

NS2024

APRIL 15 - 17 | ANAHEIM, CA

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***Optimizing Higher-Ed
Facility Performance
via Niagara in the
Cloud***

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Introductions



**David Payne, VP Operations & Energy,
SSC Services for Education**



**Dave Love, Chief Cross Sale Officer,
Albireo Energy**



**Aaron Mason
Director of Operations
Hawkeye Energy Solutions**

Set the Stage

- Why is this type of solution needed by SSC or your clients?
- What are challenges that SSC or Hi Ed clients trying to solve with their current facility management operating model?

Vision

- **Multi-faceted, single seat solution that is scalable to monitor and support multiple clients across US with (Green, Yellow, Red) pins to get a quick overview of client building status**
- **Manage educational client's facility operating data: energy consumption, BAS points trend/alarms, MEP equipment performance and work order status**
- **Manage operational and contractual SLAs to benchmark KPI's at the client site and across all accounts**
- **Provides for ongoing facility performance improvements through FDD & Analytics for predictive maintenance, energy efficiency, sustainability, operational excellence, cost reduction and student experience.**
- **Future applications include Janitorial, grounds, compliance, lighting control, water management, space utilization, filter management optimization.....**

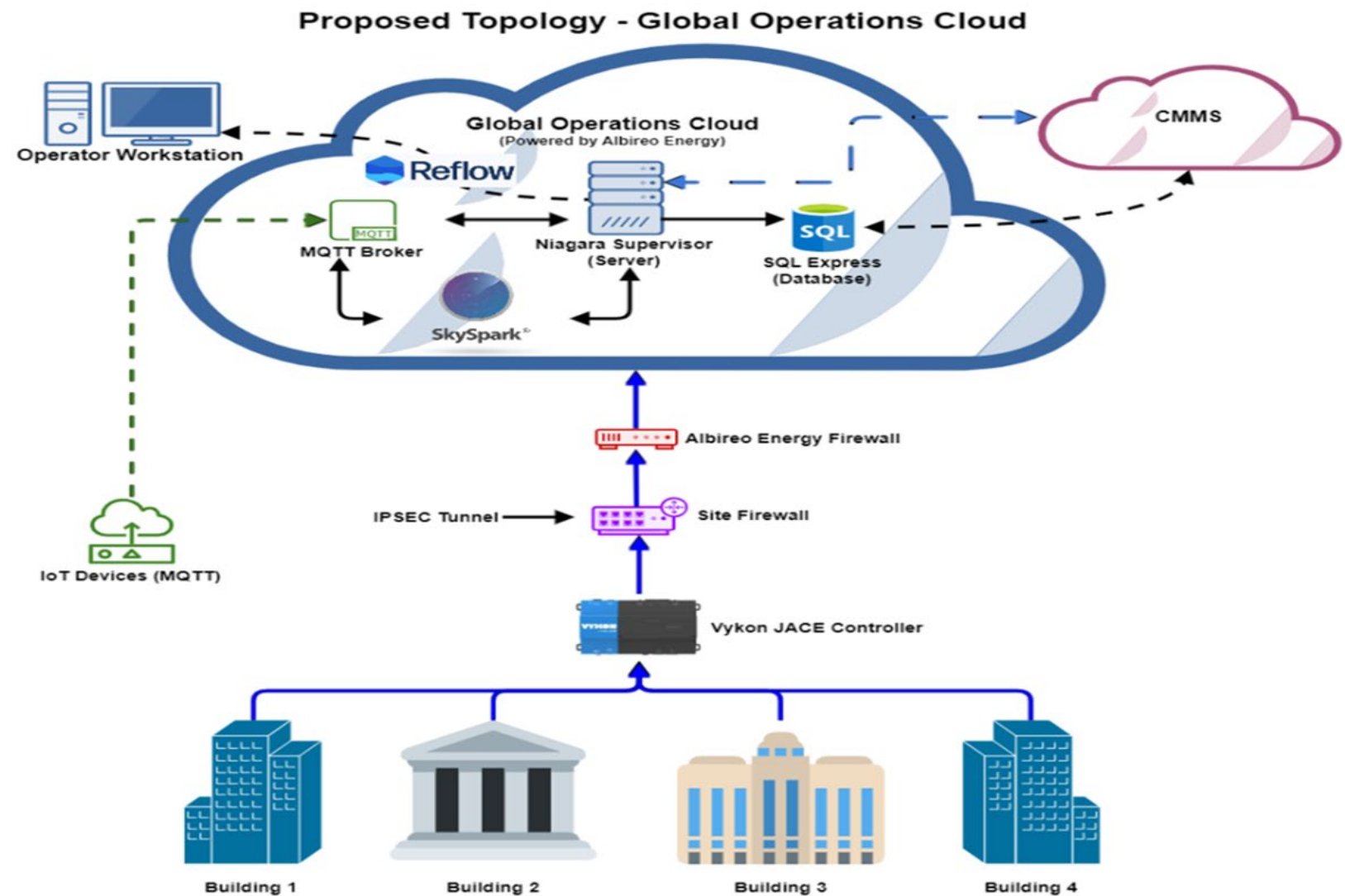
Outcomes

- **What did you expect to achieve by developing the SSC Global Operations Cloud with Niagara?**
- **How did you develop the outcomes?**
- **What were your expected outcomes vs. actual outcomes achieved?**
- **Were there any Surprise Outcomes?**

