Leveraging technology to drive healthcare outcomes

Fault Detection + Diagnostics

FHEA 2024 Fall Expo & Educational Conference

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AIA/CES

Course Description

- **Fault Detection & Diagnostics: Leveraging Technology To Drive Business Outcomes (Course No. BAS404)**

- Building technologies have evolved exponentially in the past decade and the next decade shows continued growth in capabilities and analytics that can be leveraged from these building technologies in order to enhance building operations and drive improvement in business outcomes. Furthermore, the implementation of this new technology is unlocking use case applications that provide value-adds to businesses and all their stakeholders. All the stakeholders (Leadership, facility management, designers and contractors) involved in the digitalization journey need to understand the key challenges, trends, tools, and technologies; as well as the bigger picture vision of what the outcome desired is. This course provides a roadmap on where to begin and how to proceed with leveraging Fault Detection Diagnostics (FDD) technology for managing and optimizing your facilities. This 60-minute course is tailored for architects, engineers, and facilities professionals seeking to optimize facility management. Participants will gain a comprehensive understanding of Fault Detection Diagnostics (FDD) technology, from its components to implementation best practices. Practical insights and a real-world case study to ensure tangible takeaways. The course also provides a forward-looking perspective on emerging trends, empowering participants to proactively enhance their infrastructure efficiency.

- **Learning Objectives**
1. Define Fault Detection & Diagnostics (FDD) and identify its key components within the context of healthcare facilities management.
2. Analyze practical considerations for effective FDD implementation, including the crucial aspects of leadership engagement, workflow optimization, and staff training.
3. Evaluate the role of FDD in addressing business challenges within facilities, using the real-world case study as a practical example.
4. Extract lessons learned from the real-world case study to understand successful FDD implementation strategies.

AGENDA

Jared Galloway
Jackson Health System

JARED GALLOWAY

Jackson Health System

Director of Facilities

Business Management, Florida International University, Miami, FL

1 year

- Assistant Administrator
- Developed SOPs
- Maintenance activities and facility conditions
- Emergency Management- FEMA, CEMP, HSA
- System Reporting

3 years

- Project Manager
- LEAN Construction Facilitator
- $100M Master Facilities Plan (Occupied Facility)
- USP 797/800, Lab retrofit, GI Rebuild, Cath-Labs, IR, CT's, MRIs, Chillers, ATSs

4 years

- Director of Engineering
- Capital Program Administrator
- Systems Integration - AI/ML
- EOC/LS Management
- Chairman- JHS Eng. Council
- Regulatory-AHCA, TJC, DOH, CMS, OSHA, EPA, NIOSH
- Sustainability-Practice Green Health, FPL, TECO Energy, Miami-Dade Water

Paul Salonia
Siemens Smart Infrastructure

8 years

- Design Engineering
- Project Management
- Solution Operations Management

18 years

- Branch General Management
- Sales Management
- Overall Customer Experience
- Employee Experience
- Financial Performance

3 years

- Business Dev. – Digital Services
- Supporting SEZ grow their Digital Business
- Leading with using Cloud, Analytics and Digital Services
- Deployed in Commercial Office, Healthcare, Critical Environments, Higher Education

PAUL SALONIA

Siemens Smart Infrastructure

Business Development Manager – Digital Services

Steven Wagman
Siemens Smart Infrastructure

STEVEN WAGMAN

Siemens Smart Infrastructure

**National Healthcare
Business Leader**

33 years

- Healthcare IT
- Revenue Cycle Management
- Global Services
- Strategic Account Management
- Cybersecurity
- Consulting – Clinical/Financial
- Radiology/PACS
- Design & Construction Services
- Site Planning (Medical Imaging)
- Chair, DE&I – 17,000+ Siemens Medical employees

8 years

- Energy Performance Services
- Healthcare Vertical Market Lead

Volunteer experience

- Board Member, Penn State Health System
- Trustee, Penn State University
- Director, Corporation for Penn State
- President, Penn State Alumni Association
- Advisory Board, NSF Center for Health Organization Transformation (CHOT)
- Advisory Board, MedBuild/Modspace Corp
- Advisory Board, Live It Business Development
- Advisory Board, Education Management Solutions LLC
- Special Olympics
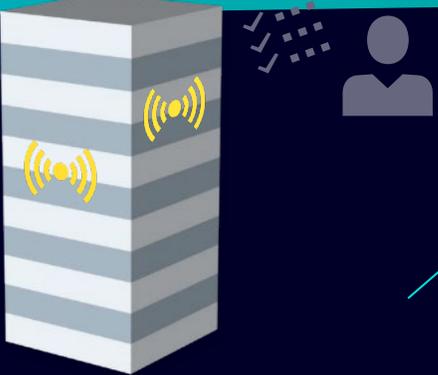
The journey toward smart hospitals
Evolution of building technology

