
NIAGARA
SUMMIT
2026
SEAMLESS CONNECTIVITY,
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CUSTOMERS
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4:30PM – 5:20PM | WEDNESDAY

NEW COMMISSIONING APPROACHES FOR HIGH-PERFORMING AND CYBER PROTECTED BUILDINGS

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SPEAKERS

Michael Stabile
Tridium

J Christopher Larry
exp

Paul Maximuk
Newcomb & Boyd

Saheel Chandrani
PingCx

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Jon Christopher Larry
PE, CxA, LEED AP, CEM

- **Exp US Services Inc.** - Director of Energy Engineering
- 35 years of comprehensive experience on energy-efficient high-performance smart and intelligent buildings.
- **AEE** – Past President and named ***"Energy Engineer of the Year 2000"*** by the Association of Energy Engineers (AEE)
- **CABA** – Vice-Chair of CABA IBC, Chair of (BIQ) Building Intelligence Quotient and Zero Energy Consortium Committees.
- **ASHRAE -** Chairman of Technology, Energy and Governmental Activities, Chapter Technology Transfer Committees.
- **NIST GCTC SBSC** - Chairperson for the National Institute of Standards and Technology (NIST) Global Cities Team Challenge (GCTC) on Smart Buildings and Smart Cities (SBSC).

Commissioning & Contractors

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Agenda

1. Definitions
2. What is a high-performance building or BAS system?
3. What is a Cyber Secure Building?
4. Types of Commissioning.
5. Ways to achieve these outcomes

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Types of Commissioning

- **New Construction Commissioning (NCCx):** Applied to new construction projects.
- **Retro-commissioning (RCx):** Applied to existing buildings that were never originally commissioned.
- **Re-commissioning (Re-Cx):** A repeat process for existing buildings to improve performance. Often called a tune-up.
- **Ongoing/Continuous Commissioning [OCx]:** A continuous process that extends beyond initial commissioning to maintain performance and optimize systems over the building's life.
- **Monitoring Based Commissioning (MBCx):** Combines traditional commissioning with advanced data analytics and energy monitoring systems for real-time performance insights
- **Building Enclosure Commissioning [BECx]:** Focuses specifically on the building's envelope (windows, roof, walls) to prevent air/water leaks and energy loss.

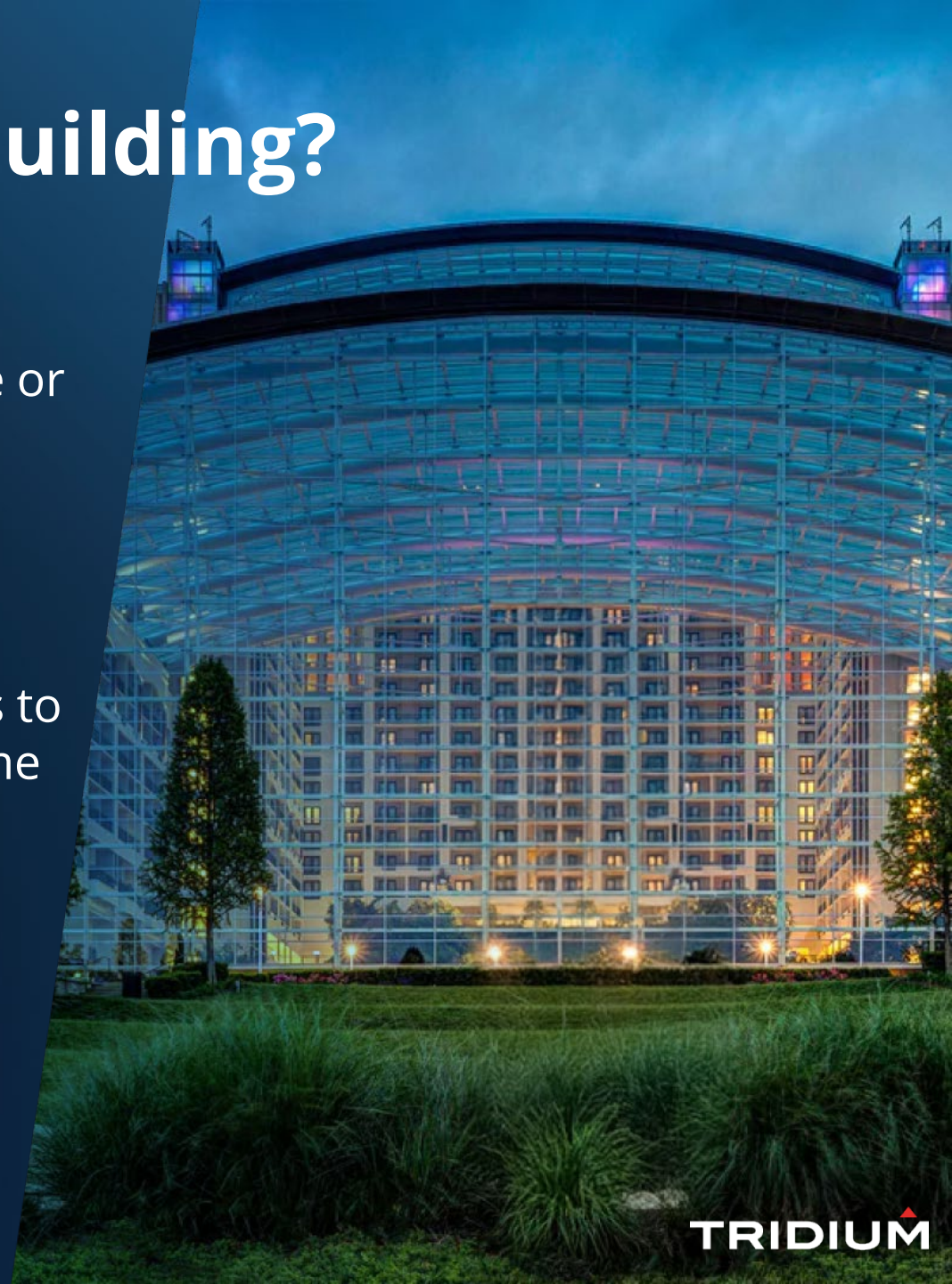
What is a High Performing Building?

High-performance buildings are those which deliver a relatively higher level of energy efficiency performance or greenhouse gas reduction than what is required by building codes or other regulations.

Architects, designers, and builders typically design and build high-performance buildings using a range of established strategies, techniques, tools, and materials to ensure that, upon completion, the building will consume a minimal amount of energy for heating, cooling, illumination, and ventilation during operation.

Summary:

- Energy Efficiency - Sustainability
- Occupant Satisfaction
- Return of Investment



Commissioning to drive better performance

- Don’t just check the box in commissioning
- Use the building automation system to commissioning the building
- The building data, operational programing and trending can be used to self commission
- Commissioning needs to include training of the BAS
  - A poorly trained O&M staff can undo all the great things the BAS contractor has done
- Illustrate issues, conditions and concerns – what you find will happen again
- Program faults to anticipate future issues which may affect performance

What is a Cyber Secure Building

- A cyber secure building is one that has been designed and implemented with robust cybersecurity measures in place to protect its systems and data from cyber threats. This includes the use of advanced security protocols, regular penetration testing, and the use of IoT devices that are properly secured.
- The building's systems are interconnected and connected to the internet, but they are protected through proper authentication, encryption, and continuous monitoring. Cyber secure buildings also have a clear action plan for addressing vulnerabilities and implementing changes to network configurations and data encryption technologies.

