

WHAT IS A SMART BUILDING

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Newcomb & Boyd
CONSULTANTS AND ENGINEERS

INTRODUCTION

MEET THE TEAM



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PE, CEM

Director, Energy and
Sustainability

Intelligent Buildings

get organized, get connected, get value

get organized

- Discovery / Assessment
- Planning
- Programming

get connected

- Field Evaluation / Drawing Review
- Stakeholder Coordination
- Generate Designs
- Procurement Assistance
- Standards Development

get value

- Performance Optimization
- Operational Efficiency
- Occupant Benefits

**SMART
BUILDINGS**

SMART BUILDING BUSINESS DRIVERS

It's important to identify early on what business factors are driving the smart building program. It can be one or more of the following priorities.

- **Energy and Resource efficiency**
- **Operational efficiency**
- **Building performance**
- **Cybersecurity**

- **Occupant Wellness + Productivity**
- **Attracting + Retaining Talent**
- **Attracting + Retaining Tenants**
- **Digital Transformation**

It's important to understand the underlying business drivers and tailor language and solutions accordingly.

SMART BUILDING BUSINESS DRIVERS



SMART BUILDING BUSINESS DRIVERS



SMART BUILDING BUSINESS DRIVERS

THE WELL BUILDING STANDARD™

SEVEN CONCEPTS FOR HEALTHIER BUILDINGS



AIR



WATER



NOURISHMENT



LIGHT



FITNESS



COMFORT



MIND

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SMART BUILDING BUSINESS DRIVERS



CORE SMART BUILDING ELEMENTS

The business drivers are diverse and application solutions may be as well, but there are some commonalities between all or most smart building and smart portfolio projects.

- **Connected systems**

- **More sensor data (in most cases)**

- **More sophisticated controls (in most cases)**

- **Intentional flexibility for evolution**

- **Greater emphasis on building and portfolio lifecycle**

- **More appreciation for the value of data**

- **Evolved ways of operating and maintaining**

These core elements form the baseline for most conversations.

**CONSULTIN
G +
DESIGN**

SMART BUILDING TEAM

There are at least three key members on successful smart building projects.



Internal Champion

A member of the Owner's team who has a vision and the influence to shape budgets, processes and multi-lateral buy-in within the customer organization.



Strategy Consultant

In some rare cases, end users have a well-defined smart building strategy in place, but most often, a consultant is required to help bring stakeholders together and establish a vision and methodology.



Design Consultant

The project design team will need consultants and engineers who can advocate for smart building, lead decision-making and implement the strategy with construction documents; specifications, drawings, etc.

DESIGN CONSULTANTS & ENGINEERS

Q

Do we really need a Smart Building Team?



A

Much the same way you look to a LEED consultant to walk you through the process, answer questions, facilitate specialized meetings and prepare unique documents, it pays to have a smart building consultant on the team.



SMART PROJECT DELIVERY

DELIVERING SMART PROJECTS

Smart Building Consulting Engineering Services

- Budgetary Estimates

- Technology Overview Presentations/Briefs

- IAQ
- People Counting
- PoE Lighting

- MSI Scope of Work (RFP or Spec)

- Peer Reviews for Smart Building Readiness/Compliance

- Division 25 Commissioning Activities

- Emerging Technology Review

- Smart Building/Technology Troubleshooting & Consulting

- Existing Conditions Discovery/Smart Building Readiness Evaluation

- Standards/Masters development

- Smart Building Program Mgmt/Owner Rep

- Smart Building Project Management

- Pilot Project Planning

DELIVERING SMART PROJECTS

Smart Building Consulting Engineering Deliverables

■ Div 25 Specifications

■ OT Drawing – Architecture Diagrams

■ OT Drawing – Division of Scope

■ OT Drawing – IoT Device Locations

■ OT Drawing – IoT Device Install

■ OT Drawing – OT Network

■ Div 22 Recommendations (Plumbing)

■ Div 23 Recommendations (HVAC)

■ Div 26 Recommendations (Electrical Power/Lighting)

■ Div 27 Recommendations (Structured Cabling/AV)

■ Div 28 Recommendations (Security & Life Safety)

■ Div 14 Recommendations (Elevator)

■ Div 12/26 Recommendations (Automated Shades)

SMART BUILDING THOUGHT LEADERSHIP

Sample Smart Building Programming Agenda Items

1. Unified User Interface – Single Pane of Glass Operational Platform

- Building Automation System
- Lighting Control System
- Energy and Water Metering
- Fire Alarm System – Information only, no control
- Elevator System – Status only, no control
- Major Equipment Status – Chiller, Generators, UPS

2. Fault Detection and Diagnostics – Operational Analytics

3. IoT Devices – Supplemental Information for Informed Operations

- Occupancy Information
- People Counting
- Device Tracking
- Indoor Air Quality Sensors

SMART BUILDING THOUGHT LEADERSHIP

Sample Smart Building Workshop Facilitation

1. Security Workshop

- Mobile Credentialing & App Interface
- Visitor Management System
- Parking Availability