TRADITIONAL
BUILDING

INTEGRATED
BUILDING

SMART
HOSPITAL

FUTURE OF SMART
HOSPITAL
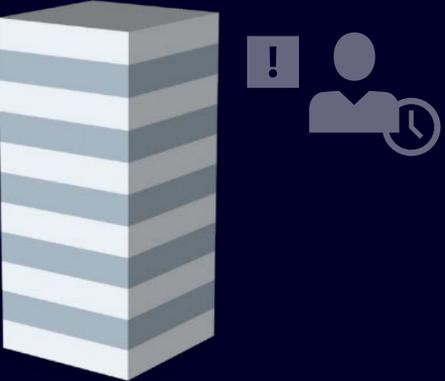
- Siloed, on-premise systems
- Preventive maintenance, on-site
- Pneumatic VAV boxes
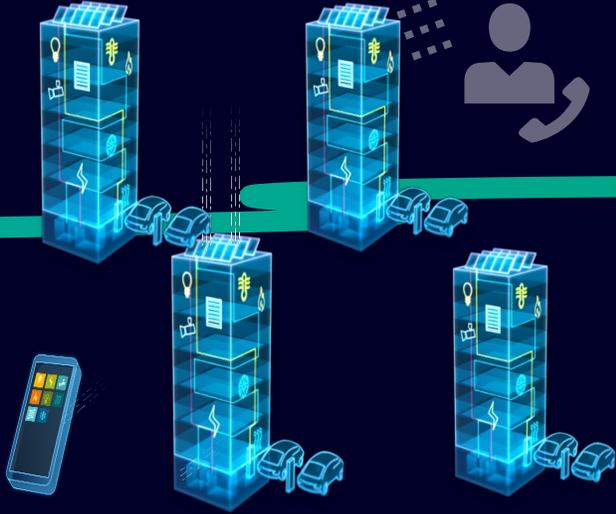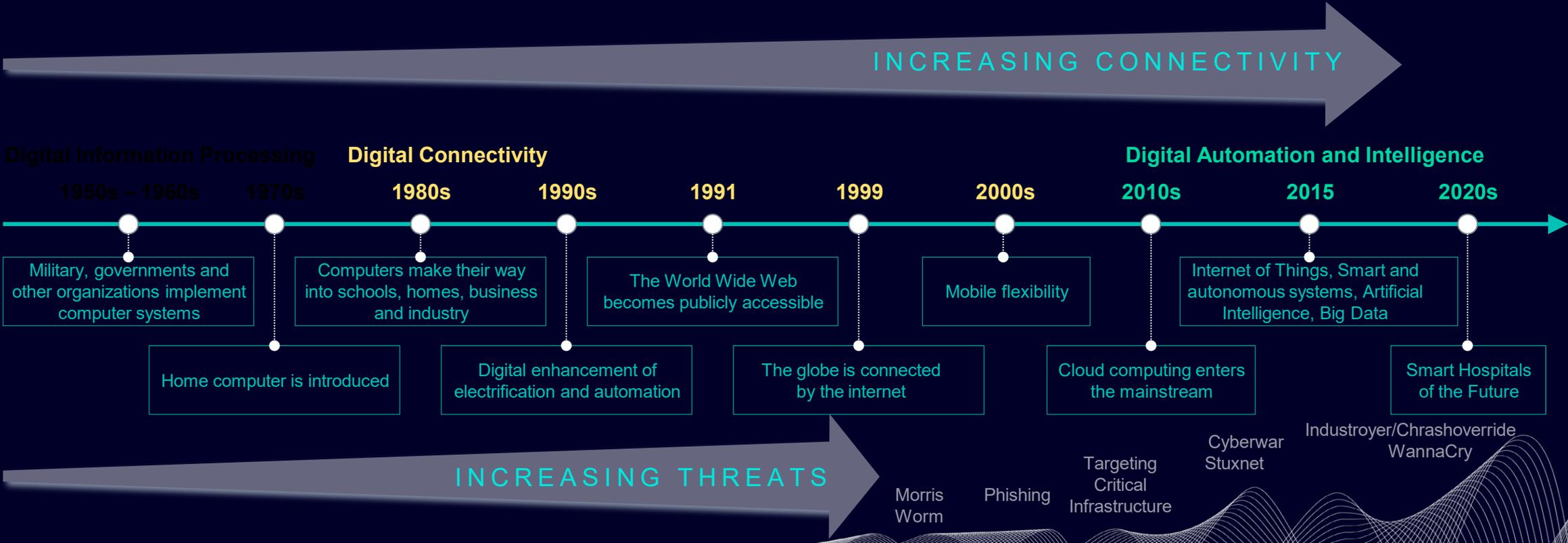
+ Digital Controls

+ Remote diagnostics

+ Integrated building management

+ Internet of Things (IoT) applications

+ Real-time data analytics

+ Single pane of glass

+ "Single pane of glass" building portfolio management

+ Simulation and artificial intelligence based on building twin

+ Self healing building systems

+ Integration of Building/Mobility

Cyberattacks against buildings are on the rise

INCREASING CONNECTIVITY

Digital Information Processing

Digital Connectivity

Digital Automation and Intelligence

| 1950s – 1960s | 1970s | 1980s | 1990s | 1991 | 1999 | 2000s | 2010s | 2015 | 2020s |