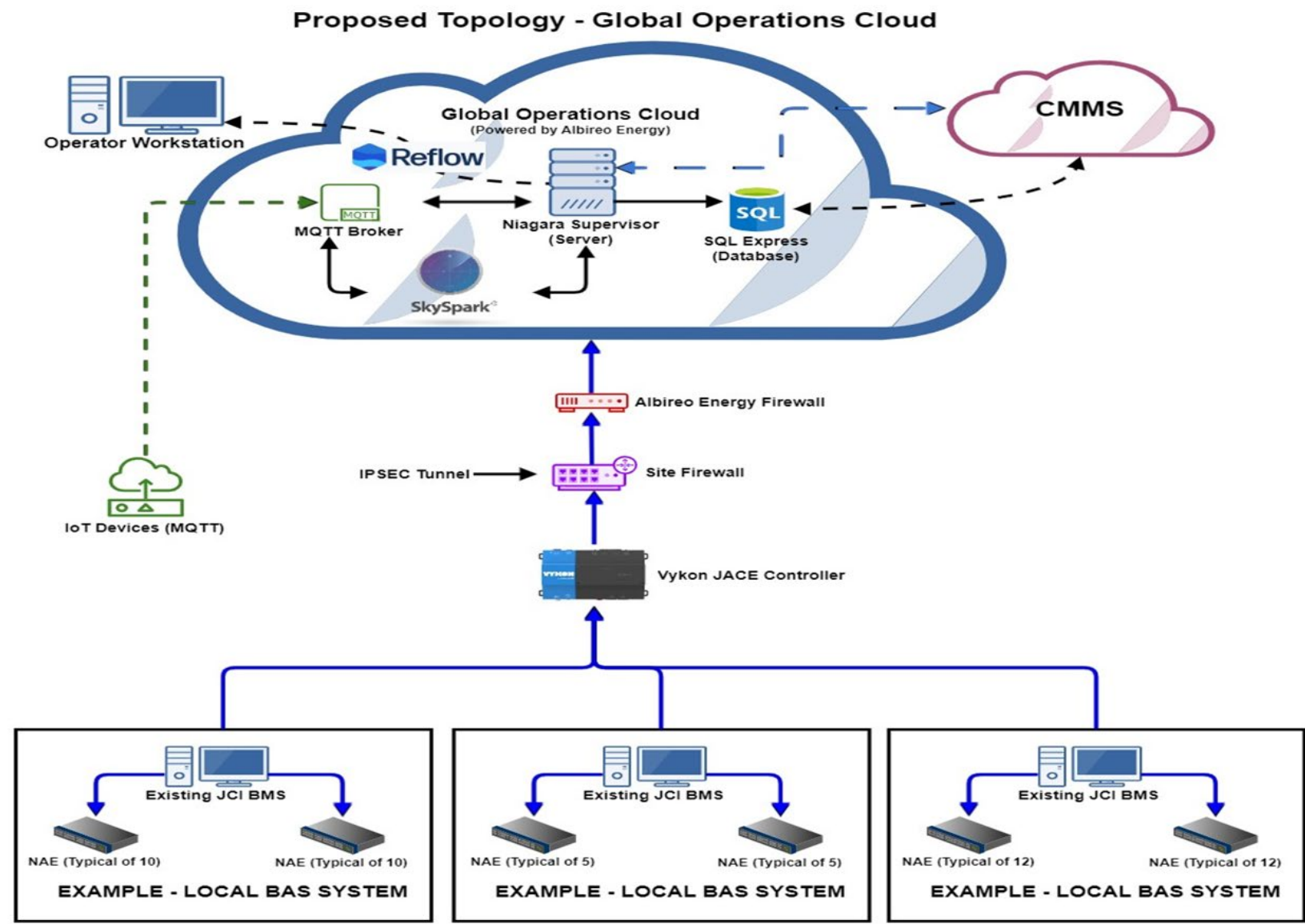
User Functionality

- **Multiple users with virtual access levels: Corporate/Regional Operations Leaders, SME's, On-site FM Director, plus University Client executive and operational levels.**
- **Integrate real-time facility and energy data into daily facility operations by the on-site facility engineers and display via alarms, graphic dashboard/meters, FDD & analytics, building graphics**
- **Integrate various applications via API's to create a robust operational platform: CMMS (Maintenance Connections), Financials (SAP), Power BI, Sky Spark, SQL, MQTT Broker and external cloud solutions ie. Energy and Utility Management, weather data, various meters, and other OT systems**
- **Plug and play to add new client campus's, new buildings, systems and points.**
- **Cybersecurity within clients network, virtual private networks etc.**

