pr	operty				Pr	roperty	
		Humidity				1.1	atituda	



Email

Configurable Email alarms/notifications

- Multiple Email alarms
- Sedona wire sheet Email alarm component triggered by logic
- Point values can be included in the email body using {{point_name}} double curly braces around the point name/instance

Email CControls_Email::Er	mail #
MessageID	Boile
Sv1	201.32
Sv2	72.53
Sv3	10.2
Trigger	false
Reset	false
Status	Success

2019

Haystack Connect

Smart Devices, Smart Buildings, Smart Business

Account	Messages
Server smtp.gmail.com	
From	Message ID#
znetsov	Temperature Alarm
Port	То
587	znetsov@ccontrols.com
User Name	CC
znetsov@gmail.com	badmin@ccontrols.com
Password	Subject
*****	Temperature Alarm
	Body
Update	Boiler is currently {{SV1}} and this is over our limit. The room temperature is {{SV2}} and the set point is {{VT1}}.
	Close

Time

• NTP time

May 13-15, 2019

- Daylight savings
- Sunrise/Sunset calculation for Sedona

	System Time	_	ти	P Config	urat	ion	
Year	2019			NTP Er	abled		
Month	May	-	NTP Server		pool.n	tp.org	
Day	9	~	Time Zone	Central:UT	C-6		•
Hour	10 AM	-	Refresh (Days)			1	
Minute	40	-	7	NTP Suc	ces	s	
	Manual Time Set		DS	ST Config	urat	ion	
	Refresh ON			🗵 DST Er	abled		
s	Sunrise/Sunset			DSTON	I I	DST OFF	
Latitude	41.808919		Month	March	•	November	•
Longitude	-88.011175		Day of Month	2nd SUN	•	1st SUN	•
Sunrise	4:38 AM		Hour	2 AM	•	2 AM	•
Sunset	6:58 PM						
	Close				Sub	mit	



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Schedule

Local schedule

- Local schedule with web page for configuration
- 7 day schedule with exceptions events/holidays
- Sedona Schedule component triggers wire sheet logic

Current S	Schedule	Default S	Schedu	le	Events
		Occupied		Unoccupied	Event
Sunday	2019-04-14	Vacant	1	Vacant	
Monday	2019-04-15	8:00		17:00	
Tuesday	2019-04-16	8:00		17:00	
Wednesday	2019-04-17	8:00		17:00	
Thursday	2019-04-18	8:00		17:00	
Friday	2019-04-19	8:00		17:00	
Saturday	2019-04-20	8:00		12:00	
			Vacan	t	
le::Sched		Year	4	Week	•
TEOT		2019 .		16:Apr •	



SchedName IsOccupied MinToOccup HeadActive HeadOccup Status



Azure cloud connectivity ready

- Microsoft Azure IoT Central cloud ready
- Simple web page configuration for BASpi device provisioning
- Create Azure account, create device, copy/paste Scope ID, Device ID, and Primary Key. You are done provisioning!







Microsoft Azure IoT Central subset cloud features

- Simple to use
- First 5 devices w/ moderate bandwidth are free
- Measurements/trends
- Bi-directional communication push data to cloud and receive commands from cloud
- Graphical dashboards





REST API Expandable

REST API allows advanced users or developers to utilize the BASpi's capabilities in custom applications

- **REST interface** presents a path-oriented method of reading and writing values **from/to the BASpi**
- Read and write **BASpi values** using the **HTML POST** method with an **XML data payload**
- Run your own Linux applications on the BASpi
- Examples in Python and Node.js



Overview

Project SHaystack + BACnet + Sedona + Azure + Powered By Raspberry Pi

- Open
- **Powerful**
- **Freely Programmable**
- **Well Connected**
- Customizable



BASPi

Thank You!

CONTEMPORARY ONTROLS®



6U6R



6U6R





BASpi-IO HAT boards

6U4R2A

BASpi-IO Enclosed controllers

BASpi-BCC BACnet client controller

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BASPi

Project Naystack + Recipet + Sedona + Azure +