Military, governments and other organizations implement computer systems

Home computer is introduced

Computers make their way into schools, homes, business and industry

Digital enhancement of electrification and automation

The World Wide Web becomes publicly accessible

The globe is connected by the internet

Mobile flexibility

Cloud computing enters the mainstream

Internet of Things, Smart and autonomous systems, Artificial Intelligence, Big Data

Smart Hospitals of the Future

INCREASING THREATS

Morris Worm

Phishing

Targeting Critical Infrastructure

Cyberwar Stuxnet

Industroyer/Chrashoverride WannaCry

AT&T Hack Blue Boxing

AOHell

Cryptovirology Level Seven Crew hack

Denial of service attacks

NotPetya

Cloudbleed sl1nk SCADA hacks

Meltdown/Spectre

SolarWinds Stadium

The **threat landscape** keeps **growing** and **changing** and attackers are **targeting IT/OT convergence** and **critical infrastructure**
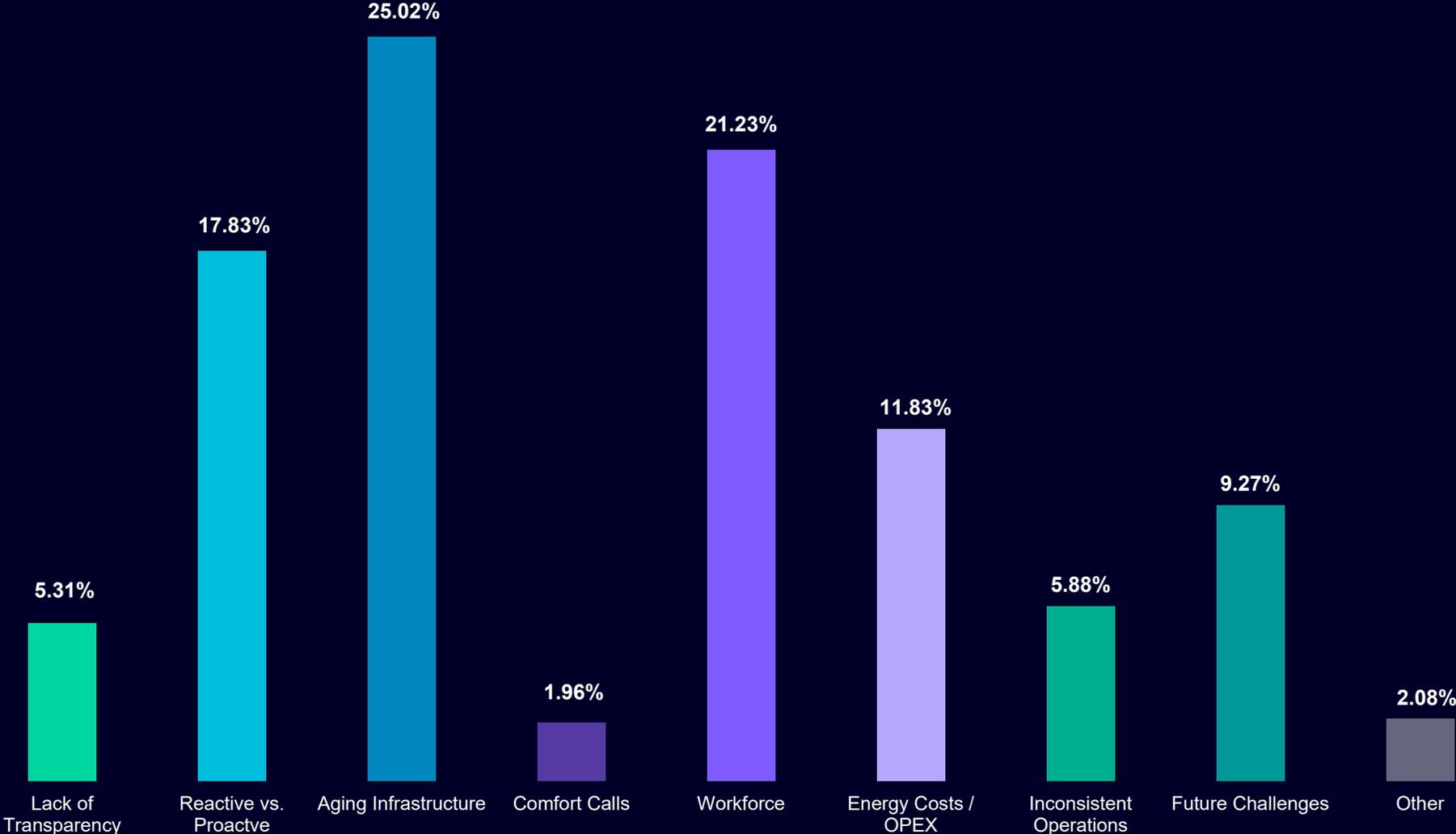
The most common challenges facilities face