Technology Stack



Technology Stack



niagara cloud SUITE™ Architecture

Niagara Data Service



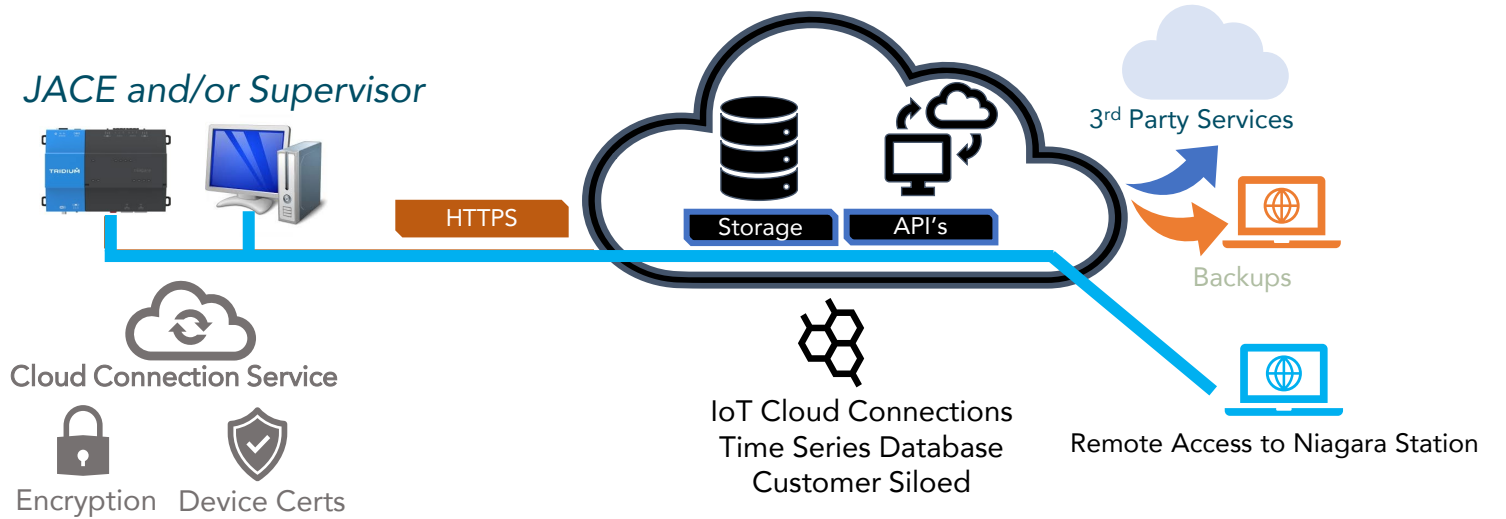
Niagara Recover



Niagara Remote



Browser
Remote Access



Lessons Learned

What worked well?

Areas to improve upon?

O&M Thoughts

- **Experience – MSI**
- **How O&M Programs Work**
- **Messy, Tough – Full of Opportunity**
- **Better, Resilience, Reduce Risk, Improve Environments**

O&M Issues

- **Technology is great**
- **Heart of O&M is the people**
- **Lot of people still needed**
- **Integration of People and Technology is key driver of success**

University & FDD

- **Clockworks Integration**
- **Analyze, Identify, Quantify, & Prioritize**
- **Cloud Based**
- **Great Tool**
- **Still Need People**

Stakeholders

- **C-Suite Layer – Reduce costs and environmental**
- **Management Layer – Streamline creatively**
- **Operations Layer – Robust systems that don't break all the time**

Clockworks & Niagara

- Dashboards, Diagnostics, & Task management features
- Lots of data to digest

The image displays three overlapping screenshots of the Clockworks Analytics web application interface.

Left Screenshot: Diagnostics and Task Management

- Header:** Clockworks Analytics, Settings, Help, Log out, Provider: (I), Org: (I)
- Left Sidebar:** HOME, DASHBOARDS, DIAGNOSTICS, TASKS, ANALYSIS BUILDER, ADMIN.
- Main Content:**
 - Diagnostics:** Bulk Action, Building, Equip. List of buildings and equipment.
 - Manage Tasks:** Task Summary table with Status and Count columns. Bulk Action, Organization, Client Task ID.
 - Bottom:** AHU Coils, Simultaneous coil operation, Supply temp, \$344, 10.0, 10.0, 5.4, and a bar chart.

