

BEST PRACTICES IN SMART BUILDING DATA INTEGRITY

Kurt A. Twiford, President/CEO

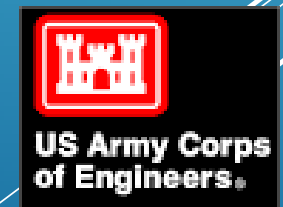
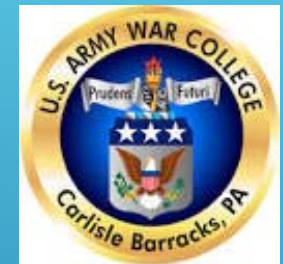
Rusty Hennessey, Manager of R&D

Jared Hardy, Senior Technician



- ▶ Founded in 2005 through the purchase of a JCI ABCS that started in 1994
- ▶ Our purpose is to transform environments to optimize comfort, safety and efficiency using open and non-proprietary smart building technologies
- ▶ Lead with Distech Controls using the Tridium Niagara front-end....also work with Johnson Controls, Honeywell, Delta Controls.
- ▶ 24 employees including 8 Niagara-certified technicians
- ▶ Work with clients throughout eastern Pennsylvania-K to 12, higher education, healthcare, Federal and State agencies
- ▶ Broad experience working with data integrity in secure environments

WHO IS CONEXUS?



WHAT IS “DATA INTEGRITY”?

- ▶ **Data integrity** is the maintenance of, and the assurance of the accuracy and consistency of, data over its entire life-cycle, and is a critical aspect to the design, implementation and usage of any system which stores, processes, or retrieves data.

-Wikipedia

- ▶ The accuracy and consistency of stored data, indicated by an absence of any alteration in data between two updates of a data record. Data integrity is imposed within a database at its design stage through the use of standard rules and procedures, and is maintained through the use of error checking and validation routines.

Read more:

<http://www.businessdictionary.com/definition/data-integrity.html>

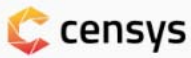
WHAT IS “DATA INTEGRITY”

It's all about security and accuracy!

- **Data integrity** is the accuracy, completeness, and the assurance of consistency of, data over its lifecycle. It is a critical aspect to the operation of any system which