Excessive comfort calls, occupant comfort

Aging equipment + infrastructure, system reliability

Overly reactive, rarely proactive

Lack of transparency

Workforce (overworked, understaffed, training)

Rising operating + energy costs

Inconsistent operation across portfolio

Future challenges

Technology expectations and challenges
Customer feedback

5.31%	17.83%	25.02%	1.96%	21.23%	11.83%	5.88%	9.27%	2.08%
Lack of Transparency	Reactive vs. Proactve	Aging Infrastructure	Comfort Calls	Workforce	Energy Costs / OPEX	Inconsistent Operations	Future Challenges	Other

Vision and leadership engagement

1

Developing the vision

2

Communicating the vision

3

Engaging early + often

Technology expectations and challenges
Connecting executives with operations

HEALTHCARE

Patient outcomes → Top clinician talent → Compliance uptime → Precise OR control → Temperature, humidity, pressure, airflow

BUSINESS GOALS

- Profitability
- Growth
- Safety
- Compliance
- Best-in-class facilities
- Operational efficiency
- Best-in-class staff

FACILITY KPIs

- Indoor environmental conditions
- System performance
- Energy + operating costs
- Workflow optimization
- Safety + compliance
- Uptime + system lifecycle

Why it's difficult to understand what your building data is telling you
Today: data management and alarm fatigue

MORE DEVICES

Fire

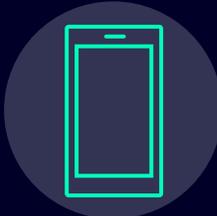BAS

Security

Lighting

MORE PROGRAMS

IoT

CMMS

Occupant apps

FDD

MORE PROBLEMS

Skilled technicians and operators are hard to keep, hire, and replace.

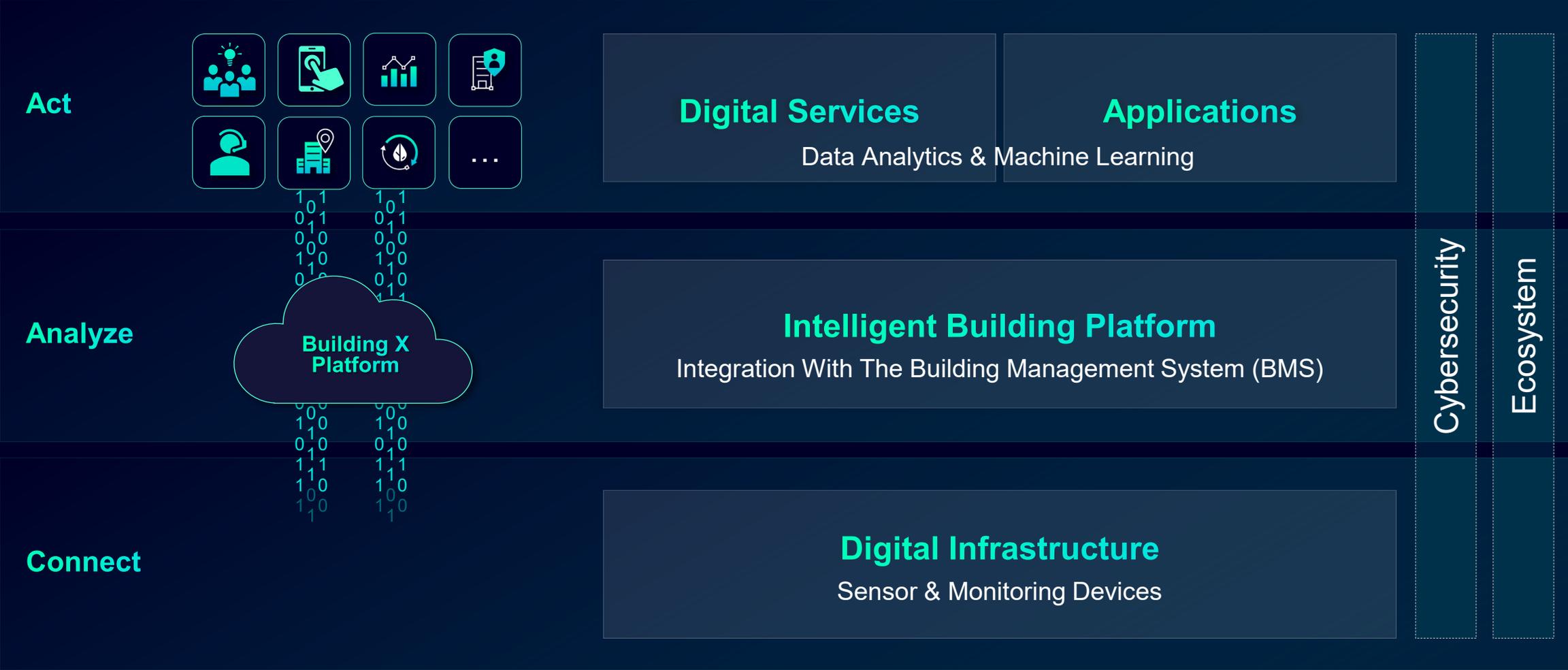Facility managers are buried in notifications, alarms, and faults.