Middle Screenshot: Diagnostic Report

- Header:** 920 - CSB - Clinical Sciences Building - AHU_12, Clockworks Analytics
- Section:** Diagnostic Report
- Analysis Results:** Fan static pressure sensor zero. Fan status data mismatch. Flat sensor em... pressure setback schedule. Return air flow higher than setpoint. Supply a...
- OPPORTUNITY: NO STATIC PRESSURE SETPOINT SETBACK SCHEDULE**
 - The static pressure setpoint was constant or nearly constant over...
 - Reducing the static pressure by VS between 9 PM and 5 AM could...
- Suggested Actions:**
 - Implement a static pressure reset schedule.
 - Please note: For some buildings, a static pressure reset schedule...
- PROBLEM: SUPPLY AIR STATIC PRESSURE HIGHER THAN SETPOINT**
 - The AHU_12 supply air static pressure is higher than its setpoint.
- Possible Causes:**
 - Fan VFD error.
 - Damper malfunction.
 - Dust or zone obstruction.
 - Fan malfunction or failure.
 - Uncalibrated or malfunctioning pressure sensor.
- PROBLEM: RETURN AIR FLOW HIGHER THAN SETPOINT**
 - The AHU_12 return air flow rate is higher than its setpoint.
- Possible Causes:**
 - Fan VFD error.
 - Fan malfunction or failure.
 - Uncalibrated or malfunctioning flow sensor.
- PROBLEM: FLOW NOT CORRELATED WITH FAN SPEED**
 - The AHU_12 return air flow sensor value was more than 40% above...
- Possible Causes:**
 - Uncalibrated or malfunctioning flow sensor.
 - Fan VFD error.
 - Controls or programming error.

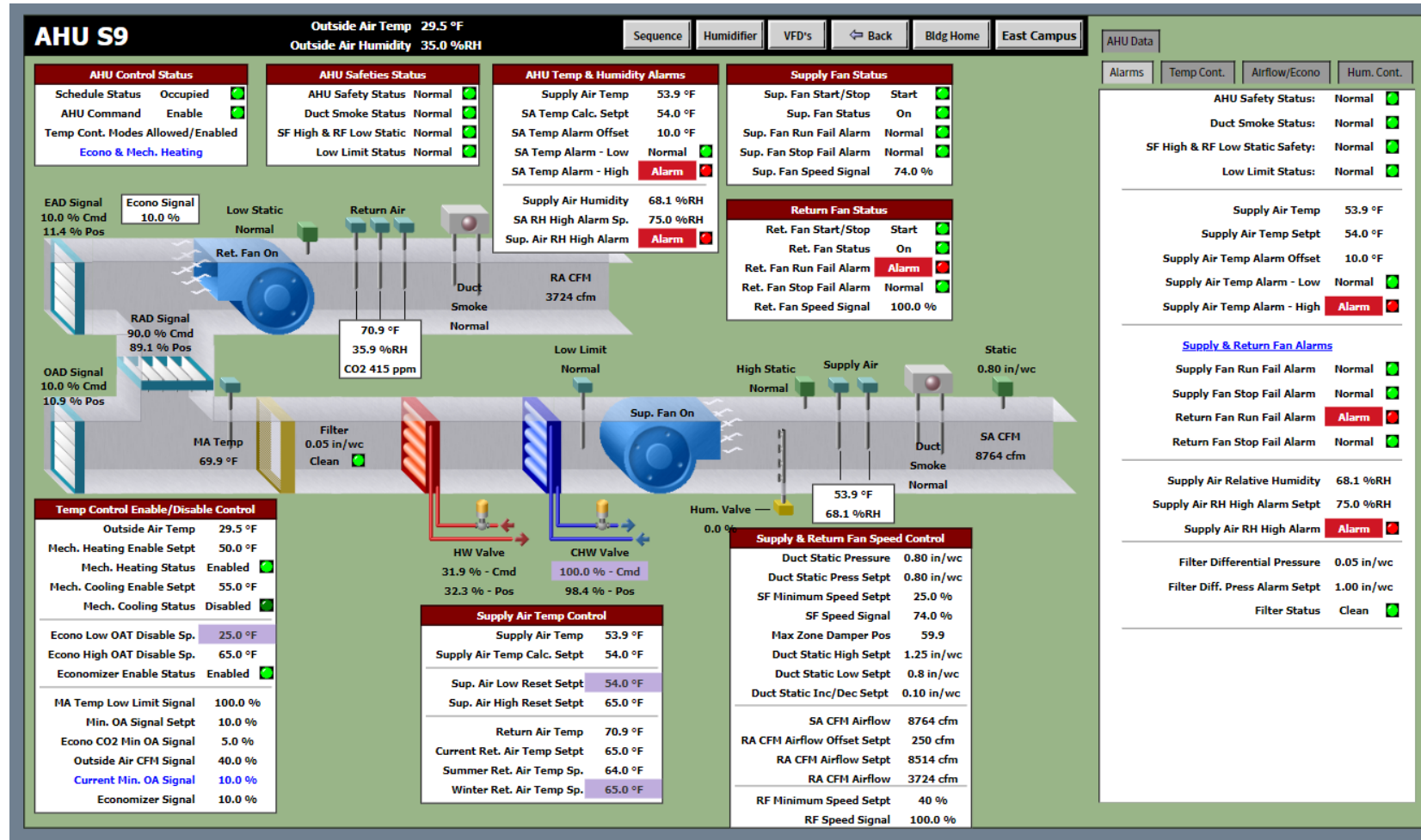
Right Screenshot: Performance Insights - Air Handlers