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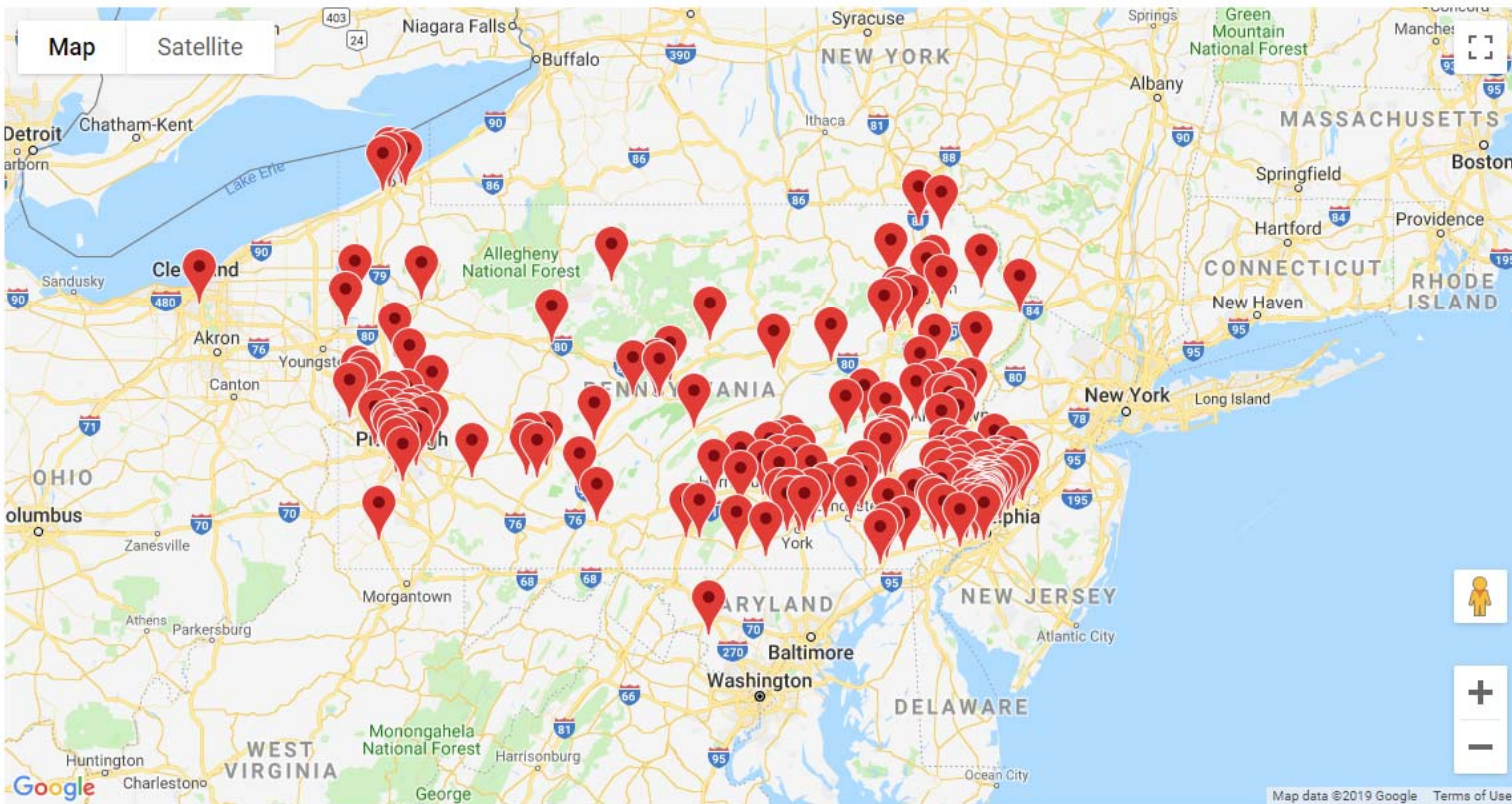
Q IPv4 Hosts

building control pennsylvania

Register
Sign In

Results Map Metadata Report Docs

WARNING: A total 15920112 hosts matched your search query. Only the first 500 will appear on this map. Please try a more specific query.



Raw Results





There are 50,000 buildings currently connected to the internet - including research facilities, churches and hospitals, and 2,000 of those are online with no password protection-Billy Rios, WhiteScope LLC, 2013



In 2016, Google paid out \$3MM in bounties to white hat/ethical hackers who identified cybersecurity bugs in their systems-some of which dealt with building systems



In their 2017 smart buildings report, IFSEC Global reported the following:

- IBM's ethical hacking team, X-Force, hacked into commercial buildings
- A 2014 hack by Jesus Molina of a 200 room hotel in Shenzhen China





COMMUNICATION
SPEED



PROCESSING SPEED



ROBUSTNESS OF
CONTROLLERS AND
COMPONENTS



COMMISSIONING
REQUIREMENTS

HOW DO SMART BUILDING SYSTEMS DIFFER
FROM SMART INFRASTRUCTURE SYSTEMS?



- ▶ The “human firewall” See: <https://www.youtube.com/watch?v=4gR562GW7TI>
- ▶ Login credentials-don’t use default credentials
- ▶ Make sure all software is up to date
- ▶ Start with the built-in securities (TLS, SSL) and build up from there
- ▶ Use Firewalls and VPN’s and tie access to systems/component by authenticated login, not IP address.
- ▶ IoT-what’s the security of the devices on your network?
- ▶ Separate IT and OT networks
- ▶ Balance cost and benefit
- ▶ Open BAS protocols are generally not secure