2. Information Technology Workshop

- Cloud vs On Prem for Smart Building Applications
- Wired vs Wireless Devices
- Indoor Positioning Technology (WiFi, BLE Beacons)

3. Occupant Engagement & Satisfaction Workshop

- Occupant Mobile Application
- User Interface to Operational Systems (Lighting, HVAC)
- Wayfinding
- Space Reservation
- Meal Ordering or Status

SMART BUILDING THOUGHT LEADERSHIP

Sample Smart Building Programming Agenda Items

1. Which features will be required in the Occupant Experience Application?
2. Should any additional features be listed as an Alternate?
3. What level of granularity will be required for services?
4. Will occupants have “opt-in” for personalized service vs. anonymous usage of the App?
5. What other amenities should be included in the “near me” services or reservable?
6. Are there any other NS Applications that need to be integrated or accessible from the mobile App?

SMART BUILDING THOUGHT LEADERSHIP

Sample Smart Building Workshop Discussion Items

1. Which systems will be considered for operational platforms?

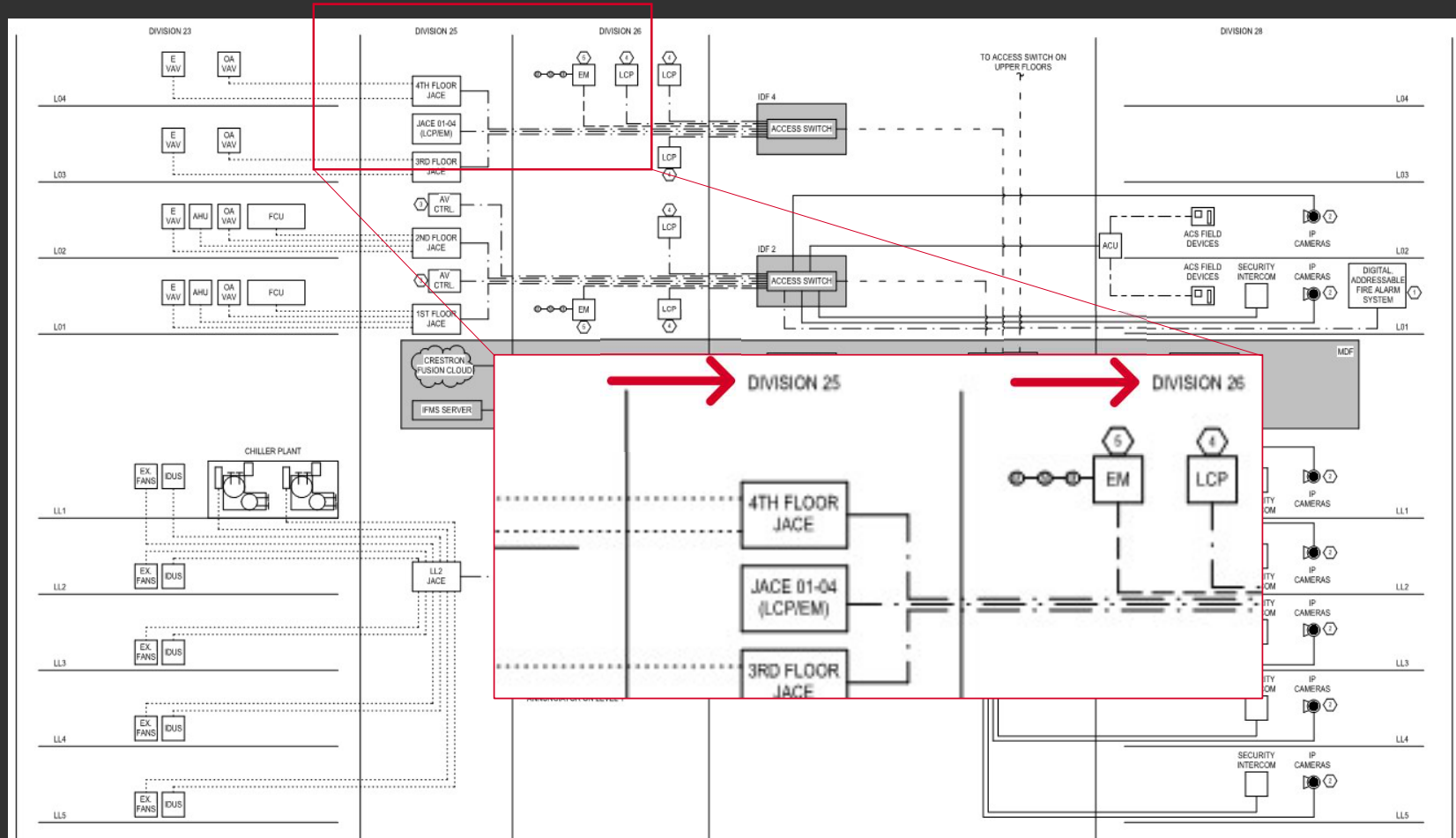
- Will an integration platform be provided on top or use a single manufacturer's system?
- Will an MSI be needed?
- Will a Smart Building Platform be the central data repository for all technology related building systems?
- Will analytics be applied to all systems or just FDD for HVAC?