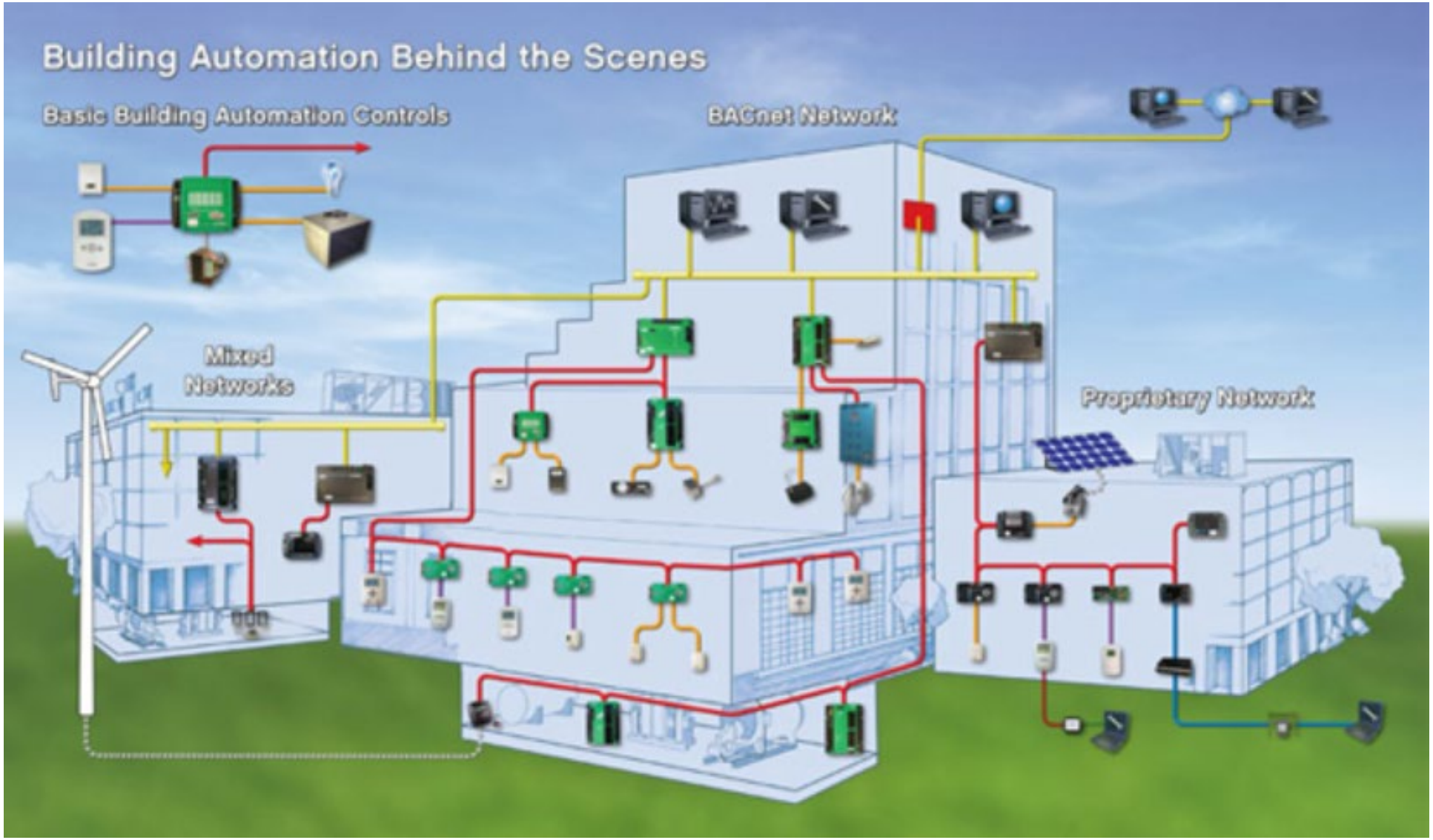
Summary:

- Regular penetration testing
- Firewalls and network compliance
- Authentication practices
- Encryption

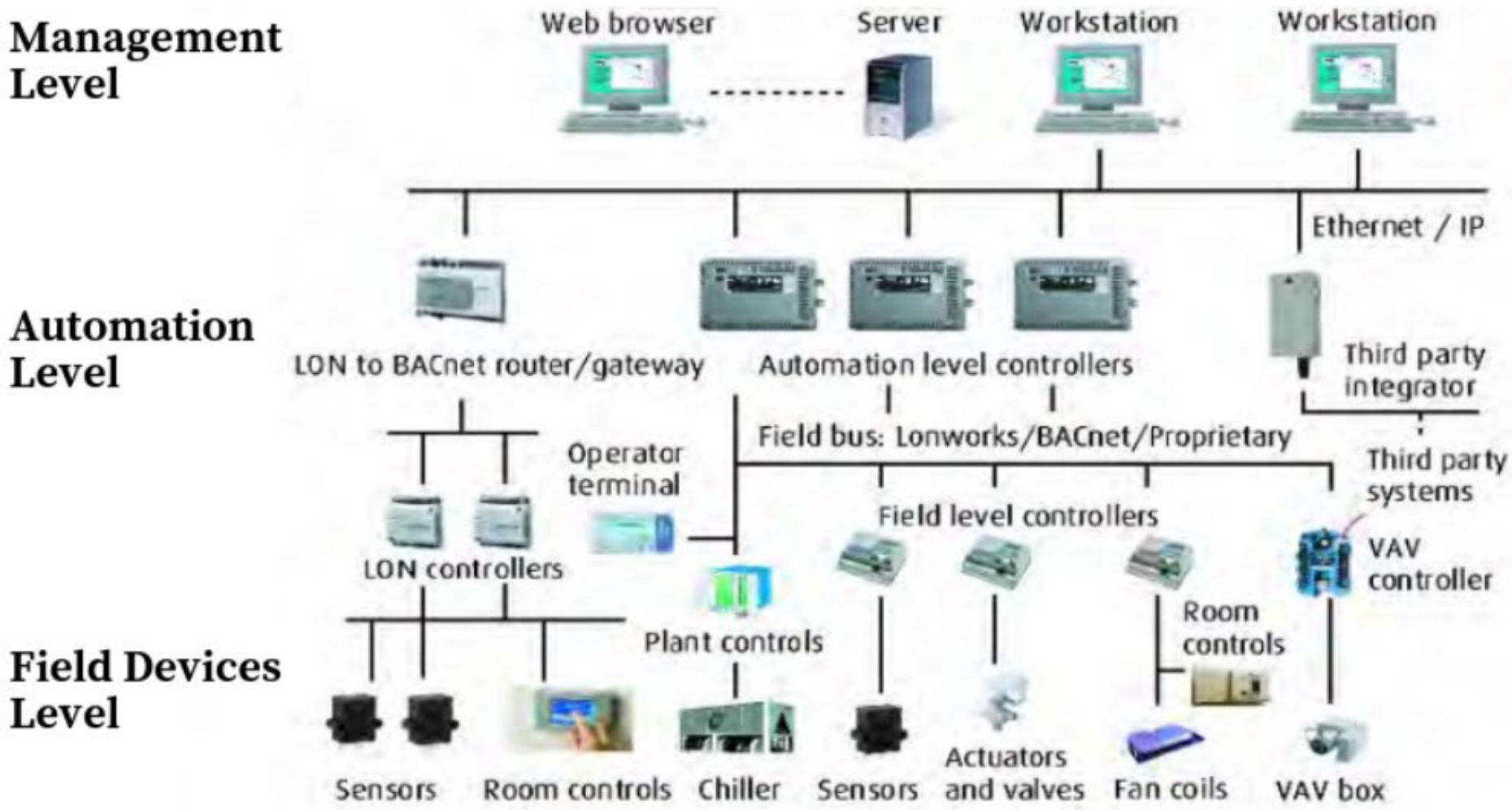
Ways to mitigate cyber security Commissioning for Cyber Security