- Header:** Clockworks Analytics, Settings, Help, Log out, Provider: (I), Org: (I)
- Section:** Performance Insights - Air Handlers
- Section 1: Air Handlers**
- Equipment Count:** 569
- Equipment Count by Type:** Donut chart showing Fan Supply, Fan Return, AHU Custom, AHU Exhaust with Heat Recovery, AHU, AHU with Economizer and Heat Recovery, Compressor, PreHeating Coil, Heating Coil, Cooling Coil, Mixing Box.
- Point Count:** 9,945
- Top 20 Point Types:** List of point types and their counts.
- Air Handler Operating Statistics:** Table with columns: Building, Equip. CL., Equip., Point Type, Point, Max, Min, Range, Avg, Last, Units.

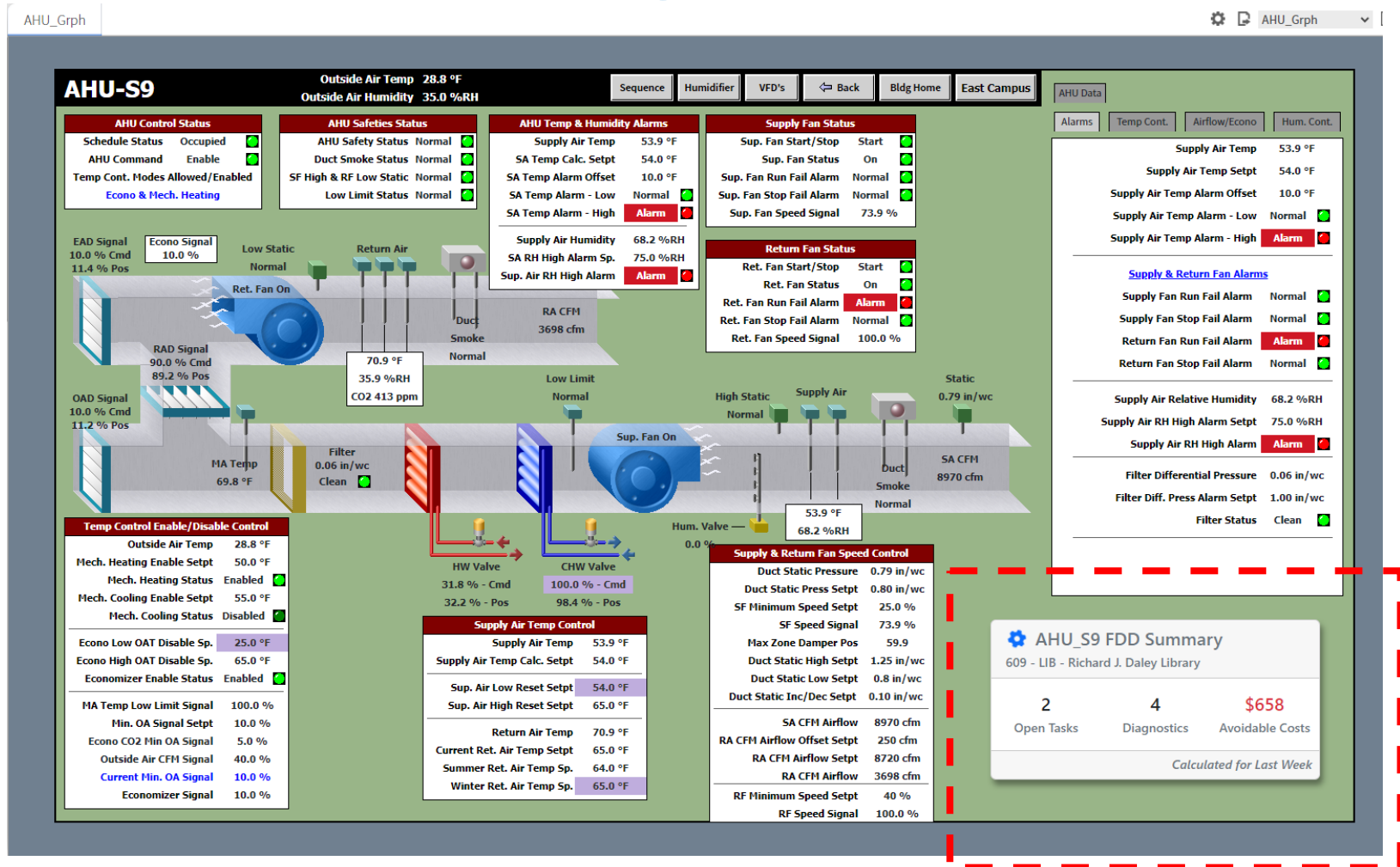
Clockworks & Niagara

- **Pilot project to create clockworks driver/widget for Niagara**
- **Lots of data to digest**
- **The more people that use this information the better**