2. What features are required for Lighting Control?

- Occupancy sensors to cover each zone?
- Additional BLE beacons for IPS?
- People counting sensors in strategic areas or throughout?
- Is individual control needed for any areas through the App?
- Lighting Control (shades, HVAC) controlled through AV interface in conference rooms?

3. Independent IAQ sensors or just utilize sensors by BAS manufacturer?

IDENTIFYING DIVISION OF SCOPE

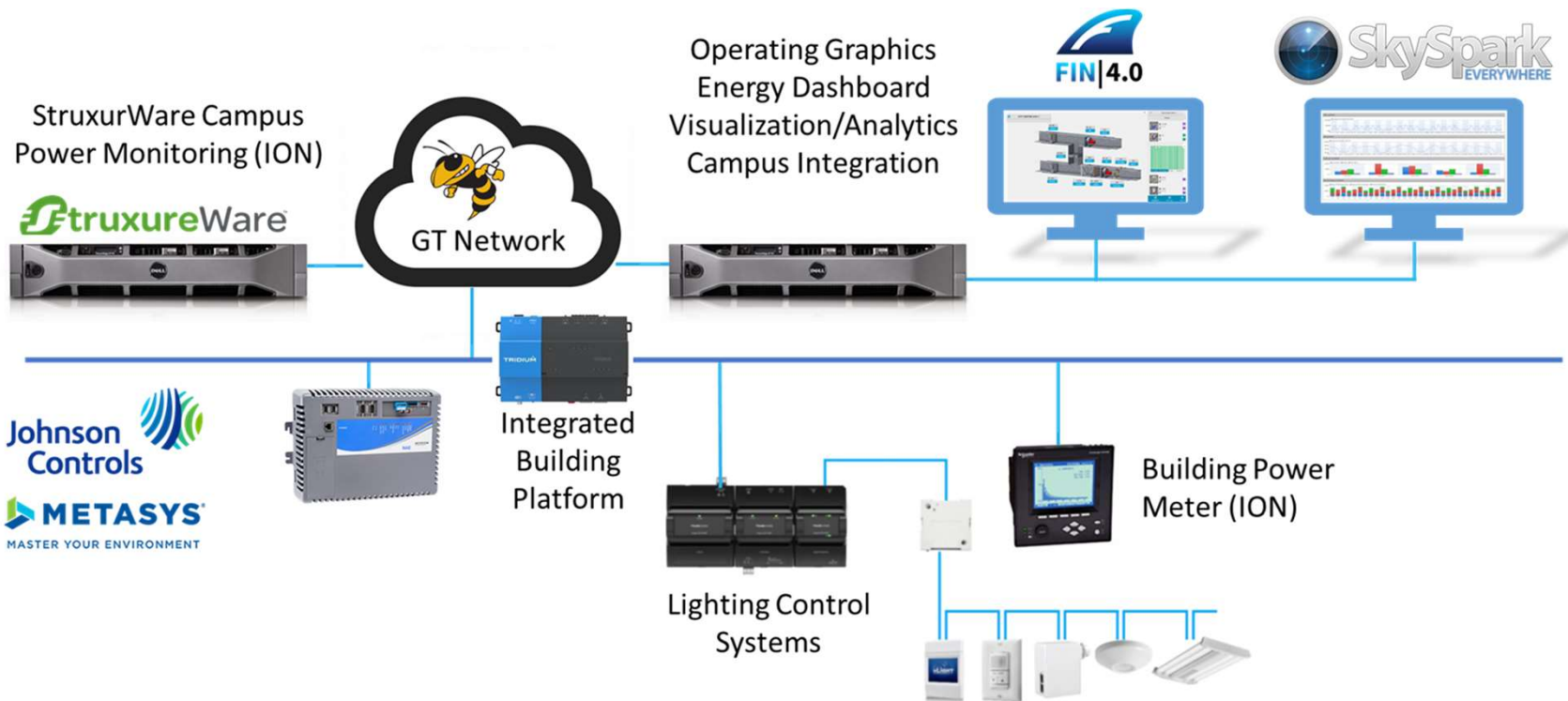


BAS OPEN PROTOCOL



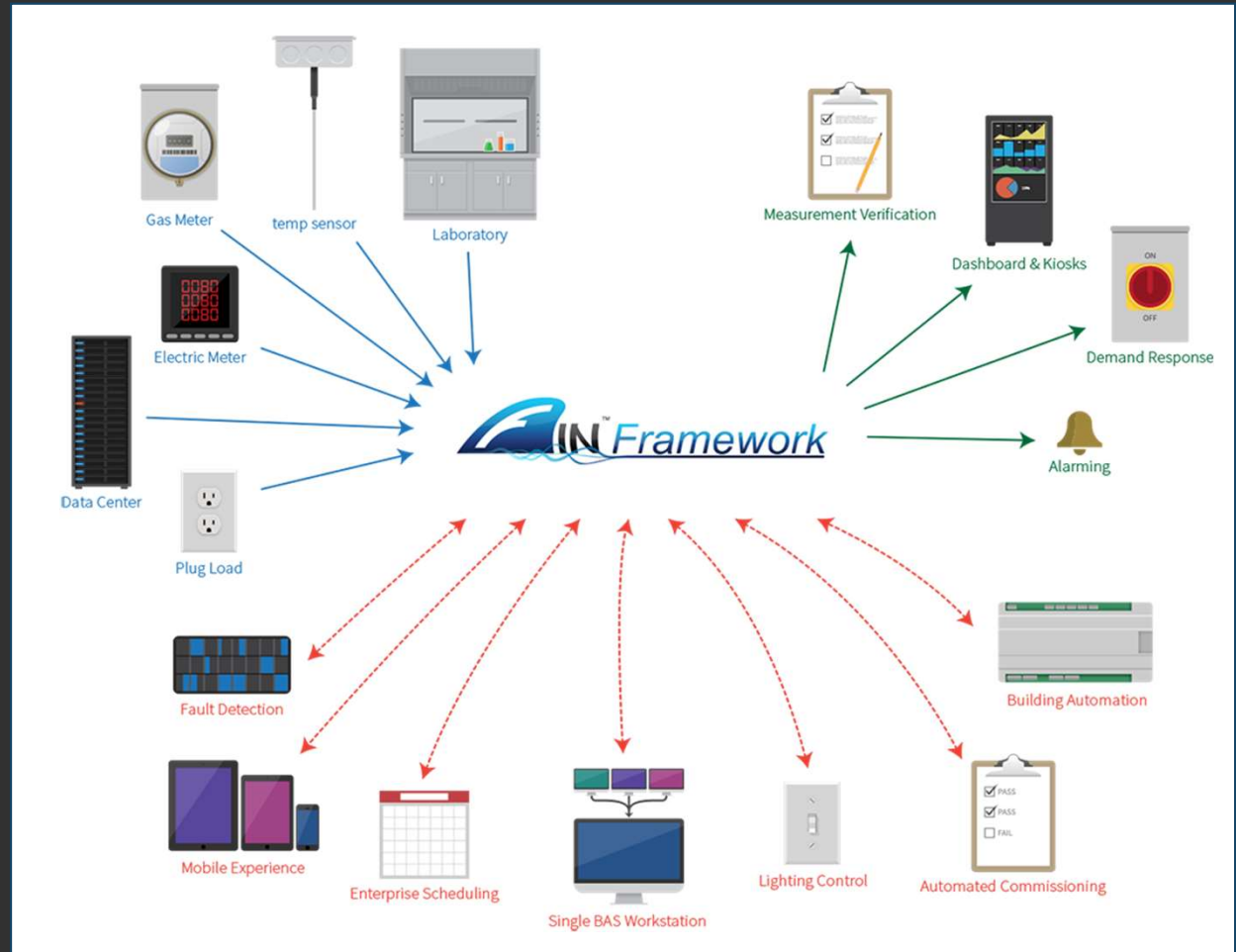
TECHNOLOG Y HIGHLIGHTS

INTEGRATED SYSTEMS



COMMON FRAMEWORK

Operations focused ecosystem



HAYSTACK TAGGING

- Normalized data via tagging

- Automating data visualization

- Automating analytics

Project  Haystack

ANALYTICS

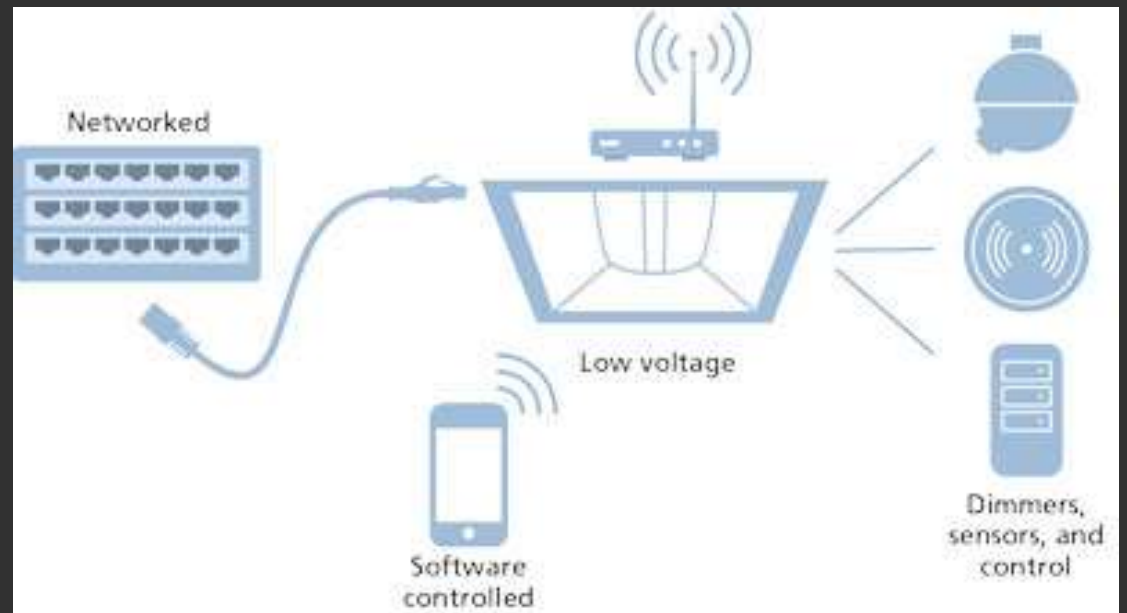


ENERGY FAULTS	COMFORT FAULTS	MAINTENANCE FAULTS	MISC. FAULTS
<p>An Energy Fault identifies an operation that may result in inefficient use of energy. This may relate to a sequence, a piece of equipment or operation scheduling.</p> <p>Report: 1 day 1 week 1 month 1 year</p>	<p>A Comfort Fault identifies building issues that may result in a negative occupant experience, such as temperature or humidity concerns.