- Start with the security network framework where all OT systems communicate
- Check usernames & Password – ensure each person has proper credentials and cyber security training
- Include FDD for cyber security health…
- Solution should include final commissioning and an ongoing commissioning process

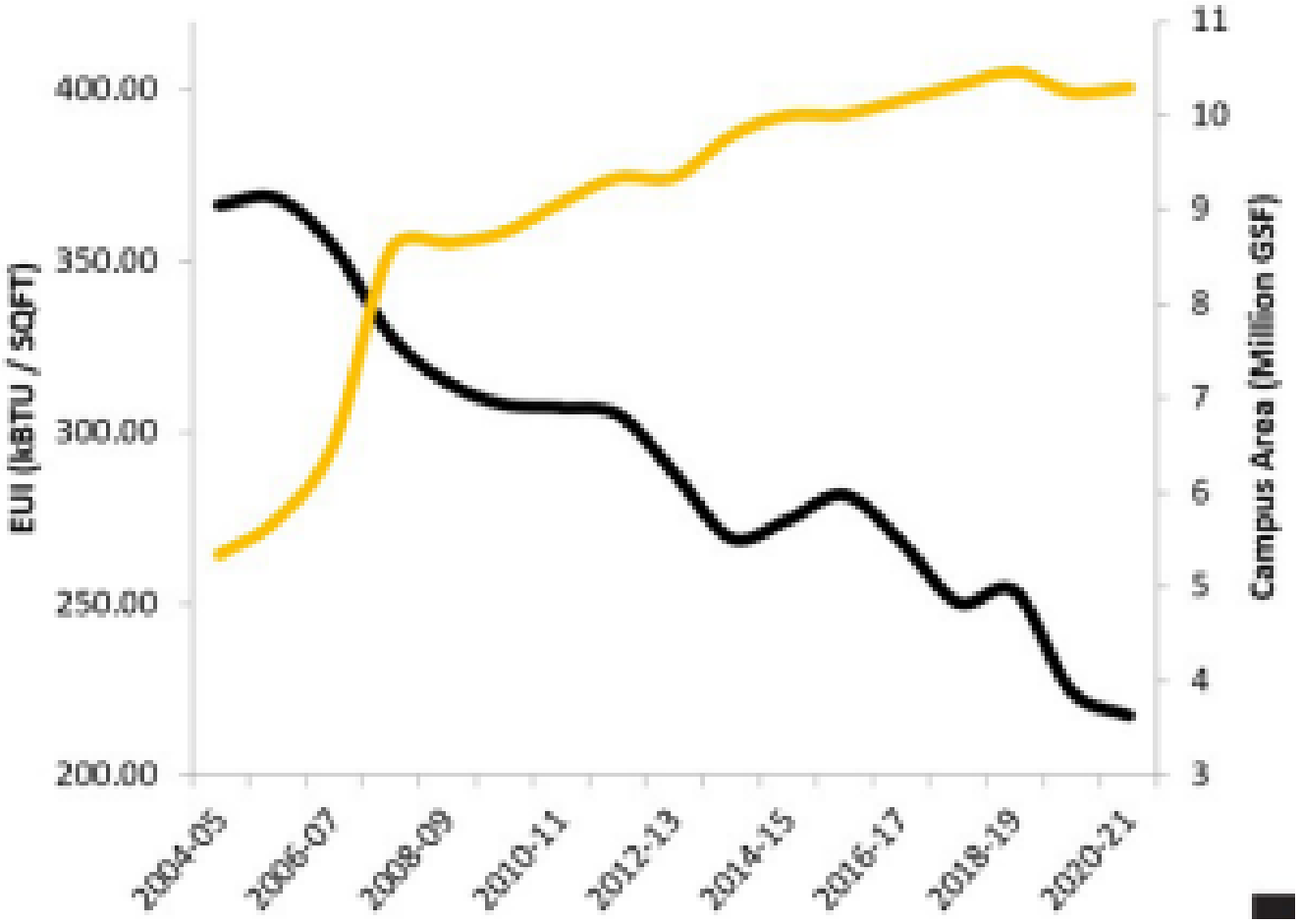
Facility Network throughout the smart building



Multi-levels of networks in a building



Key Performance Indicators



Sample KPIs

Energy or Water

- Tie meters into EMCS and track use
- Add faults for loss of connection
- Add faults for too high or too low
- Set daily, weekly, monthly limits

Efficiency

- Trend chiller KW/ton with temperatures
- Trend boiler % with temperatures
- Add faults if out of range

Operations

- Add faults if equipment is running outside of schedule
- Add faults if setpoints are out of range

Comfort

- Add faults if temperatures are outside set points
- Add faults if IAQ are outside set points
- Add faults if humidity are outside set points
- No glare

Maintenance

- Work order faults – filters not changed
- Simultaneous heating and cooling
- Doors/windows left open

Revenue

- Occupancy
- $/GSF

Dashboard of projects in a region

Building Dashboard Example

NEWCOMB & BOYD

Paul Maximuk

- Senior Associate with 40 years of experience with a strong track record in the Facility Operations, IT and Construction Services industries
- 2019 recipient of the Julie Devine Digital Impact Award from IBcon recognizing his commitment to advancing Smart Building technologies
- AEE Member
- Niagara AX and N4 Certified

The Need for Cybersecurity Commissioning

- **The Problem**: Buildings are now critical infrastructure; 56% of recent cyber incidents targeted energy-related assets.
- **Vulnerability Gap**: Traditional commissioning focuses on *if* it works, but not *how securely* it communicates.
- **Consequences**: Cyberattacks can lead to system failures, data breaches (blueprints/personal info), and physical safety risks.

Key Pillars of Cyber-Secure Commissioning

- **Network Segmentation**: Isolating building automation systems (BAS) from general IT networks to prevent lateral movement.
- **Zero Trust Architecture**: Implementing robust multi-factor authentication (MFA) and role-based access for all users and devices.
- **Physical Security of Digital Assets**: Securing controllers in locked enclosures and hiding network cables to prevent physical tampering.

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Integrated Commissioning Workflow

- **Pre-Design/Design**: Embed "Secure-by-Design" requirements into the Owner's Project Requirements (OPR).
- **Construction/Installation**: Verify hardware configurations and ensure no direct internet accessibility for BAS devices.
- **Acceptance/Testing**: Conduct automated commissioning tests alongside security audits and vulnerability assessments.

Continuous & Ongoing Commissioning (OCx)

- **Real-Time Monitoring**: Deploying systems to detect anomalies that may signal a cyber breach.
- **Incident Response**: Maintaining backups of configurations and firmware off the network for rapid recovery.

Conclusion & Future Outlook

- **Commissioning as Strategy**: It is an ongoing operational commitment, not just a project closeout task.
- **IT/OT Collaboration**: Success depends on the partnership between facility managers and IT security teams.
- **2026 and Beyond**: Expect IoT-driven standards (like ISO 19650) to become essential contractual requirements.