DATA SECURITY IN SMART BUILDINGS

DATA ACCURACY IN SMART BUILDINGS

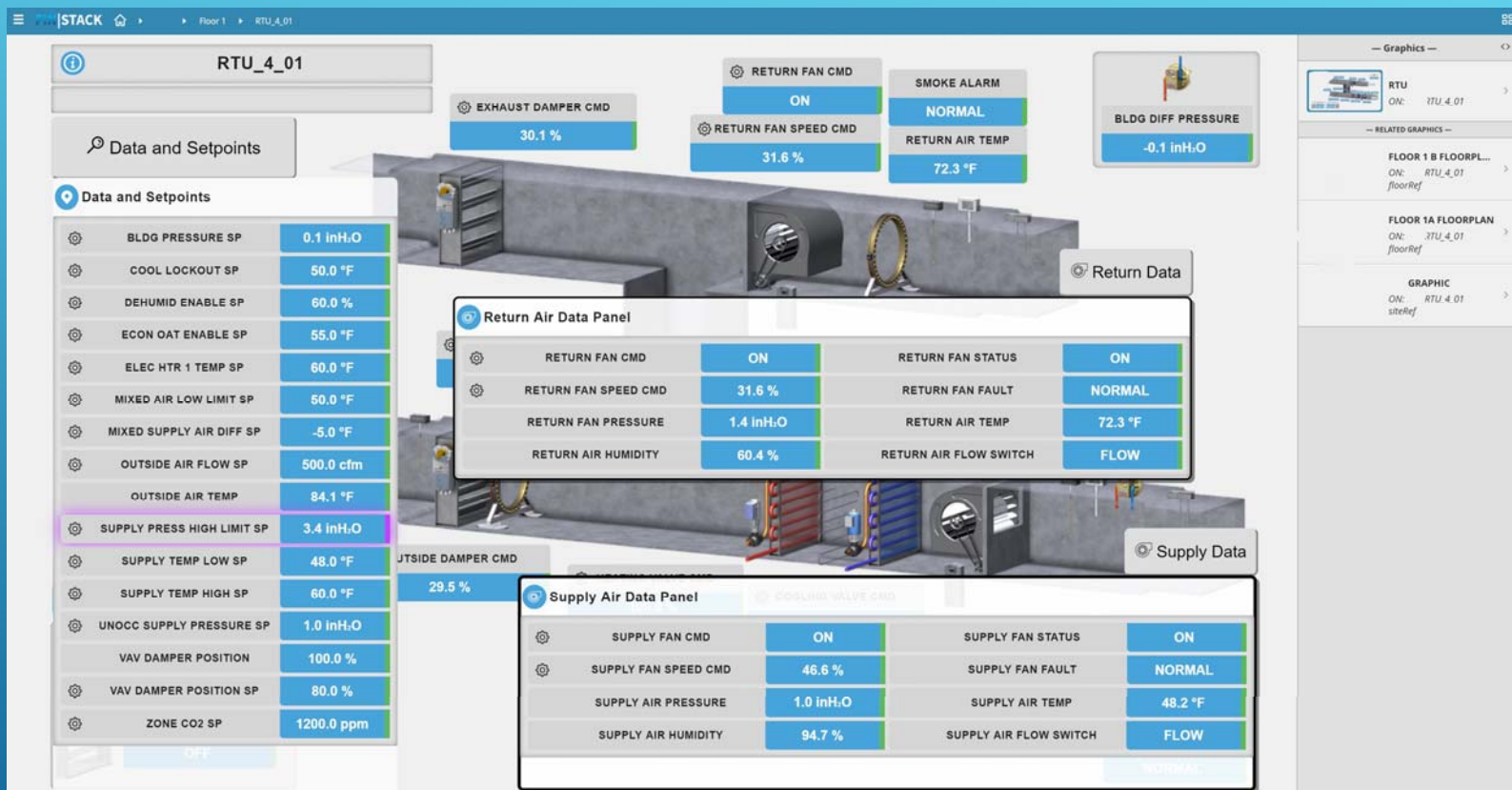
- ▶ Specific BAS commissioning requirements
- ▶ Verifying data integrity across multiple building systems
- ▶ Dealing with third-party/factory controls
- ▶ Tagging