</p> <p>Report: 1 day 1 week 1 month 1 year</p>	<p>A Maintenance Fault identifies maintenance tasks that require attention based on live data rather than typical scheduling. This may include identifying the need to replace a filter based on it's cleanliness rather than the time of year.</p> <p>Report: 1 day 1 week 1 month 1 year</p>	<p>A Miscellaneous Fault identifies a broken rule that does not yet fall into the other categories. This does not indicate a lower priority, as miscellaneous faults may become energy, comfort or maintenance faults if not addressed properly.</p> <p>Report: 1 day 1 week 1 month 1 year</p>
15	16	24	35
TOTAL ENERGY FAULTS	TOTAL COMFORT FAULTS	TOTAL MAINTENANCE FAULTS	TOTAL MISCELLANEOUS FAULTS
<p>TOP 3 ENERGY FAULTS</p> <p>AHU Faulty Econ While Cooling 6</p> <p><i>This unit appears to be using mechanical cooling while also using its economizer. Please check cooling and damper operation.</i></p> <p>AHU Static Pressure is Off-Setpoint 6</p> <p><i>This AHU's static pressure exceeds the acceptable tolerance of setpoint.</i></p> <p>AHU All Day Operation 3</p> <p><i>There is indication that this AHU was in operation for this entire 24hr period. Please verify AHU schedule and zone occupancies.</i></p>	<p>TOP 3 COMFORT FAULTS</p> <p>VAV Zone Temp Off Setpoint 13</p> <p><i>This vav is having trouble meeting setpoint. Please check zone setpoints and temperature sensor.