AUTONOMOUS BAS RECOMMISSIONING: REAL RESULTS FROM A 1M SQUARE FOOT OFFICE BUILDING

Saheel Chandrani
Co-founder & CEO - PingCx

PingCx
Lifecycle Commissioning®

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The why before the how

Labor safety & productivity

41% of today’s skilled-trade labor force will retire by 2031

Automate workflows saving greater than 50% of planned commissioning labor in new and existing facilities and greatly reduce safety risk

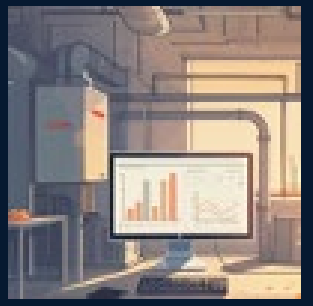
Energy waste crisis

Buildings waste 30% of their energy due to undetected faults. Stricter codes and ESG mandates are driving urgent action.

Unlock 25% savings in buildings by automatically identifying inefficiencies, meeting code compliance, and easing reporting burdens.

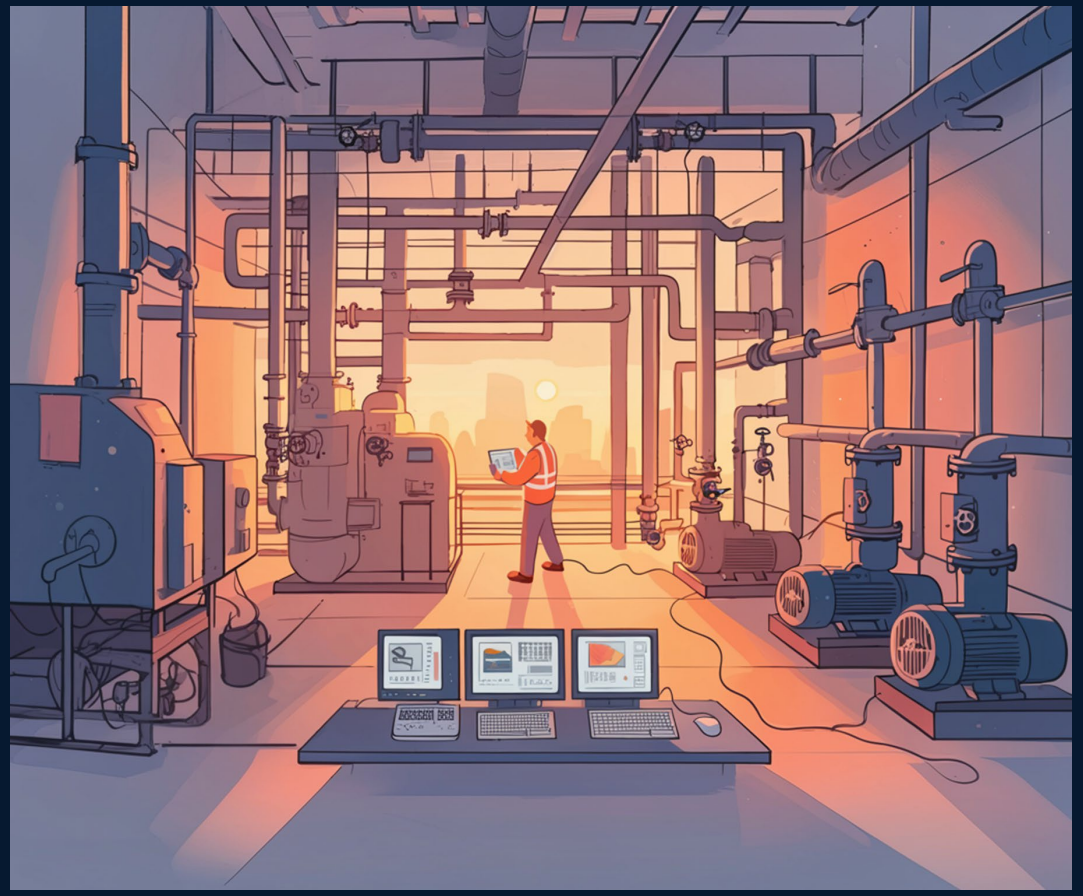
Expanded service offerings

Greater than 80% of services still performed via time-based contracts



Enable all service providers to shift to enhanced offerings which produce reoccurring revenue and stronger retention

Defining autonomous commissioning



- “denoting or performed by a device capable of operating without direct human control”
- Today, can upload project documentation, make connectivity, and autonomously perform Lifecycle Commissioning®
- For HVAC & BAS systems; highly cost effective and easy to implement

Fundamentals of autonomous commissioning

1. Lives **on the BAS network as an Administrative user**; is performing tasks and recording results much like a user normally would, however, able to do this automatically
2. BAS and HVAC system **databases and documentation imported** into PingCx platform
3. Tool leverages parser engine + tagging to **automatically homogenize and normalize data**, automated test sequences are selected and customized, assigned to the appropriate project, and scheduled for execution
4. Data is collected and analysis **engines computes results**
5. Reporting and documentation provided for **variety of stakeholders**

How it works

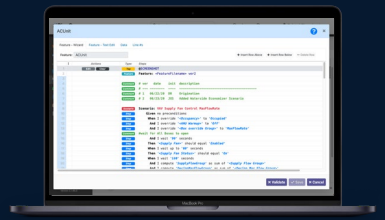
Project initiated in PingCx or other tools

Database file is uploaded

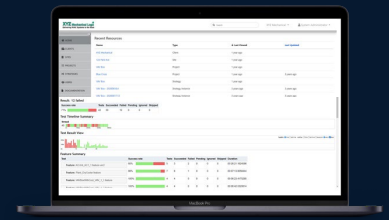
SIEMENS VYKON EasyIO
TRIDIUM DISTECH CONTROLS TOSHIBA
Honeywell AutomatedLogic
Johnson Controls LYNXSPRING
Project Haystack
Schneider Electric Delta CONTROLS ABB

Remote connectivity is established

AICPA SOC
aicpa.org/soc4so
SOC for Service Organizations | Service Organizations



Test scenarios selected



Cx process is initiated and completed

Results presented to Stakeholders

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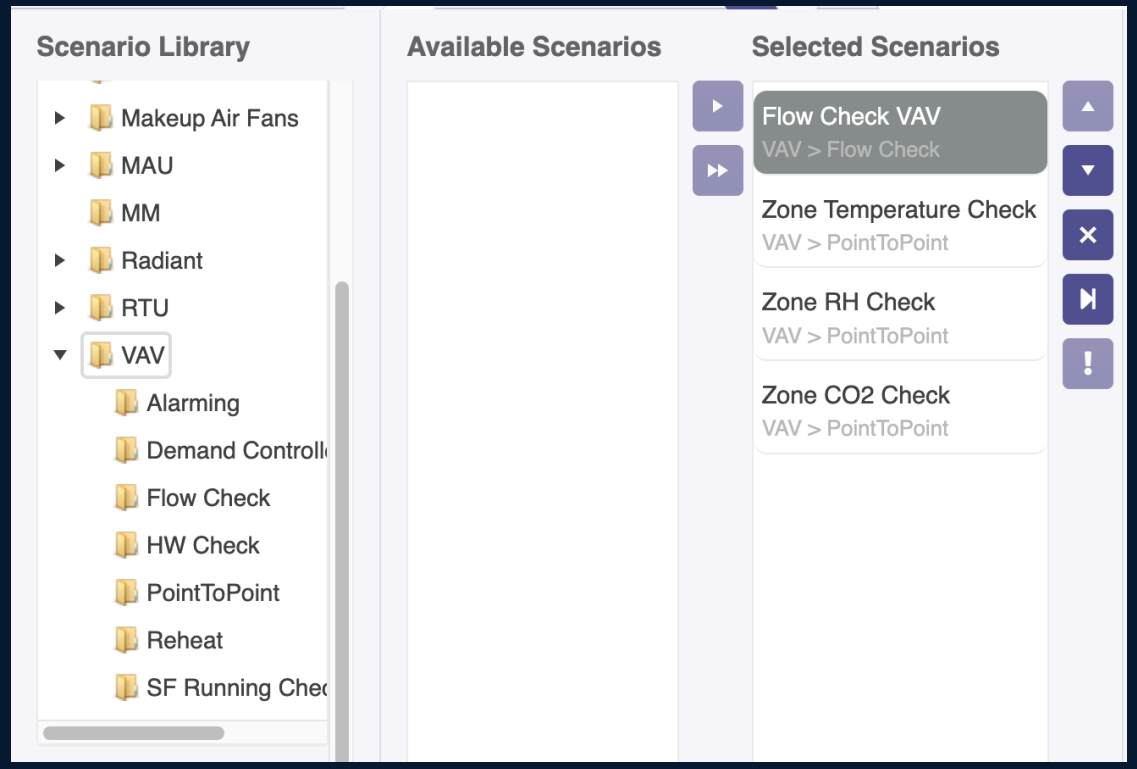
Test scenarios