Clockworks Widget



Clockworks Widget



Clockworks Widget

Smoke

Normal

°F

%RH

an Speed Control

essure 0.80 in/wc

s Setpt 0.80 in/wc

l Setpt 25.0 %

Signal 74.1 %

er Pos 59.9

l Setpt 1.25 in/wc

/ Setpt 0.8 in/wc

: Setpt 0.10 in/wc

Airflow 8929 cfm

t Setpt 250 cfm


/ Setpt 8679 cfm


Airflow 3682 cfm

l Setpt 40 %

Signal 100.0 %

Filter Diff. Press Alarm Setpt 1.00 in/wc

Filter Status Clean 

 AHU_S9 FDD Summary

2

Open Tasks

4

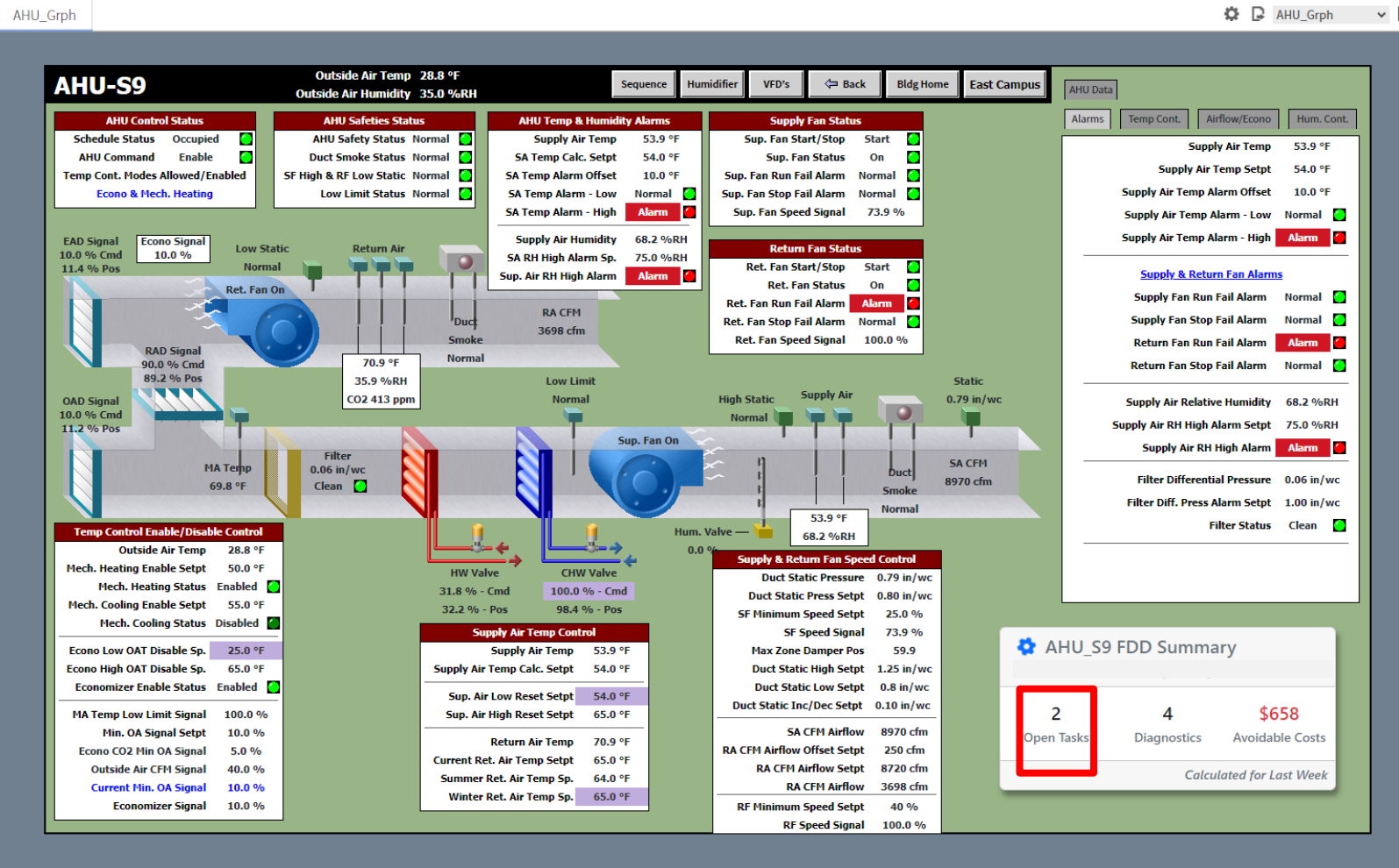
Diagnostics

\$658

Avoidable Costs

Calculated for Last Week

Clockworks Widget



Clockworks Widget

AHU_Grph

AHU-S9

AHU Control S

Schedule Status O

AHU Command

Temp Cont. Modes Allo

Econo & Mech. H

EAD Signal

10.0 % Cmd

11.2 % Pos

Econo S

10.0

RAD S

90.0 %

89.1 %

OAD Signal

10.0 % Cmd

11.0 % Pos

Temp Control Enable

Outside Air

Mech. Heating Enable

Mech. Heating S

Mech. Cooling Enable

Mech. Cooling S

Econo Low OAT Disabl

Econo High OAT Disabl

Economizer Enable S

MA Temp Low Limit S

Min. OA Signal

Econo CO2 Min OA S

Outside Air CFM S

Current Min. OA S

Economizer S

Tasks Summary for AHU_S9

Task ID 61 - AHU_S9 Flat sensor error. Out of range sensor error. Possible simultaneous or exc...

Last Modified: 12/5/2023

Status: OnHold

Description:

Flat sensor error. Out of range sensor error. Possible simultaneous or excess heating and cooling. Supply temp higher than setpoint. Config: Duplicate point type.

Recommendations:

OA Damper was overridden to 70%. Need to check if heating valve is properly closing.

Actions:

Released override on the OA damper which backed down to its minimum of 10%. Damper was overridden to 70% to cool the air. I lowered econo disable setpoint from 50 deg F to 30 deg F. Economizer enabled and temperatures came down. Checked valve and damper functionality all looked good. We have about a 6 deg increase in temperature from the mixed air to the supply air with the HW valve at 0%. Tuned point the econ temp control loop and low limit loop.

Assigned to:

-

Reported by:

-

Go to Task

Task ID 68 - AHU_S9 Flat sensor error. Out of range sensor error. Possible simultaneous or exc...

Last Modified: 1/25/2024

Status: Open

Task ID 72 - Out of range sensor error. Possible simultaneous or excess heating and cooling. S...

Last Modified: 2/8/2024

Status: Open

See All Tasks

Close

AHU_Grph

Hum. Cont.

