Introduction
Ramsey Nuwar, Director, Vertical Market - Airports

Airline Operations Experience
Airport Concession Experience
Airport Technology Experience

1. Data & Digitally Driven Solutions
2. When & How to Connect
3. Why Connected Technology
Our Passion
Safer, Smarter Connected Buildings and Cities
The Smart Micro City

- Safe
  - Frictionless
  - Intelligent

- Intelligent
  - Insightful
  - Targeted

- Welcoming
  - Concierge
  - Omni-Experience

- Destination
  - Just-in-Time
  - Business Oriented

- Sustainable
  - Green
  - Carbon Neutral

A destination location
Making the airport of the future now

The New Expectation // Always Learning and Improving
Connecting the Dots

Business Outcomes

Data, Data, Data

Partnerships

From Idea to Reality

Procurement

Digital Transformation
Connecting the Dots

- Business Outcomes
- Data, Data, Data
- Sustainability
- From Idea to Reality
- Partnerships

Digital Transformation
The Future of Built Environment is the convergence / intersection point of Design, Technology, People that will transform the way we learn, live, work, and play.

People & Social Communities
(Experience / productivity / wellness)

Occupant Experience, Social Interaction, Collaboration, Innovation – boost employee performance & productivity

Architecture & Design
(place/space)

Space Efficiency & Optimization, activated and vibrant spaces – revenue enablement

Technology
(Assets/IT/OT)

Data-driven & AI-enabled Building technologies to drive energy & asset optimization, Enterprise Security & Safety
Building Technologies are being transformed

Currently products and applications are on numerous platforms that do not converge into a single platform.

All Building Technology products and applications will be on a consistent industry accepted platform that can extract data from all devices which will enable clients to achieve specific desired outcomes.
OLD FOCUS

• Sustainability + Energy
• Collaboration + Interaction
• Product
• Insight
• Automation
• Proprietary
• Structured
• Individual Smart Systems

NEW FOCUS

• Experience + Outcomes
• Community Innovation & Wellness
• “as a Service”
• Optimization
• Autonomous
• Ecosystem
• Agile
• Platform + Applications
Digital Solutions
The New Expectation

1. Buildings
   Building Controls
   Security
   Energy

2. Data
   Device Data
   Customer Data
   External Data

3. Technology
   IoT
   Analytics
   AI

4. People
   Passengers
   Employees
   Visitors

Business Solutions
Decisions Based on Facts
The Future is Now

### Legacy Individual Systems
- Stand-alone
- Reactive response to problems and circumstances
- Minimal analytics

Yesterday's world still predominates today

### Smart Individual Systems
- Equipment optimization
- Greater functionality
- Increased analytics
- More predictive operations and service

But individual Smart Systems are increasingly common

### System of Systems
- Coordination and integration across building systems to enhance value
- Mission-based applications

Interconnection is achieved on a project by project basis

### Converged Systems
- Multi-system design and configuration
- Common/shared parts of the technology stack
- Interoperable sensor network

Converged systems are clearly the future

### AI & Data-Driven Experience Management
- Smart Enterprises & Smart Cities
  - Ambient Intelligent for space, asset and people (e.g., AI-agent for all enterprise resources)
  - Event driven approach
  - Personalized experience
  - Bi-directional interactions with infrastructure
  - Share data across enterprise applications

Efforts to go beyond this level are nascent
Connecting the Dots

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- Digital Transformation
The Value Equation

Technology Partnership + Financial Structures

= Reduced operating expenses
= Improved business outcomes
= Potential revenue streams
One of the largest operating expenses for an airport is the utility and energy charges for the terminal and gates. Air conditioning, lighting, signs, flight information displays, gate information displays, wifi access points, televisions and plug loads all contribute to the energy demand. **Smart spaces can use intelligent sensors to adjust energy usage based on real-time occupancy.** They can predict which terminal and gates will be occupied at which times when integrated to the flight information systems.