As simple as pre-configured



As complex as needed

Type	Steps
Tag	@Debug=All
Feature	Feature: <FeatureFilename>
Comment	#********** Read Tests **********
Tag	@ReadValues
Scenario	Scenario: Read Values
Step	Given no preconditions
Step	When I read '<Unit Tag>.*'
Step	Then I should pass
Tag	@PointToPoint
Scenario	Scenario: Supply Air Temperature Check
Step	Given no preconditions
Step	Then '<Supply Air Temperature>' should be between '40 F' and '100 F'

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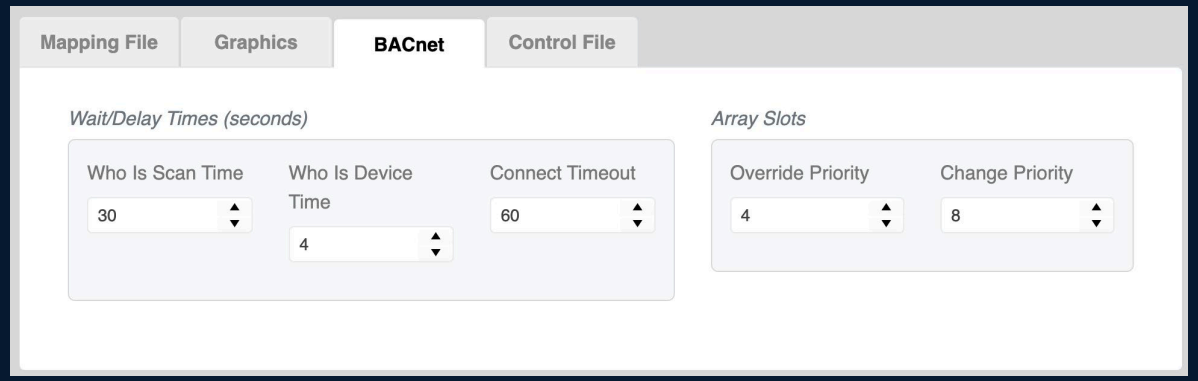
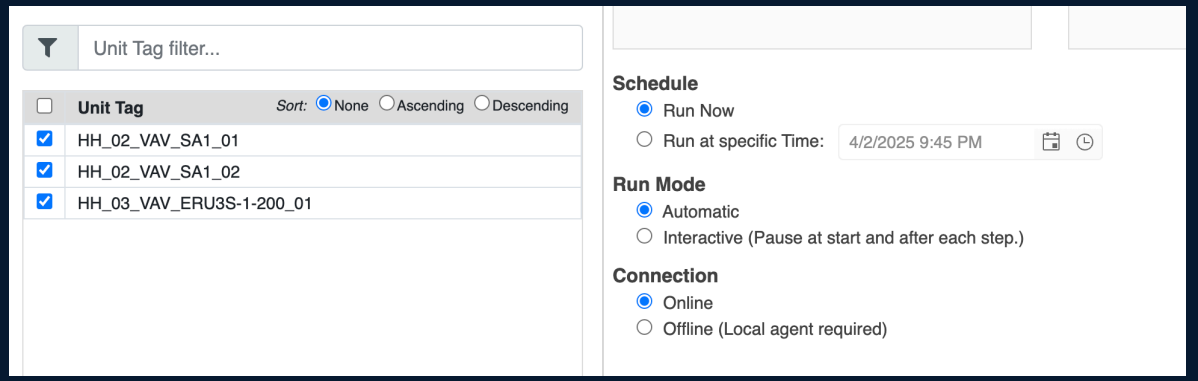
Paying attention to the details

BACnet Priorities



Highly flexible



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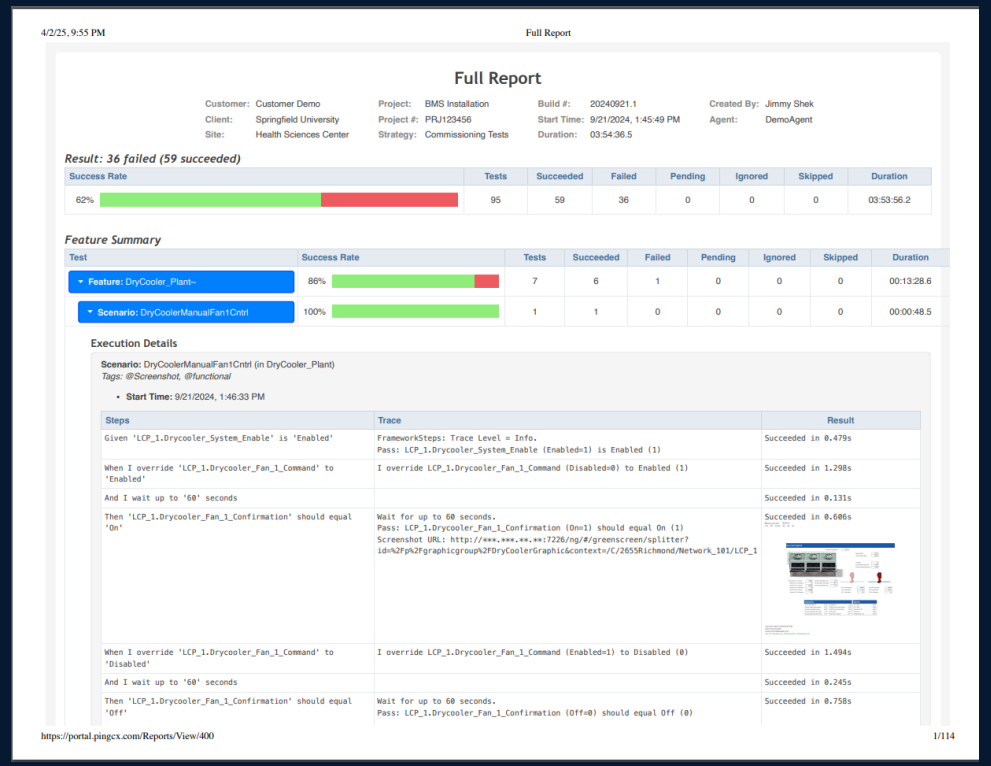
Reporting capabilities