IoT and ubiquitous sensing compounds notification fatigue.

Troubleshooting is a labor-intensive and high-skill activity.

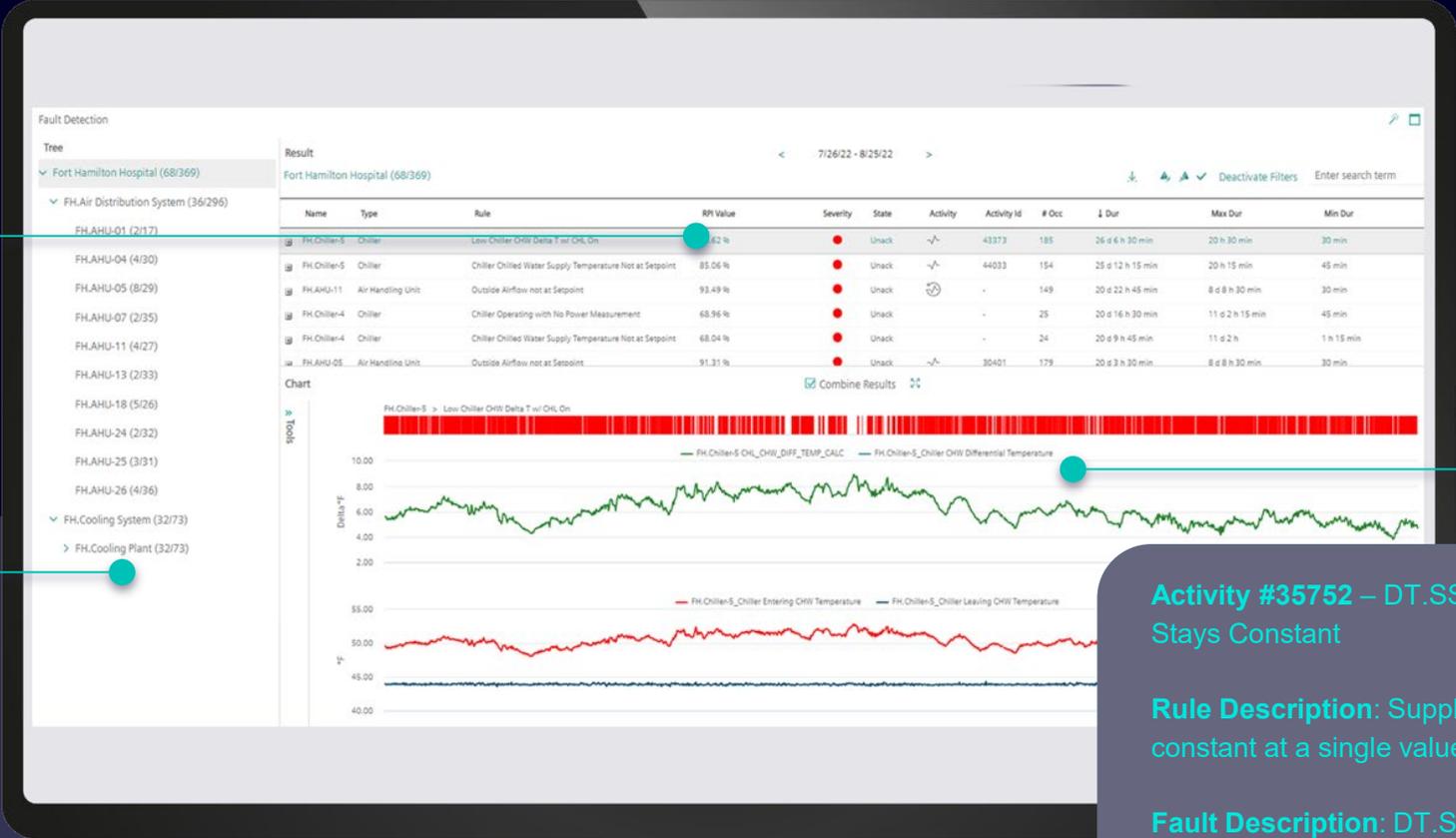# Smart building framework
Key components

Act

Digital Services   **Applications**

Data Analytics & Machine Learning

Building X
Platform

Analyze

Intelligent Building Platform

Integration With The Building Management System (BMS)