### Owner ROI
- Reduced energy usage
- Operation expense savings
- Positive passenger experience
- Reduced maintenance and labor

### Owner Value
- Optimized environment and comfort
- Passenger Experience
- Increased staff efficiency and productivity
- Safety and security
- Environmental Stewardship

### Outcomes and Benefits
- Positive passengers experience
- Increased Safety and security

### Enabling Technologies
- Building Automation System
- Access Control
- Video Management System
- Flight Tracking and Gate Management
- Lighting Controls System
- Plug Load control
Delivering Key Outcomes
Our advanced enterprise platform collects, analyzes, and visualizes your enterprise buildings data so you can advance your insights to action.

- Reduce Energy Consumption & Spend
- Demonstrate Payback on Building Investments
- Understand Utility Consumption and Spend
- Make Informed Capital Planning Decisions
- Proactively Diagnose and Resolve Issues
- Improve Tenant Management Experience
- Identify Spend Hotspots and Strategize Budget Utilization
- Achieve sustainability goals and stay compliant
- Demonstrate Payback on Building Investments
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Connecting the Dots

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Data is key to AI-enabled applications & better outcomes, experience.

Architecture, BIM, Design

HVAC, Fire Safety, Security

BAS, Lighting, Power

OT (Operational Tech)

IT (Information Tech)

- 5G
- Hyper Converged Unified Infrastructure
- Network Infrastructure
- IT Applications

Platform (Digital Vault)

Applications

A.I.

Better Outcomes. Better Experiences

✓ Wellness
✓ Productivity
✓ Social Interaction
✓ Community Innovation
Solution assets that span end-to-end, from edge-to-cloud, technology and applications

**JCI Solution Integrations**

- JEM, Tyco Cloud, CCS, CPO
- Athena, Companion

- Tyco cloud infrastructure, Digital Vault & JEM infrastructure

- JCI Cloud platform, Integration hub, API Management Layer

- JCI Cloud Applications

**JCI On-Premise Applications**

- On-premise Integration Hub/Platform

**JCI Products**

- Fire Panels
- Chillers
- Boilers
- Actuators
- Cameras
- Access Control

**3rd Party Appliance Products**

- Siemens
- Honeywell
- Schneider Electric

**Semiconductors, Sensors, and Intelligent Devices**

- Dell
- Arm
- PLC
- Intel

**On-Premise**

- Crossfire+,
- DEB Software defined Gateways,
- Metasys tier 3, C-Cure and Victor Gateways

**Cloud**

- JCI Cloud platform, Integration hub, API Management Layer

- JCI Cloud Applications

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Airport Operations Database/Gate Sharing/Other IT

- **Prepare** for future growth
- Manage common use gate utilities in conjunction with operations
- Control your environment based on usage
- Extend hardware life through managed connected systems

<table>
<thead>
<tr>
<th>Feature</th>
<th>System</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVAC and airflow optimization</td>
<td>Building Automation System</td>
</tr>
<tr>
<td>Real-time occupancy detection</td>
<td>Building Automation System</td>
</tr>
<tr>
<td>Flight tracking</td>
<td>Flight Tracking/Gate Management</td>
</tr>
<tr>
<td>Lighting control</td>
<td>Lighting control system</td>
</tr>
<tr>
<td>Window shade control</td>
<td>Shade controller system</td>
</tr>
<tr>
<td>Plug Load control</td>
<td>Intelligent plug load system</td>
</tr>
<tr>
<td>Flight information displays/computers</td>
<td>Flight management system</td>
</tr>
<tr>
<td>Personalized message</td>
<td>Digital Signage</td>
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</tbody>
</table>
Use Cases

- **Passenger**
  - Waiting for flight at gate
  - Gate detects number of people in gate area

- **HVAC/Air flow adjusted based on number of people**
- **Windows shades adjusted to optimize solar heating and brightness**

- **Airport Energy Manager**
  - Sets up public dashboard to communicate airport energy savings to passengers
  - Can review real-time energy usage and occupancy