System generated



4/2/25, 9:55 PM Full Report

Full Report

Customer: Customer Demo | Project: BMS Installation | Build #: 20240921.1 | Created By: Jimmy Shek
Client: Springfield University | Project #: PRJ123456 | Start Time: 9/21/2024, 1:45:49 PM | Agent: DemoAgent
Site: Health Sciences Center | Strategy: Commissioning Tests | Duration: 03:54:36.5

Result: 36 failed (59 succeeded)

Success Rate	Tests	Succeeded	Failed	Pending	Ignored	Skipped	Duration
62%	95	59	36	0	0	0	03:53:56.2

Feature Summary

Test	Success Rate	Tests	Succeeded	Failed	Pending	Ignored	Skipped	Duration
Feature: DryCooler_Plant--	86%	7	6	1	0	0	0	00:13:28.6
Scenario: DryCoolerManualFan1Cntrl	100%	1	1	0	0	0	0	00:00:48.5

Execution Details

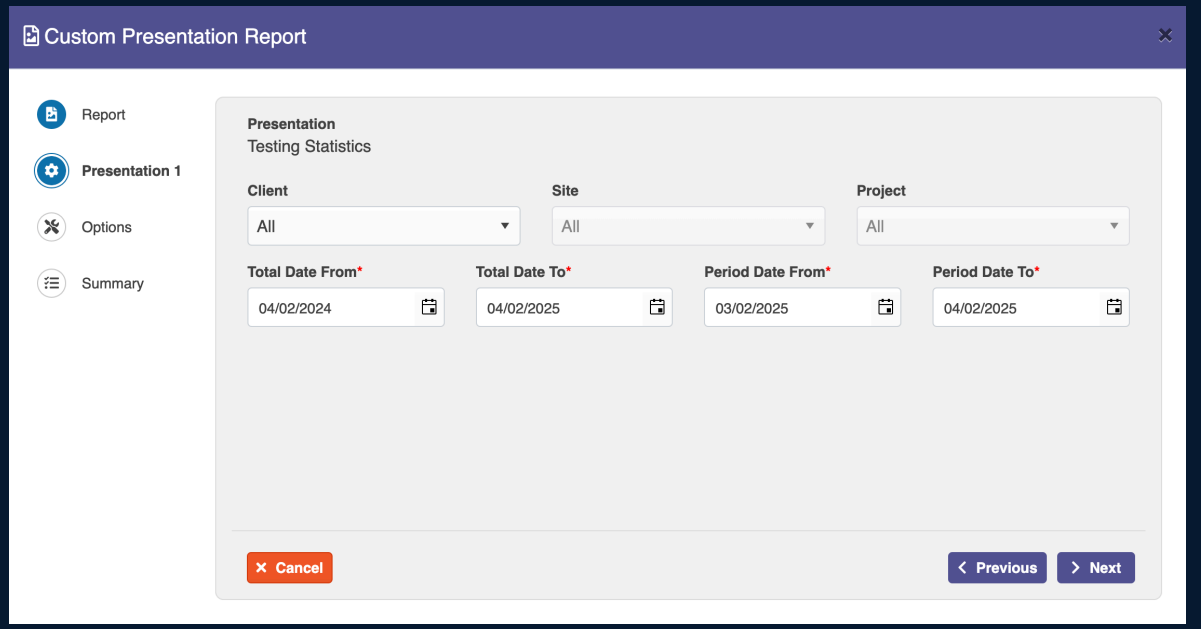
Scenario: DryCoolerManualFan1Cntrl (in DryCooler_Plant)
Tags: @Screenshot, @functional

- Start Time: 9/21/2024, 1:46:33 PM

Steps	Trace	Result
Given 'LCP_1.Drycooler_System_Enable' is 'Enabled'	FrameworkSteps: Trace Level = Info. Pass: LCP_1.Drycooler_System_Enable (Enabled=1) is Enabled (1)	Succeeded in 0.479s
When I override 'LCP_1.Drycooler_Fan_1_Command' to 'Enabled'	I override LCP_1.Drycooler_Fan_1_Command (Disabled=0) to Enabled (1)	Succeeded in 1.298s
And I wait up to '60' seconds		Succeeded in 0.131s
Then 'LCP_1.Drycooler_Fan_1_Confirmation' should equal 'On'	Wait for up to 60 seconds. Pass: LCP_1.Drycooler_Fan_1_Confirmation (On=1) should equal On (1) Screenshot URL: http://***.***.**.**:7226/ng/#/greenscreen/splitter?id=%2Fph%2Fgraphicgroup%2FDryCoolerGraphic&context=/C/2655Richmond/Network_101/LCP_1	Succeeded in 0.606s
When I override 'LCP_1.Drycooler_Fan_1_Command' to 'Disabled'	I override LCP_1.Drycooler_Fan_1_Command (Enabled=1) to Disabled (0)	Succeeded in 1.494s
And I wait up to '60' seconds		Succeeded in 0.245s
Then 'LCP_1.Drycooler_Fan_1_Confirmation' should equal 'Off'	Wait for up to 60 seconds. Pass: LCP_1.Drycooler_Fan_1_Confirmation (Off=0) should equal Off (0)	Succeeded in 0.758s

https://portal.pingcx.com/Reports/View/400 1/114

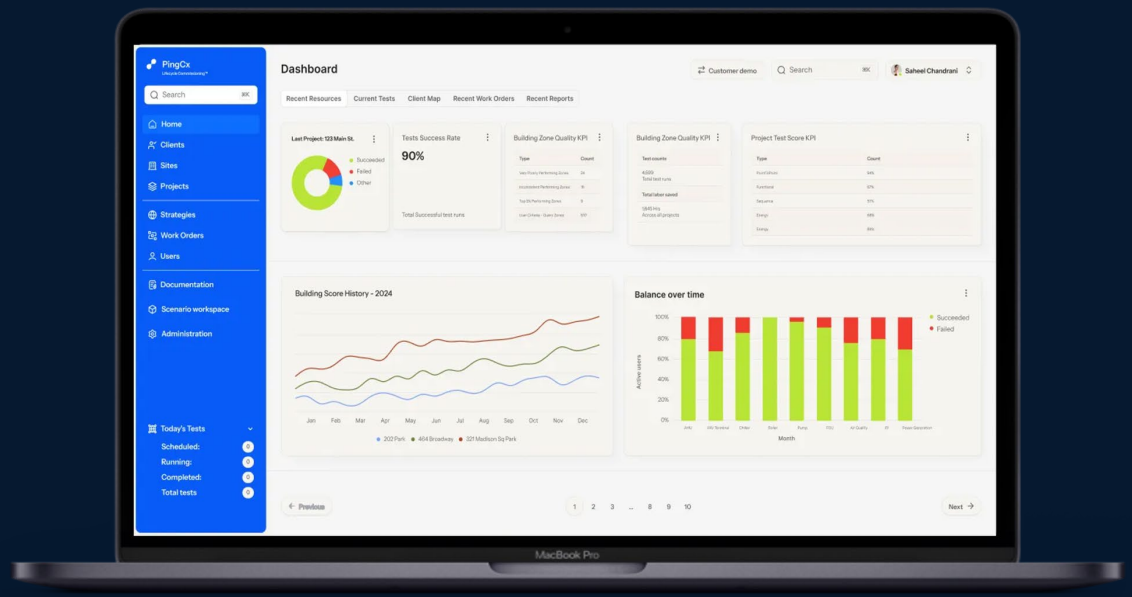
Customized



Multiple dashboards

Contractor focused

Owner focused



Case study:
90 Park Ave, NYC

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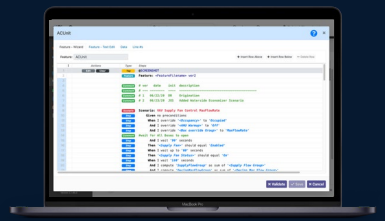
Case study: Class A commercial office building