</i></p> <p>AHU No Fresh Air While Occupied 3</p> <p><i>There are instances where the outside air damper indicates that it is closed during occupied periods. Please verify damper operation and minimum position setpoint.</i></p> <p>Null Null Null</p>	<p>TOP 3 MAINTENANCE FAULTS</p> <p>VAV Heat Malfunction 15</p> <p><i>This rule checks for situations where the heat is on without a command by looking at the discharge air temperature.</i></p> <p>AHU Outside Temperature Mismatch 3</p> <p><i>There appears to be a considerable difference between the readings of available indicators of outside air temperature. Please check sensors.</i></p> <p>AHU Cooling Failure 2</p> <p><i>This AHU should be actively cooling, but it appears as though there is no decrease in discharge air temperature. Please check discharge temperature sensor and cooling operation.</i></p>	<p>TOP 3 MISCELLANEOUS FAULTS</p> <p>Sensor has Failed 27</p> <p><i>Data indicates that this sensor may have failed. Please check sensor operation.</i></p> <p>Meter: Improper Power Factor 4</p> <p><i>Power Factor should be between 0.75 and 1.0. Please check PF sensor.</i></p> <p>AHU Invalid OAD Minimum Position 2</p> <p><i>When checking outside damper history over the past week, it appears as though the minimum damper position setpoint is too low or non-existent. Please check damper operations.</i></p>