- **Energy savings can pay for other improvements**
- **Can set lighting and HVAC appropriate for cleaning when unoccupied**

- **Passenger**
  - Flight arrives after hours or late to gate
  - System detects delayed flight from flight tracking system

- **Gate is switched to occupied 10 min prior to arrival**
- **Airflow preset to anticipate number people**

- **Passengers disembark to a well lit, comfortable gate**

- "It's really comfortable in here"
- "We're saving so much energy!"
Connecting the Dots

- Business Outcomes
- Data, Data, Data
- Digital Transformation
- Partnerships
- From Idea to Reality
- Procurement
Technology Lifecycle Partnership

**MASTER PLANNING**
- Establish Vision
- Outcome Based Technology Systems Roadmap
- Pre-Design Services
- Art of the possible
- Ideation Sessions with Key Stakeholders
- Pre-Design Budgeting
- Develop an IGMP & Technology Systems Agreement

**DESIGN ASSIST**
- Provide Consistency between Design Docs
- Identify and Eliminate Scope Gaps and Duplications
- Recognize Cost Efficiencies and Areas for Savings using Common Infrastructure
- Ensure Technology Systems Standards are Maintained
- Provide Budget Revisions throughout Design Process
- Leverage JCI Technology Ecosystem
- Align Design with Desired Outcomes

**PRE-CONSTRUCTION SERVICES**
- Establish Open Book Collaborative Project Cost Model
- Develop Final Construction Documents
- Create Coordination Matrix
- Establish Final GMP
- Incorporate Safety Plan in Compliance with Owner and Contractor Requirements

**CONSTRUCTION SERVICES**
- Provide Single Point of Responsibility for All Technology Systems
- Build Project Execution Plan
- Develop Project Schedule
- Leverage Diverse Supplier Strategies to include Local Businesses
- Selection of Subcontractors and Vendors
- Conversion of GMP to Lump Sum (if applicable)

**PROJECT TURNOVER**
- Commissioning of all systems
- Validate all Integrations
- Provide Final Technology Systems Documentation
- Identify Training Needs
- Outline Warranty Plans

**TECHNOLOGY SERVICES**
- Identify Owner Staffing Plan & Resources vs. Facility Needs
- Provide Customized Service Options to meet Facility and Client Needs
Which part of the process gives you the biggest headache?
### Johnson Controls | Connected Technologies
#### The Industry’s Partner of Choice

<table>
<thead>
<tr>
<th>Professional Services</th>
<th>Streamlined Construction</th>
<th>Digital Solutions</th>
<th>Refined Ecosystem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your needs met through the construction process</td>
<td>130 years of construction expertise &amp; learning</td>
<td>Collect data using building, business, &amp; specialty systems</td>
<td>Trusted partner within construction community</td>
</tr>
<tr>
<td>Prioritize and gain consensus on infrastructure needs</td>
<td>On time. On budget. Above expectations.</td>
<td>Use AI &amp; machine learning to make or support decisions</td>
<td>Trusted partner within technology community</td>
</tr>
<tr>
<td>Make your building work for you</td>
<td>Reduce or eliminate risk</td>
<td>Achieve the outcomes that fuel your mission.</td>
<td>Leverage to deliver your business outcomes</td>
</tr>
</tbody>
</table>

**Outcomes**

- **Speed**
- **Technology**
- **Trust**
Refined Ecosystem
Customers leverage our products & a network of partners for SMART solutions

ECOSYSTEM VALUE
- Best-of-breed partners
- Technology agnostic
- Proven, repeatable processes
- Vertical market specialization
- Reduced first and lifecycle costs

PARTNER VALUE
- Most current technology refresh & future technologies
- Highly trained & qualified
- Strategic procurement, logistics, pricing, fulfillment
- Labor diversification strategies

The market leader in SMART enabling technologies and connected environments
Connecting the Dots
Digital Infrastructure and Construction

- Traditional technology construction has focused on schedule, first costs, risk mitigation and **building** outcomes.