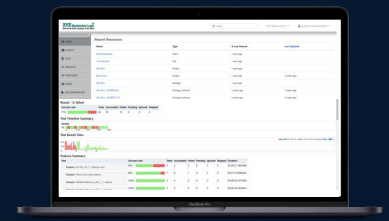
- **The building:**
- 46 story, 990,000sqft, 19,007 points – midtown Manhattan
    - Chilled/Hot Water System (3 CHs, CHWP, CWP, 3 CTs, 4 Boilers + VFDs on all pumping)
    - 8 Large AHUs + ~600 Terminal units (VAVs + PIUs)
    - Misc. systems (Sump, meters, etc.)
- Niagara front end – JCI Metasys + FX across base building + several tenant BAS implementations
- **The challenge:**
- New Chief Engineer with limited historical system knowledge & confidence that systems ”could be working better”
- NYC LL87 filing approaching, traditional RCx approach would take 30+ days of manual labor
- Occupied building with multiple tenants

Implementation approach

config.bog

Customer BMS





Project initiated in PingCx or other tools → Database file is uploaded, points unified → Remote connectivity is established

1 day

Test scenarios selected

2 days

Cx process is initiated and completed

2 days

1 2 3

Phased approach

Project planning & connectivity

1

- Meet with building team on schedules & expectations
- Coordinate with BAS contractor for database files & BAS credentials
- Establish remote connectivity to BAS
- Install/deploy agent on-site

Test writing & configuration

2

- Run project database through parsing engine
- Review points lists & project documentation
- Select test scripts from library (code/standards-based)
- Finalize scripts; review with building team

Execution & analysis

3

- Run tests over ~2 days; monitor systems
- Maintain open communication with building staff
- Review results & prepare final reports
- Present findings to building team

Sample test result

Feature Summary

Test	Success Rate	Tests	Succeeded	Failed	Pending	Ignored	Skipped	Duration
Feature: Floor9.S1_R5_AC Units_Averaging~	100%	1	1	0	0	0	0	00:02:14.3
Feature: Floor9.S1_R5_AC Units_OAT~	50%	2	1	0	1	0	0	00:04:35.3
Feature: Floor9.S1_R5_AC Units~	80%	39	16	1	3	0	19	00:03:20.0
Feature: Floor9.S2_R6_AC Units_Averaging~	100%	1	1	0	0	0	0	00:00:54.9
Feature: Floor9.S2_R6_AC Units_OAT~	50%	2	1	1	0	0	0	00:01:15.5
Feature: Floor9.S2_R6_AC Units~	68%	34	23	7	4	0	0	01:42:07.8
Feature: Floor9.S3_AC Units_OAT~	100%	2	2	0	0	0	0	00:01:13.9
Feature: Floor9.S3_AC Units~	62%	21	13	5	3	0	0	00:14:32.0

Sample test detailed result

Scenario: Minimum Flow Check - SumWinTRISP	0%	1	0	1	0	0	0	00:06:04.8

Execution Details

Scenario: Minimum Flow Check - SumWinTRISP (in Park_Ave_90_F40.VAVS_41FL.VAV_41_5_VAV)
Tags: @Screenshot, @?vavsw&trisp, @functional

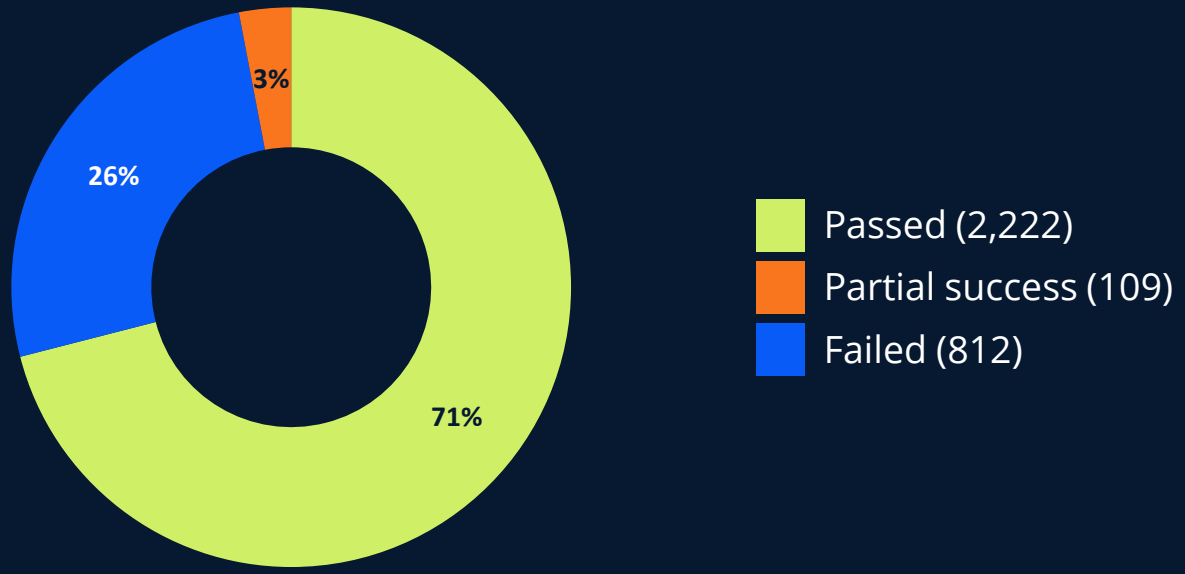
- **Start Time:** 3/3/2025, 9:30:12 AM

Steps	Trace	Result
Given precondition 'SF Running'	FrameworkSteps: Trace Level = Info. Pass: SF Running	Succeeded in 0.351s
And I override 'Park_Ave_90_F40.VAVS_41FL.VAV_41_5.SUM_WIN' to '1'	I override Park_Ave_90_F40.VAVS_41FL.VAV_41_5.SUM_WIN (WINTER=0) to 1 (SUMMER)	Succeeded in 3.420s
And I override 'Park_Ave_90_F40.VAVS_41FL.VAV_41_5.SYSTEM_MODE' to 'Cool Only'	I override Park_Ave_90_F40.VAVS_41FL.VAV_41_5.SYSTEM_MODE (Heat Only=2) to Cool Only (1)	Succeeded in 3.325s
When I override 'Park_Ave_90_F40.VAVS_41FL.VAV_41_5.CLGOCC_SP' to '8 °F' above 'Park_Ave_90_F40.VAVS_41FL.VAV_41_5.ZN_T'	I override Park_Ave_90_F40.VAVS_41FL.VAV_41_5.CLGOCC_SP (73) to 8 °F (8) above Park_Ave_90_F40.VAVS_41FL.VAV_41_5.ZN_T (75.01) ==> 83.01	Succeeded in 3.463s
And I override 'Park_Ave_90_F40.VAVS_41FL.VAV_41_5.HTGOCC_SP' to '8 °F' below 'Park_Ave_90_F40.VAVS_41FL.VAV_41_5.ZN_T'	I override Park_Ave_90_F40.VAVS_41FL.VAV_41_5.HTGOCC_SP (70) to 8 °F (8) below Park_Ave_90_F40.VAVS_41FL.VAV_41_5.ZN_T (75.01) ==> 67.01	Succeeded in 3.461s
And I override 'Park_Ave_90_F40.VAVS_41FL.VAV_41_5.ZNT_SP' to 'Park_Ave_90_F40.VAVS_41FL.VAV_41_5.ZN_T'	I override Park_Ave_90_F40.VAVS_41FL.VAV_41_5.ZNT_SP (72) to Park_Ave_90_F40.VAVS_41FL.VAV_41_5.ZN_T (75.01)	Succeeded in 3.499s
And I wait '1' minutes	Wait 60 seconds	Succeeded in 60.616s
Then 'Park_Ave_90_F40.VAVS_41FL.VAV_41_5.SAFLOW_SP' should equal 'Park_Ave_90_F40.VAVS_41FL.VAV_41_5.CLGOCC_MINFLOW'	Pass: Park_Ave_90_F40.VAVS_41FL.VAV_41_5.SAFLOW_SP (37) should equal Park_Ave_90_F40.VAVS_41FL.VAV_41_5.CLGOCC_MINFLOW (37) Screenshot URL: https://172.29.92.100/ord/station:|slot:/Drivers/NiagaraNetwork/Park_Ave_90_F40/points/VAVS_4	Succeeded in 0.416s 