Connect

Digital Infrastructure

Sensor & Monitoring Devices

Cybersecurity

Ecosystem

Fault detection dashboard

Triggered rules

Asset list
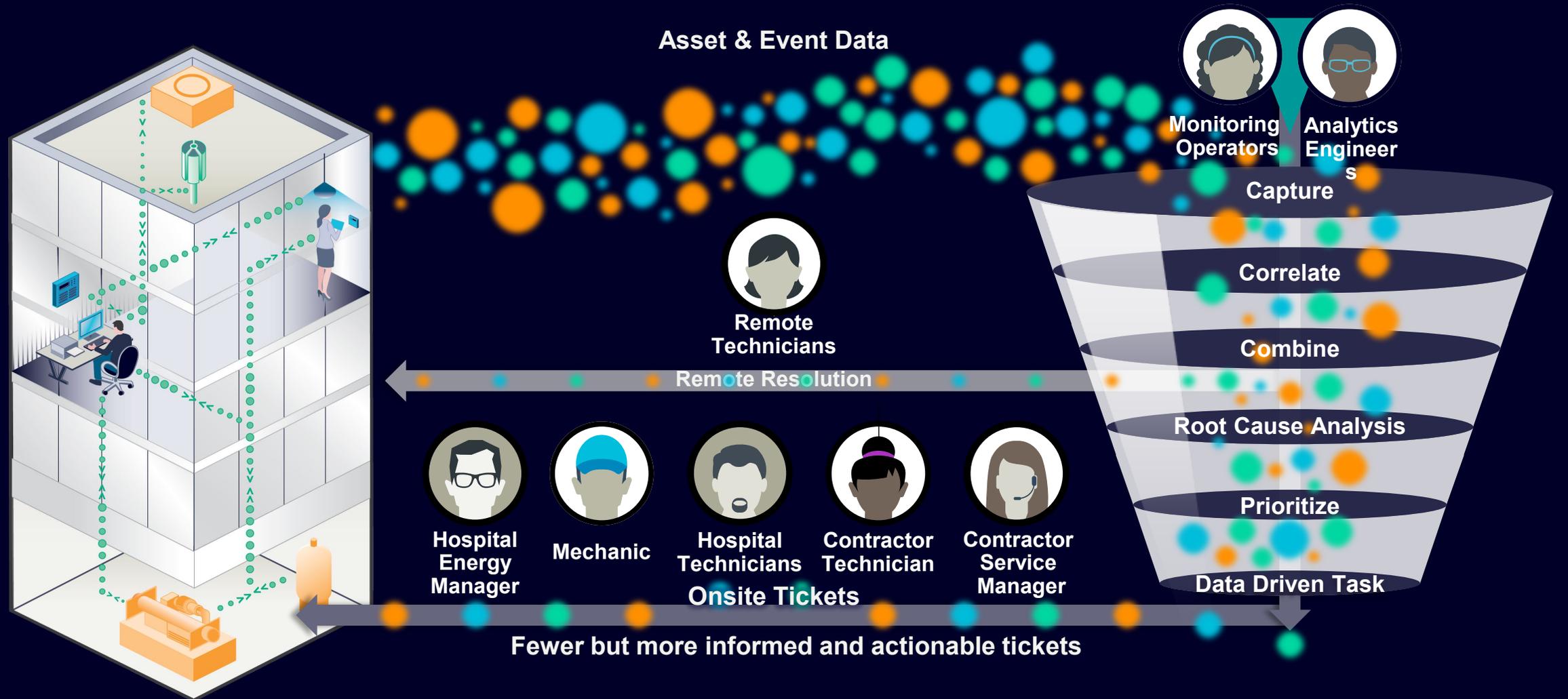
Fault performance data

Activity #35752 – DT.SSPH.AHU01_SF VFD Speed Stays Constant

Rule Description: Supply fan VFD speed is remaining constant at a single value for an extended period of time.
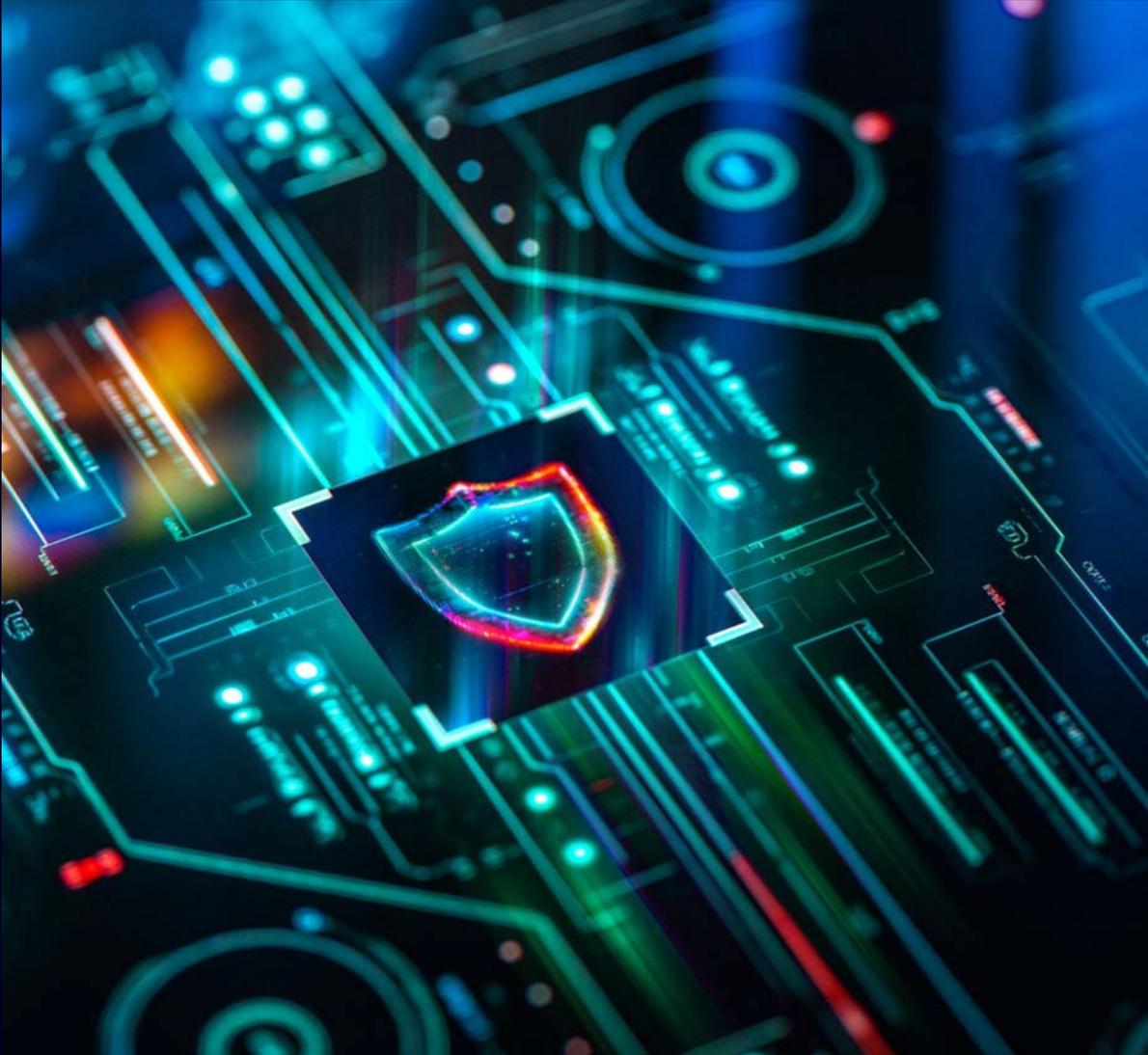
Fault Description: DT.SSPH.AHU01_SF VFD Speed Stays Constant. The units SF VFD Speed is observed to run at a constant 100%. Review the Supply Fan Speed control (line 08483) of the PPCL for better control. It appears that the point 'SP.AHU.01.CCO' is controlling the supply airflow setpoint.

Better workflows = better outcomes
One data-rich workflow eliminates redundant efforts and acts as a workforce multiplier

Asset & Event Data

Monitoring Operators

Analytics Engineers

Capture

Correlate

Combine

Remote Technicians

Remote Resolution

Root Cause Analysis

Hospital Energy Manager

Mechanic

Hospital Technicians

Contractor Technician

Contractor Service Manager

Prioritize

Onsite Tickets

Data Driven Task

Fewer but more informed and actionable tickets

Network infrastructure and cybersecurity

- ✓ Virtualization of the BMS software

- ✓ Secure remote connectivity to the BMS data

- ✓ Dedicated VLANs for the BMS hardware

- ✓ Standardization (naming conventions, BACnet configuration, etc.)

- ✓ BACnet Secure Connect (BACnet/SC)