- Johnson Controls SMART technology approach requires thinking about the experiences and interactions people will have with the building **business** outcomes.

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**Traditional Construction Approach**

- **BUILDING SYSTEMS**
  - HVAC, Security, Fire, Lighting

- **BUSINESS SYSTEMS**
  - IT Network, DAS, WiFi, AV Systems

- **VERTICAL MARKET SYSTEMS**
  - Visitor, Parking, Elevator, RTLS, POS

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**Johnson Controls Technology Professional Services Approach**

- **BUILDING SYSTEMS**

- **BUSINESS SYSTEMS**

- **VERTICAL MARKET SYSTEMS**
Technology Contracting
Reduces cost, project risk, eliminates scope gaps & enables convergence

- Architect
- Consultants
- Owner
- General Contractor
- Technology Contractor
- Mechanical Contractor
- Electrical Contractor

- Hot Water System
- Chilled Water System
- Air Distribution System
- Mechanical Equipment
- Sanitary System
- Fire Suppression
- Domestic Water
- Thermal Storage

- IT Network
- Mechanical Systems Integrations
- Building Automation
- Electrical Systems Integrations
- Mechanical Control Systems
- Fire Alarm System
- Lighting Control System
- Integrated Security System
- Smoke Control Systems
- Power Management & Assurance

- Specialty Technology Systems
  - RTLS
  - PA System
  - DAS
  - CUBE
  - Network Hardware
  - Wi-Fi Devices/Infrastructure
  - Point-of-Sale Devices
  - CATV
  - VOIP
  - LAN
  - Wayfinding
  - Video Conferencing
  - Audio/Visual
  - UPS System
  - BMS
  - MUFIDS/BIDS/GIDS
  - Digital Signage

- High Voltage Distribution
- Medium Voltage Distribution
- Electrical Equipment
- Emergency Power Generation
- Lighting & Cathodic Protection

Providing Design Assist services

Single source responsibility

Building, Business & Specialty Systems
Leveraging technology to impact first & lifecycle costs

Key drivers of waste in the traditional model

- Redundant materials: 3-4%
- Duplicate labor: 2-3%
- Potential delays and lost revenue in building completion due to integration errors
- Change orders to integrate disparate systems
- Loss of procurement benefits

Estimated waste

- Common cabling and wiring for all low voltage systems, reduces amount of material
- Integrated project management and minimized integration efforts after implementation, reduces labor
- Upfront integration and issue resolution prior to implementation, reduces sources of errors and change orders
- Johnson Controls volume and competitive bid process helps procure these systems for lower prices

TOTAL WASTE IN PROCESS: 8-12%

SOURCE: McKinsey & Company, customer interviews; team analysis
Connecting the Dots

- Business Outcomes
- Data, Data, Data
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- Procurement
- From Idea to Reality
- Digital Transformation
BUILDINGS ARE COMPLEX // LET’S NOT MAKE THEM MORE COMPLICATED

Key Outcomes

Predictive Maintenance

Energy Intelligence

Carbon Neutral

Utility Smart
Holistic solutions designed for an airport

Business Innovation Through Holistic Designs
A Major Airport Building Technology Topology Example
What do you envision for your airport?

*Think: Data, Outcomes, Partnership, Procurement, Traveler Experience*
A destination location
Making the airport of the future now

The Smart Micro City

- Safe
  - Frictionless
  - Intelligent

Business Optimized

- Intelligent
  - Insightful
  - Targeted

- Welcoming
  - Concierge
  - Omni-Experience

Customer Focused

- Destination
  - Just-in-Time
  - Business Oriented

- Sustainable
  - Green
  - Carbon Neutral

Ramsey Nuwar, Vertical Market Director – Airports, Johnson Controls // Ramsey.Nuwar@jci.com
Data is the fabric of the modern airport
Knowing the next best action is the new normal

Ramsey Nuwar, Vertical Market Director – Airports, Johnson Controls
Ramsey.Nuwar@jci.com