Air Temp

53.9 °F

Temp Setpt

54.0 °F

rm Offset

10.0 °F

arm - Low

Normal

arm - High

Alarm

Fan Alarms

ail Alarm

Normal

ail Alarm

Normal

ail Alarm

Alarm

ail Alarm

Normal

Humidity

68.1 %RH

arm Setpt

75.0 %RH

igh Alarm

Alarm

Pressure

0.07 in/wc

arm Setpt

1.00 in/wc

ter Status

Clean

\$658

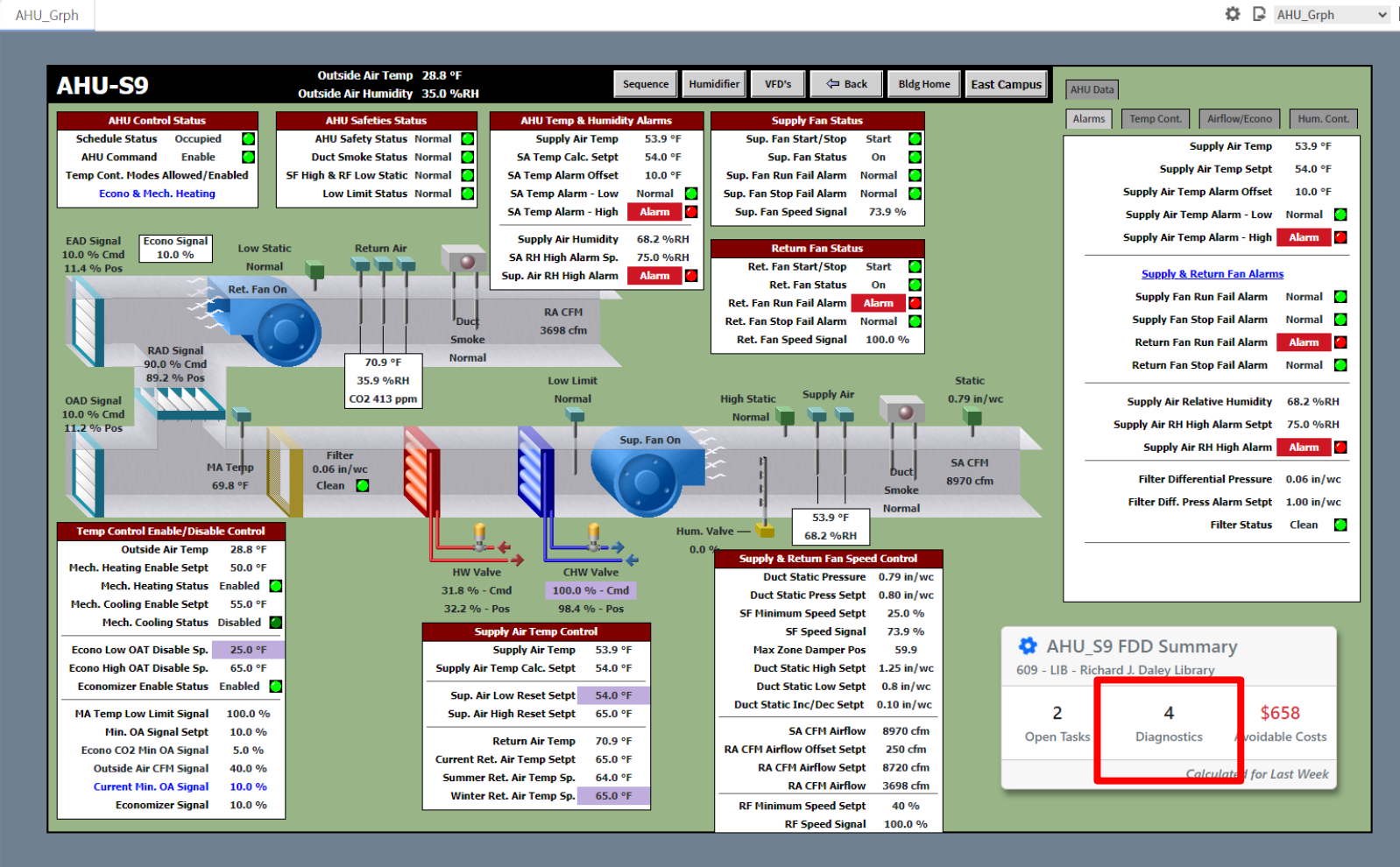
Avoidable Costs

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TRIDIUM

Clockworks Widget



Diagnostics

AHU_Grph

⚙️ AHU_Grph

AHU-S9

AHU Control Sta

Schedule Status

AHU Command

Temp Cont. Modes Allow

Econo & Mech. He

EAD Signal

10.0 % Cmd

11.2 % Pos

Econo Sig

10.0 %

RAD Sig

90.0 % C

89.1 % F

OAD Signal

10.0 % Cmd

10.8 % Pos

Temp Control Enable/

Outside Air Te

Mech. Heating Enable S

Mech. Heating Sta

Mech. Cooling Enable S

Mech. Cooling Sta

Econo Low OAT Disable

Econo High OAT Disable Sp.

Economizer Enable Status

Enabled

MA Temp Low Limit Signal

100.0 %

Min. OA Signal Setpt

10.0 %

Econo CO2 Min OA Signal

5.0 %

Outside Air CFM Signal

40.0 %

Current Min. OA Signal

10.0 %

Economizer Signal

10.0 %

Diagnostics Summary for AHU_S9

Single stream air handler with economizer

\$614 per week

- Excess mechanical cooling. Flat sensor error. Flow imbalance. Out of range se...