- # BAS COMMISSIONING

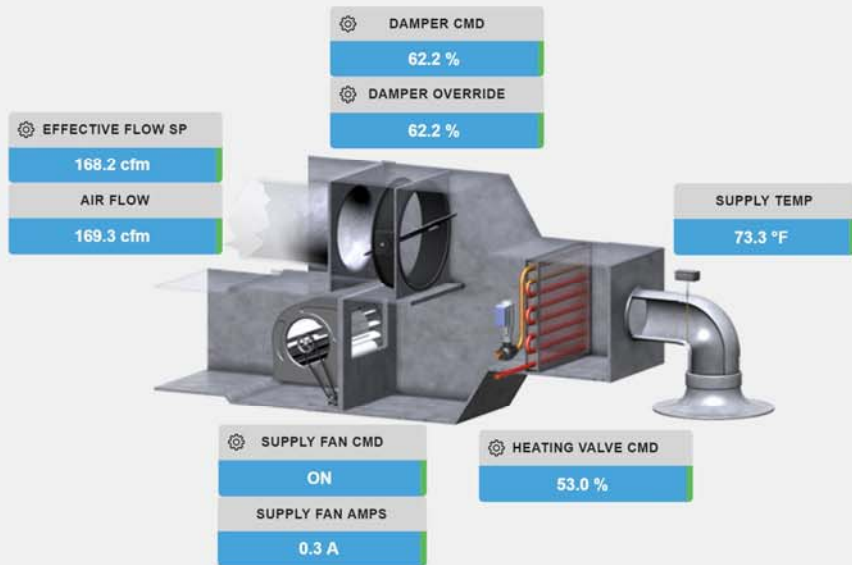
8/19/2019

- ▶ How much data does the end-user need to see? Too much, not enough or just right.
- ▶ Commission at all levels (parallel Defense in Depth)
- ▶ Coordinate early with all related contractors (or use one system integration firm)
- ▶ Periodic review of data and system integrity
 - ▶ Preventive maintenance
 - ▶ Review trend logs
 - ▶ Review for over-rides and ask “why”?