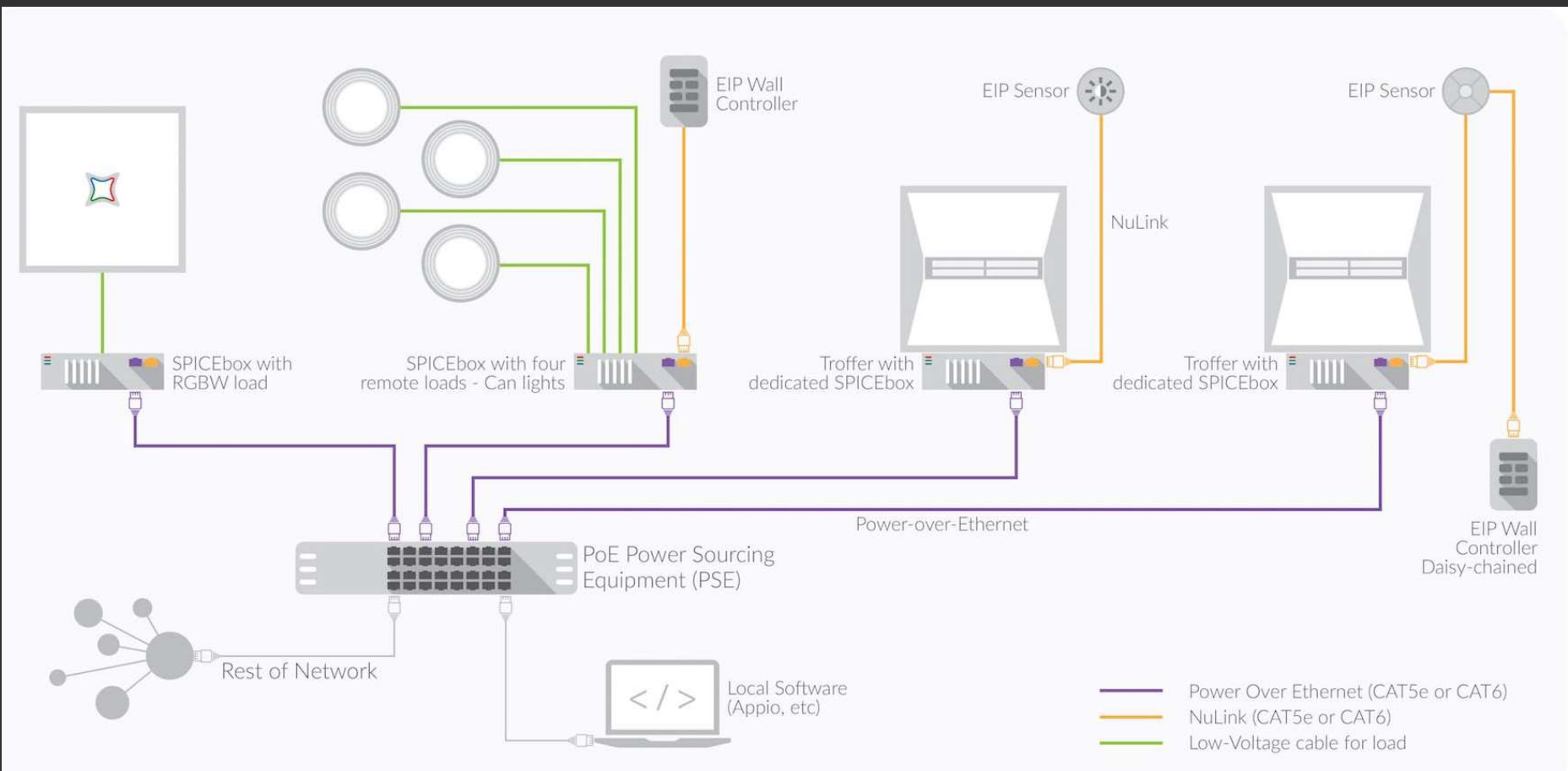
POE LIGHTING

- LED lighting fixtures powered and controlled over the network

- Single cable for both power and control



POE LIGHTING: TODAY



BAS IP ENABLED

- Network connected vs Network centric

- Data throughput

- Dual port switch vs. POE powered



SPACE UTILIZATION



OCCUPANT EXPERIENCE MOBILE APPLICATION

Room reservations

Wayfinding

Occupant feedback

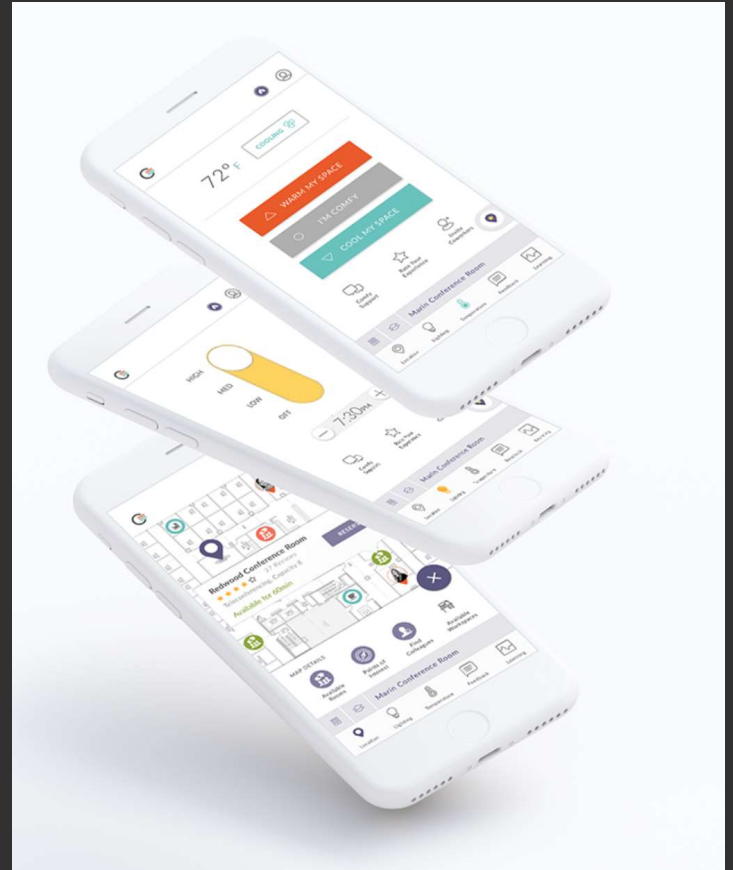
Near-me services

Personal temperature controls

Lighting controls

Food Ordering (Food Vendor Integration)