3/17/2024-3/24/2024

Analysis:

AHU Economizer

Go to Diagnostic

Description:

Excess mechanical cooling. Flat sensor error. Flow imbalance. Out of range sensor error.

Energy Priority:

10

Comfort Priority:

0

Maintenance Priority:

4

\$44 per week

- Flow sensor error. Jumping sensor error. No static pressure setback schedule. ...

3/17/2024-3/24/2024

\$0 per week

- Flat sensor error. Out of range sensor error. Possible simultaneous or excess he...

3/17/2024-3/24/2024

\$0 per week

- Energy information available (see details).

3/17/2024-3/24/2024

Full Diagnostics

Close

Supply Air Temp Calc. Setpt

54.0 °F

Sup. Air Low Reset Setpt

54.0 °F

Sup. Air High Reset Setpt

65.0 °F

Return Air Temp

70.9 °F

Current Ret. Air Temp Setpt

65.0 °F

Summer Ret. Air Temp Sp.

64.0 °F

Winter Ret. Air Temp Sp.

65.0 °F

Duct Static High Setpt

1.25 in/wc

Duct Static Low Setpt

0.8 in/wc

Duct Static Inc/Dec Setpt

0.10 in/wc

SA CFM Airflow

9016 cfm

RA CFM Airflow Offset Setpt

250 cfm

RA CFM Airflow Setpt

8766 cfm

RA CFM Airflow

3676 cfm

RF Minimum Speed Setpt

40 %

RF Speed Signal

100.0 %

609 - LIB - Richard J. Daley Library

2

4

\$658

Open Tasks

Diagnostics

Avoidable Costs

Calculated for Last Week

Q & A



THANK YOU!