VERIFYING DATA ACCURACY ACROSS MULTIPLE BUILDING SYSTEMS



FPB_1_14

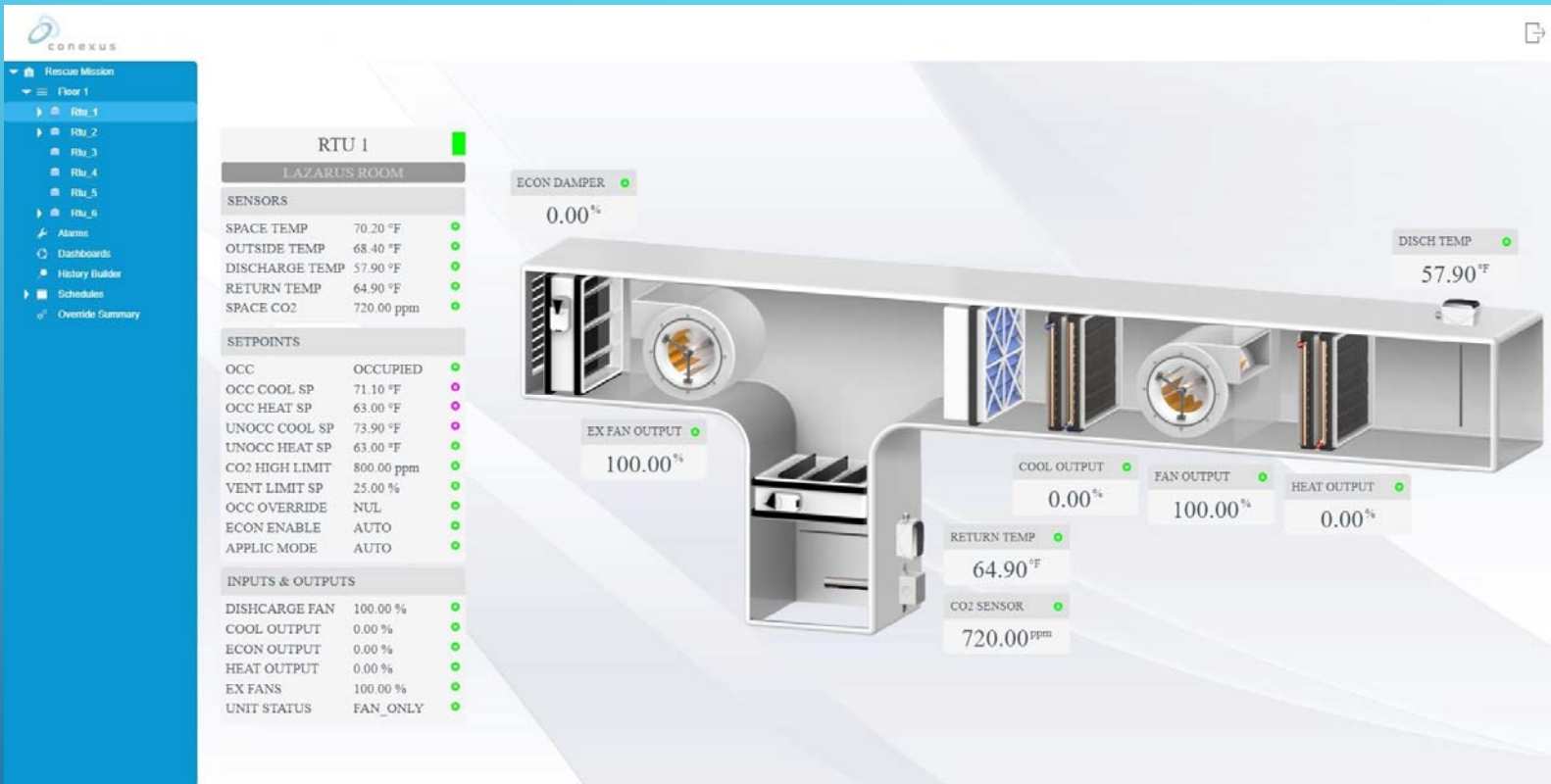


Data and Setpoints

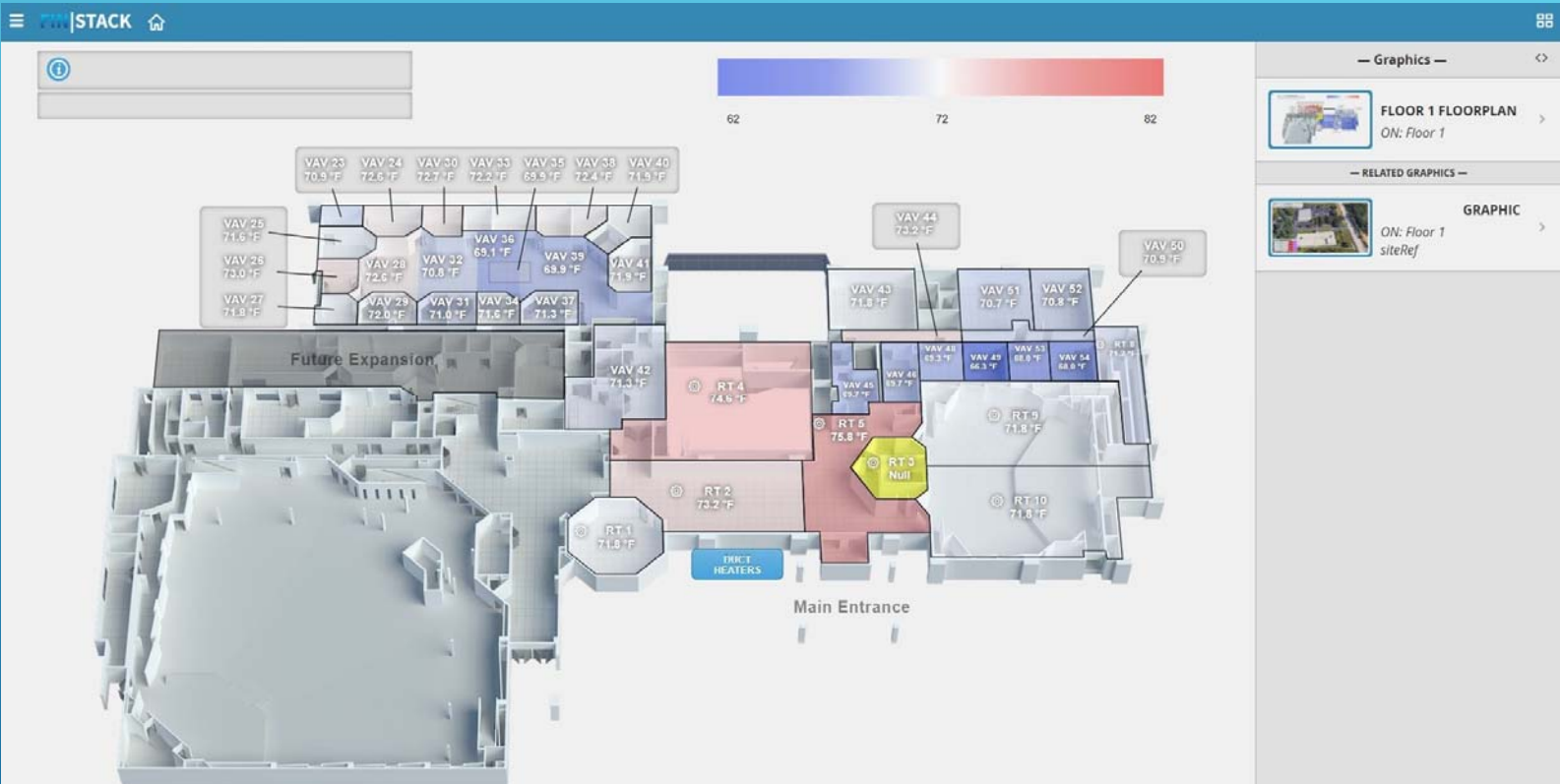
ZONE TEMP
71.8 °F

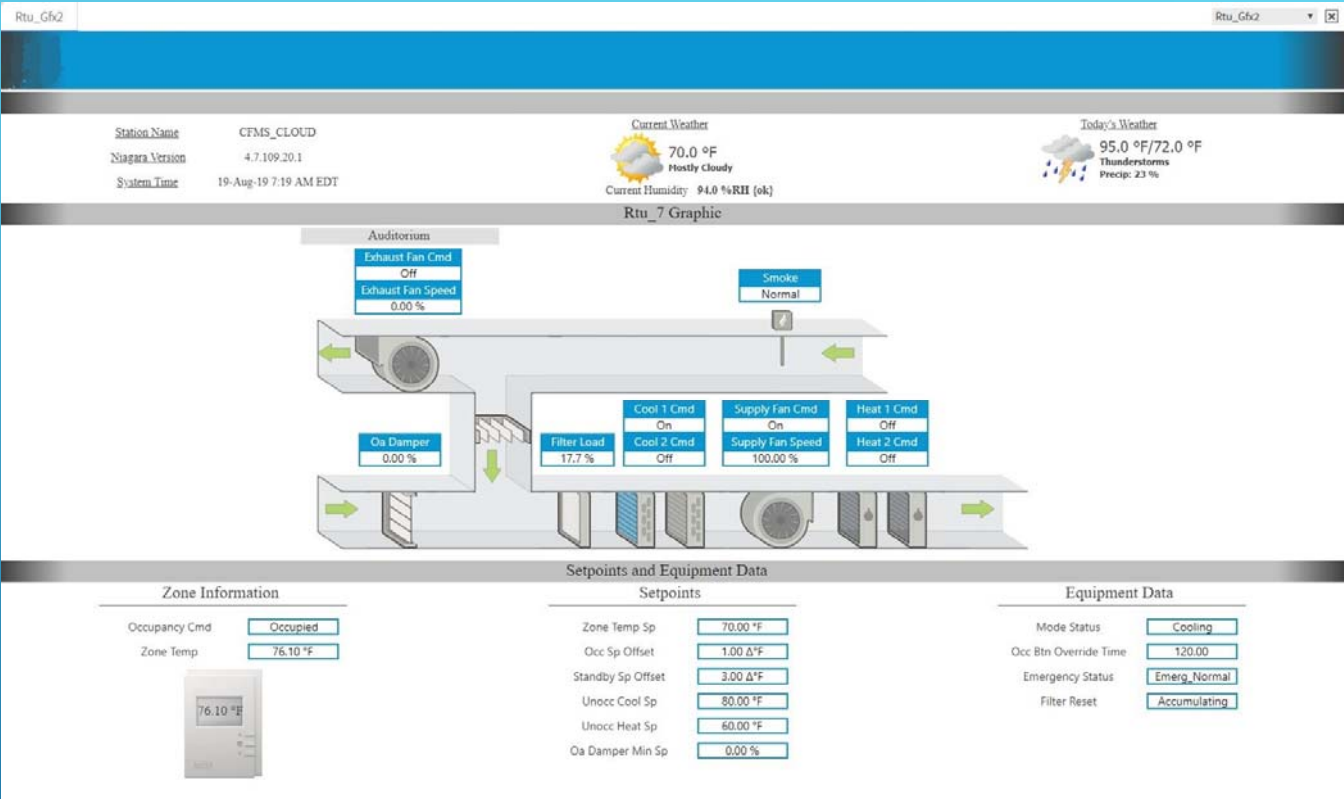
Points

AIR FLOW	169.29 cfm
DAMPER CMD	62.23 %
DAMPER OVERRIDE	62.23 %
EFFECTIVE COOL SP	75.00 °F
EFFECTIVE FLOW SP	168.25 cfm
EFFECTIVE HEAT SP	72.00 °F
EFFECTIVE OCC	Occupied
ENABLE SP ADJUST	Enabled
ENABLE TEMP OCC	Enabled
HEATING VALVE CMD	53.04 %
MAX COOL FLOW SP	250.00 cfm









Rtu_Gfx2

Rtu_Gfx2

Station Name

CFMS_CLOUD

Niagara Version

4.7.109.20.1

System Time

19-Aug-19 7:19 AM EDT

Current Weather

70.0 °F
Mostly Cloudy

Current Humidity

94.0 %RH [ok]

Today's Weather

95.0 °F/72.0 °F
Thunderstorms

Precip:

23 %

Rtu_7 Graphic

Auditorium

Exhaust Fan Cmd

Off

Exhaust Fan Speed

0.00 %

Smoke

Alarm

Not Active

Flr_Gfx1

Oa Damper

0.00 %

Filter Load

17.7 %

Zone Information

Occupancy Cmd

Occupied

Zone Temp

76.10 °F

76.10 °F

Setpoints and Overrides

Zone Temp Setpoint

Occ Sp Offset

Standby Sp Offset

Unocc Cool Setpoint

Unocc Heat Setpoint

Oa Damper Min

Flr_Gfx1

Flr_Gfx1

Station Name

CFMS_CLOUD

Niagara Version

4.7.109.20.1

System Time

19-Aug-19 7:45 AM EDT

Current Weather

70.0 °F
Mostly Cloudy

Current Humidity

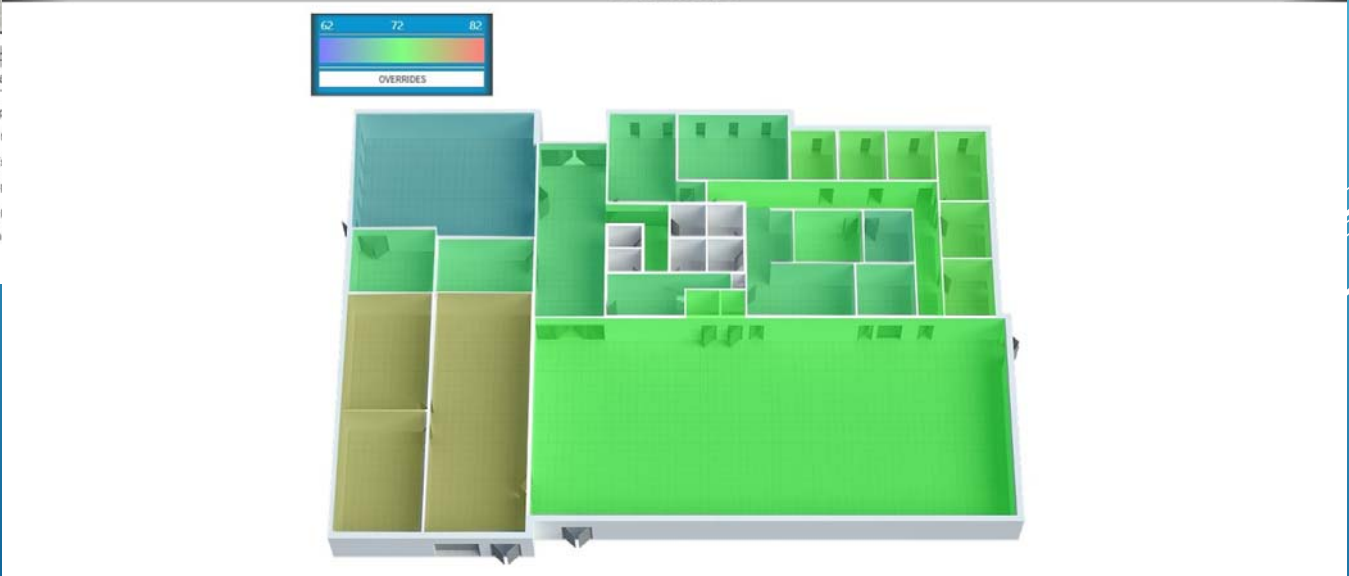
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VERIFYING DATA ACCURACY ACROSS MULTIPLE BUILDING SYSTEMS

- ▶ Specify the communication protocol and ensure that the manufacturer provides the communication card
- ▶ Verify that the manufacturer will allow communication (read only or read/write) with the points you want
- ▶ Require the manufacturer to make the points list available to the BAS with their submittal
- ▶ Verify the controller can execute the specified sequence before final payment for equipment

THIRD-PARTY/FACTORY CONTROLS

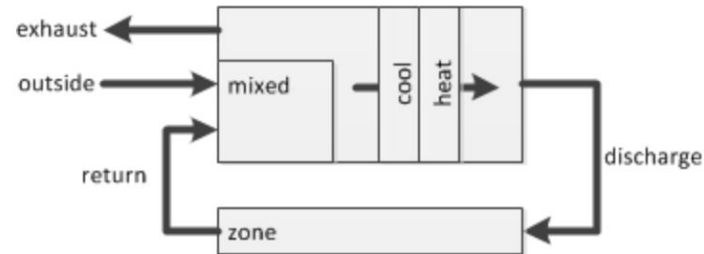
TAGGING

- ▶ Project Haystack (<https://project-haystack.org>)
- ▶ Data is everywhere – nearly every device connected
- ▶ Tagging creates a standard for devices to describe what their data really means
- ▶ Open source tagging initiatives such as project haystack allows data to use a common markup language
- ▶ Zone Temp vs Space Temp vs Room Temp (zone,air,temp,sensor)
- ▶ Central Plant: Supply, Return, Entering, Leaving
- ▶ Tagging enables additional functions such a database searching, auto generated navigation, analytics and much more

TAGGING

- zone: conditioned space associated with the unit

The follow diagram shows the logical flow of air through an AHU:



Points

The following lists points commonly used with an AHU:

Discharge

- discharge air temp sensor
- discharge air humidity sensor
- discharge air pressure sensor
- discharge air flow sensor
- discharge air fan cmd
- discharge air fan sensor

Return

- return air temp sensor
- return air humidity sensor



Security:

- Starts with the “human firewall”
- Manage BAS and OT like you do your IT
- Keep your system up to date
- BACnet, LON, Modbus are not secure protocols



Accuracy:

- Commission your system
- Coordinate early and consider a master system integrator
- Get in control of third-party/factory controls
- Leverage tagging standards

DATA INTEGRITY-ACCURACY AND SECURITY

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CONTACT