Parking Availability (Parking Management Integration)



LIGHTING / HVAC INTEGRATION

- Single sensor / multifunction

- AV equipment

- Lighting

- HVAC setbacks



OPTIMIZED SYSTEM – FLOOR LEVEL

- Controlling lights and plug loads

- Overcooling empty spaces

- Overcooling & Reheating

- Over-pressurized systems

- Reduce fan speeds

- Reduce pump speeds



OPTIMIZED SYSTEM – BUILDING LEVEL

- Understanding needs for the connected loads

- Optimizing chiller/boiler efficiency



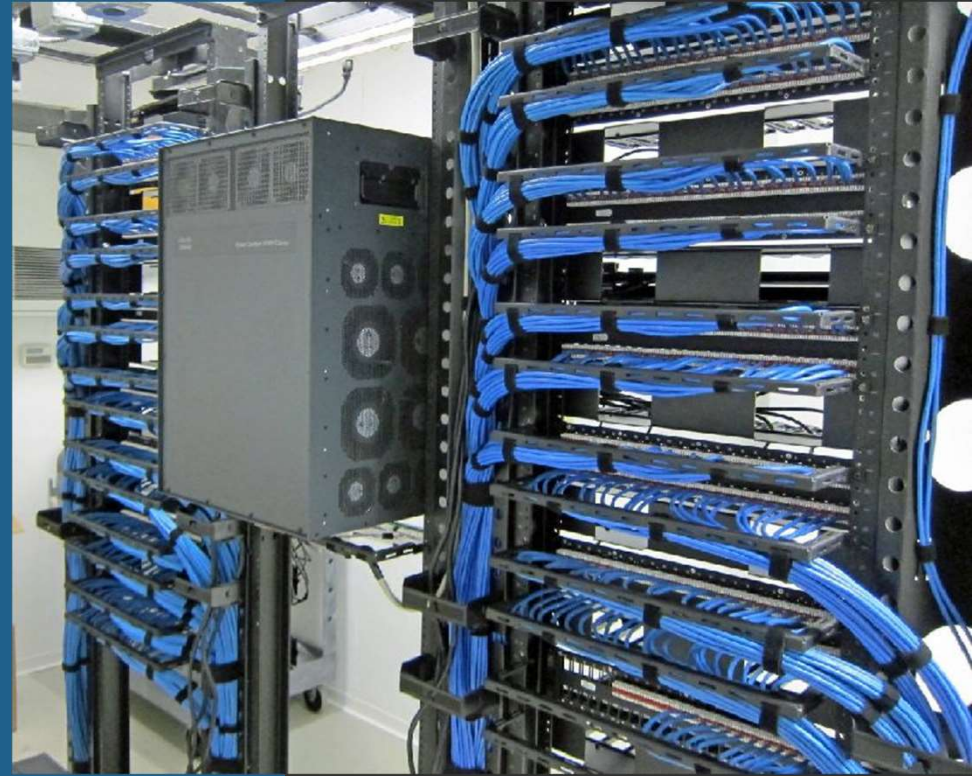
IAQ SENSORS

- Temperature
- Humidity
- CO2
- TVOCs
- Fine Dust (PM2.5)
- Ambient Light Level
- Ambient Noise Level
- RESET Certified



CONVERGED CABLING

- Single installation contractor
- Uniform cable management
- IP based systems or technology over twisted pair
- Network, Wi-Fi, Security, AV



CONVERGED NETWORK

Enterprise LAN

Security LAN

Facilities LAN

IoT LAN

Converged LAN with VLANs Firewallled

Maintain security and manage remote access



WIRELESS PRIMARY vs WIRELESS ONLY

- Wireless users / wired devices

- Flexibility

- Single wire design

- Location services enabled

- Integrated Bluetooth Beacons



INDOOR POSITIONING SYSTEMS

Wi-Fi with IPS

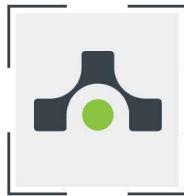
Bluetooth Beacons

Integrated Lighting Control/Fixtures

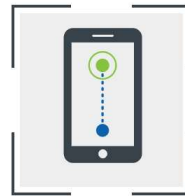
The modern wireless network powered by the cloud.