Implementation approach

1 ASSESSMENT
Digital readiness check

2 APPROACH
One-time / turnkey project vs. phased-out approach

3 MONITORING
and evaluation

Workflow optimization + staff engagement

WORKFLOW

1 Plan beyond the technology stack

2 From fault detection to fault resolution
- In-house vs. contracted service support
- Remote vs. onsite resolution
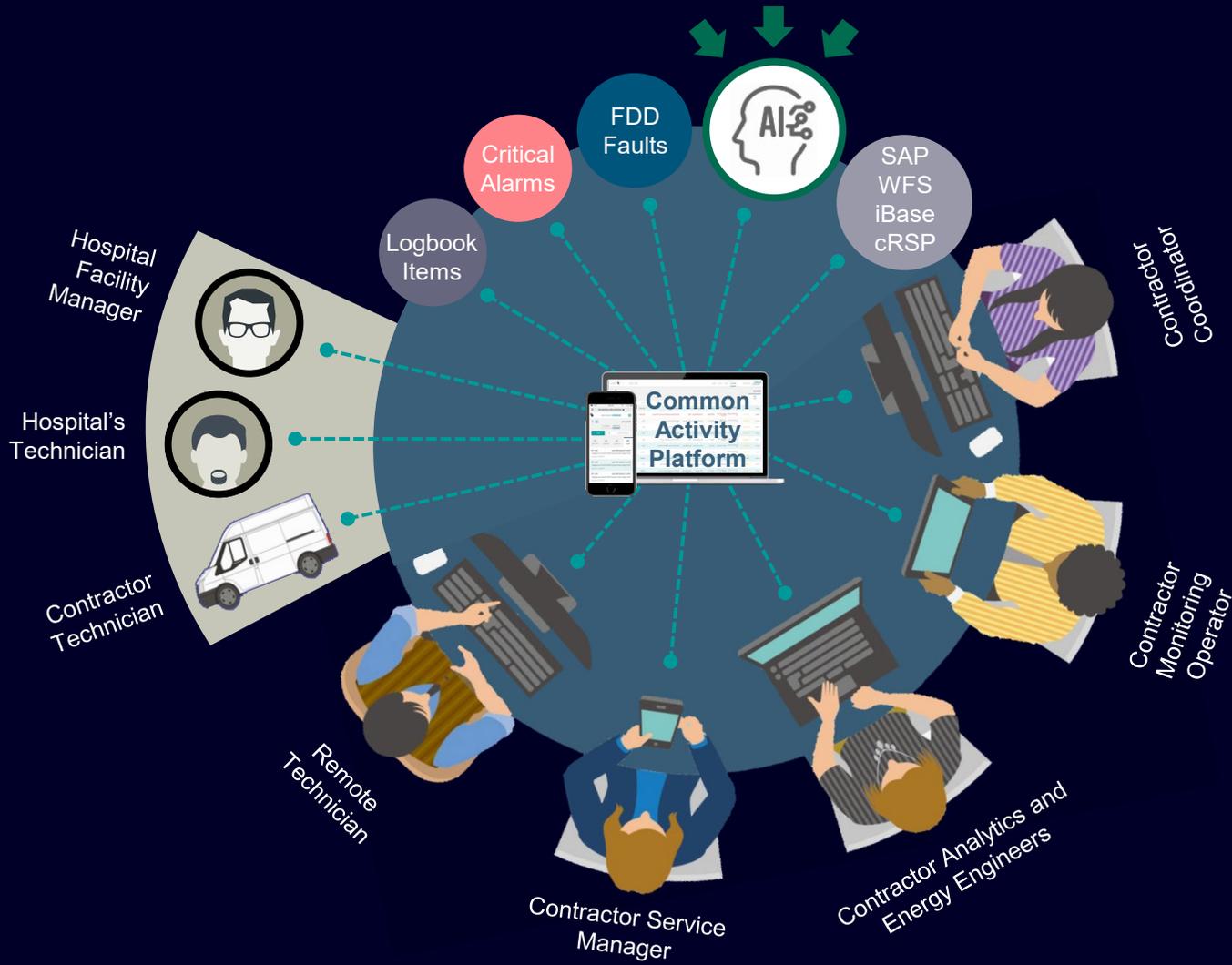
3 Roles + responsibilities

STAFF TRAINING

- Communication and collaboration
- Feedback mechanisms

IMPORTANCE OF STAFF INVOLVEMENT

CREATING A CULTURE OF PROACTIVE MAINTENANCE

CONTINUOUS MONITORING + REPORTING

All stakeholders having a seat at the table

The **right** data to the **right** person at the **right** time for the **right** action

… assisted by to further boost productivity

Jackson North Medical Center

The facilities team needed to identify and address deficiencies; they were also concerned with increasing operations and maintenance costs.

PROJECT

Siemens installed Fault Detection + Diagnostics (FDD) in the chiller plant and three air handling units.

RESULTS

- The equipment-specific information will reduce time and increase accuracy when creating future CAPEX and OPEX budgets and future reserve studies
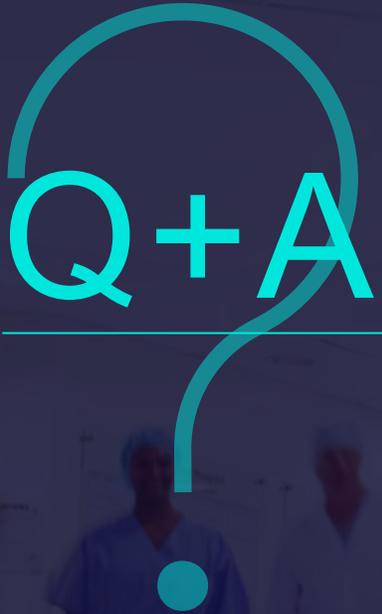
- Operator time savings

- Energy savings

LESSONS LEARNED

- Implementation to internalization phase

NEXT PHASE

- Expand FDD across campus

Q+A

JARED GALLOWAY

Jackson Health System

Director of Facilities

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