Testing results overview

Result: 812 failed (2222 succeeded)

Success Rate	Tests	Succeeded	Failed	Pending	Ignored	Skipped	Duration
72%	3143	2222	812	66	0	43	2.04:05:30.2



3,143 total tests | total runtime: 2d 4hr 5m 30.2s

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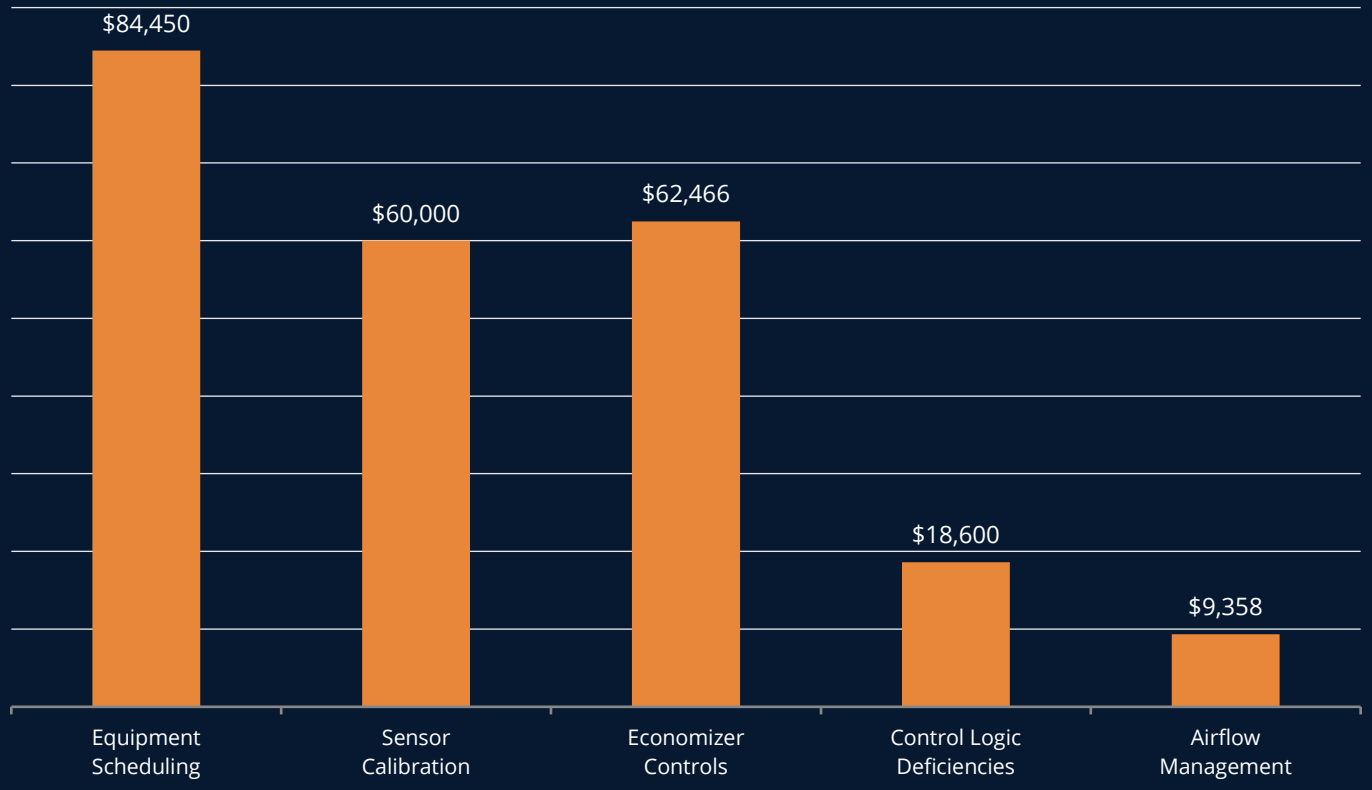
Results highlights

1. **Energy: Automated Control Limitations**
    1. AC units are improperly locked out of heating/cooling modes based on rigid outside air temperature thresholds
    2. Supply air temperature reset functionality is limited by hard-coded values
    3. Winter mode (warmup) sequences activate unnecessarily and remain engaged without proper reset capabilities
    4. Floor dampers require manual adjustment due to poor automatic control
2. **Comfort: Sensor and Measurement Issues**
    1. Significant discrepancies (20°F+) exist between outside air temperature sensors
    2. Return/mixed air temperature sensors provide poor representation of actual zone condition
    3. VAV boxes become stuck in purge mode without manual intervention
    4. CFM measurements appear inaccurate, leading to improper air distribution
3. **Safety: Safety and Scheduling Concerns**
    1. At least one freeze-stat safety device was found bypassed, creating potential system damage risk
    2. PIUs (Powered Induction Units) operate continuously instead of following floor occupancy schedule
    3. Inconsistent control methodologies exist across different building floors

Financial & environmental impact

Identified annual savings opportunities by system category



Note: Savings estimates per ASHRAE RP-1404 findings and ASHRAE Standard 105-2014 quantification methods

Total identified annual savings

$235K+

per year

Majority implementable through **programming changes** with minimal capital investment

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ROI Framework for autonomous commissioning

Cost-benefit analysis: traditional vs. autonomous approach

Metric	Traditional Approach	Autonomous Approach
Testing Coverage	10-20% (sampling)	100% of all systems
Timeline	30+ days	5 days
Labor Hours (this building)	~380+ hours	~40 hours
Documentation	Manual report generation	Automated with screen captures
Repeatability	One-time engagement	Ongoing seasonal testing
Hidden Issues Found	Limited by sample size	$235K+ annual savings identified

Per ASHRAE RP-1404: Buildings typically experience 15-30% performance degradation over 3-5 years without ongoing commissioning. Autonomous technology makes regular verification economically viable for the first time, enabling the Lifecycle Commissioning® programs envisioned in ASHRAE Guideline 1.7P.

Q+A


Your sequences need therapy.
We're taking appointments.
PingCx


Those functional tests you're dreading?
We automated them
PingCx


Smart building?
Prove it.
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TRIDIUM

Thank you!