WI-FI
WITH ASSURANCE



MARVIS
VIRTUAL ASSISTANT



USER
ENGAGEMENT



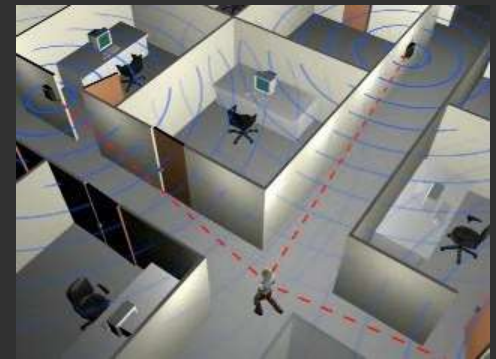
ASSET
VISIBILITY

POSITIONING: BLE vs WPS

- Bluetooth Low Energy requires beacons, often battery powered

- Wi-Fi Positioning is software only – leverages existing system

- Can be used simultaneously



POSITIONING: PRIVACY

- Bluetooth requires opt-in

- Wi-Fi does not require opt-in

- Both enable users to choose how much data is gathered



MODERN OFFICE SPACE



SYSTEM CONTROL FROM MOBILE DEVICE

- Control AV, lighting, and HVAC

- Based on your credentials and location in building



SPACE AND TECHNOLOGY RESERVATION

Find peers

Find technology



RESERVATIONS

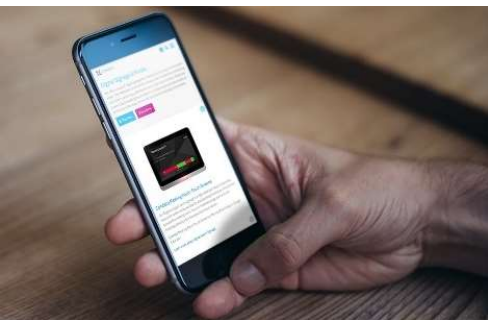
- Central platform for reserving meeting spaces and hotdesks
- Native integration with common calendar systems, like Office 365
- Unify the experience



DEVICE AGNOSTIC RESERVATIONS

- Multi-platform reservations that support any workflow

- Use kiosk, scheduling panel, desktop, or mobile device



KEYS TO SUCCESS

KEYS TO SUCCESS

- Starting with Strategy
- Alignment with GC and Procurement Strategies
- Early Budget Setting
- Champion on the Client Side
- Choosing and Integrator MSI
- Solve Business Challenges

There are many lessons learned and process improvements that a Smart Building Consultant and design team can offer.



KEYS TO SUCCESS – STRATEGY FIRST

Smart Building and Portfolio projects often struggle without a strategic plan to serve as mandate. Without one, a project can suffer the following:

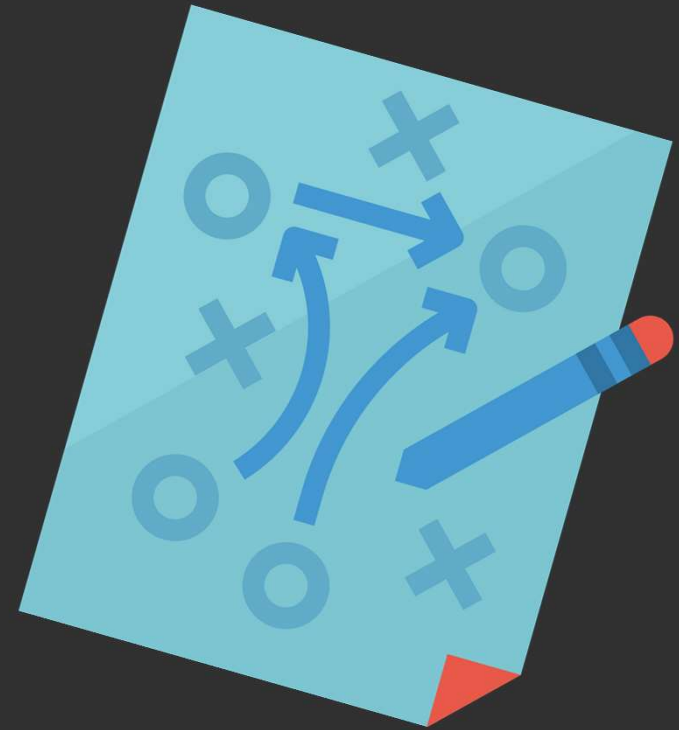
- Ideas without action

- Lack of coordination

- Elements “VE’d” out easily

- No way to tell if a proposed system is ‘worth it’

- No way to define success



KEYS TO SUCCESS – PROCUREMENT

Procurement strategy is a key area where smart building projects benefit from experienced professionals

- Contracting Structure

- Scope Guidance & Gap Analysis

- Direct-to-Owner Scope Development



Budget Strategy is equally critical.

- Early project budget setting

- CapEX vs OpEX Decisions

- Estimates for emerging technology not covered by most estimators

BUILDINGS vs PORTFOLIOS

BUILDINGS vs PORTFOLIOS

Think big! Projects pursued at an enterprise or institution at the highest levels can be easier to find success. Portfolio-level projects offer:

- 01** Have access to different and often larger funding vehicles.
- 02** Decisions are made at higher levels, providing project mandates that are hard to “value engineer” out of projects
- 03** Bigger customer impacts
- 04** Greater Scalability



■ CONCLUSION and QUESTIONS



THANK YOU